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The Globalization of *Homo sapiens*

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Abstract : *Homo sapiens* began as a small-group species 160,000 years ago and remained tribal until the Agricultural Revolution about 10,000 years ago. Exponential growth began at that time and accelerated during the Industrial Revolution until, during the 20th century, the population doubling time was less than the human life span in some countries. In the latter part of the 20th century, the ecological overshoot rose to 24%, which meant humankind was exceeding Earth's carrying capacity. In addition, global heating and other types of climate change threatened to reduce food supplies, while population continued to grow. About one-half the population lived reasonably successfully in urbanized areas, although post-peak oil would probably make this undertaking more difficult. Most important, nations had not developed world governance to manage such problems as: (1) global heating and other types of climate change, (2) acidification of the oceans, (3) regulation of carbon dioxide [which affects both problems (1) and (2)] and other greenhouse gases, (4) stabilization of the human population within Earth's carrying capacity, (5) equitable and fair allocation of resources among humans and with the 30+ million other life forms with which humans share the planet, (6) management of the global commons, (7) requiem for reason. In order to address these global problems successfully, humankind must quickly develop global governance systems that transcend national limits so that the biospheric life support system is restored to and maintained in a healthy condition.

Key words : Ecological globalization, Carrying capacity, Greenhouse gases, Oceanic acidification, Biospheric life support system.

We're in a giant car heading toward a brick wall and everyone's arguing over where they're going to sit. **David Suzuki**

Individual advances turn into social change when enough of them occur. **Elizabeth Janeway**

Nature knows no indecencies; man invents them. **Mark Twain**

Humankind began 160,000 years ago as a small-group species spread thinly over the planet. Not only were the numbers small, but so was the rate of population growth. For thousands of years, humankind lived sustainably. Then came the Agricultural Revolution and the Industrial Revolution - the latter accelerated by fossil fuels. At present, the human population has exploded to nearly 7 billion, about one-half living in large cities. The planet's carrying capacity is a function of both numbers and lifestyle. However, the 24% ecological overshoot (Wackernagel *et al*., 2002) provides persuasive evidence that humankind has exceeded the planet's carrying capacity - resources are being used faster than they can be regenerated. Furthermore, the world is at or near peak oil, after which availability will decline rapidly. Biofuels, once touted as substitutes for petroleum, have substantial disadvantages (Brown, 2007; Cairns, 2007).

Global Heating and Climate Change

The third report of the Intergovernmental Panel on Climate Change

(5 April 2007) reached some very important conclusions!

(1) Global greenhouse gas (GHG) emissions have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.

(2) The largest growth in global GHG emissions between 1970 and 2004 has come from the energy supply sector (an increase of 145%).

(3) With current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades. For example, carbon dioxide emissions between 2000 and 2030 from energy use are projected to grow 45-110% over that period.

(4) Six scenario groups are possible, each with different assumptions (*e.g.*, very rapid economic growth) and outcomes (*e.g.*, preservation of local identities).

This complicated third report of the Intergovernmental Panel on Climate Change emphasizes various new technologies, but does not focus as intently on human lifestyle changes. The latter could be critical, especially in intensive energy-use countries (*e.g.*, United States), but ethics, equity, and fairness require a more equitable and fair allocation of resources or the poor countries might not participate in reducing the rate of climate change.

The short summary just provided indicates that the next three decades will be turbulent, especially if crops fail and millions of environmental refugees seek better conditions. The future will be less hazardous and more predictable if each nation, especially the ones most responsible for GHG emissions, both ceases increasing them and reduces them to a level likely to result in a reduced rate of change or, ideally, a climate resembling the late 20th century. Lifestyle changes (*e.g.*, markedly reduced driving) could greatly reduce GHG emissions. However, lifestyle changes at the global level will require individuals to have a strong commitment to the human global community.

Acidification of the Oceans

Control of carbon dioxide emissions will help reduce both global heating and ocean acidification. Carbon sinks are evolving in a changing climate (Fung *et al.*, 2005). Deforestation is an important component of this issue (Howden, 2007). Both acidification and overfishing can destroy the world's largest ecosystem. Restoring a damaged ecosystem the size of an ocean is a problem of great scale and complexity and has no precedents to follow, should restoration be necessary. Regrettably, restoration may be necessary since climate change can slow oceanic absorption of carbon dioxide (Perkins, 2007). All of Earth's ecosystems are important to humankind, and, thus, resource regeneration of the oceans is critical. Resource consumption already exceeds regenerative capacity. For example, the New Economics Foundation (2007) provided persuasive evidence that the United Kingdom went into ecological debt on 15 April 2007. Britain's "ecological debt day" - the day the nation began living beyond its means - falls only one-third of the way through the year and has crept ever earlier over the last four decades.

