

TOWARDS A SUSTAINABLE GLOBAL SOCIETY

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Biological Carrying Capacity and Economics

Classical economists pictured the world as largely empty of human activities. According to the empty-world picture of economics, the limiting factors in the production of food and goods are shortages of human capital and labour. The land, forests, fossil fuels, minerals, oceans filled with fish, and other natural resources upon which human labor and capital operate, are assumed to be present in such large quantities that they are not limiting factors. In this picture, there is no naturally-determined upper limit to the total size of the human economy. It can continue to grow as long as new capital is accumulated, as long as new labour is provided by population growth, and as long as new technology replaces labour by automation.

Biology, on the other hand, presents us with a very different picture. Biologists remind us that if any species, including our own, makes demands on its environment which exceed the environment's carrying capacity, the result is a catastrophic collapse both of the environment and of the population which it supports. Only demands which are within the carrying capacity are sustainable. For example, there is a limit to regenerative powers of a forest. It is possible to continue to cut trees in excess of this limit, but only at the cost of a loss of forest size, and ultimately the collapse and degradation of the forest. Similarly, cattle populations may for some time exceed the

carrying capacity of grasslands, but the ultimate penalty for overgrazing will be degradation or desertification of the land. Thus, in biology, the concept of the carrying capacity of an environment is extremely important; but in economic theory this concept has not yet been given the weight which it deserves.

The terminology of economics can be applied to natural resources: For example, a forest can be thought of as natural capital, and the sustainable yield from the forest as interest. Exceeding the biological carrying capacity then corresponds, in economic terms, to spending one's capital. It is easy to exceed the carrying capacity of an environment without realizing it. The populations of many species of wild animals exhibit oscillations which are produced when a population increases beyond the limits of sustainability and then crashes. It seems likely that the earth's population of humans is headed for a similar overshoot of the sustainable limits of its biophysical support system, followed by a crash.

There is much evidence indicating that the total size of the human economy is very rapidly approaching the absolute limits imposed by the carrying capacity of the global environment. For example, a recent study by Vitousek et al. showed that 40 percent of the net primary product of landbased photosynthesis is appropriated, directly or indirectly, for human use. Thus, we are only a single doubling time away from 80 percent appropriation, which would certainly imply a disastrous degradation of the natural environment.

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Another indication of our rapid approach to the absolute limit of environmental carrying capacity can be found in the present rate of loss of biodiversity. The total number of species of living organisms on the earth is thought to be between 5 million and 30 million, of which only 1.4 million have been described. Between 50% and 90% of these species live in tropical forests, a habitat which is rapidly being destroyed, because of pressures from exploding human populations. 55% of the earth's tropical forests have already been cleared and burned; and an additional area four times the size of Switzerland is lost every year (WRI et al., 1992). Because of this loss of habitat, tropical species are now becoming extinct at a rate which is many

¹The net primary product of photosynthesis is defined as the total quantity of solar energy converted to chemical energy by plants, minus the energy used by the plants themselves.

thousands of times the normal background rate.

If losses continue at the present rate, 20% of all tropical species will vanish irrevocably within the next 50 years (WRI et al., 1992). One hardly dares to think of what will happen after that. The beautiful and complex living organisms on our planet are the product of more than three billion years of evolution; but today, delicately balanced and intricately interrelated communities of living things are being destroyed on a massive scale by human greed and thoughtlessness, an offense against nature and against the integrity of creation which might perhaps be compared, morally, to the Nazi death-camps of World War II (J. van Klinken, 1989).

Further evidence that the total size of the human economy has reached or exceeded the limits of sustainability comes from global warming, from the destruction of the ozone layer, from the rate of degradation and desertification of land, from statistics on rapidly vanishing non-renewable resources, and from recent famines (R. Goodland et al., 1991, D. Meadows et al., 1992).

Instead of burning our tropical forests, it might be wise for us to burn our books on growth-oriented economics. (I would not go so far as to advocate burning the economists!) Certainly an entirely new form of economics is needed today - not the empty-world economics of Adam Smith, but what might be called "full-world economics", or "equilibrium economics".

