

THE END OF THE CORNUCOPIAN* DELUSION

We don't see things as they are, we see them as we are..

Anais Nin

How long will researchers working in adjoining fields . . . abstain from expressing serious concern about the splendid isolation in which academic economies now finds itself?

Wassily Leontief, 1982
Nobel Laureate in Economics

At least half the human population has not experienced anything close to the cornucopian experience and lifestyle. However, many believe that the cornucopian dream can be theirs if they can get to a place, such as the United States, where others appear to be living the dream, even though evidence shows that the Industrial Age and all its material benefits are ending. Even the recipients of the cornucopian fulfillment of their desires may have trouble deciding whether it is a blessing or a curse. McCarthy (2007) quotes a report of the National Petroleum Council that urged cutting back on oil consumption, which should serve as the ultimate wake-up call about a looming energy crunch. Cheap oil has fueled the Industrial Revolution, which made abundance of material goods and food possible. Now that era is ending, and humankind has delayed preparing for the post-industrial world too long.

One would never come to the conclusion that the privileged component of humankind has abandoned the cornucopian delusion from listening to the "debate" about reducing greenhouse gas emissions – at least, not if economic growth is viewed from an anthropocentric viewpoint. Resistance is strong to an attempt to reduce greenhouse gas emissions that *might* adversely affect the economy. However, inadequate attempts are being made to reduce greenhouse gas emissions to protect climatic conditions that have been remarkably favorable to *Homo sapiens* for approximately 160,000 years and the genus *Homo* for about 1 million years. The species that collectively make up the biospheric life support system, which maintains these favorable conditions, are also vulnerable to climate change, and a large percentage of these favorable conditions may be lost in the 21st century. As Hansen *et al.* (2007, p. 1938) note, about one fourth of fossil fuel CO₂ emissions will remain in the air more than 500 years. No "silver bullet" (i.e., rapid fix) is available for the atmospheric gas imbalance now being created. Hansen *et al.* (2007, p. 1939) state:

Given the estimated size of fossil fuel reservoirs, the chief implication is that we, humanity, cannot release to the atmosphere all, or even most, fossil fuel CO₂. To do so would guarantee dramatic climate change, yielding a different planet than the one on which civilization developed and for which extensive physical infrastructure has been built.

In short, humankind would be creating an alien planet (Cairns 2007). Hansen *et al.* (2007, p. 1939) further state that estimated oil and gas reserves, with only modest further use of coal, are sufficient to bring atmospheric CO₂

**cornucopia* (i.e., the horn of plenty) – the symbol of food and abundance (i.e., the property of being extremely abundant). In Greek mythology, Amalthea raised Zeus on the milk of a goat. In return, Zeus gave Amalthea the goat's horn, which had the power to give the person in possession of it whatever he or she wished.

to approximately 450-475 ppm atmospheric concentration. In addition, this scenario includes the need to phase out coal use, except where the CO₂ is captured – unlikely if present and contemplated energy uses prevail. Most important, Hansen *et al.* (2007, p. 1949) propose that Earth will be in imminent peril if initiation of

dynamical and thermodynamical processes on the West Antarctic and Greenland ice sheets, which will produce a situation out of humanity's control with a devastating sea level rise, are not avoided. The authors further note that the gravest threat they foresee starts with surface melt on West Antarctica and interaction among positive feedbacks leading to catastrophic ice loss.

This information is recent and disturbing and provides evidence that Earth's abundance, in human terms, is already declining. However, the older list of climate change consequences (e.g., drought, expanded range of many diseases, reduced freshwater for both municipal and agricultural use) was already cause for concern. The words *imminent peril* add a heightened sense of urgency not previously present. Humankind should have a strong interest in preserving a planet resembling the one on which civilization developed. The present administrator of the US Environmental Protection Agency observed that humankind does not know that the present climate is optimal (ABC News 2007). This observation is true, but the climate has been satisfactory for *Homo sapiens* for 160,000 years and for the genus *Homo* for over a million years. Observed climate changes are much less satisfactory in many areas of the world, and some appear to be unsuitable. As greenhouse gas emissions increase, the rate of change will increase until humankind reaches one or more tipping points, beyond which situations will develop that humankind cannot control.