However, some positive trends can be noted. For example, South Pacific nations

have agreed that one-quarter of the world's oceans will be protected from fishing boats that drag heavy nets across the ocean floor (BBC, 2007). However, such efforts will be useless if the oceans become so acidic that they will no longer support thriving fisheries. As Whitty (2007) notes, by the end of the 21st century, half of all species on Earth may be extinct. Clearly, even if only a portion of these species are oceanic, the demise of the terrestrial species will have some effect, perhaps a major effect, upon oceanic fisheries. In addition, restoring damaged oceanic ecosystems will be virtually impossible in the context of a major loss of species that were present before the serious damage occurred. Changes in the oceanic biota, combined with other factors, will produce a variety of other phenomena that will make conditions alien to indigenous species. For example, an algal bloom in the coastal water of southern California has produced record levels of a toxic acid (domoic acid) that has been blamed in the deaths of numerous marine mammals and seabirds (Associated Press, 2007). Concerns are due to the number and variety of sea lions, dolphins, and birds that have washed ashore between Santa Barbara and San Diego. Confirmation that the dead and sick animals had been exposed to domoic acid poisoning is still needed, but, in an era of rapid climate change, such situations are likely to become more common. Confirmation is hindered by the lack of sufficient qualified professionals to gather the necessary data, either in the United States or elsewhere in the world. Since rapid climate change will almost certainly make such situations far more common than they are today, governments should take steps to ensure more qualified professionals become available.

Regulation of Carbon Dioxide

Evidence confirms that carbon dioxide produced in one locale moves to quite distant locales. For example, a pall of carbon monoxide that hovered over Australia during wildfires there in 2004 came, in part, from forest fires in South America, some 13,000 kilometers (8,000 miles) away (Staff Writers, 2007a). Of course, carbon monoxide will combine with oxygen to produce carbon dioxide. Other changes have also been observed. For example, scientists have discovered a massive eddy that sweeps around Antarctica (Staff Writers, 2007b). Since the surface layers of the oceans absorb carbon dioxide, determining what happens to both the warm water and the carbon dioxide is extremely important. This information can then be factored into the global models.

Arguably, the acid test for the globalization of *Homo sapiens* is a willingness to limit greenhouse gas emissions for the benefit of humanity and the other life forms with which humans share the planet. Humankind is not testing well at present. Even the conservative Intergovernmental Panel on Climate Change states that accumulating concentrations of greenhouse gases could reach dangerous levels in a decade or two. Some individual scientists who participated in the Intergovernmental Panel on Climate Change studies are even more outspoken. For example, Olav Hohmeyer, a German delegate to the Bangkok conference sponsored by United Nations stated: "Time is running out. We have the measures, but we have to put the policies in place and act upon them. We

have to do it because time is short" (Casey, 2007). Commenting on the same report, Revkin (2007a) noted that the report made clear the risks of delay, noting that emissions of greenhouse gases have risen 70% since 1970 and could rise an additional 90% by 2030 if nothing is done. However, Revkin (2007b) reports that "The Bush administration estimates that emissions by the United States will grow nearly as fast through the next decade as they did during the previous decade." Although Kristen A. Hellmer, a spokeswoman for the White House on environmental matters, stated that the President's actions addressing climate change are working, an assortment of experts on climate trends and policy, when shown the US Climate Action Report, described the projected emissions as unacceptable. Greenhouse gas emissions also will continue to rise in countries such as China and India. The problem of addressing heating at a global level also may suffer a setback at the G8 Summit in June 2007 since the United States objects to a pledge to limit global heating to 2°Celsius in this century and cut world greenhouse gas emissions by 50% below 1990 levels by 2050 (Lovell, 2007). The leaders of Britain, the United States, Russia, Canada, Japan, Italy, and France will attend the G8 Summit, hosted by Germany from 6-8 June 2007. Also present at the meeting will be the heads of state of South Africa, Mexico, Brazil, China, and India as the key group of major developing countries. The stakes for this meeting are high since scientists predict that average temperatures will rise by between 1.8 and 3.0° Celsius, which could cause floods and famines and place millions of lives at risk.

