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Tribal to Global: Can Humankind Make the Transition in Time?

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Abstract : Earth is changing rapidly to a hostile, alien planet. Humankind is using natural resources over 30% faster than Earth can regenerate them, and 215,000 more individuals are added to the global population every day. Species are being driven to extinction at a rate unprecedented in human history, and, yet, no real sense of urgency has emerged. Plans are made to take remedial measures by 2025 or 2050 or some other future date, as if no climate, food, energy, or population crises exist. Still, the outdated mind set and inappropriate use of resources continue. Sequestered carbon in fossil fuel safely underground is brought to the surface and burned, increasing global greenhouse gas emissions. These activities are suicidal and are not the path to achieving a global system favorable to human occupancy for many generations.

Key words : Carrying capacity, Ecolate perspective, Global food shortage, Exponential population growth, Assimilative capacity, Civilization collapse.

Most men occasionally stumble over the truth, but most pick themselves up and continue as if nothing had happened.

Winston Churchill

It is evident that the fortunes of the world's human population, for better or for worse, are inextricably interrelated with the use that is made of energy resources.

M. King Hubbard

If we don't get it right this time and we punt it 10 years further down the road, in 10 years all we're going to be doing is figuring out how to adapt to change. And it doesn't look at the moment that it's going anywhere near far enough. **Bill McKibben**

Few men realize that their lives, the very essence of their character, their capabilities and their audacities, are only the expression of their belief in the safety of their surroundings.

Joseph Conrad

The principles of population biology and comparative zoology that have worked so well in explaining the rigid systems of social insects could be applied point for point to vertebrate animals.

E. O. Wilson

Anyone with even a modest understanding of exponential growth should be aware that a continual growth rate of merely 1% per year of human population will have catastrophic consequences on a finite planet —shockingly, no robust, global discussion is occurring on this issue. As a result, no significant efforts are being made to eliminate this problem. If present trends continue, rapid climate change will add additional catastrophic consequences. Global discussion has begun at least on climate change, although effective countermeasures have not yet been implemented. Persuasive evidence indicates that the global human population has already exceeded Earth's carrying capacity (i.e., ecological overshoot). Approximately one-half of Earth's human population is either starving or malnourished, is lacking adequate

medical care, is poorly housed, and is lacking safe drinking water, while approximately 1% of the global human population enjoys unprecedented wealth. Does humankind wish to have even more people at a subsistence level or would a much smaller human population enjoying a quality life within the planet's carrying capacity be a superior objective? Some aid from developed countries to developing countries has not produced desirable results, and some subsidies within both developed and developing countries have produced perverse results. The biospheric life support system, which has maintained a climate favorable to the genus *Homo* for approximately two million years, has already been severely, possibly irreversibly, damaged by present human numbers and lifestyles. In addition, many species, which collectively comprise the planet's life support system, have been driven to extinction. One species, *Homo sapiens*, has been too "successful," and this high energy/technological success threatens civilization. Addressing these complex issues will require: (1) literacy, (2) numeracy, and (3) an ecolate (i.e., systems level) perspective.

On 7 April 2008, the world human population total was 6,659,805,879 (http://www.census.gov/main/www/popclock.html). In 1963, the growth rate of the world human population was 2.2%. In 1750, the world human population was estimated at 791 million. About 70,000 years ago, the eruption of super volcano Mount Toba drew a curtain between Earth and the sun, and a thousand years of the Ice Age began. Humans were nearly wiped out, and their numbers are estimated as low as 10,000–40,000 (http://www.starch.dk/isi/energy/population.htm). When agriculture growth, including domestication of animals and plants, began about 10,000 years ago in Mesopotamia, the carrying capacity of the planet for humans increased dramatically over the numbers in the hunter/gatherer tribes of the genus *Homo*. Agricultural changes made possible the production of more food per capita than the hunter/gatherer obtained, and, thus, enough food was available for a hierarchal society. A few thousand years later, the Industrial Revolution, using fossil sunlight (petroleum, coal, natural gas), provided benefits to humankind through a substantial increase in available per capita energy. Access to resources was dramatically improved because of an energy-based technology. The emerging field of agribusiness used a variety of machines to prepare the soil and harvest the grain — even the fertilizer came from petroleum. Coal provided energy for transportation and heat. These advances allowed the global human population to rise to approximately 1.6 billion in 1900. The current human population, just over 100 years later, is approximately four times this figure. The global human population has more than doubled in the average American citizen's lifespan. Doubling the human population anywhere on the planet means doubling the food supply, the capacity of the medical and educational systems, the energy supply, housing, police forces (including jails), highways, water supplies, transportation, sewage disposal, and other infrastructure components. All this increase is needed just to maintain the existing standard of living. With the global human population increasing at 1.5 million per week and ecological overshoot increasing by at least 1% per year, the present standard of living is unlikely to be maintained.