As the United States approaches an array of ecological and societal tipping points, efforts are being made to avoid reaching them. One effort was the Congressional bill to have 15% of electricity generated with renewable energy by 2020. The so-called Renewable Energy Standard (RES) was nearly undermined by Senator Pete Dominici, who wanted coal and nuclear power in the mix, but failed to get enough votes. Then, Senator James Inhofe held up the bill until it was too late for a vote on the bill and the over 100 amendments attached to it (Dorner 2007). The RES is now moribund for a time. All delays to cope with either the energy or climate crisis increase the probability of crossing one or more tipping points and/or thresholds and, thus, diminish the probability of survival for human society as it now exists and, in the worst case scenario, threaten the survival of the human species.

In contrast, in spring 2007, the US Government Accountability Office finally concluded that peak oil is real, although M. King Hubbard proposed peak oil in 1956. The GAO not only concluded that peak oil is real but also that, if it occurs soon, it could cause a worldwide recession.

Will Economic Growth Survive if the Biospheric Life Support System Fails?

One previously offered idea is that greenhouse gas emissions cannot be reduced because the course to reduction might have adverse effects upon the economy. At present, that situation is slowly beginning to change. However, Gelbspan (2007) remarks:

Humanity is standing at crossroads between a more just, peaceful world and an increasingly chaotic, turbulent, and authoritarian future driven by a succession of climate-driven emergencies. We could find ourselves struggling to survive a desolate era of climate hell marked not only by a degraded and fractured society but also by more authoritarian governments.

Gelbspan makes other important points:

- (1) *The private, corporation forces that have produced the climate emergency are powerless to cure it.*
- (2) *Humanity must cut its use of coal and oil worldwide by about 80 percent in a very short time by shifting to clean energy.*
- (3) *The technical remedies favored by the big energy companies are mostly the wrong ones, such as "clean coal" and mechanical carbon sequestration.*
- (4) *What's required is significant government action, and on a global scale.*
- (5) *The United States, as the world's most disproportionate energy consumer, is in a position either to lead an energy transition, or to thwart it.*
- (6) *In 2004, the insurance industry giant, Swiss Re, noted: "There is a danger that human intervention will accelerate and intensify natural climate change to such a point that it will become impossible to adapt our socio-economic systems in time.*
- (7) *Looking at the transformative economic and political potential of a clean energy future, one can feel very optimistic. What injects a feeling of pessimism, however, is both the looming imminence of runaway climate change and the dismal lack of leadership by U.S. politicians of both parties.*

The Future of *Homo sapiens*

Focusing primarily on the health of the human economic system is clearly a “tunnel vision” approach. The biggest shift humankind must make is from an anthropocentric to an ecocentric perspective. If humankind does not focus on the health and integrity of Earth’s biospheric life support system, the human race will continue to be in grave danger and may not even survive. However, Hawken (2007, p. 1) describes the groups that gathered after one of his talks as follows:

These people were typically working on the most salient issues of our day: climate change, poverty, deforestation, peace, water, hunger, conservation, human rights. They came from the nonprofit and nongovernmental world, also known as civil society. They looked after rivers and bays, educated consumers about sustainable agriculture, retrofitted houses with solar panels, lobbied state legislatures about pollution, fought against corporate-weighted trade policies, worked to green inner cities, and taught children about the environment. Quite simply, they had dedicated themselves to trying to safeguard nature and ensure justice.

These people are the ones upon whom future scenarios should be based – I hope there are enough of them on the planet!

Basic Assumptions for My Future Scenario

My future scenario is based upon the following assumptions.

