

FEEDBACK AND DIS-EQUILIBRIUM IN HUMAN OVERPOPULATION

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Overwhelming evidence has engendered a consensus among global scientists that the human population level and trend are unsustainable. Although we are part of nature, we may have some choice in the ongoing process of which our numbers are but one variable. Individual, social, and institutional factors are examined, and policy options are considered. Evidence is given debunking the claim that the rich attempt to coerce poor nations to reduce fertility. Carrying capacity and optimum population concepts are discussed, particularly as to equilibrium potential. Prospects for pro-active success are entertained.

Keywords: population, environment, sociobiology, human values

INTRODUCTION

"A suitable total for the number of citizens cannot be fixed without considering the land..."

Plato, Laws, V

During the New Millennium, many unexpected events and conditions will undoubtedly surprise our progeny and us. Perhaps the decline of fossil energy sources will be rendered benign due to scientific discoveries. Perhaps "factor ten" improvements in technological efficiency will aid in the rehabilitation of the environment. Perhaps our species will self-select for survival tolerances in polluted or otherwise altered conditions. These possibilities are little more than speculations.

We can have a bit more confidence that our numbers will not continue the growth pattern of the last century, during which they quadrupled. This paper will briefly explore why it is that a consensus of the world's experts believe the rate of growth will continue to slow, whether or not a reduction or crash is likely, and if it is plausible that stabilization might occur at some level other than extinction.

Some people claim that humans are somehow exempt from the sorts of systemic constraints, which limit the populations of other life forms. We indeed have managed to extend our range into vastly diverse habitats due to our adaptive fitness. Language, abstract thought, and reflective consciousness are traits, which aided this expansion. However, in a largely closed system, physical expansion cannot be infinite.

We will explore possible scenarios, which might lead to stabilization or equilibrium.

Projections vary somewhat, but the next half-century is conservatively expected to result in a 50% increase to approximately nine billion of us. We will explore the extent to which it is conceivable that human planning could affect the actual outcome.

The first section will provide brief evidence that overpopulation is a problem. The fascination with "virtual realities" and the myth of the "de-materialization" of economies are examples of impediments to the grasping of this issue. The vast majority of humans who are unwired know they cannot live on bits and bytes even if some of us believe otherwise; their needs include food, water, and energy.

The second section will outline some variables affecting human reproductive behavior as positive and negative feedback. These include our genetic make-up (hard wiring), environmental conditions, socio-economic values, institutional pressures, and what is called "free will".

Next will be the question of what could constitute equilibrium. Carrying capacity connotes a maximum number of a species, which can endure in a habitat. Tolerances in a complex ecosystem are variable to inputs and internal changes, and are most sensitive when near maximum thresholds. Freedom has been described as the key human value, and it is reflected in maximal options for future decisions and actions. (Buchanan, 1997) Equilibrium seems inconsistent with carrying capacity, since the proximity of potential constraints would reduce future options and maximize the destabilizing risks of changing conditions. If attainable, equilibrium at some variable optimum level should maximize freedom and well-being, and minimize destabilizing occurrences.

Finally, I will venture into the realm of speculation to consider the prospects for success in the self-determination of equilibrium. Peace and the minimization of future suffering seem to be related to the ultimate outcome.

WHAT PROBLEM?

"Intensification of production to feed an increased population leads to a till greater increase in population." (Peter Farb, 1978)

Albert Bartlett, Emeritus Professor of Physics at The University of Colorado, has demonstrated that with a 1% annual growth rate, human population would in 17,000 years equal all the atoms in the universe. (Bartlett, 1996) As a reference, the last ice age was about 17,000 years ago. We currently are growing at a rate around 50% faster than that. Bartlett was responding to the claim of the possibility of 1% annual growth of the human population for seven billion (then corrected to seven million!) years by Management professor Julian Simon. If space were the only requirement for a healthy, enduring habitat, the issue would be relatively easy to address. In short, sustainable (non-stop) growth of physical systems is an oxymoron.

