

Two Threats to Global Security

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In October 1347, a Genoese merchant ship returned from a trading expedition to the Black Sea, docking at Messina in Sicily. On board the ship were sailors who had been infected by the bubonic plague. The plague had originated in China, which at the time was one of the world's busiest trading nations. The epidemic followed a path along the silk road to the Black Sea, Europe's gateway to the treasures of the Orient. From there, the Italian merchants brought the deadly cargo to Sicily and Southern Italy. By the following year – approximately fifteen years after its initial outbreak in China – the plague had spread as far north as England, where it was dubbed “The Black Death” for the black spots it produced on the skin. After five years, the plague claimed one-third of Europe's population (25 million people), significantly altering the course of European social and economic history.

Obviously, this factual account of the plague's spread does not do justice to the huge toll in human suffering, and the tremendous fears generated in European towns and villages as they wondered when and where the plague would next strike. Lacking an understanding of the principal host and the vector, rats and fleas respectively, Medieval Europeans could do little to control the epidemic. Environmental sanitation conditions at this point in European history were appalling, and would not see significant improvement until the public health measures first implemented in England four to five hundred years later. This not only promoted the epidemic's rapid spread, but also enabled smaller outbreaks of the plague to continue until the early 18th century.

The plague constitutes the Western world's first environmental security calamity. In relative terms, if the same epidemic were to occur today it would eliminate the equivalent of the entire US population. Just as the plague was a bacterial infection that took advantage of patterns of trade and alteration of the environment to spread itself, today's environmental security threats are likely to come from nature's responses to human-induced changes in the planet's biophysical systems. Although we have a knowledge of the workings of the natural world undreamt of in the Middle Ages, the environmental challenges confronting us are also several orders of magnitude larger. The world is becoming warmer due to greenhouse gases, more fertilized due to nitrogen fixing, and drier due to human appropriations of freshwater and changes in land cover.¹ Furthermore, the number of people living in miserable, unsanitary conditions that can only be compared to those of Medieval European cities, is also far greater than at any time in the past.

The thesis of this chapter is that population growth and patterns of economic globalization (as manifested by consumption, trade and the growing power of multi-national corporations) may have grave and unforeseen consequences for the environment and humankind. As with the plague 650 years ago, there is a sense in which these processes are seemingly beyond our control, as if the root causes of the current global disequilibrium are not sufficiently understood to allow us to reverse the trend. Although a growing number of people in the world have a vision of an alternative future based on simpler lifestyles, greater equity, meaningful work, and social justice, getting from 'here' to 'there' will be tougher than most imagine. Still, it is necessary for humanity to choose its future, or the world will continue to be beholden to processes that perpetuate vast inequalities and generate tremendous human suffering in the form of poverty and civil strife.

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The starting point: population

The greatest threats to global environmental security stem from the activities of two particular subsets of the global population: the absolute poor and the affluent. These sub-populations cut across national borders, and do not correspond strictly to the traditional regional categories of lower-, middle-, and upper-income countries. Thus, a poor indigenous person in Malaysia or Brazil, both rapidly industrializing countries, would be on the same socio-economic level and have essentially the same environmental impacts as a rural farmer in Mali, one of the world's least developed countries. And, with some minor differences, the up and coming computer programmer in Bangalore, India, is on a par in terms of consumption of resources and waste generation, with middle-income residents of Madrid, Spain. Although precise numbers for these two sub-groups are not generally available (Table 1 shows some estimates), it can be estimated that approximately 1.5 billion of the world's population is very poor and another 1.5 billion are affluent (i.e. in the upper or upper-middle classes). At today's population of 5.8 billion, this leaves about 2.8 billion people in the middle-income category.ⁱⁱ

Table 1. Comparative estimates of world population by wealth category

UNDP – 1992 ⁱⁱⁱ	Bill-ions	A. Durning – 1992 ^{iv}	Bill-ions	IIASA – 1990 ^v	Bill-ions
Richest fifth (83% of income)	1.1	Consumers	1.1	Top	0.29
Upper middle (12% of income)	1.1			Upper middle	1.00
Middle (2.3% of income)	1.1	Middle income	3.3	Lower middle	2.00
Lower middle (1.9% of income)	1.1			Bottom	2.00
Poorest fifth (1.4% of income)	1.1	Poor	1.1		
Totals:	5.5		5.5		5.29

The absolute poor generally carry out environmentally threatening activities at a very local level, such as over-cultivating, over-harvesting, deforestation, encroachment on protected areas, land clearing on steep slopes, and unsanitary disposal of wastes. They do so out of necessity, and because they often lack the capital, appropriate technologies, and training to adopt alternative practices. The threat stems partly from their practices, and partly from the scale and magnitude of these practices, which is directly related to their increasing numbers (i.e. their population growth rates). This is a case of local-level environmental degradation being carried out on such a scale that, in aggregate, it amounts to a global problem (at least in the developing world).

In the final analysis, however, the material 'needs', consumer preferences, and economic activities of the affluent pose a far greater threat at the global level. These needs, preferences, and activities are directly related to culturally-prescribed patterns of consumption and the ongoing process of economic globalization. Free trade, the dominance of multi-national corporations, and currently available models of development are creating a situation that will have severe long-term environmental implications. Again, it is a question of scale. Although the affluent are a relatively small subset of the world's population, they consume a disproportionate share of the world's resources. And, their numbers are growing rapidly as countries around the world strive to compete in the global economic marketplace for their share of the economic pie.

A corollary of these arguments is that population stabilization and remedial efforts to protect or improve the environment will not succeed at the far larger task of putting the world on the course of social, economic, and environmental sustainability. These are necessary but insufficient conditions for achieving sustainability. The pursuit of "true" environmental sustainability will require tackling complex issues that are at the very foundations of modern civilization. It will also mean redressing the economic injustices that currently prevail in the world system, and persuading the entrenched interests that benefit from

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current political and economic arrangements to reprioritize their agenda from the pursuit of profits to meeting human needs. In short, it will require a clarity of understanding and a political will that does not currently exist, but which, as the situation worsens, can hopefully be realized.

