POPULATION, DEVELOPMENT, AND HUMAN NATURES

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In this paper we want to make three basic points. First, the problems of development are intertwined with human population size, population growth rates, and patterns of consumption. Second, two critical ways in which development will likely be negatively affected by those variables is through their impacts on humanity's natural capital – the ecosystems that supply society with a flow of indispensable goods and services – and on our epidemiological environment. And third, the failure of human cultural evolution in the areas of sociopolitical organization and ethics to keep pace with the evolution of technological capability constitutes a major impediment to development and the achievement of a sustainable society.

Taking a global view, it is clear that the "population-consumption problem" can adversely affect all people, and especially those in developing countries. This is perhaps most obvious in the area of climate change (Intergovernmental Panel on Climate Change 1996). There is a high positive correlation between both the numbers of people and their consumption levels and the fluxes of greenhouse gases (GHGs) into the atmosphere, although there is substantial variation in consumption levels and GHG fluxes among societies (Schneider 1989; Schneider 1997). Furthermore, expansion of population and consumption is modifying existing sinks for those gases, the particulate content of the atmosphere, and the reflectivity of the Earth (its albedo) in complex ways. Neither global nor regional impacts of human activities on the climate can be predicted with precision now, although some changes will be likely to occur everywhere. Nonetheless, most atmospheric scientists believe there is perhaps a 10 percent chance that changes will be rapid and large enough to create severe problems for agriculture and other climate-dependent portions of the human economy (Schneider 1995). And, of course, everything else being equal, people in the poorest nations will be least able to ameliorate negative climatic impacts successfully, should they occur. The prospects for widespread famine may be greater than many analysts (e.g., Johnson 2000; but see Smil 2000) believe. We may have had a small foretaste of climate changes in store for us if the extreme weather

events experienced in the past decade were related in part to the build-up of greenhouse gases in the atmosphere. Whether and to what degree they were connected to the build-up will never be known, but the events were of the sort predicted in a warming world.

Humanity is already paying some costs in planning and political conflict related to efforts to mitigate and prepare for a destabilized climate – as battles over provisions of the Kyoto Protocol indicate. And even without rapid climate change, overpopulation is already helping to cause one of humanity's gravest environmental problems: increasing shortages of fresh water in many regions (Postel, Daily et al. 1996; Gleick 1998; Gleick 2000). Indeed, recent work shows that much of humanity is "currently experiencing water stress" and that the single greatest factor is not global warming but "the socioeconomic equivalent of the Mauna Loa curve, namely, rapid population growth and economic development" (Vörösmarty, Green et al. 2000, p. 284).

Another area in which population changes are now causing very serious difficulties is in the deterioration of the epidemiological environment. It has long been recognized (e.g., Ehrlich 1968, pp. 70ff) that increasing human numbers carry with them epidemiological risks. Many epidemic diseases cannot persist in small populations; measles, for instance, requires human aggregations of 200,000 to 500,000 people to maintain itself. In smaller societies, all the susceptible individuals contract the disease and either die or become immune, and the virus dies out. Virtually all transmittable diseases of human beings are caused by organisms that originally attacked other animals, transferred to human beings, and evolved strains specialized in attacking us. There are many more pathogens in nature that have not yet managed to invade people, either because human beings are too alien an environment for them to invade, or because transfer is a stochastic process and there have not been sufficient opportunities. Meanwhile we seem to be doing everything possible to increase those opportunities. For instance, suburbanization is increasing contact of people in the United States with the ticks that transmit lyme disease. And the mice that serve as intermediate hosts of the pathogenic spirochete that causes the disease appear to be more common because of the extermination of passenger pigeons that once competed with the mice for food (Blockstein 1998).