- (1) No major remedial measures will be taken to reduce greenhouse gases until one or more climate tipping points have been passed and climate change is beyond human control.
- (2) Humankind will not take drastic measures to preserve the remaining petroleum reserves until supply has become too insufficient to make a graceful transition to a low energy global society.
- (3) Economic growth will continue to be humankind’s primary goal until at least 2015.
- (4) The human population will not be stabilized by social action but will be by natural, limiting factors (e.g., starvation and disease).
- (5) Present resource wars will continue until at least 2015, using precious resources to continue fighting rather than sharing resources.
- (6) The environmental refugee problem will become severe, perhaps unmanageable, because of both inaction on climate change and inadequate prior planning.
- (7) Governments will, in some cases, block or delay state or regional efforts to address greenhouse gas emissions from automobiles as the US Environmental Protection Agency is now doing in the case of California and other US states that are making efforts to improve on federal standards.
- (8) Since humankind is faced with a global crisis unprecedented in human history, stochastic events (random or probabilistic but with some direction; synonym of *random* and counterpart of *deterministic*) will occur. Creative groups must be assigned to remediate these events, which may require immediate attention, even though they were unexpected.
- (9) A pandemic disease that disrupts global society for at least six months will probably disrupt human society including health.

This manuscript will seem both frightening and new to many people. However, although I feel a sense of horror about these distressing events, this news is not new. In November 1992, The Union of Concerned Scientists issued a “World Scientists’ Warning to Humanity” (Scientist Statement 1992). I was one of the over 1670 scientists who signed the document, and the signers included 104 Nobel laureates. The primary thrust of the message was that not more than one or two decades remained before the opportunity to reduce the threats now present will be lost and the prospects for the future of humankind will be immeasurably diminished. As one of the signers from Southwest Virginia, I expected at least one phone call from the news media – none came. In fact, the warning received very little attention. Now, over a decade and a half later, events have proved that the issuance of the warning was justified, despite the lack of attention it received. Even though huge amounts of robust data have been generated since 1992, the general public still lacks the necessary sense of urgency needed to make a major reduction of risk in the time remaining. One idea is that the more distant a problem is perceived to be in time or space, the less interest the average individual has in it. Clearly, humankind’s attitude is inappropriate for the global problems that, if not corrected, will have a major deleterious influence on posterity. Starvation and inadequate health care in third world countries will probably not arouse adequate concern in a

developed country that has significant numbers of starving people and inadequate health care for its own citizens.

Peak Oil and Economic Growth

As Duncan (2007) notes, the life expectancy of the industrial civilization is about 100 years. He estimates it reached a critical stage about 1930 and may end about 2030. Duncan includes an excerpt from a letter written by Walter Youngquist on March 20, 2006:

As the British historian, Toynbee, wrote 'The U.S. will set a record in the rate of rise and fall of an empire.' Between wide open borders and fall of the dollar and growing population against a declining resource base, the United States will be defeated from within. Mobs will rule the streets in the nation that is now the third largest in the world – right behind China and India – and unable to support its population except by taking resources from other countries.

Campbell (2005, p. 315) states: “We will have to change the way we live as (oil) production declines toward eventual exhaustion.” Since the human economic system depends on cheap oil and a stable society, things do not look promising for a system based on economic growth.

Walter Youngquist, a geologist, and Richard Duncan, Director of the Institute on Energy and Man, have made a series of ten forecasts of world oil production – one per year over ten years (Duncan 2007). One of the forecasts put the world peak at 2005; two put it at 2006, six at 2007, and one at 2008. The exact year matters short term, but long term, what matters is when advance planning to cope with this major event began. Brazil began such planning three decades ago; Europe was not far behind; and the United States has barely started, and many of its “plans” depend on unproven technologies (e.g., carbon sequestering). Deffeyes (2003) discusses the world oil shortage in some detail. In the US Congress, discussion on biofuels and more energy efficient automobiles has been plentiful; however, discussion is lacking on how roads and parking lots paved with asphalt will be maintained when oil becomes scarce (Walter Youngquist, personal communication). As Youngquist points out, asphalt is the “bottom of oil refining operations and one cannot pave roads with ethanol, biodiesel, or hydrogen.” Youngquist maintains that humankind has been enjoying the “oil interval” – a brief, bright, “blip” in human history. This era will be missed. Will the fragile economic system that must be protected, even above the biospheric life support system, survive the loss of fossil sunlight (oil and coal)?

