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THAT LEADS TO ACTION

*THE WEALTH OF NATIONS REVISITED*

# CADMUS

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*The acronym of the South-East European Division of The World Academy of Art and Science – SEED – prompted us to initiate a journal devoted to seed ideas - to leadership in thought that leads to action. Cadmus (or Kadmos in Greek and Phoenician mythology) was a son of King Agenor and Queen Telephassa of Tyre, and brother of Cilix, Phoenix and Europa. Cadmus is credited with introducing the original alphabet – the Phoenician alphabet, with “the invention” of agriculture, and with founding the city of Thebes. His marriage with Harmonia represents the symbolic coupling of Eastern learning and Western love of beauty. The youngest son of Cadmus and Harmonia is Illyrius. The city of Zagreb, which is the formal seat of SEED, was once a part of Illyria, a region including what is today referred to as the Western Balkans and even more. Cadmus will be a journal for fresh thinking and new perspectives that integrate knowledge from all fields of science, art and humanities to address real-life issues, inform policy and decision-making, and enhance our collective response to the challenges and opportunities facing the world today.*

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## Entropy and Economics

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### Abstract

*In this essay, human society is regarded as a “superorganism”, analogous to colonies of social insects. The digestive system of the human superorganism is the global economy, which ingests both free energy and resources, and later excretes them in a degraded form. This process involves an increase in entropy. Early in the 20th century, both Frederick Soddy and Nicholas Georgescu-Roegen discussed the relationship between entropy and economics. Soddy called for an index system to regulate the money supply and a reform of the fractional reserve banking system, while Georgescu-Roegen pointed to the need for Ecological Economics, a steady-state economy, and population stabilization. As we reach the end of the fossil fuel era and as industrial growth falters, massive unemployment can only be avoided by responsible governmental action. The necessary steps include shifting labor to projects needed for a sustainable economy, dividing the available work fairly among those seeking employment, and reforming the practices of the financial sector.*

### 1. Human Society as a Superorganism, with the Global Economy as its Digestive System

A completely isolated human being would find it as difficult to survive for a long period of time as would an isolated ant or bee or termite. Therefore, it seems correct to regard human society as a superorganism. In the case of humans, the analog of the social insects' nest is the enormous and complex material structure of civilization. It is, in fact, what we call the human economy. It consists of functioning factories, farms, homes, transportation links, water supplies, electrical networks, computer networks and much more. Almost all of the activities of modern humans take place through the medium of these external “exosomatic” parts of our social superorganism.\*

The economy associated with the human superorganism “eats” resources and free energy. It uses these inputs to produce local order, and finally excretes them as heat and waste. The process is closely analogous to food passing through the alimentary canal of an individual organism. The free energy and resources that are the inputs of our economy drive it just as food drives the processes of our body, but in both cases, waste products are finally excreted in a degraded form.

\*The terms “exosomatic” and “endosomatic” were coined by the American scientist Alfred Lotka (1820-1949). A lobster's claw is endosomatic - it is part of the lobster's body. The hammer used by a human is exosomatic - like a detachable claw. Lotka spoke of “exosomatic evolution”, including in this term not only cultural evolution but also the building up of the material structure of civilization.

Almost all of the free energy that drives the human economy came originally from the Sun's radiation, the exceptions being geothermal energy which originates in the decay of radioactive substances inside the earth, and tidal energy, which has its origin in the relative motion of the Earth-Moon system. However, since the start of the Industrial Revolution, our economy has been using the solar energy stored in fossil fuels. These fossil fuels were formed over a period of several hundred million years. We are using them during a few hundred years, i.e., at a rate approximately a million times the rate at which they were formed.

The total ultimately recoverable resources of fossil fuels amount to roughly 1260 terawatt-years of energy (1 terawatt-year = 10<sup>12</sup> watt-years - 1 TWy is equivalent to 5 billion barrels of oil or 1 billion tons of coal). Of this total amount, 760 TWy is coal, while oil and natural gas each constitute roughly 250 TWy. In 1890, the rate of global consumption of energy was 1 terawatt, but by 1990 this figure had grown to 13.2 TW, distributed as follows: oil, 4.6; coal, 3.2; natural gas, 2.4; hydropower, 0.8; nuclear, 0.7; fuel wood, 0.9; crop wastes, 0.4; and dung, 0.2. By 2005, the rate of oil, natural gas and coal consumption had risen to 6.0 TW, 3.7 TW and 3.5 TW respectively. Thus, the present rate of consumption of fossil fuels is more than 13 terawatts and, if used at the present rate, fossil fuels would last less than a century. However, because of the very serious threats posed by climate change, human society would be well advised to stop the consumption of coal, oil and natural gas well before that time.