Furthermore, rapid transport systems now can make the transfer of a novel pathogen from an animal reservoir into a local human population a global threat. In addition, those systems facilitate the spread of dangerous known vectors and pathogens, as the recent arrivals of Asian tiger mosquitoes and West Nile Virus in North America exemplify. The deterioration of the epidemiological environment appears to be exacerbated by human alteration of the climate; thus global warming will allow the poleward spread of the mosquitoes that transmit malaria and dengue fever (e.g., Bryan, Foley et al. 1996). And, as always, the impacts of this deterioration fall most heavily on the populations of developing nations, which cannot afford the public health measures necessary to ameliorate them. The most dramatic example is the incidence of HIV/AIDS in Africa, where 13 percent of the world's population accounts for 69 percent of the world's cases (Population Reference Bureau 2000).

Not only is human health affected by the expansion of the human enterprise, but ecosystem health as well. The disastrous forest fires in North America in the summer of 2000 and in tropical regions a few years earlier reflect not only changes in weather patterns possibly due to the beginnings of global warming, but also to past abuse or poor management of forest resources. The apparent recent increase in severe floods and droughts in many regions from Bangladesh and India to Nicaragua and Texas can also be traced at least partly to land degradation, especially deforestation of watersheds, with devastating impacts on local or regional human populations. Even less appreciated generally is that in the last couple of centuries, the marine ecosystems of the western North Atlantic have suffered extreme degradation, which has greatly reduced their value to human beings. Stocks of many large fishes have plummeted due to overfishing and destruction of critical habitat on the continental shelf by mechanized harvesting. Similar problems beset marine ecosystems around the world. Oyster beds have been destroyed by overexploitation and agricultural runoff, and cascading losses from food chains have synergized with eutrophication, climate change, and disease (the latter probably associated with some type of human disturbance) to decimate coral reefs (Jackson 2001).

Humanity's dependence on natural capital and the ecosystem services that flow from it is not widely recognized by political leaders and other decision makers in either developed or developing countries. They do not understand that humanity is utterly

dependent on natural services (Daily 1997), flowing from natural ecosystems which can be thought of as natural capital (Vogt 1948). These services include: amelioration of climate and weather; running of the hydrological cycle that brings us fresh water; generation and maintenance of soils and recycling of nutrients essential to farming and forestry; disposal of wastes; control of the vast majority of potential crop pests and disease vectors; pollination of many crops and other valued plants; and the supply of forest and other natural products and food from the sea. As a result of this lack of recognition , in comparison with other forms of capital, "ecosystems are poorly understood, scarcely monitored, and (in many cases) undergoing rapid degradation and depletion" (Daily, Söderqvist et al. 2000, p. 395). Natural capital also is not appropriately valued in conventional economics; still less is it properly depreciated in national accounts (Repetto, Wells et al. 1987).

The community of natural scientists finds the human predicament, and its population component, very alarming. To them, the resultant need to limit the growth of the human enterprise is fully apparent (Ehrlich and Holdren 1971) (Holdren 1991) (Vitousek, Ehrlich et al. 1986; National Academy of Sciences USA 1993) (Union of Concerned Scientists 1993; Vitousek, Mooney et al. 1997). In theory, how that should be accomplished is straightforward: growth of the human population should be halted and a slow decline begun toward a sustainable population size, perhaps to an "optimum" size in the vicinity of 1.5-2.0 billion people (Daily, Ehrlich et al. 1994); wasteful consumption in rich nations must be limited in order to provide room for needed growth of consumption among the poor (Ehrlich and Ehrlich 1989; Ehrlich, Ehrlich et al. 1995); and much more efficient and environmentally benign technologies need to be deployed (e.g., Von Wiezacker, Lovins et al. 1990; Johansson, Kelly et al. 1993). In short, while more scientific information would be useful in dealing with the predicament, more than enough is in hand to know the sorts of changes that will be necessary to establish a sustainable society.