The absolute poor

Since the primary focus of this paper is on the environmental impacts of the affluent, this section on the absolute poor and their environmental impact will necessarily be brief. The issues have been dealt with ably in a number of publications, most notably UNICEF's *State of the World's Children 1994*. In this publication, UNICEF introduced the population-poverty-environment spiral (see Figure 1), which illustrates how population growth, poverty, and environmental degradation combine in a mutually reinforcing cycle that makes it increasingly difficult for poor people to meet even their basic needs. The discussion below centers on the poor living in rural areas, for it is in these areas that their impacts upon the environment are most pronounced and far reaching.

Figure 1. The population-poverty-environment spiral

(PPE spiral diagram here)

Source: See endnote ^{vi}.

Fundamentally, the connections between population, poverty, and the environment have to do with *human security*. Today, a large and growing portion of the world's population is coping with such dramatic insecurity that their desperation forces them to eke out a living in any way they can. This leads them to do two things: 1) to "mine" environmental resources such as farm plots, forests, fisheries, and common lands in an unsustainable manner, and 2) to have many children in order to capture more of these resources, and to provide security in old age. Many factors contribute to their initial insecurity, including lack of access to land and resources (e.g. insecure land tenure), lack of education and human resource development, inadequate modern-sector employment opportunities, pricing policies biased toward the urban middle-class and elites, undeveloped local markets, dictatorial regimes, lack of civil liberties, and skewed distribution of income and assets. Historically, many of these problems stemmed from failures of governance so common in the poorest developing countries. More recently, structural adjustment

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packages (SAPs) that were imposed by the World Bank and IMF in response to the Third World debt crisis, together with the extensification of commercial export agriculture in order to earn valuable hard currency to pay off these debts, have exacerbated these problems.

Whatever the initial causes of insecurity, however, current patterns of environmental degradation further reduce security and provide a perverse incentive for high fertility. Why? Because, in contexts where many environmental resources are scarce, it pays to have more hands to tend to basic household chores: collecting water and firewood, sowing crops, weeding crops, protecting crops from birds, harvesting and processing crops, livestock herding and collection of non-timber forest products.^{vii} Thus, paradoxically, the collective effect of reproductive decision making by a very large number of households is to further increase the pressure on already strained natural resources. In other words, at a household level, it is perfectly rational to have a large number of children, while at a societal level, it is leading to progressive impoverishment of the resource base.^{viii} Another common demographic response to increasing household insecurity – the selective migration of able bodied members to urban areas for employment – acts as a safety valve to reduce environmental pressure in rural areas, but it is increasingly straining the resources and infrastructure of urban areas. The urban receiving areas in much of the developing world are overcrowded, lack adequate water and sanitation services, and cannot possibly provide employment opportunities to all who come.

Although the environmental and socioeconomic problems confronting the rural poor are great, they are not insurmountable if functioning institutions were put in place with sufficient technical and financial resources at their disposal. In fact, the best path to increased security for the world's rural poor is to empower them through participatory approaches to development that lead to greater access to and control over local resources. Not only can their pursuit of a sufficient livelihood be made less environmentally damaging, but their reproductive behavior can be successfully addressed through family planning and reproductive health programs. In fact, population programs are now vital means of liberation for women of the developing world from the burden of childbearing and childrearing.^{ix} However, as women become increasingly free (or forced due to economic circumstances) to find a place in the workforce, it will be important not to under-value the contribution they make to providing social glue through their roles as nurturers and creators of home life. Furthermore, now that women in developing countries are increasingly pursuing careers or finding work in the informal sector, new questions will need to be asked about the impact of so many additional workers on overall unemployment, and the impact of additional household income on consumption patterns.

Small scale deforestation, soil erosion, declining farm yields and urban sanitation are not glamorous problems, and they are not susceptible to 'big science' solutions, but they can be addressed with our current knowledge, resources, and understanding. In contrast, as will be discussed in the following sections, the problems generated by the affluent world (e.g. global warming, ozone depletion, and hazardous waste disposal) are far more intractable because they involve complex social and institutional arrangements and widely shared assumptions regarding life styles and the benefits of economic growth.

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The affluent

The poor are locked in poverty largely because the rich control the world's markets, resource flows, prices, and finance. But they are aware of one another. Modern communications and tourism bring the luxury of the rich before the eyes of the poor, and the latter no longer accept these disparities with patience or as a part of some natural historical order.

– *Caring for the Earth*, 1991^x

Although much of the developed world's attention and policy action has been focused on the destructive impact of the world's poor, and on the security threats that unbridled immigration from poor countries bring to the United States and Europe,^{xi} the most prominent threat to global environmental security stems from patterns of consumption, trade, and development that together constitute 'economic globalization'. Both industrialized and developing countries share responsibility for these trends, but it is the industrialized world, through its disproportionate consumption of natural resources, production of greenhouse gas emissions and hazardous wastes, and dominance of world trade, that is having the greatest environmental impact.^{xii}

Colorful depictions of the "ugly" over-consumers – e.g. wealthy Americans who drive ostentatious luxury cars, fly in private planes, own yachts, wear animal furs, and indulge their tastes for exotic foods imported from around the world – have tended to cloud understanding of the consumption-environment nexus. Many people believe that if society could simply eliminate such extravagant and wasteful consumption patterns, and make an extra effort to drive less and recycle cans and bottles, that many environmental problems would be resolved. This betrays a basic misunderstanding of the size and scope of current environmental problems, and how difficult it will be to change the consumption and behavior patterns of average consumers in the industrialized and the newly industrialized countries in order to have a meaningful impact on the environment.

