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A Philosophical Look at Some Natural Resource and Environmental Problems

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# a philosophical look at some natural resource and environmental problems 

Heresy is no guarantee of truth; but let us not forget that every new truth begins with heresy.

T.H. Huxley

## Introduction

Despite the intensification of ecological and economic problems of the past decade or so, it still appears that many cannot bring themselves to the realization and consideration of a number of emerging and ultimate truths.

Despite growing scientific evidence that man's activities are causing irrevocable and evolutionary changes in the biosphere and its component ecosystems, we appear to be mesmerized by our narrow conception of current economic problems that the preservation of the biosphere is regarded as an externality. Such a view lacks foundation and may well present immediate and long-term difficulties. It flies in the face of the well documented, unalterable reality that man's economy, indeed, his entire civilization, does not and cannot exist apart from its surrounding environment.

There is no doubt that environmental stresses; particularly those impacting food and fibre production, have undermined earlier civilizations. It should also be noted that the conventional prescription of continued, indiscriminate material growth is being called into question. Something must be amiss in our economic system if economic survival depends on the possibility of ecological destruction.

Nature applies all of her laws all of the time and it is incorrect to blame these laws for any aspect of our economic problems. To the contrary, thanks should be given that nature gives any warning at all, and that we have wisely, if sometimes begrudgingly, invested some
of our good fortune in developing an understanding of our environment and our predicament. Clearly a turning point in resource management is at hand.

Today, very few people believe that the ecological and resource concerns are merely a fad, which after a brief pirouette in the limelight, will give way to a newer and more severe crisis.

All one has to do is look at the litany set forth in the "Global 2000" report to confirm the problems facing us. The Global 2000 report's findings confront us with some of the most difficult resource management and environmental challenges over the next two decades.

Ecological systems (ecosystem and all living organisms) form the foundation of our economic base. In addition to supplying all our food, these systems provide virtually all the raw materials for industry, and commerce. The condition of these systems cannot be clearly separated from the economy.

As the economy expands; pressures on the ecological systems mount. Human claims on these systems are approaching an unsustainable level, a point where their productivity is becoming impaired. When this happens, fisheries collapse, forests disappear, grasslands are converted to barren wastelands and croplands deteriorate.

The extensive deterioration of this major resource base is not an issue of concern only to the environmentalists. The economic system is highly dependent on this resource base. Anything that seriously threatens its productivity threatens the productivity of the economy.

The days of cheap energy are over, in spite of the fact that there may be short-term and temporary market surpluses of ofl. Conservation must continue to be the watchword, and new far reaching adjustments are called for not only in the developing of new sources of
energy, but also in the mobilization of scientific and engineering know how to increase energy efficiency in every sector of the world economy.

Inflationary forces continue to stir as a result of these claims on the earth's resources, precipitated by a continuously expanding economy. Consequently, at some point in time biological systems begin to deteriorate; oil wells begin to dry up; high-grade, easily accessible mineral reserves are used up; and there is no more fertile; well watered cropland that can be brought under the plough. As the demand for the more scarce resources begins to outstrip supplies, scarcity-induced prices begin to rise (the seeds of inflation).

Diminishing returns on investment in these basic sectors of the economy, growing inflationary pressures, and widespread capital scarcity have begun to slow economic growth. The slow down has not originated in some human failure to manage the economic system. It is rooted in humanity's relationship, the carrying capacity of our ecological systems. In effect, the changing growth prospect reflect the constraining forces inherent in the earth's natural systems and resources.

Achieving the necessary restraint in the use of renewable and non-renewable resources will require new ways of thinking by the people and their governments. It will require the widespread adoption of an approach to resources and environment that, while attuned to the needs of each society; recognizes not only the importance of resources and environment to our sustenance, well-being and security; but also our obligation to pass this vital legacy along to future generations.

It is in the face of this situation that controversy continues to grow between those who argue for solutions from the perspective of conventional economic and political wisdom, (short-term solutions yield quick gains and long-term losses), and those who see such solutions possible through the integration of social science with biology/ecology.

Sustainable Growth

For years, the belief has existed that Canada and other nations would achieve some particular greatness in this century. Certainly progress has been made, but at what cost? However, with less than two decades left before reaching the year 2000, this Utopian dream of greatness still eludes us and as a result, thoughtful people are seriously asking the question "What kind of a globe will mankind have to live on by the end of the century?"

The club of Rome has warned that man's exploding appetite for energy and minerals threatens to turn the world into a wasteland. Rachel Carson pictures the disastrous results of continuing water pollution acid rain, eutrophication and toxics.

Lady Barbara Ward Jackson utilizes the "global village" concept to make the point that people in one country or region cannot go on living in relative luxury while elsewhere others are living in abject poverty and squalor.
E.F. Schumacher, in his book "Small is Beautiful" argues in favour of a new direction for "technological development so that it serves man instead of destroying him".

Today, there are some indications that current growth in both population and industrial activity will likely level off or fall; and that the transition to slower growth may be made less traumatic through conscious anticipatory action by society.