How those necessary changes are to be achieved, however, is a much more difficult problem. Humanity possesses a gigantic body of extra-genetic information called "culture," and that culture is continually evolving. But there is now a dramatic mismatch in rates between two important areas of cultural evolution; our technological

capabilities have been evolving very rapidly, much more rapidly than our ability to understand and alter our behavior toward each other and (most recently) our environments. Technological advances in the public health area triggered the population explosion of the past half-century, pushing death rates down rapidly (Ehrlich, Ehrlich et al. 1977; Ehrlich and Ehrlich 1990). Those advances far outpaced cultural evolution in human understanding of their demographic consequences or the ability of societies to deal with them. Between 1950 and 2000, the world population expanded from 2.5 billion to 6 billion. Development planners were faced with the need to increase food production and bring billions of people out of poverty and pre-industrial living conditions in some of the poorest societies while they were doubling their numbers in as little as twenty years. Changing the norms of a recent past of high birth rates (which had been paired with high infant mortalities) proved a greater challenge than was first expected. Even so, rates of resource exploitation and consumption have leaped ahead even faster than population growth as the industrial model of development was adopted around the world. By the end of the century, the consequences for the world's life-support systems of this expansion, in the form of mounting pollution problems and impaired natural services, were becoming more apparent.

So now the pressure is on the social sciences, and especially on economics, to find ways to direct cultural evolution in attitudes towards family size and consumption in order to facilitate a transition to sustainability (Ornstein and Ehrlich 1989) (Ehrlich 2000). Much has been learned about factors that influence reproductive behavior, such as the relationship of education and opportunities for women to declining fertility rates (Ehrlich, Ehrlich et al. 1995; Dasgupta 2001), and the need to ensure that men are supportive of those decisions (Holl, Daily et al. 1993). This knowledge has contributed to the relative success of family limitation programs and declines in fertility rates in many areas of the world (Gelbard, Haub et al. 1999); by the 1980s nearly every nation had established a program for services to provide access to methods of birth control (Ehrlich, Ehrlich et al. 1995). The declines may have accelerated since the United Nations Conference on World Population and Development in Cairo in 1994 (Population Reference Bureau 2000), which highlighted the connections of fertility to the status of women.

Nonetheless, these efforts have not yet been adequate to halt global population growth. It continues now at an annual rate of 1.4 percent. That may well decline further, but because low birthrates have not yet been achieved in all societies, and because of the momentum generated by past high fertility mainly in developing nations, growth is projected by demographers to add several billion more to the six billion people now on Earth before it finally ends.

Although in most industrialized nations population growth has largely ended, or even has been reversed, few people seem to realize that overpopulation in rich countries remains a major cause of the destruction of the world's life-support systems. Perhaps the most seriously unsustainable situation is that of the United States, where the total fertility rate (TFR) is 2.1, the "replacement rate" at which each generation just replaces itself in the next generation. Part of the TFR difference, as well as the high annual rate of growth (1 percent), is traceable to an influx of immigrants from high fertility nations into the U.S., but part also traces to the utter failure of the American government to establish a policy to discourage couples from having more than two children. For the U.S, a much more reasonable TFR would be at the level of 1.2-1.5 found in nations such as Italy, Spain, Portugal, Germany, Russia, and Canada.

The global seriousness of U.S. overpopulation traces to the huge size of its population, over 275 million people (the third largest national population), combined with the highest level of per capita consumption found in any large nation. That means that about a quarter of the total assault on the global environment (measured by GNP or energy use) is caused by the activities of the United States – making it truly Earth's most overpopulated nation. But generalized ignorance of the seriousness of human impacts on those systems results in society's failure to recognize the key drivers of growth in numbers and per capita consumption in the United States and other overdeveloped nations. Unfortunately, this neglect frequently spills over to developing nations, which although they often have at least some appreciation of the social and traditional economic costs of rapid population growth, usually have at best a hazy view of the externalities associated with ecosystem degradation.