Between 1960 and 1995 global population nearly doubled from 3 to 5.7 billion and global economic output more than tripled, from \$5.74 trillion to over \$19 trillion (in 1987 U.S. dollars). Between 1995 and 2030, world population is likely to grow by half again to 8.7 billion and global economic output is projected to increase three-and-a-half times to approximately \$67 trillion.^{xiii} Rapid growth in the economies of East Asia, Latin America, and the Middle East coupled with a possible tripling of the economic output in industrialized nations accounts for most of this projected growth. The nascent consumer class in the countries in South and East Asia already outnumbered by several million the consumers in Western Europe and North America. Citizens in these Asian countries and in most other developing countries apparently wish to emulate the living standards of the developed world, and are being encouraged to do so by media advertising campaigns.^{xiv} Although the environmental repercussions of this rapid economic growth will depend on the nature and composition of global economic activity and the technologies employed, the projected increases in the production and consumption of goods will undoubtedly have a significant impact. In other words, the energy use and material throughput of the economy will not grow in direct proportion to gross domestic product (GDP), but it would take major advances in science and technology to de-couple them entirely.

At a superficial level, consumer demand is what drives the production of goods and services that, in turn, generates environmental impacts. Indeed, under the assumption of consumer sovereignty, economists identify the market as the specific mechanism by which goods and services are produced in response to consumer preferences.^{xv} This leads one to conclude that individuals and households have the greatest responsibility for the environmental effects of consumption, which is only partially true. While there is no question that "we" as individuals are solely responsible for our consumption-related decisions, this simple market-based model does not take into account a number of important factors that make the relationship between consumption and the environment more complex. The first is advertising. Over the course of this

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century marketing specialists have developed highly sophisticated means of advertising to shape consumer preferences and stimulate demand for products that meet psychological needs (as opposed to basic needs for shelter, food, clothing, and transportation). This is a case of the market 'tail' wagging the consumer 'dog'; if it were not for large-scale advertising campaigns, many of the products that are harmful to the environment (and to human health, such as cigarettes) would not have such widespread appeal.

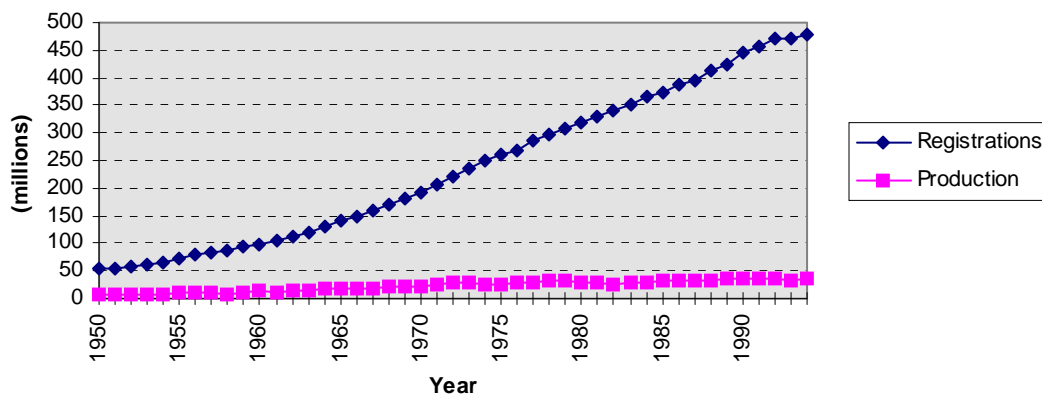
The second factor contributing to complexity relates to government procurement and purchasing patterns. There are a whole set of market demands that are generated by governments and large institutions for everything ranging from large buildings and power plants to military hardware. Very importantly, governments also have the power to intervene in markets through regulatory action and the provision of subsidies, and thus bear a significant responsibility for the impacts of consumption on the environment. The last of the complicating factors relates to the design and production process of the consumer products themselves. Decisions made within corporations about which industrial processes or materials to use for the production and packaging of certain goods may only be marginally influenced by consumer preferences.^{xvi} These choices, for the most part, are made by engineers, scientists, and research and development specialists in conjunction with marketing teams, within limits imposed by government regulations. Provided the end products are essentially the same, consumers may be indifferent to these 'embedded choices' that form a part of the product design, production and marketing process even though they may have significant environmental implications. For example, the styrofoam packaging used by McDonald's was eventually replaced by paper packaging when environmentalists pointed out that styrofoam contributes to CFC emissions and is non-biodegradable. From the perspective of the consumer, the current packaging works just as well – it is just that the company's marketing and R&D staff had not initially considered the environmental implications of hamburger packaging. The point here is that these factors have little to do with consumer preferences of individuals and households, and yet they add tremendously to the complexity of the consumption-environment nexus.

At the dawn of the industrial revolution two centuries ago, when Adam Smith wrote *The Wealth of Nations*, markets were primarily local. The person who produced your horse-drawn cart was local, and would probably repair the cart for you as well. This is no longer the case. Instead, goods and increasingly services are often produced at great distances from where they are consumed. Tomatoes and lettuce produced in California are shipped by truck and air freight around the world. Even water consumed by elites in Singapore, Hong Kong, and throughout the United States is bottled in France. Services too are increasingly performed at a distance. Insurance claims generated in the US are sent by fax to Ireland for processing. Capital is free to go wherever labor is cheapest and environmental regulations are most lax. This is the essence of economic globalization. The global economy knows few boundaries, and the corporations and interests which benefit from economic expansion are rapidly seeking to knock down the few barriers to trade and the movement of capital that remain.^{xvii}

The process of economic globalization and its links to consumption are well illustrated in the case of automobiles. The automobile is a supremely useful invention, a fact that is confirmed by the consumer choices being made around the world. More than a means of getting from point A to point B, it reflects broadly held values such as individual freedom and mobility, and provides a vehicle (literally) for personal statements of prestige, power, and even environmental awareness (witness the small economical models). In Jungian dream analysis, cars are symbolic of personal power, ego, and drive. However, humanity's love affair with the car is having major environmental ramifications. These take the form of greenhouse gas emissions (CO₂ and CFCs), urban smog, noise pollution and congestion, paving of once productive or aesthetically pleasing landscapes, and depletion of petroleum reserves. There are additional environmental costs related to the manufacture (mining of raw materials, energy use, chemical disposal, etc.), maintenance (crank case oil, CFCs for air conditioners, etc.), and disposal of automobiles and their component parts (batteries, tires, air conditioning units, etc.).