There are a number of possible reasons that this current rapid expansion may either be moderated or completely arrested.

First, look at the matter of the development (dependent on ecosystems). For any ecosystem, its carrying capacity can be defined by its endowment of physical capabilities - availability of water, raw materials, energy, and climate regime; the lifestyle adopted by its inhabitants specifically in the way the population chooses to exploit the system's endowment; and by the time period over which the ecosystem is required to support activity. Man can exercise control over the system in several ways. He may increase or perhaps maintain the capacity by adopting a more frugal lifestyle, requiring fewer amenities, and thus, lowering the ecological input per person. On the other hand, the time horizon can be reduced by demanding more and more from the ecosystem, then it can only be expected to support man for a shorter time period rather than forever. By judicious application of ingenuity, man may develop situations where fewer ecological inputs are necessary to provide the same amenities - "technology". It should be noted that technological gains are directly related to the avallability of fuel and resources required to power technological advances.

The impact of this last item is, and has been, extremely important. It has produced a very high rate of exponential growth. Why? Improvements in treatment of disease; increased energy supply; increased food and coordinating capability have brought about such a major relative change, that expansion has been taking place in what might be considered a constraint free vacuum.

This recent explosive expansion of human activity is historically quite abnormal, and it is reasonable to assume that such growth will not continue. Mankind will return sooner or later to the historically normal situation where the level of human activity is pressing against the carrying capacity of the ecosystem and the rate of expansion is controlled by a slow, but steady lifting of the physical and social constraints through sporadic, hard won discoveries. Growth and development are strange bedfellows. They are combined processes that are sometimes in conflict. The challenge is to seek compromise - for
example, development can occur by careful utilization of the waste generated by a rapid system of growth. Ideally, all waste would be recycled.

The important limits to expansion have not been eliminated by the breakthroughs of the last century. Many constraints still exist, although they are not as currently evident as in the past. People still die - though at age seventy instead of age thirty. Sustainable land yields per hectare are still finite; although often three thousand kilogram crops per hectare rather than seven hundred - but artificially increased by mechanization and fossil fuel.

There still is a limit - in relative terms - to the size of cities that can be managed - though it may now be eight million people rather than one million. The available potentially arable land is still limited - although there are now 3.2 billion hectares as compared to roughly 1 biliion in the "old world". However; it is apparent that this range of rapid expansion, relative to carrying capacity, will likely shrink and new constraints will begin to appear at a more rapid pace than currently, and will be more difficult to overcome. There will be more difficult problems to solve and maintaining the same rapid rate of growth will perhaps be impossible.

For what reasons are future expansion rates forecast to be lower?

I Unavoidable onset of diminishing returns in a finite world - where there are fewer and fewer new places to look for minerals and very few new elements that are accessible and exploitable at anything approaching a meaningful economic cost.

II Strong interconnections among problems in a crowded and complex society - where a noisy, polluting power source is no longer an acceptable means of providing power. Some, however, may be prepared to accept the power source rather than pay more for "clean" power.

III Tendency for many problems to appear simultaneously in a closely coupled system - where a power failure not only removes light, heat and cooling; but makes most stored food inedible.

IV Implementation delays for new solutions are much longer in a society where a large number of people are affected by decisions - where fanatic proponents and opponents to any conceivable suggestion are guaranteed.

All of the above can be construed as signs of stress and imbalañe which can precipitate chaos within the ecosystem.

It is probable that the rate of expansion in human activity, in relation to the earth's carrying capacity; will slow down to a more "normal" rate from an historical perspective, say, to doubling times of the order of a century rather than doubling times of the order of a decade as are found in the current era. This suggested condition, might well be considered to be "equilibrium" or "a steady state condition".

The suggestion has been made that there will be a slow down in the rate of growth. The next question is how this might take place. There are a variety of mechanisms that could contribute to this possible slow down.

One method would be to allow expansion to continue until it approaches the natural carrying capacity and allow natural forces - lack of resources, polluted water supplies, inadequate food supplies - to slow
down the rate of growth. This could result in a society that is kept stable by strong, unpleasant negative pressures on birth rate and capacity for industrial expansion.

A second means is that the uncontrolled rapid expansion of the environmental and social load may build up a momentum too great to be overcome. Once the sustainable limits are surpassed, the result will be a reduction in carrying capacity (for instance destruction of soil fertility from overly intensive agriculture, depletion of non-renewable resources faster than substitutes can be developed) eventually forcing not only stabilization of; but even reduction in, the level of human activity. The slower the observation of and, the response to such overruns, the larger the overshoot will be and the more drastic the contraction. Perhaps this is already upon us?

Another mechanism whereby the current rapid growth might be arrested would be conscious human choice to slow down expansion before the strict constraints of the carrying capacity were encountered. This seemingly more desirable option has already begun a societal value change away from the value structure of growth. Hopefully, such a change will occur before the natural constraints are reached. If the necessary time is not available - if natural constraints are reached before people become sufficiently knowledgeable to automatically abandon rapid material growth - then a societal value change must be actively initiated in advance. Such a value change might make possible a smooth adjustment to a sustainable or steady state situation, however, great foresight and a very large measure of voluntary restraint would be required.