Less understandable, perhaps, is the failure of the inhabitants of the United States, and American decision makers in particular, to recognize even the most basic "population

externality," (Ehrlich, Daily et al. 1992; Dasgupta 2001) that of crowding. As American freeways congeal with nearly all-day "rush hours" and suburbs sprawl increasingly into farmland, desert, and forest, the role of population growth underlying the process is continually ignored by government, the media, and most of the public. The role of population growth in the destruction of human life support systems is rarely mentioned even in the environmental and scientific communities. Thus there is no serious discussion of the relative costs and benefits of, say, choosing limitation of population size as an adjunct to measures such as carbon taxes for limiting the flux of greenhouse gases.

This lack is not entirely due to ignorance in those communities or among politicians. There is considerable social resistance to the notion that there can be too many people, and there is no institutional structure, outside of a few relatively weak NGOs, to encourage or even mandate that it be part of public discourse. As a result, there is the danger of social or political repercussions for public discussion of the population problem. This is exemplified by the 2000 presidential campaign, in which Al Gore (wisely) did not raise the population issue even though we know, from his writings (Gore 1999) and personal conversations with him, that he is fully aware of its seriousness.

Social scientists have not focused their attention on how cultural evolution might be guided – indeed they rarely think about the process of getting issues onto the agenda for public discussion as the critical part of cultural evolution that it clearly is. A major step in that evolution would be to bring population and other crucial but presently largely neglected issues, such as nuclear weapons policy and ballistic missile defense (Committee on International Policy and Arms Control 1997; O'Hanlon 1999), to the forefront of political consciousness and debate. These are all issues of great importance to developing nations as well, and they should be using their diplomatic voices and ethical capital to keep them alive in the international arena.

Another taboo subject in most rich countries is that other major driver of environmental destruction, overconsumption. While consumption has been a topic of substantial interest to economists (e.g. Hunt and D'Arge 1973), there has been little economic analysis of the role of consumption in the degradation of human life support systems. First principles and simple analyses of the correlation of consumption with ecosystem deterioration (e.g., Ehrlich 1995) indicate that it is just as important as

population growth itself. Environmental scientist John Holdren has shown that it is biophysically feasible to close the rich-poor gap and limit the impact of the human enterprise on the environment to a level that might be at least temporarily sustainable (see summary in Ehrlich and Ehrlich 1991, pp. 43-44). But both the urgency of doing so and the opportunities it may open for improving human well-being so far have, unlike the need for population limitation, only begun to reach the international agenda. Instead, discussions have largely centered on whether global warming is a "real problem" and ignored the other trends such as massive deforestation and land degradation – also resulting from rising consumption -- that will make societies even more vulnerable to global warming's adverse effects.

Too little attention has been paid by social scientists to ways that growth of consumption among the rich might be restricted, especially given the widespread conclusion that consumption among the poor – which can be a form of investment (e.g., Dasgupta 1993, p. 249) -- needs to be increased in order to provide all with decent lives. In detail, this is a difficult problem (e.g., how is consumption to be defined and measured; what kinds and forms of consumption are important; into what units should it be decomposed for analysis; how would overconsumption be detected?). But even with those questions unanswered, the dimensions of the problem are clear (see, e.g. Daly 1996, pp. 14-15). At the moment there are no institutional arrangements that would encourage social discourse on or analysis of the dimensions of consumption. And there certainly is no substantial constituency for limiting aggregate consumption, despite the obvious point that, if it continues to expand, the damage to the environment is bound to escalate, perhaps to the point of catastrophe.

There is an ethical dimension as well to our behavior relative to population, consumption, and the environment. Human beings are distinguished from all other living animals by, among other things, a combination of intense consciousness, empathy, social attribution, and language with syntax, and that enormous, expanding body of culture. That body of culture is so vast, and has evolved in such diverse directions, that each individual, indeed each society, can only possess a small portion of it. As a result, there is really no singular "human nature" – just a multitude of "human natures" (Ehrlich 2000). Our combination of unique characteristics has led to the evolution of ethics –

culturally shared values that involve notions of right and wrong. Ethics themselves evolve constantly; to see that, one only need consider the different views of ancient Greek and modern western philosophers on the issue of slavery. That, in turn, suggests that there is no transcendental source of values, and that the so-called "naturalistic fallacy," that "is" carries implications for "ought," is appropriately named.