The rate of growth of new renewable energy sources is increasing rapidly. These sources include small hydro, modern biomass, solar, wind, geothermal, wave and tidal energy. However, these sources currently account for only 2.8% of total energy use. There is an urgent need for governments to set high taxes on fossil fuel consumption and to shift subsidies from the petroleum and nuclear industries to renewables. These changes in economic policy are needed to make the prices of renewables more competitive.

The shock to the global economy that will be caused by the end of the fossil fuel era will be compounded by the scarcity of other non-renewable resources, such as metals. While it is true (as neoclassical economists emphasize) that “matter and energy can neither be created nor destroyed”, free energy can be degraded into heat, and concentrated deposits of minerals can be dispersed. Both the degradation of Gibbs free energy into heat and the dispersal of minerals involve increase of entropy.

## **2. Frederick Soddy**

One of the first people to call attention to the relationship between entropy and economics was the English radiochemist Frederick Soddy (1877-1956). Soddy won the Nobel Prize for Chemistry in 1926 for his work with Ernest Rutherford demonstrating the transmutation of elements in radioactive decay processes. His concern for social problems then led him to a critical study of the assumptions of classical economics.

Soddy believed that there was a close connection between Gibbs free energy and wealth, but only a very tenuous connection between wealth and money. He was working on these problems during the period after World War I, when England left the gold standard, and he advocated an index system to replace it. In this system, the Bank of England would print more money and lend it to private banks whenever the cost of standard items indicated that too little money was in circulation, or conversely destroy printed money if the index showed the money supply to be too large.

Soddy was extremely critical of the system of “fractional reserve banking” whereby private banks keep only a small fraction of the money that is entrusted to them by their depositors and lend out the remaining amount. He pointed out that, in this system, the money supply is controlled by the private banks rather than by the government, and also that profits made from any expansion of the money supply go to private corporations instead of being used to provide social services. Fractional reserve banking exists today, not only in England but also in many other countries. Soddy’s criticisms of this practice cast light on the subprime mortgage crisis of 2008 and the debt crisis of 2011.

As Soddy pointed out, real wealth is subject to the second law of thermodynamics. As entropy increases, real wealth decays. Soddy contrasted this with the behavior of debt at compound interest, which increases exponentially without any limit, and he remarked: “You cannot permanently pit an absurd human convention, such as the spontaneous increment of debt [compound interest] against the natural law of the spontaneous decrement of wealth [entropy]”. Thus, in Soddy’s view, it is a fiction to maintain that being owed a large amount of money is a form of real wealth.

Frederick Soddy’s book, *Wealth, virtual wealth and debt: The solution of the economic paradox*, published in 1926 by Allen and Unwin, was received by the professional economists of the time as the quixotic work of an outsider. Today, however, Soddy’s commonsense economic analysis is increasingly valued for the light that it throws on the problems of our fractional reserve banking system, which becomes more and more vulnerable to failure as economic growth falters.

### 3. Nicholas Georgescu-Roegen

The incorporation of the idea of entropy into economic thought also owes much to the mathematician and economist Nicholas Georgescu-Roegen (1906- 1994), the son of a Romanian army officer. Georgescu-Roegen’s talents were soon recognized by the Romanian school system, and he was given an outstanding education in Mathematics, which later contributed to his success and originality as an economist.

Between 1927 and 1930 the young Georgescu studied at the Institut de statistique in Paris, where he completed an award-winning thesis: *On the problem of finding out the cyclical components of phenomena*. He then worked in England with Karl Pearson from 1930 to 1932, and during this period his work attracted the attention of a group of economists who were working on a project called the Harvard Economic Barometer. He received a Rockefeller Fellowship to join this group, but when he arrived at Harvard, he found that the project had been disbanded. In desperation, Georgescu-Roegen asked the economist Joseph Schumpeter for an appointment to join his group. Schumpeter’s group was in fact a remarkably active and interesting one, which included the Nobel laureate Wassily Leontief, and there followed a period of intense intellectual activity during which Georgescu-Roegen became an economist.