Leonhardt (2007) lists three broad principles that assist in sorting the substantive attempts to reduce climate change from those that lack substance: (1) acknowledge the costs, (2) let the market work, and (3) keep the solution simple. However, huge political problems exist. For example, in 2007, the National Journal asked a group of Republican senators and congressional house members: "Do you think it's been proven beyond a reasonable doubt that Earth is warming because of man-made problems?" Only 13% of these Republicans agreed that global heating has been proved. Worse yet, Representative Roscoe Bartlett (1978; Rep., Maryland) and Vernon Ehlers (Rep., Michigan), both research scientists, were denied seats on the Select Committee on Energy Independence and Global Warming (Chait, 2007). The Congressional Democrats strongly endorse the scientific evidence but do not have enough members in either the House or the Senate to override a presidential veto. Clayton (2007) asserts that, in order to halt catastrophic climate change, the United States has less than a decade to learn how to capture and store carbon dioxide.

Stabilizing the Human Population within Earth's Carrying Capacity

Nutting (2007) noted that, although the political climate on global heating is changing, the hard part, especially for politicians, is to outline the sacrifices the public must make to curb global heating. However, as Hawken (2007, p. 16) notes:

> Because we are educated to believe that salvation is found in the doctrines of a single system, we are naively susceptible to

> dissimulation and cant. Ideologies prey on these weaknesses and pervert them into blind loyalties, preventing diversity rather than nurturing natural evolution and the flourishing of ideas. Ecologists and biologists know that systems achieve stability and health through diversity, not uniformity. Ideologues take the opposite view.

Each country will have different problems, but all are related to population growth and affluence, which is rarely discussed in most countries. The global population is 1,000 times greater than it was 7,000 years ago (McEvedy and Jones, 1978). However, humans use 100 to 1,000 times more resources and energy than their ancestors did; in short, Earth today withstands at least 100,000 times the impact it did in 5,000 BCE (Hawken, 2007). Each nation has a different population problem, but few, arguably none, have a population stabilization goal based on the nation's carrying capacity for humans on a long-term, sustainable basis. For example, the United States, which uses a disproportionate share of the world's resources, has a rapidly increasing population that is driven primarily by legal immigrants and illegal aliens. It would be neither fair nor equitable for the legal immigrants to have fewer resources per capita than resident citizens, but the United States already has a sizable ecological deficit. A long-term, truly sustainable US population, without cheap oil, is probably more like 150-200 million (Powell, 2007). In May and June 2007, the US Congress was debating legislation on immigration reform, but no where in the hours of debate was carrying capacity or optimal population numbers mentioned. Despite this omission, population growth is a major cause of both environmental and social problems.

India is, at present, experiencing an economic boom, but close to one-fourth of the population still lives on less that US$1 per day (Varshney, 2007). Clearly, a global resource distribution problem exists. For example, an electricity crisis represents one of the major obstacles to India's attempt to attain the front ranks of the global economy (Gurgaon, 2007). Deforestation at a rate greater than the regenerative rate is clearly unsustainable and will almost certainly affect food production and other components or carrying capacity. Many mourn the lost natural systems of their childhoods and often forget that the global population has more than doubled in their lifetimes.

Exponential growth of any kind is usually a major problem; however, for a population of 10,000 people that is growing at 7% per year, the population will become 10,000,000 people in just 100 years. Clearly, unlimited population growth on a finite planet is not possible. Without a global population policy, natural law will ensure that the human population, in the long term, stays within Earth's carrying capacity. Population size will be limited by famine, disease, wars, and other unpleasant factors. However, surely an intelligent species that is able to reason should be able to devise a more humane way of limiting population growth. In addition, optimum population size that will permit a quality life should be achievable. However, in view of religious and ideological conflicts, a quality life, at present, seems a utopian dream. Global

heating and other types of climate change will probably reduce global carrying capacity and exacerbate the already difficult situation. However, matching global carrying capacity and human population size is at least theoretically possible, and a willingness to discuss population issues freely and openly is essential to a humane solution to the problem.

Equitable and Fair Allocation of Resources

The allocation of planetary resources must include the 30+ million other species with which humans share the planet. Since these other life forms constitute the biospheric life support system upon which humans depend, allocation of resources among all species is a moral/ethical act as well as one of enlightened self interest. The first action should be to stay within Earth's biocapacity. Venetoulis and Talberth (2005) suggest deducting 13.4% of each environmental footprint analysis from biocapacity to ensure the well being of present and future generations of all life forms. This value is suggested as a starting point, pending additional evidence regarding the actual percentage necessary. Venetoulis and Talberth (2005) also found that, on a global level, humanity is exceeding its ecological limits by 39% -- nearly double the amount of ecological overshoot in their 2004 report and using the old approach. In short, humankind would need 1.39 Earths to ensure that future generations are at least as well off as the present generation. This information is clearly a high priority item that affects all of human society.