Adam Smith was perfectly correct in saying that the free market is the dynamo of economic growth; but exponential growth of human population and economic activity have brought us, in a surprisingly short time, from the empty-world situation in which he lived to a full-world situation. In today's world, we are pressing against the absolute limits of the earth's carrying capacity, and further growth carries with it the danger of future collapse. Full-world economics, the economics of the future, will no longer be able to rely on growth to give profits to stockbrokers or to solve problems of unemployment or to alleviate poverty. In the long run, growth of any kind is not sustainable; and we have now reached or exceeded the sustainable limits of growth.

The limiting factors in economics are no longer the supply of capital or human labour or even technology. The limiting factors are the rapidly vanishing supplies of petroleum and metal ores, the forests damaged by acid rain, the diminishing catches from overfished oceans, and the cropland degraded by erosion or salination, or lost to agriculture under a cover of asphalt. Neo-classical economists have maintained that it is generally possible to substitute

man-made capital for natural resources; but a closer examination shows that there are only very few cases where this is really practical (R. Goodland et al., 1991).

The size of the human economy is, of course, the product of two factors - the total number of humans, and the consumption per capita. If we are to achieve a sustainable global society in the future, a society whose demands are within the carrying capacity of the global environment, then *both* these factors must be reduced. The responsibility for achieving sustainability is thus evenly divided between the North and the South: Where there is excessively high consumption per capita, it must be reduced; and this is primarily the responsibility of the industrialized countries. High birth rates must also be reduced; and this is primarily the responsibility of the developing countries. Both of these somewhat painful changes are necessary for sustainability; but both will be extremely difficult to achieve because of the inertia of institutions, customs and ways of thought which are deeply embedded in society, in both the North and the South.

Population and food supply

Let us look first at the problem of high birth rates: The recent spread of modern medical techniques throughout the world has caused death rates to drop sharply; but since social customs and attitudes are slow to change, birth rates have remained high. As a result, between 1930 and 1988, the population of the world increased with explosive speed from two billion to five billion. United Nations experts believe that by the year 2100, the earth's population will have stabilized at between 10 and 15 billion - roughly double or triple today's size, most of the increase having been added to the less-developed parts of the world.

During the last few decades, the number of food-deficit countries has lengthened; and it now reads almost like a United Nations roster. (L.R. Brown, 1978, 1981). The food-importing nations are dependent, almost exclusively, on a single food-exporting region - the grain belt of North America. In the future, this region may be vulnerable to droughts produced by global warming.

An analysis of the global ratio of population to cropland shows that we probably already have exceeded the sustainable limit of population through

our dependence on petroleum: Between 1950 and 1982, the use of cheap petroleum-derived fertilizers increased by a factor of 8, and much of our present agricultural output depends their use. Furthermore, petroleum-derived synthetic fibers have reduced the amount of cropland needed for growing natural fibers, and petroleum-driven tractors have replaced draft animals which required cropland for pasturage. Also, petroleum fuels have replaced fuelwood and other fuels derived for biomass. The reverse transition, from fossil fuels back to renewable energy sources, will require a considerable diversion of land from food production to energy production. For example, 1.1 hectares are needed to grow the sugarcane required for each alcohol-driven Brazilian automobile. This figure may be compared with the steadily falling average area of cropland available to each person in the world - .24 hectares in 1950, .16 hectares in 1982.

As population increases, the cropland per person will continue to fall, and we will be forced to make still heavier use of fertilizers to increase output per hectare. Also marginal land will be used in agriculture, with the probable result that much land will be degraded through erosion or salination (A.H. Ehrlich and U. Lele, 1992). Reserves of oil are likely to be exhausted by the middle of next century. Thus there is a danger that just as global population reaches the unprecedented level of 10 billion or more, the agricultural base for supporting it may suddenly collapse. The resulting ecological catastrophe, possibly compounded by war and other disorders, could produce famine and death on a scale unprecedented in history - a catastrophe of unimaginable proportions, involving billions rather than millions of people. The present tragic famine in Africa is to this possible future disaster what Hiroshima is to the threat of thermonuclear war - a tragedy of smaller scale, whose horrors should be sufficient, if we are wise, to make us take steps to avoid the larger catastrophe.