Despite offers of a permanent position at Harvard, Georgescu-Roegen returned to his native Romania in the late 1930s and early 1940s in order to serve his country. He served as a member of the Central Committee of the Romanian National Peasant Party. His experiences at this time led to his insight that economic activity involves entropy. He was also helped to

this insight by Borel's monograph on Statistical Mechanics, which he had read during his period of stay in Paris.

Georgescu-Roegen later wrote: "The idea that the economic process is not a mechanical analogue, but an entropic, unidirectional transformation began to turn over in my mind long ago, as I witnessed the oil wells of the Ploesti field of both World Wars' fame becoming dry one by one, and as I grew aware of the Romanian peasants' struggle against the deterioration of their farming soil by continuous use and by rains as well. However it was the new representation of a process that enabled me to crystallize my thoughts in describing the economic process as the entropic transformation of valuable natural resources (low entropy) into valueless waste (high entropy)." After making many technical contributions to economic theory, Georgescu-Roegen returned to this insight in his important 1971 book, *The Entropy Law and the Economic Process* (Harvard University Press, Cambridge, 1971), where he outlines his concept of bioeconomics. In a later book, *Energy and Economic Myths* (Pergamon Press, New York, 1976), he offered the following recommendations for moving towards a bioeconomic society:

- the complete prohibition of weapons production, thereby releasing productive forces for more constructive purposes;
- immediate aid to underdeveloped countries;
- gradual decrease in population to a level that could be maintained only by organic agriculture;
- avoidance, and strict regulation if necessary, of wasteful energy use;
- abandon our attachment to "extravagant gadgetry";
- "get rid of fashion";
- make goods more durable and repairable; and
- cure ourselves of workaholic habits by rebalancing the time spent on work and leisure, a shift that will become incumbent as the effects of the other changes make themselves felt.

Georgescu-Roegen did not believe that his idealistic recommendations would be adopted, and he feared that human society was headed for a crash.

#### **4. Limits to Growth: A steady-state economy**

Nicholas Georgescu-Roegen's influence continues to be felt today, not only through his own books and papers but also through those of his student, the distinguished economist Herman E. Daly, who for many years has been advocating a steady-state economy. As Daly points out in his books and papers, it is becoming increasingly apparent that unlimited economic growth on a finite planet is a logical impossibility. However, it is important to distinguish between knowledge, wisdom and culture, which can and should continue to grow, and growth in the sense of an increase in the volume of material goods produced, which is reaching its limits.

Daly describes our current situation as follows: "The most important change in recent times has been the growth of one subsystem of the Earth, namely the economy, relative to

the total system, the ecosphere. This huge shift from an “empty” to a “full” world is truly ‘something new under the sun’... The closer the economy approaches the scale of the whole Earth, the more it will have to conform to the physical behavior mode of the Earth... The remaining natural world is no longer able to provide the sources and sinks for the metabolic throughput necessary to sustain the existing oversized economy – much less a growing one. Economists have focused too much on the economy’s circulatory system and have neglected to study its digestive tract.”

In 1968, Aurelio Peccei, Thorkil Kristensen and others founded the Club of Rome, an organization of economists and scientists devoted to studying the predicament of human society. One of the first acts of the organization was to commission an MIT study of future trends using computer models. The result was a book entitled *The Limits to Growth* published in 1972. From the outset the book was controversial, but it became a best-seller. It was translated into many languages and sold 10 million copies. The book made use of an exponential index for resources, i.e. the number of years that a resource would last if used at an exponentially increasing rate. Today, the more accurate Hubbert Peak model is used instead to predict rate of use of a scarce resource as a function of time. Although the specific predictions of resource availability in *The Limits to Growth* lacked accuracy, its basic thesis – that unlimited industrial growth on a finite planet is impossible – was indisputably correct. Nevertheless, the book was greeted with anger and disbelief by the community of economists, and these emotions still surface when it is mentioned.