The scale of automobile use is increasing at an alarming rate around the world, and this is occurring well beyond the traditional strong-holds of North America and Europe. Between 1950 and 1994, the total number of passenger car registrations increased at an average annual rate of five percent, from 53 to 480 million (see Figure 2). In 1950, three-quarters of all registrations were in the United States, whereas in 1994 this proportion had declined to 30 percent. Production of passenger cars has remained steady at an average clip of 35 million cars per year for the past decade, up from 8 million in 1950. The population per car ranges from 2 in North America, 4 in Europe, 15 in South America, to 69 in Africa.^{xviii} Globally, one-third of world oil consumption and 14 percent of carbon dioxide emissions can be attributed to motor vehicles. In the United States, the figures are 50 percent of oil demand and 25 percent of carbon dioxide emissions.^{xix}

Figure 2. World passenger car registrations and production, 1950-1994



Source: see endnote 18.

On average, Americans consume roughly 22 liters of fossil fuels per person per day, generating 19.5 tons of carbon dioxide annually per person.^{xx} If the rate of fossil fuel consumption were to be reduced to sustainable levels (i.e. no net contribution to the green house effect), by 2010 average consumption per person world wide would need to be reduced to 1 liter of carbon-based fuel per day. Excluding all other fuel use, an individual would have the choice of traveling only 24 kilometers by car, 50 kilometers by bus, or 10 kilometers by plane each day.^{xxi} We are participating in a massive global experiment in which each year billions of gallons of fossilized carbon that took millions of years to form are being extracted and pumped into the earth's atmosphere. No one can accurately predict the full environmental consequences, though climate change, increasing seasonal and spatial variability in rainfall, sea-level rise, and displacement of ecosystems are among the results that scientists reasonably expect. Possibly we will return to the kind of jungle-like conditions that produced the fossil carbon in the first place.

It appears that in this domain, as in many others, the imperatives of the financial world are taking precedence over the needs of the living world of humans and other species.^{xxii} Car manufacturing and sales is big business. With annual sales of around one trillion dollars, the industry accounts for one in ten jobs in industrialized countries. According to *The Economist*, "Developing countries, having seen the wealth the industry has created, aspire to their own car plants as symbols of economic virility and a source of jobs. With markets in America, Japan and Europe now growing only slowly, the world's big car companies are scrambling to set up shop, with local partners, in China, India and Latin America, where car output this year will rise by a quarter."^{xxiii} In other words, large-scale marketing campaigns and agreements between developing country governments and car manufacturers are encouraging the spread of US-style transportation models all over the world. For example, the *New Scientist* reports that in

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Calcutta the Japanese International Cooperation Agency is financing the construction of six highway over-passes to the tune of \$46 m, which is more investment than the city's tram system has received in the past 20 years.^{xxiv} Bicycle rickshaws and hand pulled carts will be banned from the center of the city, and tram lines that cross busy intersections will be shut down, all in favor of a mode of transportation that will solely benefit the middle and upper class while increasing air pollution and creating havoc in the streets.

Scenarios like these are becoming common place in the developing world. Bangkok is so congested that traffic crawls along at less than 10 kilometers per hour. Even in Africa, where car ownership is most limited, cities such as Lagos, Nairobi, and Dakar have fallen prey to the craze for personal transport, paralyzing their streets with grid-lock. In China, where economic growth rates have averaged close to eight percent over the past decade, the growing middle class is hungry for automobiles and other consumer goods. The number of automobiles is expected to increase 11 fold between now and 2010, from 1.8 million to 20 million.^{xxv} With the ubiquitous bicycle being replaced by cars, the country is headed for ecological catastrophe that will have global ramifications, not to mention monumental traffic jams.

In a world in which the consumer is sovereign, the collective impact of millions of individual decisions in favor of personal transportation is leading us incrementally away from environmental sustainability.^{xxvi} As incomes rise, people desire more individual freedom and mobility. However, if everybody paid the true environmental and social costs of personal transportation using the automobile (i.e. if these costs were 'internalized' via higher sticker prices, gasoline taxes, and tolls for road use), then cars would be a far less attractive option when compared with public transportation. For those who could still afford them, cars would be more fuel efficient and environmentally friendly. But that day is still far off. The successful battle against the BTU tax in the United States shows how vigorously the automobile and petroleum industry trade associations fight against any proposals that would increase the costs of personal automobile use. Today, most environmental and social costs of the personal automobile are externalized (or socialized, via government subsidies), and, furthermore, even if they were internalized, the true long-term costs of large-scale transportation based on the personal automobile are not fully known. Unfortunately, the prospects for moving the world toward a more sustainable transportation model are growing dimmer with each additional kilometer of black top that is laid.

Survival of the fittest

The forces that are seeking the expansion of global economic activity, whatever the perils to the environment, are far greater than countervailing environmental forces. Societies around the world are increasingly being shaped by a form of economic Darwinism in which only the fit survive. Global competition in the name of greater economic efficiency is the holy grail of economic globalization. This raises important questions, however, about who truly benefits from this globalization process. Cornucopians and other proponents of unbridled economic growth would have us believe that everyone benefits from greater production of material goods, because more goods implies greater well being.^{xxvii} However, others are beginning to question this basic assumption of the modern world system.