As Tainter (1996) notes: “Systems of problem solving develop greater complexity and higher costs over long periods. In time, such systems either require increased energy subsidies or they collapse.” Presumably, this statement applies to both economic systems and the nation-states that protect them. Tainter (1988) remarks that the factors that cause societies to collapse take centuries to develop. Arguably, the cluster of problems (global heating and other types of climate change, exponential increase in human population size, peak oil, coal burning pollution, ecological overshoot, and oceanic acidification) is humankind’s greatest challenge. Certainly, the loss of the planet’s favorable (to humans) biospheric life support system is an apocalyptic threat more serious than damage to the human economy. However, Tainter (1995) notes that many aspects of human behavior appear to be complexity averse. After all, humans evolved as a small-group species and, only recently in evolutionary time, have over 50% lived in huge cities and depending on outside sources for food, energy, and housing. Since much of the world’s food supply depends on a suitable climate and adequate but not excessive rainfall, climate change will threaten it. In addition, food conversion (e.g., corn) to fuel threatens the food supply of the poor. Finally, energy is essential to preserve the food and transport it from the source to the consumers. The 24% ecological overshoot is persuasive evidence that humankind has already exceeded Earth’s carrying capacity. When, if ever, greenhouse gas emissions will be reduced or to what level is unknown, so estimating future climate conditions is impossible. They probably will not be as favorable to either humans or agriculture as they were for most of human history. As Kunstler (2005, p. 7-8) notes, the journey back to non-oil population homeostasis will not be pretty.

Hansen (2007) remarks that animals and plants are adapted to specific climate zones, and they can survive only in those zones. Of course, as long as cheap energy is available, *Homo sapiens* is the only species that need not adapt. However, if one regards the human species as a part of an interdependent ecosystem, this advantage is not as attractive as it initially appears. As Flannery (2006) points out, 70% of all people alive at present will still be alive in 2050. As a caveat, I add: unless mass mortality results from a pandemic disease, starvation, or nuclear warfare, to mention a few unattractive possibilities. Flannery is hard on his country of

Australia, but the United States is no model either. He notes that, some time in the 21st century, the time will arrive when human influence on the climate will overwhelm all other natural factors.

Encouraging reports indicate that animals and plants are moving into the new climate zone (i.e., isotherm), but to expect all the species of an entire interdependent ecosystem to move and flourish simultaneously is irrational. As a consequence, natural capital and the ecosystem services it provides will initially suffer a major loss. Also, since the rate of climate change driven by human activities is much greater than natural climate change, preserving both natural capital and ecosystem services will be a difficult ecological problem.

Foraging vs Traditional Agriculture

The fact that at least some species are colonizing new areas with warmer temperatures is good news. However, just as whole ecosystems cannot move as a unit to new areas, neither can agricultural systems. In addition, property lines and state and national boundaries become a problem. Added to this problem is a highly probable, global food shortage enmeshed in a conflict between the use of corn for food or fuel (e.g., Cairns, in press). A balance must be achieved between targeted compassion for motorists and multidimensional compassion for those who use grain for food (Cairns 1998). Costanza *et al.* (1996) discuss the practical issues of ecological economics, and a superb summary of the biofuels issue is presented in Runge and Senauer (2007). Holt-Giménez (2007) presents a somewhat different perspective in an overview paper. In the worst case scenario, severe food shortages will result in anarchy and resource wars, neither of which is likely to result in economic growth and which are more likely to result in a depression.