The Venetoulis and Talberth (2005) report provides evidence that humankind has overshot sustainable biocapacity levels by about 8 global hectares per capita. This overshoot of biocapacity indicates a reduction in natural capital to fill the gap. However, the major challenge is the disproportionate ecological deficits (negative ecological balances) for various nations. The largest deficits are United Arab Emirates (-213), Kuwait (-146), the United States (-89), Belgium and "Luxembourg (-62)", and The Netherlands (-56). The nations with the largest per capita ecological surpluses (positive ecological balances) are Mongolia (+163), Namibia (+97), Gabon (+96), Mauritania (+68), and Papua New Guinea (+65).

Venetoulis and Talberth (2005) make the very important point that the effects of global heating (and other types of climate change), as well as toxics in the environment, almost certainly have effects upon biocapacity. These effects are not always benign. Also, the effects of depletion of aquifers, loss of sustained in-stream flows, and degradation of water quality upon biocapacity are not well documented.

Managing the Global Commons

Tickell (2006) and the Joint Science Academies (2005) note that global problems require global responses. For some problems, such as climate change, the need is obvious. For others, such as misuse of the global commons, unmanaged use has been common for at least a century (Cairns, 2003).

May (2007) remarks that, although ice ages have come and gone, the most recent 8,000 years, since the beginnings of agriculture and the first cities, have had an unusually steady climate. At present, anthropogenic greenhouse gases have already impaired that stability, and, due to

increased levels of greenhouse gases, the instability is likely to worsen unless global remedial actions begin now. Lanchester (2007) remarks that inaction may be due to the fact that even people who feel most strongly about climate change on some level cannot quite bring themselves to believe in it. He also remarks:

> Part of the problem is one of scale. Global warming is as a subject so much more important than almost anything else that it is difficult to frame or discuss. . . . I suspect we're reluctant to think about it because we're worried that if we start we will have no choice but to think about nothing else.

My obsession is global heating/peak oil - closely related topics with global consequences. At 84 years of age, my personal concerns are minor. However, as a parent/grandparent, I fear for my children and grandchildren. As a scientist, I am witnessing an unprecedented global experiment in which humans are the experimental animals. A huge leap in social evolution might enable humankind to live sustainably, but in dramatically reduced numbers. Humankind's relationship with the global community (*e.g.*, the atmosphere, oceans, etc.) will be a major factor in the future of *Homo sapiens*.

Sea turtles provide a superb example of the issues in managing the global commons. Sea turtles are members of "the global commons" and must be managed as such (Eckert, 2002). Since they are strongly migratory, international cooperation and collaboration among range states is essential to their survival - as is true for whales and other migratory species. Like all migratory species, sea turtles should be a resource used sustainably, equitably, and fairly.

Requiem for Reason

Former US Vice-President Al Gore (2007) remarks:

> We must create new ways to engage in a genuine and nonmanipulative conversation about our future. We must, for example, stop tolerating the rejection and distortion of science. We must insist on an end to the cynical use of pseudostudies known to be false for the purpose of intentionally clouding the public's ability to discern the truth. Americans in both parties should insist on the reestablishment of respect for the rule of reason.

Monbiot (2007) deduces that the problem is not that people are not hearing about global heating, but that they do not want to know. He also notes that the problem is not just a matter of a failure to engage, but humans are assisted in their reluctance by an active campaign of dissuasion (p. 22). He devotes an entire chapter to "The Denial Industry," which is both fascinating and depressing.

Globalization

Even nations can participate in avoiding scientific evidence or ignoring it when it might threaten economic growth. For example, Cooper and Revkin (2007) call attention to the battle that will pit US President Bush with the Western European members of the Group of 8 on cutting greenhouse gas emissions by 50% by 2050. Cooper and Revkin (2007) quote one

European diplomat as stating: "The United States, on this issue, is virtually isolated." This path does not lead toward globalization of humankind.