Following are some opinions from diverse sources. In a letter to me dated October 3, 1996, U.S. Vice-President Al Gore stated: "I consider the dramatic growth in the world's population to be the greatest challenge currently facing the environment...The effects of this rapid increase are felt around the globe. Starvation, deforestation, and lack of clean water are just some of the problems..."

Stuart L. Udall, former US Secretary of the Interior, wrote in a recent essay:

"...current consumption of the two cornerstone resources of modern life - water and oil - foreshadow shortages that will cripple the economies of many nations if present [population] trends continue."(Udall, 2000)

There is a solid scientific consensus evidenced by a 1992 joint statement by The British Royal Society and the (US) National Academy of Sciences urging world leaders to address human overpopulation, as well as by the "World Scientists' Warning to Humanity" written in 1993 and signed by over 1600 senior scientists from 70 countries which includes the following:

"The earth is finite. Its ability to absorb wastes and destructive effluent is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the earth's limits."

"Pressures resulting from unrestrained population growth put demands on the natural world that can overwhelm any efforts to achieve a sustainable future. If we are to halt the destruction of our environment, we must accept limits to that growth."

"No more than ...a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished."

" We must stabilize population."

" We must ensure sexual equality, and guarantee women control over their own reproductive decisions."

Many people besides world leaders and scientists understand the seriousness of our predicament. John H. Adams, Executive Director of The Natural Resources Defense Council, an organization not active in population affairs, began an essay entitled "What Matters Most" in The Amicus Journal:

"There is no single thing more significant for the future of the world than the fact of human population growth."(Adams, 1997)

Author of Pulitzer Prize winning Guns, Germs, and Steel Jared Diamond wrote in The Third Chimpanzee:

"A nuclear holocaust is certain to prove disastrous, but it isn't happening now. An environmental holocaust is equally certain to prove disastrous, but it differs in that it is already well underway."(Diamond, 1992)

Diamond may unfortunately underestimate the risk of a quick, violent demise.

The University of Toronto's Peace and Conflict Studies Program has done extensive research on factors influencing violent conflict. One area of the program is the Project on Environment, Population, and Security. Scarcities, depletion, and degradation of resources such as potable water are part of the feedback loops of human activity-habitat systems which impact violent conflict.(Homer-Dixon, et al. 1993)

"Don't worry, be happy" is sadly no longer applicable to our predicament. There are some, though, who dismiss these concerns as fiction. They point to past analyses (Ehrlich 1968) which contained some incorrect judgments as to the timing of approaching limits. Evidence is strong, though, that the trends are

proceeding as he envisioned if we believe the scientific consensus. The nay -sayers include those like the late Julian Simon and Reason Magazine's Ronald Bailey who conveniently ignores issues like declining stocks of fish which are to be shared by a quarter of a million net additional people daily.(Bailey, 2000)

The UN has been at the forefront in seeking solutions for overpopulation. The poorest nations are struggling to address the issue, but aid promised by wealthy nations has been slow in coming. India recently announced a national population policy and China is still struggling with the issue. Denial that overpopulation exists and is a serious problem led biologist Garrett Hardin to write a new book last year called *The Ostrich Factor*. Suffice it to say that I view the evidence as overwhelming.

FEEDBACK

"The more we examine the relationships between population, resources, and the environment the stronger the connections appear." (Dr. Nafis Sadik in an address to The UN Conference on Environment and Development, Geneva, 1991)

INDIVIDUAL/SOCIAL/ENVIRONMENTAL

The widely accepted theory called the demographic transition holds that upon reaching a secure and materially comfortable lifestyle, birthrates tend to decline. The case histories of North America and Western Europe are used as evidence for the theory's validity. In some cases, correlations have occurred, and causal links may seem obvious. However, many physical and social scientists are more rigorous when seeking causal evidence. Virginia Abernethy a professor of psychiatry at Vanderbilt University Medical School, argues convincingly that the perception of the commencement of better economic times (material well-being) leads to higher fertility rates. She gives several good examples:

"In times of privation in France, prior to the revolution, a sense of limits promoted reproductive caution, and small families were the norm...Prosperity induced high fertility rates in Ireland after the introduction of the potato, and in Turkey, when families received land." (Abernethy, 1994)

Even when a "demographic transition" is claimed to have occurred, there could be several generations between supposed cause and effect, making the number of variables too numerous and complex to yield analytic certainty. Several generations of high fertility, like those in the US during the first half of the twentieth century, could result in a rapid population increase, after which a slowdown in births occurs. Abernethy claims that the rise of the US as an economic power, with concomitant optimism for well-being by it's citizens, was key to the high birthrates. She sees uncertainty about real wages and job security, combined with the high costs of education and health care as factors in the slowdown in US fertility in the latter part of the century.

Humans do not easily embrace this sort of evidence, but we must continue to examine the possible causes of our actions if we are to pursue effective solutions. Many animals exhibit reduced fertility and/or lower survival rates of young offspring well in advance of serious food shortages. This is an adaptation for survival. Humans exhibit similar patterns when stressed by overcrowding and environmental scarcities. D.H. Stott discussed this at length, and I continue by quoting:

"...the predicted catastrophe of a world population increasing by geometrical progression to the point of starvation is unlikely to occur. It will be forestalled, if not by conscious human design, by physiological mechanisms, which have evolved to obviate such a calamity. This is not to minimize the fact that these mechanisms themselves are highly unpleasant. Nature prescribes happiness when it has survival value. To man nevertheless is given an answer. We need not wait for the physiological killers and maimers to come upon us...It should not, however, be beyond the capacity of man to develop cultural methods of regulating population-numbers which do not involve distress and unhappiness." (Stott, 1962)

Bill Rees, well known for developing the ecological footprint concept, noted ten years ago the relevance of work by Prigogine and Stengers, Crutchfield et al., and Palmer regarding thresholds of unpredictability. The systemic feedback that will affect human numbers with or without our intent may be unexpected in timing and intensity. Worth noting here is the principle of the weak link as expressed by Rees:

"It should be understood that while human society depends on many ecological resources and functions for survival, carrying capacity is ultimately determined by the single vital resource or function in least supply." (Rees, 1990)

There are well-entrenched historically based values, which provide disincentives to reducing fertility. Only children were thought to be deprived by the lack of siblings. This "folk wisdom" is still widely believed despite the lack of conclusive supporting evidence. Large families are accepted by many societies as a joy or a blessing. When farm labor was important for economic viability, this might have reflected rational criteria. In modern industrialized nations, agriculture depends more on energy, chemicals, and technology than on farm hands, and a very small percentage of families is engaged in farming. In many countries the family farm has been subdivided among offspring for generations, resulting in small, unviable plots. Feedback of this nature can be mythical, but nonetheless is still effective.

In societies with high mortality rates for infants and youth, and lack of institutional old age security, poor families need to produce children as their only realistic means of attempting to secure their future. Here the biological constraint of the prospect of inadequate food is challenged by the human need for future security. This seems a most basic example of the human predicament, called by The Club of Rome, the "global problématique."

POLICY OPTIONS

What types of actions might prove useful in a humane attempt to influence fertility? The acceptance that we have some sphere of free will seems necessary to continue this exploration; just how much is not easy to say.

"Sociobiology's premise is that individuals of all species including humans are genetically predisposed to act in ways that maximize their 'inclusive fitness'...Axiomatically, every living individual had ancestors that succeeded...so most of us carry genes impelling us..." (Abernethy, 1993)

It is not my intention to attempt to classify or divide human behavior into determined movements or free actions - or any percentage combination of the

two. Tendencies or predispositions can be accepted as indicators of probabilities or expectations. We plan and make choices about our role in sexual reproduction to greater or lesser degrees. Ansley Cole has delineated three categories for successful intentional implementation of reduced fertility. First is the actualization and realization that both parties indeed have a choice in the matter. Second is that they perceive benefit(s) from the resulting smaller family. Third is the availability and knowledge of various means of implementing their choice.(Coale, 1989)