Sociologists Kempton and Payne address what they term the myth of "social evolution for individual benefit."^{xxviii} By myth, they are referring to a set of ideas that persist and spread because they have some function, or fit within culturally prescribed belief systems, and thus are commonly accepted. The "social evolution for individual benefit" myth runs something like this: the organization of human societies has gone through an evolutionary process that increases the benefits (materially and psychologically) to all members of that society.

Upon reviewing the evidence on the two major revolutions in human organization (i.e. from hunter-gathering societies to sedentary agricultural societies, and from agricultural societies to industrial), they conclude that the "major social transitions will occur if they provide benefits to decision making elites

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and greater 'fitness' at a societal level (e.g. military advantage or rapid growth and spread of the socio-political system). Increasing the quality of life of individuals is not a criterion for choosing the direction of social evolution."

In the current social transition, defined as it is by increasing globalization and the growth of multinational corporations, this principle is being borne out. The concentration of wealth and power in the upper most echelons of society continues unabated, while a large and growing number of people are losing out.^{xxxix} Even average Americans, who are the world's winners from the perspective of per capita income, find themselves on an economic tread mill that cheats them of basic elements contributing to quality of life: free time, low stress, low crime, and a happy family life.^{xxx} Several million Americans now find themselves among the working poor, frustrated by jobs that pay just above the minimum wage, with few benefits, and even fewer prospects for advancement.^{xxxxi}

In the developing world, a small number of people are benefiting from economic globalization, largely at the expense of the poor and economically disenfranchised. In the words of Castells, "The current process of restructuring is fragmenting the social fabric of the planet. It is also recomposing it, but only in part, into a structure that primarily suits the interests of dominant governments and corporations, and of those areas or institutions for which the dominant powers have specific interests."^{xxxii}

Proponents of free trade as institutionalized under the World Trade Organization argue that developing countries can benefit from trade liberalization by taking advantage of their comparative advantages. However, the principal comparative advantages of most developing countries – plentiful supplies of cheap labor and lax environmental regulations and enforcement – are more likely to lead to social, economic, and environmental impoverishment than to improved well-being.^{xxxiii} In fact, many poor farmers and laborers in the developing world have already experienced first hand the 'benefits' of free trade, as they see their agricultural lands expropriated for commercial agriculture, or they find themselves in assembly industry jobs earning survival wages producing goods for Northern consumption.^{xxxiv} In short, the quest for greater efficiency in response to global competition has not produced greater human well-being, but rather has led to progressive dehumanization.

A response to the cornucopians: Why technology and information won't "save" us

When discussing global environmental trends, cornucopians and other proponents of economic growth have tended to focus on the following proposition: that unlike other animal species we have culture and knowledge, and therefore can shape our environment to a degree that far surpasses any other living organism. As Lutz notes, the very fact that humans think about their own impact upon the environment sets us apart from other species.^{xxxv} This is a very important argument, and it needs to be dealt with seriously. The fundamental question regarding the fate of the planet can thus be reduced to the following: will human culture be able to generate responses to the very environmental problems that humans are creating fast enough to remain "in control" of the process, or will we reach a point at which we have gone too far and environmental (and even societal) processes get beyond our control?

The standard response of the cornucopians and those who benefit from current world economic arrangements is that science and technology will develop solutions to many of the problems of diminishing resources, and that the information explosion, as exemplified by the internet and diffusion of knowledge around the world at record speed, will aid us as we develop these new technological approaches.

Let us take these arguments one at a time. Science and technology indeed have served us well. Today, thanks to the Green revolution in agriculture, we are able to feed more people than ever before. Thanks to

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medical advances, there is less sickness and disease, and life expectancy has increased dramatically. Thanks to the internet and international courier services we are able to communicate faster than at any time. Our computers are faster. Our ability to travel between places has never been easier.

However, today and in the recent past, dramatic claims regarding the future impact of science and technology have the aspect of idolatry, for they are based on the supposition that man can save himself from his increasingly perilous situation if he just applies sufficient know how. This is science and technology as religion. Ironically, it is not the hard scientists who evince the most faith in science and technology. Rather, it is usually the cornucopian economists. A recent joint statement from the scientific academies of 58 countries makes this point clearly: "As scientists cognizant of the history of scientific progress and aware of the potential of science for contributing to human welfare, it is our collective judgment that... it is not prudent to rely on science and technology alone to solve problems created by rapid population growth, wasteful resource consumption, and poverty."^{xxxvi}

Rustum Roy, a mechanical physicist, writes that "Humanity's capabilities are bumping up against the absolute ceiling of Nature's givenness."^{xxxvii} Despite abundant evidence that progress in science and technology is reaching a plateau as it hits against the limits imposed by the fundamental physical principles governing the universe, Roy laments that most of the U.S. government committees on R&D policy still plan within the framework of a linear growth and progression hypothesis. In the field of biology, where new revolutions are still occurring in the area of genetic engineering, it is likely that scientists will run afoul of widely held ethical values regarding the sanctity of life, resulting in a slow down – if not a halt – in further progress.

In contrast to these modest statements by scientists, Cato Institute economist Stephen Moore writes, "As we progress further into the current information age, the notion of finite physical resources is becoming all the more outmoded. At an unparalleled pace, human ingenuity is unlocking ever more spectacular advances in technology and scientific knowledge that are advancing our mastery over the finite physical universe."^{xxxviii} In essence, the cornucopians project a rapid growth in scientific discoveries on the basis of the information revolution and past trends in technological progress.

The information age has indeed brought a deluge of information, some of which has been quite useful for science. Television aside, which is the most popular medium of information dissemination, but contributes little to scientific advance, there has been an incredible upsurge in information exchange made possible by advances in telecommunications. For example, Internet connectivity has increased from a few thousand e-mail accounts in 1980 to 30-40 million today, and the number of sites on the World Wide Web is up from 130 in 1993 to 650,000 in 1997.^{xxxix} Within a few years, it will be possible to find close to any possible piece of information on the Web (given sufficient time to sift through what is not useful). There is also no question that communication and the exchange of ideas between scientists has been enhanced by electronic mail.