The area of attitudes toward population and the environment is one where ethics are now evolving rapidly, as can be seen in the variance of views on many related topics. In the United States for instance, the following questions will elicit very different answers from different individuals. Was Al Gore's campaign neglect of the population issue ethical? Is it ethical for people to have large families despite well-known population externalities (Ehrlich, Daily et al. 1992)? Is driving a heavy sport utility vehicle ethical where there is no need for its special off-road capabilities? Is building a 600 square meter house for a family of four on relatively undisturbed land ethical, when hundreds of millions of people have no semblance of decent shelter and human life-support systems are threatened by habitat destruction? Similar questions are being discussed in nations as diverse as Australia, Mexico, India, and China. That cultural evolution is involved in such ethical issues is clear; these questions would not have made sense to most educated people even 50 years ago.

A great hope for building a sustainable society is that that the evolution of ethics apparently can be guided. Examples of attempts to guide it abound – even though participants would not describe their efforts in those terms. In the United States, the abolition, women's rights, and temperance movements, and after World War II, the civil rights, environmental, and anti-abortion movements, are outstanding examples. Similarly, numerous attempts have been made to guide ethical evolution in other nations, from campaigns to support decolonization after World War II to those to revive religious fundamentalism today. With possibly a few exceptions, such movements involve "moral entrepreneurs," in sociological terms (Becker 1963), who did not think of themselves as trying to steer cultural evolution – but that's what they were doing. Sociologists have examined the history of changing social norms, norms such as the proscription against political discussion of population issues in the United States. Analyses and theories of

"deviance" abound (Adler and Adler 2000) – and deviance is obviously an important feature of cultural evolution, for without it there would be stasis.

But social scientists have made little progress in understanding why some attempts at directing cultural evolution have been successful (abolition) and others have not (temperance). One of the possible causes of the lack of progress in changing attitudes toward population and the environment, which could make solving the human predicament even more challenging, is that people raised in different cultures actually have different systems of thought (Nisbett, Peng et al. 2000). Just as an organism's genetic system must be considered if one is attempting to understand its biological evolution (Ehrlich, Holm et al. 1974), understanding of a society's cognitive system may be a prerequisite of influencing its cultural evolution.

Important changes occurring rapidly have been a feature of cultural evolution ever since the "great leap forward" some 50,000 years ago (Sahlins 1968; Diamond 1989; Mellars 1991) ended a long human history in which periods of technological stasis (Oldowan, Acheulean, Middle Paleolithic) lasted for hundreds of thousands to more than a million years (Klein 1999). In recent centuries, the speed of technological revolutions appears to have been accelerating, as is apparent from comparison of the technologies of 1500 with those of today. Social change also seems to be accelerating, as attested by changing attitudes about slavery, colonialism, economic equity, and racial, religious, and gender prejudice, in the past century or so. The question is whether such evolution can be pointed in the right direction and accelerated sufficiently to catch up with the technology-driven degradation of human life support systems. We certainly believe it is possible; whether it is likely is another question.

In summary, it is clear that population growth, runaway consumption, and the use of faulty technologies are an enormous threat to the persistence of civilization. The need to change all three are clear if there is to be any hope of achieving a sustainable global society, one in which cultural diversity will (we hope) persist but where the yawning gap between rich and poor will have disappeared. But before this can be accomplished, many more people need to become familiar with the dimensions of the predicament, and enormous changes in values will be required. The latter seems to us especially true of values relating to equity, for it seems unlikely that the cooperation needed to solve the

human predicament can be obtained when so many people are living lives of severe deprivation (Daily and Ehrlich 1996). The most important challenge before us is, therefore, to find ways to change the natures of very many human beings -- to direct cultural evolution toward effecting changes in values as rapidly as possible.

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