Economic activity is usually divided into two categories, 1) production of goods and 2) provision of services. It is the rate of production of goods that will be limited by the carrying capacity of the global environment. Services that have no environmental impact will not be constrained in this way. Thus, a smooth transition to a sustainable economy will involve a shift in a large fraction of the workforce from the production of goods to the provision of services.

In his recent popular book *The Rise of the Creative Class*, the economist Richard Florida points out that in a number of prosperous cities – Stockholm, for example – a large fraction of the population is already engaged in what might be called creative work – a type of work that uses few resources, and produces few waste products – work which develops knowledge and culture rather than producing material goods. For example, producing computer software requires few resources and results in few waste products. Thus, it is an activity with a very small ecological footprint. Similarly, education, research, music, literature and art are all activities that do not weigh heavily on the carrying capacity of the global environment. Furthermore, cultural activities lead in a natural way to global cooperation and internationalism, since cultural achievements are shared by the people of the entire world. Indeed, the shared human inheritance of culture and knowledge is growing faster than ever before. Florida sees this as a pattern for the future, and maintains that everyone is capable of creativity. He visualizes the transition to a sustainable future economy as one in which a large fraction of the workforce moves from industrial jobs to information-related work. Meanwhile, as Florida acknowledges, industrial workers feel uneasy and threatened by such trends.

## 5. 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 labor. 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 labor is provided by population growth, and as long as new technology replaces labor 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.

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 industrial growth to give profits to stockbrokers or to solve problems of unemployment or to alleviate poverty. In the long run, neither the growth of industry nor that of population is sustainable; and we have now reached or exceeded the sustainable limits.

The limiting factors in economics are no longer the supply of capital or human labor 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 croplands 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.

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.

## **6. 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 2011, the population of the world increased with explosive speed from two billion to seven billion.

During the last few decades, the number of food-deficit countries has lengthened; and it now reads almost like a United Nations roster. 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 on 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 fuel wood 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.

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. Reserves of oil are likely to be exhausted by the middle of this century. Thus, there is a danger that just as global population reaches the unprecedented level of 9 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.

At present, a child dies from starvation every five seconds – six million children die from hunger every year. Over a billion people in today's world are chronically undernourished. There is a threat that unless prompt and well-informed action is taken by the international community, the tragic loss of life that is already being experienced will increase to unimaginable proportions.

As glaciers melt in the Himalayas, threatening the summer water supplies of India and China, as ocean levels rise, drowning the fertile rice-growing river deltas of Asia, as aridity begins to decrease the harvests of Africa, North America and Europe as populations grow, as aquifers are overdrawn, as cropland is lost to desertification and urban growth and as energy prices increase, the billion people who now are undernourished but still survive, might not survive. They might become the victims of a famine whose proportions could exceed anything that the world has previously experienced.

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 Liberia, the rate of population growth is 4 percent per year, which means that the population of Liberia doubles in size every eighteen years. Under such circumstances, despite 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.

Education 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.

At the United Nations Conference on Population and Development, held in Cairo in September 1994, a theme which emerged very clearly was that one of the most important keys to controlling the global population explosion is giving women better education and equal rights. These goals are desirable for the sake of increased human happiness, and for the sake of the uniquely life-oriented point of view which women can give us; but in addition, education and improved status for women have shown themselves to be closely connected with lowered birth rates. When women lack education and independent careers outside their homes, they can be forced into the role of baby-producing machines by men who do not share in the drudgery of cooking, washing and cleaning; but when women have educational, legal, economic, social and political equality with men, experience has shown that they choose to limit their families to a moderate size.

Sir Partha Dasgupta of Cambridge University has pointed out that the changes needed to break the cycle of overpopulation and poverty are all desirable in themselves. Besides education and higher status for women, they include state-provided social security for old people, provision of water supplies near dwellings, provision of health services to all, abolition of child labor and general economic development.

## 7. 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 of 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 is 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.

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*“Western society urgently needs to find new values to replace our worship of power, our restless chase after excitement, and our admiration of excessive consumption.”*

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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 industrial growth implies future collapse, western 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.\* 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.

Older cultures have much to teach industrial society because they are already pressing against environmental limits. 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 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 ethical principle the rule that the land must not be degraded, but 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 advertising that they overpower and sweep aside the wisdom of older societies. Today, the whole world seems to be adopting values, fashions, and standards of behaviour 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.

“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.”