It is vital for the world to stabilize its population, not only because of the threat of a catastrophic future famine, but also because rapid population growth is closely linked with poverty. Today, a large fraction of the world's people live in near-poverty or absolute poverty, lacking safe water, sanitation, elementary education, primary health care and proper nutrition. Governments struggling to solve these problems, and to provide roads, schools, jobs and medical help for all their citizens, find themselves defeated by the rapid doubling times of populations. For example, in Kenya, the rate of population growth is 4% per year, which means that the population of Kenya

doubles in size every eighteen years. Under such circumstances, in spite of the most ambitious development programs, the infrastructure per capita decreases. Also, since new jobs must be found for the new millions added to the population, the introduction of efficient modern methods in industry and agriculture aggravates the already-serious problem of unemployment.

It was once hoped that development could raise living standards and educational levels to such an extent that birth rates in the developing countries would decline automatically, as they have done in the industrialized countries. However, in a large part of the world, populations are increasing so rapidly that, in the words of the demographer Kayfitz, "population growth prevents the development which would have slowed population growth".

Recent statistics show that the world can be divided into two demographic regions of roughly equal population. In the first region, which includes North America, Europe, the former Soviet Union, Australia, New Zealand and Eastern Asia, populations have completed or are completing the demographic transition from the old equilibrium where high birth rates were balanced by a high death rate to a new equilibrium with low birth rates balanced by a low death rate. In the second region, which includes Southeast Asia, Latin America, the Indian subcontinent, the Middle East and Africa, populations seem to be caught in a demographic trap, where high birth rates and low death rates lead to population growth so rapid that the development which could have slowed population growth is impossible. The average population increase in the slow growth regions is 0.8% per year, while in the rapid growth regions, the average increase is 2.5% per year. Thus there is a very marked division of the world into two demographic regions, and there seems to be no middle ground. ²

A recent study, (conducted by Robert J. Lapham of the Demographic Health Surveys and W. Parker Mauldin of the Rockefeller Foundation), has shown that the use of birth control is correlated both with socio-economic setting and with the existence of strong family-planning programs. The implication of this study is that even in the absence of increased living standards, family-planning programs can be successful, provided that they have strong government support. The examples of Japan, Singapore and Hong

²Some individual countries in the rapid growth regions (such as Argentina, Cuba and Uruguay in Latin America) have completed or are completing the demographic transition, but their numbers are too small to influence the regional trends.

Kong show that countries which have first stabilized their populations have found it easy, thereafter, to raise living standards.

China, the world's most populous nation, has adopted the policy of allowing only one child per family. This policy has, until now, been most effective in towns and cities; but with time it may also become effective in rural areas. Chinese leaders obtained popular support for their one-child policy by means of an educational program which emphasized future projections of diminishing cropland per person if population increased unchecked. Like other developing countries, China has a very young population, which will continue to grow even when fertility has fallen below the replacement level because so many of its members are contributing to the birth rate rather than to the death rate.

Education of women and higher status for women are vitally important measures, not only for their own sake, but also because in many countries these social reforms have proved to be strongly correlated with lower birth rates. Religious leaders who oppose programs for the education of women and for family planning on "ethical" grounds should think carefully about the scope and consequences of the catastrophic global famine which will undoubtedly occur within the next 50 years if population is allowed to increase unchecked.

Social Values and Levels of Consumption

Let us next turn to the problem of reducing the per-capita consumption in the industrialized countries. The whole structure of western society seems designed to push its citizens in the opposite direction, towards ever-increasing levels of consumption. The mass media hold before us continually the ideal of a personal utopia filled with material goods.

Every young man in a modern industrial society feels that he is a failure unless he fights his way to the "top"; and in recent years, women too have been drawn into this competition. Of course not everyone can reach the top; there would not be room for everyone; but society urges all us to try, and we feel a sense of failure if we do not reach the goal. Thus, modern life has become a struggle of all against all for power and possessions.

One of the central problems in reducing consumption is that in our present economic and social theory, consumption has no upper bound; there is no

definition of what is enough; there is no concept of a state where all of the real needs of a person have been satisfied. In our growth-oriented present-day economics, it is assumed that, no matter how much a person earns, he or she is always driven by a desire for more.

The phrase “conspicuous consumption” was invented by the Norwegian-American economist Thorstein Veblen (1857-1929) in order to describe the way in which our society uses economic waste as a symbol of social status. In *The Theory of the Leisure Class*, first published in 1899, Veblen pointed out that it was wrong to believe that human economic behavior is rational, or that it can be understood in terms of classical economic theory. To understand it, Veblen maintained, one might better make use of insights gained from anthropology, psychology, sociology, and history.