Assimilative Capacity

Assimilative capacity is the ability of natural systems to assimilate wastes of human and other species without observable harm (Cairns, 2008). Until the Industrial Revolution, wastes (output) of all species in natural systems were the resource (input) of a variety of other species. However, industrialization created wastes that were both qualitatively and quantatively different. For most of the two

million years that the genus *Homo* has existed, Earth could assimilate the carbon dioxide produced by a variety of processes. Much of this carbon was sequestered in petroleum, coal, and natural gas; humankind later used technology to access this sequestered carbon and burned it, and much carbon dioxide was released into the atmosphere. At about 1850, global carbon dioxide emissions from fossil fuels were negligible, but they had risen to 1,000 million tons of carbon by 1925 and exceeded 8,000 million tons by 2000 (Moore, 2008).

Old growth forests traditionally have removed much carbon dioxide from the atmosphere and sequestered it in tree trunks and roots. Clearance of rainforests causes great destruction and releases high amounts of carbon into the atmosphere through burning. The main causes of the total clearance of rainforests are agriculture and, in drier areas, collection of wood for fuel (Position Paper, 2008). The circumpolar boreal forest, another great store of sequestered carbon, is threatened by climate change. The loss of these great forests will inevitably release carbon dioxide into the atmosphere, exacerbating what is already a crisis situation (Intergovernmental Panel on Climate Change Reports).

Energy and Population

Heinberg (2005) notes that an industrial civilization is based on consumption of energy resources that are inherently limited in quantity and that are quickly becoming scarce. Some persuasive evidence indicates that peak oil occurred in 2007, but the peak oil date is less important than the fact that the "easy oil" period is essentially over and a "tough oil" era has begun — oil is less accessible and much of the reserve oil is in the possession of politically unstable countries. This situation means that the cost of oil will be greater and the delivery more uncertain. However, optimism has arisen about coal as a substitute for petroleum, although coal is not as versatile as petroleum in producing such products as fertilizer and plastic. Reports from the Energy Watch Group in Germany conclude that growth in total volumes of coal can continue for 10 to 15 years (Heinberg, 2007). Three primary conclusions from these reports follow.

(1) World proven reserves (i.e., reserves that are economically recoverable at current economic and operating conditions) of coal are decreasing quickly.

(2) The bulk of coal production and exports is becoming concentrated within a few countries and market players, which creates the risk of market imperfections.

(3) Coal production costs are steadily rising all over the world due to the need to develop new fields, the increasingly difficult geological conditions, and the additional infrastructure costs associated with development of new fields.

Even if global heating were not a major environmental problem, global consumption of all fossil fuels should be reduced, especially coal, to avoid future shortages and price volatility until more solar and wind powered sources are on line. The present human society was built on energy, and the transition to lower per capital energy consumption should not be traumatic.

Food and Population

The classic publication of Reverend Thomas R. Malthus (1895) identified the basic problem of food and population: the increase in food supply is linear and population increase is exponential. For many years, technology and genetic engineering provided evidence that, in the short term, Malthus was wrong, although Paul R. Ehrlich (personal communication)

noted that, in the 1980s, 100,000 people died of hunger and hunger-related diseases. In addition, Cooper (2008) comments: "With the dramatic surge in the price of rice, corn, wheat and other basics, some experts predict the effects of a global food crisis are going to bite more quickly than climate change." What Cooper seems to have missed is that, arguably, climate change is the major factor in the food shortage because it has affected agricultural systems worldwide. Of course, diversion of corn to produce ethanol for automotive fuel has made matters worse and will continue to do so until alternative non-edible sources of fuel are developed and energy conservation and management are greatly improved. Hurst (2008) reports that food riots paralyzed Haiti and caused violence in Egypt in a two-week protest at government subsidized bakeries, which ended in the deaths of ten Egyptians in clashes with police. Rice is the staple food of 4 billion people, and the price for it, along with corn, wheat, and other basics, has surged by 40% to 80% in the last three years and has caused panicked uprisings in some of the poorest countries on Earth (Hurst 2008). The jump in global fuel prices has triggered a chain reaction in the entire food production system. The demand for meat has exploded in large nations such as China and India (Hurst, 2008). David Bell, Emeritus Professor of Environmental Studies at York University comments: "Critics have continually insisted that Malthus was too pessimistic. Humans would always find alternatives to resources that have been exhausted, they say, or develop new technologies to improve crop yield. But how far can substitutions go?" (Bell as quoted in Hurst, 2008).