## 8. 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

\* Unfortunately, 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.

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.

*“The economics of growth must be replaced by equilibrium economics, where considerations of ecology, carrying capacity, and sustainability are given proper weight, and where the quality of life of future generations has as much importance as present profits.”*

Economists, industrialists and business leaders have a duty to the peoples of the world and to the global environment in much the same way that physicians have a sacred duty to the welfare of their patients. Therefore, the education of economists and industrialists ought to emphasize ethical and ecological principles. Like doctors, economists and industrialists carry matters of life and death in their hands: Think of the 10 million children who die each year from poverty-related causes; think of the wholesale extinction of species; think of global warming; think of the risk of a catastrophic future famine caused by population growth, by energy shortages, by climate change and by ecological degradation. We urgently need to introduce biology, ecology and ethics into the education of economists. The economics of growth must be replaced by equilibrium economics, where considerations of ecology, carrying capacity, and sustainability are given proper weight, and where the quality of life of future generations has as much importance as present profits.

Not only economists, but students of business administration should also be made conscious of the negative, as well as positive effects of globalization, and should consider the measures that will be needed to correct the negative effects. Students of business administration should be helped to develop an attitude of responsibility towards the less developed countries of the world, so that if they later become administrators in multinational corporations, they will choose generous and enlightened policies rather than exploitative ones.

The economic impact of war and preparation for war should be included in the training of economists. Both the direct and indirect costs of war should be studied, for example, the effect of unimaginably enormous military budgets in reducing the money available to solve pressing problems posed by the resurgence of infectious disease (e.g. AIDS, and drug-resistant forms of malaria and tuberculosis); the problem of population stabilization; food problems; loss of arable land; future energy problems; the problem of finding substitutes for vanishing non-renewable resources, and so on. Many of these problems were discussed at a recent conference of economists in Copenhagen, but the fact that all such global emergencies could be adequately addressed with a fraction of the money wasted on military budgets was not discussed.

Finally, economics curricula should include the problems of converting war-related industries to peaceful ones – the problem of beating swords into plowshares. It is often said that our economies are dependent on arms industries. If this is so, it is an unhealthy dependence, analogous to drug addiction, since arms industries do not contribute to future-oriented infrastructure. The problem of conversion is an important one. It is the economic analog of the problem of ending a narcotics addiction, and it ought to be given proper weight in the education of economists.

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. 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 governmental 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.

The economic recession that began with the US subprime mortgage crisis of 2007 and 2008 can be seen as an opportunity. It is thought to be temporary, but it is a valuable warning of irreversible long-term changes that will come later in the 21st century when the absolute limits of industrial growth are reached. Already we are faced with the problems of preventing unemployment and simultaneously building the infrastructure of an ecologically sustainable society.

Today's economists believe that growth is required for economic health; but at some point during this century, industrial growth will no longer be possible. If no changes have been made in our economic system when this happens, we will be faced with massive unemployment. Three changes are needed to prevent this:

- ♦ Labor must be moved to tasks related to ecological sustainability. The tasks include development of renewable energy, reforestation, soil and water conservation, replacement of private transportation by public transport. Health and family planning services must also be made available to all.
- ♦ Opportunities for employment must be shared among those in need of work, even if this means reducing the number of hours that each person works each week and simultaneously reducing the use of luxury goods, unnecessary travel, conspicuous consumption and so on. It will be necessary for governments to introduce laws reducing the length of the working week, thus ensuring that opportunities for employment are shared equally.
- ♦ The world's fractional reserve banking system needs to be reformed. We have the chance, already today, to make these changes in our economic system. The completely unregulated free market alone has proved to be inadequate in a situation where economic growth has slowed or halted, as is very apparent in the context of the present financial crisis. But, halfway through the 21st century, economic growth

will be halted permanently by ecological constraints and vanishing resources. We must construct a steady-state economic system – one that can function without industrial growth. Our new economic system needs to have a social and ecological conscience, it needs to be responsible, and it needs to have a farsighted global ethic. We have the opportunity to anticipate and prevent future shocks by working today to build a new economic system.

The introduction of Pigovian taxes by one country may make it less able to compete with other countries that do not include externalities in their pricing. Until such reforms become universal, free trade may give unfair advantages to countries which give the least attention to social and environmental ethics. Thus free trade and globalization will become fair and beneficial only when ethical economic practices become universal.