Conclusions

Gore (2007) quotes US Senator Robert Byrd of West Virginia, who was on the Senate floor just before the United States launched the invasion of Iraq: "This Chamber is, for the most part, silent - ominously, dreadfully silent. There is no debate, no discussion, no attempt to lay out for the nation the pros and cons of this particular war. There is nothing. We stand passively mute in the United States Senate." Gore asked: "Why was the Senate silent?" He further asks: "Why do reason, logic, and truth seem to play a sharply diminished role in the way America now makes important decisions?" One might well make the same comments about the greatest global crisis humankind has ever faced - overpopulation, rapid depletion of petroleum, climate change, biotic impoverishment (*e.g.*, loss of honeybees), environmental toxins, and exceeding carrying capacity. Humankind may be no different than over 99% of the species that inhabited this planet and are now extinct. Humans are not lords and masters of the universe - and this realization is not welcome news.

The Internet has made globalization of information flow possible. What is lacking is globalization of the decision making process. Even when the scientific information is robust, even overwhelming, it may be rejected for reasons that have nothing to do with science (*e.g.*, economic growth, political ideology) by persons with few or no scientific credentials. In the case of greenhouse gases, just one or two nations with large greenhouse gas emissions may place the entire planet at high risk. The reasons for this situation may be denied by claiming scientific illiteracy, corporate greed, lack of public discourse, inadequate coverage by the news media, or a religious belief that an Armageddon is imminent (*e.g.*, the rapture).

Justifying environmental damage to protect the economy is not a persuasive argument. If natural capital and ecosystem services are damaged or degraded, the human economy will not flourish and will almost certainly decline. However, Monbiot (2007) remarks:

> But if those governments that have expressed a commitment to stopping climate change have found their efforts frustrated, it is partly because they wanted them to be frustrated. They know that inside their electors there is a small but insistent voice asking them both to try and to fail. They know that if they had the misfortune to succeed, our lives would have to change. They know that we can contemplate a transformation of anyone's existence but our own.

However, politicians and the general public aside, the gigantic global experiment, casually begun, probably can no longer be reversed. Worse yet, Rachel Carson's 1962 Commencement Address at Claremont College (given on June 12) warned that the experiment should never have been started:

> So nature does indeed need protection from man: but man, too, needs protection from his own acts, for he is part of the

> living world. His war against nature is inevitably a war against himself. His heedless and destructive acts enter in the vast cycles of the earth, and in time return to him …

Ironically, a plan to honor Rachel Carson on her centennial (her 100th birthday, had she lived, would have been 27 May 2007 - her best known publication is *Silent Spring*) was blocked by US Senator Tom Coburn (Rep., Oklahoma) (Zabarenko, 2007). US Senator Ben Cardin (Dem., Maryland), who planned the Senate honor, expected an easy approval of an honor for a scientist who has been an inspiration to several generations of scientists and all who love nature, but the White House Council on Environmental Quality recently made more than 180 changes to a report on global heating, virtually all of which had the effect of exaggerating scientific uncertainties and minimizing certainties (Kolbert, 2007). This path does not lead to scientific globalization of the general public.

Ehrlich and Ehrlich (2004) sum up humankind's present situation superbly: "Now we have a global state-corporate empire centered on the United States. There is still a limited time to circumvent a long-term environmental collapse that would destroy this new state-corporate empire and be the first global collapse. But the empire must change its ways."

Much has happened in the three years since the Ehrlichs wrote their book (Ehrlich and Ehrlich, 2004). Global heating and other types of climate change have occurred more rapidly than expected. Peak oil looms large for a culture addicted to cheap, readily available petroleum. Europe has made some worthwhile adjustments to a lower energy future, such as public transportation and windmills. Many countries and individuals are using low energy lighting. However, the United States is still making profligate use of finite global supplies of petroleum. *Homo sapiens* has, in the past, demonstrated admirable cultural adaptability and, one hopes, will do so in the present perilous circumstances.

The number of outcomes is almost unlimited, but three illustrate the range.

(1) Humankind waits too long to control greenhouse gas emissions and the climate becomes too hostile for humans to survive.

(2) Humankind acts in time to prevent irreversible damage to the biospheric life support system but billions die due to a markedly lower food supply, pandemic diseases, and resource wars.

(3) A global awareness of the need to live harmoniously with the biospheric life support system develops and is sustained.

Economic globalization has resulted in both environmental degradation and vast income disparity. However, ecological globalization (cherishing the biospheric life support system) should produce a sustainable world. Globalizing *Homo sapiens* would require cherishing the planetary ecosystem.

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