Dr. John R. Weeks is the Director of the International Population Center at San Diego State University. He develops Coale's concepts into policies with direct and indirect impacts on reproductive behavior. From a systems perspective, these constitute feedback. Direct policies include full legal rights for women, payments for having fewer children, higher (rather than lower) taxes per child, legalization of contraceptive technologies, abortion and sterilization, and availability of family planning services in local outlets. Examples of indirect policies are improved secular education, increased economic opportunities for women, lower infant and child mortality rates, community birth quotas, and public campaigns promoting knowledge and use of birth control.(Weeks, 1990)

Further discussion of possible planned intervention will be undertaken in the final section of this paper: Prospects.

INSTITUTIONAL OBSTACLES

Government

Most governments, even when well-meaning, have discovered deficit financing and become addicted to revenue growth. The addition of interest results in larger total future payments than the amount of the original loan. This inevitably results in a race to keep up, as new borrowings are added on a regular basis. With the onset of declining fertility and demographically aging populations in many developed nations, immigration increases are sought to keep the economy growing and to expand payments into the pension system. There have been attempts in Germany and France, among others, to stimulate higher fertility by native born women. This may reflect fear of cultural dilution by societies, and is evidenced by recent political victories by advocates of restricted immigration. If there were a national wealth surplus rather than a debt, growth would not only be unnecessary, it might be undesirable. Old age security would be covered, and remaining wealth could be shared by fewer people.

Business

Globalization has been accompanied by the dominance of multi-national corporations. It is the mandate of corporations to deliver maximum profits to shareholders, and managers seek to maximize their own income and security by achieving that goal. It is not rational for corporations (or any business) to seek shrinking markets for goods or services. So the system has a built in growth imperative. At the same time, labor shortages would give bargaining power to workers, and would likely increase costs to business. For decades businesses have been relocating facilities to areas where labor is abundant and therefore cheaper. A lack of necessary skills may be a short term

constraint, but a declining population is generally not appealing to businesses.

Now let's have a look at how a Chinese expert perceives this. Zhang Zhirong is Deputy Director of China Population Welfare Foundation in Beijing. He wrote a report to the Third Conference of the International Consortium for the Study of Environmental Security from which I quote:

"China is caught in a vicious cycle of swelling population and diminishing resources...Economic growth is the goal of China's industrial policy. However rapid population growth allays the economic growth that occurs." (Zhirong, 1994)

It appears that it is possible for business leaders to catch on that there is a point of diminishing return to population linked economic growth. I expect this feedback to spread globally, like a viral meme, as systemic instability increases.

Religion

There are many religious (and ethnic) beliefs which can influence human reproductive behavior. Some examples include Muslim sects, Orthodox Jewish, and Catholic doctrine. The most extreme example that I'm aware of is the Mormon belief that twelve offspring by a man places him closest to God. Groups at war have overtly used competitive breeding as an alternate method of conquest, and rape has been used as part of ethnic cleansing. Other than obscure suicide sects, I know of no religions, which advocate a reduction in the number of their adherents. Some might recognize that overpopulation is a problem. This could present a dilemma to them as they seek to spread their version of the truth and the good. The Dalai Lama gave a speech in New Zealand a few years ago where it was reported that he said the world's population problem would benefit from more priests, nuns, gays, and lesbians. I interpret this as a touch of humor applied to a serious problem by a wise leader.

EQUILIBRIUM

"All optima must lie between the minimum viable population size, MVP, and the biophysical carrying capacity of the planet." (Gretchen C. Daily, A. Ehrlich and P. Ehrlich)

The above range is wide enough to drive all the vehicles in the world through. How might we narrow it? The authors state in the same paper:

"...social preferences are critical because achieving any target size requires establishing social policies to influence fertility rates. Human population sizes have never, and will never, automatically equilibrate at some level. There is no feedback mechanism that will lead to perfectly maintained, identical crude birth and death rates." (Daily, et al. 1994)

Although I agree with the need for planning, it seems like a conceptual error to place it somehow outside the feedback system. Again ignoring the free will issue, it is not reasonable in my opinion to somehow excise our planning from the ecosystem of which we are a part. Recall Stott's point about natural governors of fertility. Our planning could be part of our adaptive fitness.