The catch is that an increase in information does not mean a commensurate increase in our collective well-being. As we become inundated by information and facts from our newspapers, television news, and Internet sources, we need to fit them within some kind of framework in order to make sense of them, so that they will contribute to our world view, and to the advance of civilization. As E.F. Shumacher wrote,

We cannot get an overall view merely by assembling more and more facts. By themselves, facts mean nothing, prove nothing, and lead to no conclusions. Facts need to be evaluated, that is to say fitted into a value system, to be of use.^{xl}

The point here is that more and more information, generated at greater and greater speed, without time for reflection or putting in its proper context, simply generates information overload. This is knowledge as

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junk, or dissociated 'factoids'. Though we try to order the information better through information management and databases, the sheer scale of the task is quite daunting. Fundamentally, unless we change the value system and assumptions upon which global economic system is operating – e.g. economic advance for human welfare instead of personal enrichment, material gain, or to further the aims of corporations – we will just harness increased information and technological progress for the same ends. This was foreseen, in poetic fashion, by Edna St. Vincent Millay, who wrote in *Huntsman, What Quarry?*:

Upon this gifted age, in its darkest hour,
Rains from the sky a meteoric shower
Of facts...They lie unquestioned, uncombined.
Wisdom enough to leech us of our ill
Is daily spun, but there exists no loom
To weave it into fabric...^{xli}

Tackling the two threats: creating alternate futures

For now and into the foreseeable future, the greatest threat to the environment stems from “economic globalization,” which is directly related to trends in consumption and trade, and to the currently available models of development. Attempts to put the world on a more socially and environmentally sustainable course through population stabilization and environmental protection are necessary and need to be pursued more vigorously. The problem is that the sums of money invested in these areas are dwarfed by the size of private-sector investments that, each day, are incrementally moving the world away from environmental sustainability.^{xlii} Furthermore, it could be argued that the aid dollars dedicated to population stabilization and environmental conservation serve as red herrings to divert attention from the far more intractable issues surrounding economic globalization.^{xliii} Although efforts in these two domains *do* need to be stepped up, commitment to these activities on the part of governments, multi-national corporations, international non-governmental organizations, and the UN cannot be used as an excuse for inaction on other, more vital fronts.

Paul Harrison, a British writer on population and environmental sustainability, writes of a “Third Revolution”.^{xliiv} The first revolution was the shift from hunting and gathering to agriculture, with all the attendant changes in settlement patterns. This permitted the specialization of labor, the rise of large civilizations, increased concentrations of population, and a whole host of other societal changes. The second revolution was the industrial revolution, with its incredible reliance on petrochemicals (as discussed above). This has resulted in further specialization of labor, even more complex social organization, and the rise of mega-cities of 10 million people and more.

It is still unclear what the third revolution is going to be. There have been attempts during the recent series of UN conferences (UNCED, the Human Rights Conference, the International Conference on Population and Development, the Social Summit, the Women's Conference, and Habitat) to create action plans to redress global inequalities, stabilize population, and improve the environment. They hint at a more equitable, just, and sustainable global society, but they suffer from two weaknesses: they lack teeth, and they fail to address the underlying causes of inequity and unsustainability which can be found in the process of economic globalization described above.^{xliv} Being conferences of government officials representing nation states, they may also lack the imagination or foresight to know what major revolution is coming down the road next. Perhaps that is because the nation state itself may become a thing of the past.

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Although we don't know what society will look like after the third revolution, it can only be hoped that it will demonstrate some of the following characteristics:

- a respect for human beings – especially disadvantaged groups such as the poor, children, the elderly, ethnic minorities, and women.
- a desire to place human needs before economic efficiency and profit making.
- more democratic and participative forms of social organization.
- greater international cooperation instead of competition.
- a growing willingness to challenge the interests of multi-national corporations.
- an increasing recognition of the importance of cultural and biological diversity, and locally adapted solutions for sustainable development.
- empowerment of the rural poor through education and training so that they no longer perceive themselves as victims of circumstances.
- greater respect for the environment.
- greater understanding of the human place in Nature, and of how our collective activities and individual consumption patterns impact upon the environment.
- a merging of sophisticated, information age technologies, with traditional knowledge.

The Chinese curse, “may you live in interesting times,” seems to be coming true. Today, we live in very interesting times, and while it is easy to see the curse in all of this, there is also perhaps a blessing as well. The blessing is that those of us who are alive today have the opportunity to contribute to the making of an entirely different form of social and economic organization. Fortunately, unlike Medieval Europeans at the time of the plague, we are not beholden to forces of nature over which we have little control or understanding. We have a self-awareness and an ability to choose alternative paths that can lead us away from calamity. If we fail to do so, the risk is very great. But if we succeed, the future generations will thank us for using our creativity to bring about a more equitable global society that respects the environment while meeting human needs.

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End Notes

ⁱ (a) Global warming: according to the Intergovernmental Panel on Climate Change (IPCC), global temperatures are projected to rise approximately 3 degrees Celsius between now and 2100 under business as usual assumptions. (b) Fixed nitrogen: humans 'fix' nitrogen through their use of chemical fertilizers to promote plant growth. Due to its increased use in agriculture (half of the industrial nitrogen fertilizer used in human history has been applied since 1984), humans have now doubled the amount of fixed nitrogen available to all living things. (c) Water: The FAO currently estimates that over one-half of all accessible surface water runoff is committed to human uses. By 2025, if all human needs are to be met while ensuring that sufficient water is left to safeguard the environment, overall water requirements may exceed accessible runoff by five percent. Meanwhile, changes in land cover such as deforestation and inadequate soil conservation practices are increasing the areas subject to desertification.