Brown (2006, p. 5) states the current situation well: "The bottom line is that the world is in what ecologists call an 'overshoot-and-collapse' mode. Demand has exceeded the sustainable yield of natural systems at the local level countless times in the past. Now, for the first time, it is doing so at the global level." He (Brown, 2006, p. x) further notes: "Since virtually everything we eat can be converted into automotive fuel either in ethanol distilleries or biodiesel refineries, high oil prices are opening a vast new market for farm products." Brown (2006, p. 14) also prophetically states:

> The first big test of the international community's capacity to manage scarcity may come with oil or it could come with grain. If the later is the case, this could occur when China – whose grain harvest fell by 34 million tons, or 9 percent, between 1998 and 2005 – turns to the world market for massive imports of 30 million, 50 million, or possibly even 100 million tons of grain per year. Demand on this scale could quickly overwhelm world grain markets. When this happens, China will have to look to the United States, which controls the world's grain exports of over 40 percent of some 200 million tons.

Diamond (2005, p. 6) notes that past collapses of civilizations tended to follow somewhat similar courses, constituting variations on a theme. Population growth forced people to adopt intensified means of agricultural production (such as irrigation, double cropping, or terracing) and to expand farming from prime lands first chosen into more marginal land in order to feed the growing number of hungry mouths. Unsustainable practices led to environmental damage. The consequences for society included food shortages, starvation, resource wars, and overthrows of governing elites by disillusioned masses. One wonders what will happen now that globalization has occurred. Rose (2008) quotes Martin Luther King's last sermon: "Through our scientific and technological genius, we have made of this world a neighborhood and yet we have not made the

ethical commitment to make it a brotherhood . . . We must all learn to live together as brothers or we will all perish together as fools." Rose (2008) also quotes Mahatma Gandhi: "God forbid that India should ever take to industrialization after the manner of the West . . . If (our nation) took to similar economic exploitation, it would strip the world bare like locusts." Regrettably, humankind virtually ignored these words of wisdom, which would have put humankind on the path to a sustainable global community.

Diamond (2008, p. 87) notes:

> We regularly ignore the fact that the thirst for vengeance is among the strongest of human emotions. It ranks with love, anger, grief, and fear, about which we talk incessantly . . . There is no doubt that state acceptance of every individual's right to exact personal vengeance would make it impossible for us to coexist peacefully as fellow citizens of the same state. Otherwise, we, too, would be living under the conditions of constant warfare prevailing in non-state societies like those of the New Guinea Highlands.

However, in an era of resource scarcity, people will be tempted to steal rice and other food items from the plots of neighbors. Will these thefts provoke attempts at vengeance? Another consideration is geopolitical resource wars (Klare, 2008).

Ironically, present practices are widening the gap between the ultra-wealthy and those people living in crushing poverty. Worse yet, governments are playing a major role in this process because of concerns over energy security, but without calling on voters to change their consumption habits (Howden, 2008). Howden (2008) remarks that the real story of ethanol in Brazil is one of energy security, not climate change mitigation. Brazil's tropical climate allows it to source alcohol from its sugar crop — this process is as carbon efficient as any in the world (Howden, 2008). This process is contrasted (Howden, 2008) with the practice of converting corn into ethanol in the United States (with substantial government subsidies) — a process that releases more carbon dioxide per gallon than from simply burning conventional fuels. However, robust evidence indicates that massive investments in biofuels by developed countries are helping to cause a food crisis for the world's poor (Milmo, 2008). A major ecological cost also results from the push to produce millions of gallons of gas and diesel from plant material.

Monbiot (2008) has identified another component of the food crisis — food is plentiful, but it is just not reaching human stomachs. Of the 2.13 billion tons of food likely to be consumed this year, only 1.01 billion, according to the UN Food and Agricultural Organization (FAO), will feed people. The World Bank points out that "the grain required to fill the tank of a sports utility vehicle with ethanol . . . could feed one person for a year. Last year, global stockpiles of cereals declined by 53 million tons" (Monbiot, 2008). The production of biofuels this year will consume almost 100 million tons, which suggests that this production is directly responsible for the current food crisis (Monbiot, 2008). Monbiot (2008) further remarks that the United Kingdom (and he might have added the United States) is legally obliged to use food as fuel since the percentage of ethanol in automotive fuel is government mandated. Finally, 100 million tons of food will be diverted this year to feed cats; 760 million tons will be snatched from the mouths of humans to feed other animals. This use could cover the global food deficit 14 times (Monbiot, 2008). Weisman (2008) reports that the world's economic ministers declared that shortages and skyrocketing prices for food posed a potentially greater threat to economic and political stability