Those Blessed by the Cornucopia

Uchitelle(2007) reports that only twice before over the last century has 5% of the national income gone to families in the upper 1/100th of 1% of the income distribution – currently, the almost 15,000 families with incomes of US\$9.5 million or more per year (according to an analysis of tax returns by the economists Emmanuel Saez at the University of California, Berkeley and Thomas Piketz at the Paris School of Economics). Uchitelle (2007) compares the present era with the prosperous period before World War I and notes: “The new titans often see themselves as pillars of a similarly prosperous and expansive age, one in which their successes and the philanthropy have made government less important than it once was. He also quotes a former US Federal Reserve Board chairman, Paul A. Volcker, who said in an interview, challenging the contentions of the very rich that they are the driving force of a robust economy, that he did not see a relationship between the extremes of income now and the performance of the economy.

However, the quotation of the day in the 5 August *New York Times* provides yet another viewpoint:

I know people looking in from the outside will ask why someone like me keeps working so hard. But a few million doesn't go as far as it used to. Maybe in the '70s, a few million bucks meant "Lifestyles fo the Rich and Famous," or Richie Rich living in a big house with a butler. But not anymore.

Hal Steger, a Silicon Valley millionaire

In addition, the process of becoming a billionaire may be very damaging to the environment. As Hurowitz (2007) notes

But many of these capitalist converts need watching. While Wall Street's eco-splurge has generated a flood of financing for legitimately clean ventures like wind and solar powers, it's also spawned extremely dangerous projects that are painted green by their unscrupulous backers, but that at their core are as black as, well, coal.

Conclusions

Bartlett (2006) remarks that the term *sustainable growth*, as used by political leaders (i.e., applied to material things), is clearly an oxymoron. He emphasizes that the idea of *sustainable* has to mean “for an unspecified long period of time.” He also emphasizes that humans must acknowledge the mathematical fact that exponential growth gives very large numbers in modest periods of time. Endless economic growth that depends on natural resources of any kind is irrational because, as Meadows et al. (1972) note, factors exist that inevitably limit growth. Hubbert (1972) has established that, for a non-renewable resource (e.g., petroleum), the

expected date of the peak production of the resource can be estimated. After peak oil, the industrial society will be unable to avoid a terminal decline since it was based on cheap energy. Duncan (2007) estimates that peak oil will be reached in 2007. As McCarthy (2007) remarks: "When executives from the world's largest oil companies say we need to cut back on our consumption, it should serve as the ultimate wake-up call about a booming energy crunch."

Humankind is facing the biggest challenges in history – peak oil, global climate change, and exceeding Earth's carrying capacity for humans simultaneously. If the present, profligate fossil fuel energy use is continued, carbon dioxide levels will be approximately twice their value in the past 670,000 years. The human population expanded from between 1.6-1.7 billion in 1900 to 6,612,087 on 10 July 2007. This huge increase in population was made possible by cheap, readily available oil, useful in large scale agriculture, for fertilizer, and for long-range transport and storage. The same biospheric life support system has had to provide suitable conditions and resources for nearly four times as many people in 2007 with far more stresses and damage than it endured in 1900. Most statements that humankind should not decrease greenhouse gas emissions come from politicians with poor or no credentials in the field of economics. In contrast, a statement by 25 of the world's leading economists, including both a number of Nobel laureates in economics and former members of the US President's Council of Economic Advisors, emphasizes that the United States should move to control greenhouse gas emissions (Statement 2005). Ackerman and Stanton (2005) believe the costs of inaction could be as high as US\$74 trillion. Morales (2007) quotes Sir Nicholas Stern (Select Committee on Economic Affairs 2005) as saying that the cost might be US\$9.6 trillion.

Clearly, the economic costs of inaction are very high. The loss of human lives is not easily measured in dollars, but would be unacceptably high if apathy and inaction are the responses of humankind to global heating.

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