The paper goes on to state criteria for choosing optimum population size. First is a desired minimum quality of life balanced by the impacts to the ecosystem for sustaining it. Second is an acceptance that material wealth will

always be unequally divided among humans, and the resulting need for a cushion (or excess) of continuously available per capita resources. They include a consideration of waste reprocessing without toxification of the system.

Next is the value of cultural diversity. They believe geographic dispersion requires a certain minimum amount of population. I think this is a prehistoric era consideration, and not meaningful now. Rather it seems that an excess of people combined with globalization, results in cultural extinctions. I find this categorically different than the prior criteria, believing that adaptation in evolution will result in ongoing cultural changes in any event.

A "critical mass" distributional criteria similarly perplexes me, although I understand the cultural value of urbanization. These two criteria seem more like value judgments based on the cultural biases of the authors, who live in the developed world.

Next is the need to protect biodiversity. Obviously each human displaces (or alters habitat potentially useful for) other life forms, with the partial exception of human parasites. Biodiversity, they explain, is anthropocentrically valuable as part of our habitat and is necessary for our health. It also provides aesthetic pleasure. They then add the ethical responsibility of humans to minimize species loss. Cultural bias seems involved in the latter two elements, but it is arguable that they reflect universal human values.

The authors then add the key value of human freedom that was mentioned in the introduction:

"In general, we would choose a population size that maximizes very broad environmental and social options for individuals." (Daily, et al., 1994)

For a different perspective, let's turn again to Zhang Zhirong on China's population: "According to The China Academy of Sciences, and based on estimated land resources, the optimum population in China is 950 million now, and 1.16 billion by 2000." (Zhirong, 1994). Zhirong then states that China's carrying capacity, also based on "land resources" is no more than 1.6 billion. He believes that serious environmental and social problems exist and will worsen as China's population first exceeds the optimum level, and then the carrying capacity level. Maybe China expected to add some land resources between 1994 and 2000. What other variables could cause its optimum population to go up by 7% in six years? No answer is given in the report.

Nicolaas Bloembergen, Nobel winner in Physics and Harvard professor, said in a presentation to colleagues: *"Would a total world population of about one billion as existed two hundred years ago represent a reasonable compromise between quantity and quality of human life? The answer...clearly involves value judgments."* (Bloembergen, 1996)

J. Kenneth Smail, Professor of Anthropology and Sociology at Kenyon College in Ohio, has an argument for *"...a sustainable optimum of approximately 2 billion by the beginning of the 23rd century. He presents much evidence that mere stabilization during the 21st century will result in a 'future demographic catastrophe.'" (Smail, 1995)*

I see no clear way, given the current cultural, economic, and geophysical variables of societies on earth, to expect a consensus for approximating an optimum human population. Stabilization, or equilibrium, if it is to be realized anytime soon, would seem to be based on fragmented actions, or

unintentional outcomes. What is obvious from my investigations is that most concerned with the issue believe that the desired direction for human population is downward.

PROSPECTS

"Nobody knows if a steady state population could be reached by the year 2050. Perhaps a period of negative population growth could be envisioned...hopefully not be caused by ...war, famine, and pestilence." (Bloembergen)

We have discussed a variety of influences on human reproduction. Included were inherent predispositions and individual responses to environmental and social conditions. We also explored possible policy options, which many believe have the potential to influence our demographic future. Besides the institutional obstacles mentioned, there are some common misconceptions by many well-meaning people. I will mention only one, which, if sufficiently countered, might abet a more humane resolution.

The environment and social justice are issues, which have growing support among those able to think about more than their immediate material needs. Advocates seem certain that their own issue is the most important one, but many fail to question its sufficiency. A typical response to the introduction of the overpopulation factor is that the rich should reduce their consumption and waste production instead of chiding the poor people of the planet. This demonstrates a lack of knowledge that the poor have been clamoring for our aid in population matters, and that they have banded together to help themselves. Provision of such aid is not a substitute for encouraging conservation and cleaner economies at home. There is no either/or involved. Both are desirable.