ⁱⁱ Although the focus of this chapter is on the environmental impacts of the 3.0 billion people in the 'poorest' and 'richest' categories, it would be wrong to suggest that those in the middle category exist without making an environmental impact. Even meeting needs in a modest way requires natural resources and environmental services. Furthermore, as will be discussed in a later section, many middle-income consumers are now aspiring to the same goods and services that previously were reserved for the affluent.

ⁱⁱⁱ UNDP, *Human Development Report 1992* (New York: Oxford University Press, 1992) p. 35.

^{iv} A. Durning, *How Much is Enough?* (New York: W. Norton & Company, 1992) p. 27.

^v W. Lutz, C. Prinz, and J. Langgassner, "World Population Projections and Possible Ecological Feedbacks," *Popnet: Population Network Newsletter*, 23 (Summer 1993) Table 4, p.10.

^{vi} UNICEF, *State of the World's Children 1994* (New York: Oxford University Press, 1994) p. 25.

^{vii} These arguments have been developed more fully in the following publications: A. de Sherbinin, "Human Security and Fertility: The Case of Haiti," *Journal of Environment and Development*, 5 (March 1996) 28-45; P. Dasgupta, "Population, Poverty and the Local Environment," *Scientific American* (February 1995) 26-31; and T. Panayotou, "The Population, Environment and Development Nexus," in R. Cassen (Ed.) *Population and Development: Old Debates, New Conclusions* (Washington, DC: Overseas Development Council, 1994) 149-180.

^{viii} It is important to understand that high fertility does not necessarily benefit all members of a household.

Demographers have increasingly recognized that the male role in reproductive decision making is dominant, particularly in sub-Saharan Africa, but also in South Asia and Latin America. In the realm of reproductive decision making, it is clear that costs and benefits of each additional child are not distributed evenly. Men bear fewer of the costs of child raising, while benefiting disproportionately from the additional hands that each child brings to the household productive unit.

^{ix} For more on this, see "Opportunities for Women Through Reproductive Choice," *Population Reports*, Series M, No. 12, July 1994.

^x IUCN-The World Conservation Union, World Wide Fund for Nature, and United Nations Environment Programme. *Caring for the Earth: A Strategy for Sustainable Living* (Gland, Switzerland: IUCN, 1991), p. 43.

^{xi} A. de Sherbinin, "World Population Growth and U.S. National Security," *Environmental Change and Security Project Report*, 1 (Spring 1995) 24-39.

^{xii} To quote the President's Council on Sustainable Development, *Population and Consumption Task Force Report* (Washington, DC: PCSD, 1996) p. 33: "Agenda 21... identifies 'the unsustainable pattern of production and consumption, particularly in industrialized countries,' as 'the major cause of the continued deterioration of the global environment.' Facts support this assertion: approximately 20 percent of the world's population in the late 1980s lived in industrialized countries. These countries consumed 85 percent of the aluminum and synthetic

chemicals used in the world; 80 percent of paper, iron, and steel; 75 percent of timber and energy; 60 percent of meat, fertilizer, and cement; half the world's fish and grain; and 40 percent of the fresh water."

^{xiii} Population Reference Bureau (PRB), *World Population Estimates and Projections by Single Years: 1750-2100*, (mimeo, 1995); World Bank, *World Development Report 1992: Development and the Environment*. (New York: Oxford University Press, 1992) pp. 32-33.

^{xiv} According to Richard Wilk in his study of emulation and global consumerism in Belize, "Among teenage high-school students, exposure to US media and foreign travel is strongly correlated with aspirations to buy and own American consumer goods and fashions." However, Wilk found that emulation was not universal (older Belizians tended not to desire American products), and that the specific constellation of goods and services that will be attractive to people in any national context will likely be influenced by cultural factors. (R. Wilk, "Emulation and Global Consumerism," paper presented to the National Academy of Sciences workshop on the Global Environmental Impact of Consumption in the United States, Washington, DC, November 1995.)

^{xv} J. Tinbergen and R. Huetting, "GNP and Market Prices: Wrong Signals for Sustainable Economic Success That Mask Environmental Destruction," in R. Goodland, H. Daly, and S. El Serafy (Eds.), *Population, Technology, and Lifestyle* (Washington, DC: Island Press, 1992), pp. 52-62.

^{xvi} Paul Stern, presentation to the National Academy of Sciences workshop on the Global Environmental Impact of Consumption in the United States, Washington, DC, November 1995.

^{xvii} For more on this topic, see D. Korten, *When Corporations Rule the World* (Hartford, Conn.: Kumarian Press, 1995), and H. Daly, "The Perils of Free Trade," *Scientific American* (November 1993) pp. 24-29.

^{xviii} American Automobile Manufacturers Association (AAMA), *World Motor Vehicle Data 1996*, (Washington, DC: AAMA, 1996) pp 2-15.

^{xix} J. Mackenzie and M.P. Walsh, *Driving Forces: Motor Vehicle Trends and their Implications for Global Warming, Energy Strategies, and Transportation Planning*. (Washington, DC: World Resources Institute, 1990), p. 7.

^{xx} Data on fossil fuel consumption from *The Statistical Abstract of the United States 1996* (Washington, DC: Government Printing Office, 1996), [Table 917](#), p. 580.

^{xxi} M. van Brakel and M. Buitenkamp, *Sustainable Netherlands: A Perspective for Changing Northern Lifestyles* (Amsterdam: Friends of the Earth, 1992); and A. Hittle, *The Dutch Challenge: A Look at How the United States' Consumption Must Change to Achieve Global Sustainability* (Washington, DC: Friends of the Earth, 1994).

^{xxii} D. Korten, "Civic Engagement in Creating Future Cities," *Environment and Urbanization*, 8 (April 1996) p. 37.