than turmoil in capital markets. However, Monbiot (2008) notes that humankind could resolve this issue by not using food for fuel and by eating less meat, but these solutions are short term if exponential population growth continues. Klare (2008) goes even further by stating: "The combination of rising demand, the emergence of powerful new energy consumers, and the contraction of the global energy supply is demolishing the energy-abundant world we are familiar with and creating in its place a new world order." How can humankind cope with this dramatically different situation?

The Ecolate Perspective

Hardin (1980) defines ecolacy as: ". . . the level at which a person achieves a working understanding of the complexity of the world, of the ways in which each quasistable state gives way to other quasistable states as time passes." He further notes: "The basic insight of the ecolate citizen is that the world is a complex of systems so intricately interconnected that we can seldom be very confident that a proposed intervention in this system of systems will produce the consequences we want" (Hardin, 1980).

The recent biofuels fiasco is a superb example of the consequences of failure to achieve an ecolate perspective. For example, the United States wished to decrease its dependence on foreign oil. Conservation, including fuel efficient cars and appliances, was one possibility in achieving this goal, but it was hardly discussed, although it had worked for Japan and Europe, which have good public transportation systems. Instead, US President Bush, with initial enthusiastic support of the US Congress, chose to use fuel (ethanol) produced from food (corn) as an answer. Food prices have soared (e.g., Klare, 2008), and no major reduction in dependence upon foreign oil has been realized. Production of some biofuels (e.g., palm oil) has caused major destruction of forests where much carbon was sequestered. The world population is still growing, but the world economy is not. A system (i.e., ecolate) perspective is essential in order for globalization to succeed. Hardin (1980) also notes that two other levels of education must accompany ecolacy — literacy and numeracy must be greatly improved. For example, what is the actual ratio of input to output energy when producing ethanol? What is the amount of carbon dioxide produced per unit of energy from petroleum and coal? Clearly, humankind is far from achieving an ecolate perspective.

Conclusions

After approximately two million years of functioning as a tribal species, humankind is attempting to function as a global community and, not surprisingly, is not making a good start on the transition. Petroleum, grains, and health care (to mention a few examples) are more costly almost daily, and global food shortages are occurring all over the planet. Lacey (2008) discusses the riots that have resulted from global food shortages. However, little mention is made of the 2.5 billion additional people expected to be added to the global population in this century. Where will the food, shelter, and medical care for these additional people come from? Lacey (2008) quotes Jeffrey D. Sachs, the economist and special advisor to the UN Secretary General, as stating: "It's the worst crisis of its kind in more than 30 years."

Berry (2008) remarks:

> Our national faith so far has been: "There's always more." Our true religion is a sort of autistic industrialism. People of intelligence and ability seem now to be genuinely embarrassed by any solution to any problem that does not involve high technology, a great expenditure of energy, or a big machine.

Who, after reading about the problems of the 21st century — overpopulation, food shortages, energy decline, climate change, species extinction, and severe financial difficulties — could assert that the transition from tribal to global is going well? However, *Homo sapiens* has been an adaptable species and might be able to be so again if the rate of climate change is slowed and climate stabilization returns at conditions favorable to humans. However, a major change in lifestyle based on an ecolate perspective will be essential to a successful transition, but, at present, the prospects for doing so are not good.

The global human population is still expanding exponentially, greenhouse gas emissions are increasing dramatically, humankind is using Earth's resources far faster than they are being regenerated, and all too many remedial measures have target dates of 2025 and 2050 for greenhouse gas emissions reduction. No credible plans are in place for stabilizing the human population within Earth's carrying capacity. Global grain stocks are at an all time low, which means that the world is only one poor harvest away from total chaos in world grain market (Brown, 2008). Economic globalization may be a reality, but societal globalization is not!

One short-term response to this emergency is to stop converting food to fuel and to diminish meat consumption. In the long term, the human population must be reduced so that it is within Earth's carrying capacity. However, long-term carrying capacity will be impossible to estimate until the climate returns to a quasistable state comparable to the one that existed before anthropogenic greenhouse gas emissions became a catastrophic problem. Formidable threats to civilization already exist. The time for remedial action is short, yet humankind has the potential to reduce these threats markedly.

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