In 1989, as verified by The UN Population Fund, the following countries signed a statement urging early stabilization of human population. Austria, Bangladesh, Barbados, Bhutan, Botswana, Cape Verde, China, Columbia, Cyprus, Dominica, Dominican Republic, Egypt, Fiji, Grenada, Guinea-Bissau, Haiti, Iceland, India, Indonesia, Jamaica, Japan, Jordan, Kenya, Rep. of Korea, Liberia, Malta, Mauritius, Morocco, Nepal, Nigeria, Panama, Philippines, Rwanda, Senegal, Seychelles, Singapore, Sri Lanka, St. Kitts-Nevis, St. Lucia, St. Vincent & the Grenadines, Sudan, Thailand, Tunisia, Vanuatu, and Zimbabwe. Note the absence of most wealthy nations. It is ridiculous to claim that the rich are trying to coerce the poor nations to reduce population. In fact, they are not responding to the affirmed needs of the poor.

The following countries are part of either the South Commission or Partners in Population and Development: Zimbabwe, Kenya, Mexico, Colombia, Thailand, Indonesia, Bangladesh, Morocco, Egypt, Tunisia, China, India, Pakistan, Uganda, Algeria, Argentina, Brazil, Cuba, Guyana, Ivory Coast, Jamaica, Kuwait, Malaysia, Mozambique, Nigeria, Philippines, Senegal, Sri Lanka, Uruguay, Venezuela, Yugoslavia (former), and Western Samoa. The "Partners" share expertise with each other in reproductive health, appropriate technologies, and population policy. The Challenge to the South: Report of the South Commission, included this unequivocal statement:

"In the long run the problem of overpopulation of the countries of the South can be fully resolved only through their development. But action to contain the rise of population cannot be postponed." (Nyerere, 1990)

Easier said than done. Nature will provide, as they say, but what percentages of any "cure" will be higher mortality versus lower fertility? What percentages of lower fertility could be due to willful constraint versus physiological changes? We may have some choice in the answers to these questions, but acts of omission (purposeful inaction) decrease that possibility. Smail says he is "*cautiously optimistic*" that humans will take global action based on "*an individual and collective concern for posterity.*"

Bloembergen summarizes six measures proposed by Joel Cohen, which have been widely supported. "Educate and empower women; educate men; promote the distribution of contraceptives; save the children, improve the economics in developing countries; all of the above." Abernethy strongly supports the empowerment and education of women. The economic element may need refinement to address the "opportunity model" (Abernethy and Smail) in which population expands in synch with perceived future well-being. This is the most difficult element of feedback to address in my opinion, since the poor naturally and expectedly strive for better material conditions. Perhaps sustainable development combined with other comprehensive measures is the right approach. Traditional development with minimal population policy action is a recipe for continued suffering by humans and the rest of the planet, only greater in scope and severity.

Udall's essay calls for the establishment of "a direct-to-the-people non-profit organization financed by a consortium of billionaires." It would be primarily locally staffed, and deliver women to women reproductive health services to the poorest nations of the world. The Ted Turner, Bill Gates, George Soros, Rockefeller, Packard, and many other foundations have recognized the importance of this issue. It may well be that those enmeshed in fierce economic competition are blinkered by their focus to succeed, while those who are very rich have the opportunity to step back and look farther into the future. A trillion dollars in assets passed to progeny can't by itself guarantee them a peaceful planet, clean air and water, delicious healthy food, and the joys of a diverse natural environment.

A primary need is for human action to accelerate systemic feedback to augment womens' empowerment, health, and education. The technical means already exist to control fertility. A second, and not previously mentioned challenge is the need for system science methodology to grow worldwide and to ultimately replace irrational, power based approaches to social organization. Overpopulation is but one of the global issues we must address; and the principle of the weak link applies to the whole system.

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