^{xxiii} *The Economist*, "A Survey on Living with the Car," (22 June 1996) p. 3.

^{xxiv} J. Whitelegg, "India's Roads to Ruin," *New Scientist* (1 February 1997) p. 51.

^{xxv} Op Cite 21, p. 4.

^{xxvi} This is similar to the paradox of individual reproductive decision-making described in the section on the absolute poor. One of the fundamental problems confronting humankind is that decisions that are rational on an individual basis can be irrational at the societal level. For more on micro-rationality versus macro-irrationality, see S. Boyden and S. Dovers, "Natural-resource Consumption and Its Environmental Impacts in the Western World: Impacts of Increasing Per Capita Consumption," *Ambio* Vol. 21, No. 1 (February 1992) pp. 63-69.

^{xxvii} Cornucopians refers broadly to the proponents of free trade and analysts at conservative think tanks such as the Cato Institute, American Enterprise Institute, and Heritage Foundation, among others.

^{xxviii} W. Kempton and C. Payne, "Cultural and Social Evolutionary Determinants of Consumption." Paper presented to the National Academy of Sciences workshop on the Global Environmental Impact of Consumption in the United States, Washington, DC, November 1995.

^{xxix} Soros writes "In many parts of the world control of the state is so closely associated with the creation of private wealth that one might speak of robber capitalism, or the 'gangster state', as a new threat to the open society." G. Soros, "The Capitalist Threat," *The Atlantic Monthly* (February 1997) p. 55.

^{xxx} Survey research and focus groups conducted by the Pew Charitable Trusts' Global Stewardship Initiative and the Merck Family Fund have found that Americans would be willing to trade consumer goods for reduced stress and more free time.

^{xxxi} K. Grimsley, "U.S. Corporations Look for Incentives to Entice Low-Wage Workers to Stay," *International Herald Tribune* (March 24, 1997) p. 7.

^{xxxii} M. Castells, "High Technology and the International Division of Labour," *Labour and Society*, Vol. 14 (1989), in "The City From Here," *Environment and Urbanization*, Vol. 8, No. 2 (October 1996) p. 105.

^{xxxiii} According to Martine, "developing countries may be pushed to a competition based on spurious advantages by their lack of real comparative advantages." G. Martine, "Population/Environment Relations and International

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Security: The Impacts of Economic Globalization," paper prepared for the Third Conference on Environmental Security, 31 May - 4 June, 1994, Tufts University, Somerville, Massachusetts.

^{xxxiv} See D. Korten, *When Corporations Rule the World* (Hartford, Conn.: Kumarian Press, 1995) pp. 49-50, and National Labor Committee, "Sweatshop Development," in J. Ridgeway (Ed.), *The Haiti Files: Decoding the Crisis* (Washington, DC: Essential Books, 1994) pp. 89-112.

^{xxxv} W. Lutz, "Population and Biodiversity: A Commentary," in V. Dompka (Ed.) *Human Population, Biodiversity and Protected Areas: Science and Policy Issues*, (Washington, DC: American Association for the Advancement of Science, 1996) 229-242.

^{xxxvi} *Population Summit of the World's Scientific Academies: A Joint Statement by 58 of the World's Scientific Academies*. (Washington, DC: National Academy of Sciences Press, 1994).

^{xxxvii} R. Roy. *Experimenting with Truth: The Fusion of Religion with Technology, Needed for Humanity's Survival* (New York: Pergamon Press, 1981) pp. 26-29.

^{xxxviii} S. Moore. "The Coming Age of Abundance," in R. Baily (Ed.), *The True State of the Planet* (New York: The Free Press, 1995) pp. 112-113.

^{xxxix} C. Lynch, "Searching the Internet," *Scientific American* (March 1997) p.45.

^{xl} E.F. Shumacher, "The Age of Plenty: A Christian View," in H. Daly and K. Townsend (Eds) *Valuing the Earth: Economics, Ecology, Ethics* (Cambridge, Mass.: MIT Press, 1993) p. 161.

^{xli} In N. Postman, "Currents," *Utne Reader* (July-August 1995) p. 35.

^{xlii} In 1995 the members of the Organization for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC) provided \$59 billion dollars in official development assistance (ODA), of which approximately five percent went to the health and population sector, another five percent to water and sanitation, and 7.5% to agriculture. Even within development assistance, these activities are poor cousins compared to assistance given to social and administrative infrastructure (27.3%), economic infrastructure (21.2%), and production (11.2%). Compare the \$59 billion in ODA, however, with the estimated \$4.3 trillion dollars in global trade and the \$170 billion in private financial flows to developing countries (1995 figures), and it is clear that aid can only have a modest impact in most developing countries.

^{xliii} Martine writes "Environmental problems, at both the national and world level, have turned out to be considerably more complex than had originally been touted in the romantic dawn of environmental activism. Activists, along with politicians, abhor complexity. In such situations, focusing on specific and manageable causes constitutes an understandably-attractive alternative. This type of transfer, for instance, explains the extraordinary intensity of attention focused on the Brazilian Amazon during recent years. Although this emphasis helped develop environmental awareness and reduce the rate of deforestation in the Amazon, it has done little for increasing the environmental feasibility of industrial civilization. Indeed, it might even be contended that the enormous amount of world concern centered on the Amazon actually served to deviate attention away from the crux of the development/environment dilemma for at least a five year period." G. Martine, "Population/Environment Relations and International Security: The Impacts of Economic Globalization," paper prepared for the Third Conference on Environmental Security, 31 May - 4 June, 1994, Tufts University, Somerville, Massachusetts.

^{xliv} P. Harrison, *The Third Revolution*, (London: Penguin Books, 1992).

^{xlv} D. Korten addresses this in greater depth in his article, "Civic Engagement in Creating Future Cities," *Environment and Urbanization*, 8 (April 1996) 35-50.