The sensation caused by the publication of Veblen’s book, and the fact that his phrase, “conspicuous consumption”, has become part of our language, indicate that his theory did not completely miss its mark. In fact, modern advertisers seem to be following Veblen’s advice: Realizing that much of the output of our economy will be used for the purpose of establishing the social status of consumers, advertising agencies hire psychologists to appeal to the consumer’s longing for a higher social position.

When possessions are used for the purpose of social competition, demand has no natural upper limit; it is then limited only by the size of the human ego, which, as we know, is boundless. This would be all to the good if unlimited economic growth were desirable. But today, when further growth implies future collapse, industrial society urgently needs to find new values to replace our worship of power, our restless chase after excitement, and our admiration of excessive consumption.

The values which we need, both to protect nature from civilization and to protect civilization from itself, are perhaps not new: Perhaps it would be more correct to say that we need to rediscover ethical values which once were part of human culture, but which were lost during the process of industrialization when technology allowed us to break traditional environmental constraints.

Our ancestors were hunter-gatherers, living in close contact with nature, and respecting the laws and limitations of nature. There are many hunter-gatherer cultures existing today, from whose values and outlook we could

learn much.³ In some parts of Africa, before cutting down a tree, a man will offer a prayer of apology to the spirit of the tree, explaining why necessity has driven him to such an act. The attitude involved in this ritual is something which industrialized society needs to learn, or relearn.

When Mahatma Gandhi died, someone took a photograph of all his possessions - a pair of sandals, his glasses, a simple garment, and not much else. We know Gandhi for his philosophy of non-violence; but in this photograph he appears in a new light - as a pioneer of changed social values. He deliberately reduced the number of his possessions to almost nothing in order to demonstrate that personal honor and merit are not proportional to the amount that one owns.

Gandhi's original word for non-violence, *ahimsa*, means literally "doing no harm". His interpretation of this word contains an element of respect for nature and the idea that all living things are related to each other and to us. Thus Gandhi's ethics have a non-anthropocentric component. The same theme of reverence for all life, whether human or nonhuman, can also be found in the teachings of St. Francis of Assisi, in Buddhist ethics, and in Chinese Taoist philosophy.

Older cultures have much to teach industrial society because *they already have experience with full-world situation which we are fast approaching*. In a traditional culture, where change is extremely slow, population has an opportunity to expand to the limits which the traditional way of life allows, so that it reaches an equilibrium with the environment. For example, in a hunter-gatherer culture, population has expanded to the limits which can be supported without the introduction of agriculture. The density of population is, of course, extremely low, but nevertheless it is pressing against the limits of sustainability. Overhunting or overfishing would endanger the future. Respect for the environment is thus necessary for the survival of such a culture.

Similarly, in a stable, traditional agricultural society which has reached an equilibrium with its environment, population is pressing against the limits of sustainability. In such a culture, one can usually find expressed as a strong

³Unfortunately, instead of learning from them, we often move in with our bulldozers and make it impossible for their way of life to continue. During the past several decades, for example, approximately one tribe of South American forest Indians has died out every year. Of the 6000 human languages now spoken, it is estimated that half will vanish during the next 50 years.

ethical principle the rule that the land must not be degraded, but must be left fertile for the use of future generations.

It would be wise for the industrialized countries to learn from the values of older traditional cultures; but what usually happens is the reverse: The unsustainable, power-worshipping, consumption-oriented values of western society are so strongly propagandized by television, films and advertizing, that they overpower and sweep aside the wisdom of older societies.

Today, the whole world seems to be adopting values, fashions, and standards of behavior presented in the mass media of western society. This is unfortunate, since besides showing us unsustainable levels of affluence and economic waste, the western mass media depict values and behavior patterns which are hardly worthy of imitation. Motivated only by the desire to sell their products, television and film producers seem to be competing with each other in exploring increasingly murky depths in the swamp of popular taste, appealing to the worst instincts of their audience rather than to its better side.

Instead of calming the spirit, western culture aims at producing excitement. Instead of showing values and behavior which would lead to happiness and social stability, our mass media are preoccupied with violence, crime, and greed. Here we see a contrast with the values of traditional societies, where family solidarity is strong, where hospitality is maintained, and where much of the quality of life derives from the fact that people's motives are not purely economic.