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 ensure that all who wish it may have jobs. Market forces alone cannot achieve this. The powers of government are needed.

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*“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.”*

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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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## Notes

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At the root of the current crisis are not subprime mortgages, credit rating agencies, financial institutions or central banks. It is the Great Divorce between finance and economy, which is a subset of the widening precipice between economy and human welfare.

The Great Divorce: Finance and Economy

*The Limits to Growth* proved the inherent limitations of the existing industrial model of economic growth, not any inherent limits to growth itself.

Garry Jacobs & Ivo Šlaus, From Limits to Growth to Limitless Growth

Focusing on growth of the part without reference to its impact on the whole is a formula for social disease.

Economic Crisis and the Science of Economics

The idea of nuclear deterrence is a dangerous fallacy, and that the development of military systems based on nuclear weapons has been a terrible mistake, a false step that needs to be reversed.

John Scales Avery, Flaws in the Concept of Nuclear Deterrence

The first step into the direction of a world parliament would be the establishment of a Parliamentary Assembly at the United Nations.

Andreas Bummel, Social Evolution, Global Governance & a World Parliament

The evolution from physical violence to social power to authorized competence and higher values is an affirmation of the value basis of law.

Winston P. Nagan & Garry Jacobs, New Paradigm for Global Rule of Law

We propose that a new organisation be set up, perhaps called the 'World Community for Food Reserves'.

John McClintock, From European Union to World Union

A proper and well accepted definition of (forms of) misconduct, reliable means of identification, and effective corrective actions deserve a high priority on the agenda of research institutes, universities, academies and funding organs.

Pieter J. D. Drenth, Research Integrity

The clearing house should encourage thinking ahead so that law and governance can attempt to accommodate the numerous challenges of globalization, many new technologies, and the emerging Anthropocene Era.

Michael Marien, Law in Transition Biblioessay

The economics of growth must be replaced by equilibrium economics, where considerations of ecology, carrying capacity, and sustainability are given proper weight, and where the quality of life of future generations has as much importance as present profits.

John Scales Avery, Entropy & Economics

A strong and strategic knowledge system is essential for identifying, formulating, planning and implementing policy-driven actions while maintaining the necessary economic growth rate.

Jyoti Parikh, Dinoj Kumar Upadhyay & Tanu Singh,  
Gender Perspectives on Climate Change & Human Security in India

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# CADMUS

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## *Inside This Issue*

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The very possession of nuclear weapons violates the fundamental human rights of the citizens of the world and must be regarded as illegal.

*Winston P. Nagan, Simulated ICJ Judgment*

The emerging individual is less deferential to the past and more insistent on his or her rights; less willing to conform to regimentation, more insistent on freedom and more tolerant of diversity.

*Evolution from Violence to Law to Social Justice*

It is more rational to argue that developing countries cannot afford unemployment and underemployment, than to suppose that they cannot afford full employment.

*Jesus Felipe, Inclusive Growth*

The tremendously wasteful underutilization of precious human resources and productive capacity is Greece's most serious problem and also its greatest opportunity.

*Immediate Solution for the Greek Financial Crisis*

The Original thinker seeks not just ideas but original ideas which are called in Philosophy Real-Ideas. Cadmus Journal refers to them as Seed-Ideas. Ideas, sooner or later, lead to action. Pregnant ideas have the dynamism to lead to action. Real-Ideas are capable of self-effectuation, as knowledge and will are integrated in them.

*Ashok Natarajan, Original Thinking*

Given the remarkable progress of humanity over the past two centuries, the persistence of poverty might not be so alarming, were it not for the persistent poverty of new ideas and fresh thinking on how to eliminate the recurring crises, rectify the blatant injustices and replace unsustainable patterns with a new paradigm capable of addressing the deep flaws in the current paradigm.

*Great Transformations*

Our global systems can be resilient if they are based not only on efficient markets that can cope with future crises, but on principles that also allow for the projection of civic will and preference onto the global level. Stability and resilience are laudable goals but they need to be achieved in all three dimensions, the financial, the economic and the social, in a participatory fashion.

*Patrick M. Liedtke, Getting Risks Right*

*Continued . . .*

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