So far as values are concerned, the developed and developing parts of the world might well interchange their names: With respect to values, and with respect to the attitudes which are needed for sustainability, industrial society is not yet developed.

The Responsibility of Governments

Like a speeding bus headed for a brick wall, the earth's rapidly-growing population of humans and its rapidly-growing economic activity are headed for a collision with a very solid barrier - the carrying capacity of the global environment. As in the case of the bus and the wall, the correct response to the situation is to apply the brakes in good time - but fear prevents us from doing this. What will happen if we slow down very suddenly? Will not

many of the passengers be injured? Undoubtedly. But what will happen if we hit the wall at full speed? Perhaps it would be wise, after all, to apply the brakes!

The memory of the great depression of 1929 makes us fear the consequences of an economic slowdown, especially since unemployment is already a serious problem. Although the history of the 1929 depression is frightening, it may nevertheless be useful to look at the measures which were used then to bring the global economy back to its feet. A similar level of governmental responsibility may help us during the next few decades to avoid some of the more painful consequences of the necessary transition from the economics of growth to the economics of equilibrium.

In the United States, President Franklin D. Roosevelt was faced with the difficult problems of the depression during his first few years in office. He was lucky to have as his advisor the great English economist John Maynard Keynes (1883-1946). Keynes encouraged Roosevelt to use governmental control of interest rates as an instrument of social policy; and this proved to be an effective means of reducing unemployment. Since that time, most governments have adopted a Keynesian philosophy, and have used their monetary powers to achieve social goals. Roosevelt also introduced a number of special programs, such as the Civilian Construction Corps and the Tennessee Valley Authority, which were designed to create new jobs on projects directed towards socially useful goals.

The transition to a sustainable global society will require a similar level of governmental responsibility, although the measures needed are not quite the same as those which Roosevelt used to end the great depression. In spite of the burst of faith in the free market which has followed the end of the Cold War, it is unlikely that market mechanisms alone will be sufficient to solve problems of unemployment during the next fifty years, or to achieve conservation of land, natural resources and environment.

The Worldwatch Institute, Washington D.C., lists the following steps as necessary for the transition to sustainability: 1) Stabilizing population; 2) Shifting to renewable energy; 3) Increasing energy efficiency; 4) Recycling resources; 5) Reforestation and 6) Soil Conservation (L.R. Brown and P. Shaw, 1982). All of these steps are labor-intensive; and thus, wholehearted governmental commitment to the transition to sustainability can help to solve the problem of unemployment.

In much the same way that Keynes urged Roosevelt to use governmen-

tal control of interest rates to achieve social goals, we can now urge our governments to use their control of taxation to promote sustainability. For example, a slight increase in the taxes on fossil fuels could make a number of renewable energy technologies economically competitive; and higher taxes on motor fuels would be especially useful in promoting the necessary transition from private automobiles to bicycles and public transport.

Governments already recognize their responsibility for education. In the future, they must also recognize their responsibility for helping young people to make a smooth transition from education to secure jobs. If jobs are scarce, work must be shared with a spirit of solidarity among those seeking employment; hours of work (and if necessary, living standards) must be reduced to insure that all who wish it may have jobs. Market forces alone cannot achieve this. The powers of government are needed.

Governments must recognize their responsibility for thinking not only of the immediate future but also of the distant future, and their responsibility for guiding us from the insecure and socially unjust world of today to a safer and happier future world. In the world as it is today, a trillion dollars are wasted on armaments each year; and while this is going on, children in the developing countries sift through garbage dumps searching for scraps of food. In today's world, the competition for jobs and for material possessions makes part of the population of the industrial countries work so hard that they damage their health and neglect their families; and while this is going on, another part of the population suffers from unemployment, becoming vulnerable to depression, mental illness, alcoholism, drug abuse and crime.

In the world of the future, which we now must build, the institution of war will be abolished, and the enormous resources now wasted on war will be used constructively. In the future world as it can be if we work to make it so, a stable population of moderate size will live without waste or luxury, but in comfort and security, free from the fear of hunger or unemployment. The world which we want will be a world of changed values, where human qualities will be valued more than material possessions. Let us try to combine wisdom and ethics from humanity's past with today's technology to build a sustainable, livable and equitable future world.

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