Today, there appears to be a number of indications that the transition from growth to "equilibrium", now upon us. As evidence of this consider the constraints that are currently visible and that have the potential for limiting human material activity. There is the continuing large-scale starvation in most parts of the world and, as well the need for industrialized countries to take an increasing proportion of
their resource supplies from the poorer countries that have not yet had the time or need to consume those resources. The contamination of the environment - of air, food and water - is another obvious example. Others are the increasing inability to cultivate new land due to the lack of fresh water; the emergence of heat islands around large cities caused by intensive consumption of energy; the risks involved in the establishment of large reactor programmes because of the lack of safe dumping grounds for nuclear waste. These are but a few of the emerging physical constraints on human activity that are evident today. All of this is degrading the quality of life and many people are discontent with this situation and reacting accordingly.

At the same time, it is not difficult to sense the emergence of major social constraints that are related to the physical ones. For example, friction between countries as a result of unilateral extension of fishing territories on a international basis - a symptom of social constraint that has been precipitated by approaching limits of annual fishing catches. The human suffering in the more poverty stricken areas of the world is the result of inequitable land distribution. In many parts of the world the land is exploited for export purposes and not to feed the population. Finally, shortages of energy supplies have led to the establishment or organizations such as O.P.E.C. These types of organizations can be clearly identified as a political constraint on an energy source. At the present time, oll does not appear to be a major problem. However, lest we become complacent, today's glut on the ofl market has to be considered a short-term situation. O.P.E.C. could very quickly change its production quotas, and what would be the situation if Iran closed the Strait of Hormuz in the Persian Gulf as part of its war strategy with Iraq? We are seeing currently the first manifestations of closure - the increasing attacks by both sides on gulf tanker traffic. A major decline in gulf shipments is taking place as a result of military activity and as well increasing insurance rates.

Many scientists, not only the ecologist, now recognize that "you can never do one thing", yet the conduct of research is premised on the assumption we can. Science - both "hard" and "soft" - has progressed by fragmenting reality into manageable bits and pieces, but in the process has tended to ignore the larger questions of meaning. To supplement "normal" science, broad vision is needed to tell us the meaning of all the bits and pieces. The interrelated economic and ecological crises transcends the relatively fixed boundaries between academic disciplines, and the various professions. To respond to this crisis, reductionism and narrow academic specialization must be surmounted in order to perceive the complex functioning of the whole systems. The perceptions of the generalist and the specialist must be integrated to create interdisciplinary modes of thought and enquiry.

The ecological perspective also suggests a different orientation toward time and values. As change quickens in pace and becomes more abrupt, there is greater need for anticipation of future problems having historically unique attributes. This implies the adoption of future oriented methods of enquiry, including techniques for forecasting probable futures and for designing more desirable alternative futures that are possible; but not necessarily probable. The role of the "value free" scientist who observes but remains intellectually and morally detached is no longer adequate to a world of rapidly multiplying human needs.

The conjunction between ecological concepts and traditional disciplines led some to propose radical changes in our approach to reality. Nicholas Georgescu-Roegan and Herman Daly have proposed that the social sciences adopt the perspective of modern physics, which would suggest the sustainable society" concept where growth must eventually come into balance with resources. Elaborate theories have been developed of the economic process, but unfortunately, they do not take into consideration physical constraints. Perhaps no less absurd are the theories of development and modernization that are predicted on a
continuing abundance of energy and resources. "Development" needs to be redefined for an era of scarcity; "conflict" and "peace" should be interpreted more broadly to take into account the impact of present generations on the welfare of future generations; definitions of "crisis" and "catastrophe" normally applied to social interactions need to be supplemented with the idea of man/nature interactions; new ideas of dependence and interdependence are needed to describe relations in a world where resources are unevenly distributed.

Resources, Environment and Economics

There is little doubt that a socio-economic transformation is underway, which involves an amalgam of many components - the population explosion, the microprocessing revolution, the sudden spread of communications, the energy crunch, the potential of biological resources, the uncertain swings of climate, the changing nature of work, the shifting requirements for education, the curiously stabilizing period of nuclear weapons; the thickening web of international interdependence, and the growing dangers of poverty in a shrinking world.

This changing viewpoint means that action must be taken to deal with practical problems of resource depletion, ecological decay; unemployment and inflation. These appear to be largely unyielding at the moment, but recognition of the growing scientific evidence that man's activities are causing irrevocable and evolutionary changes in the biosphere and its component ecosystems, and a weakening of the strong belief in the narrow concept of current economic thought, that the preservation of the biosphere is regarded as an externality, should make it possible to make a start at solving some of these basic problems.

Contemporary economics appears to have failed to take adequate account of other values, other objectives; even other imperatives than economic ones. Much criticism, not all of it warranted, has been devoted to economic indicators as a guide for policy adjustments (GNP is a good
example). The main point of the criticism is that measures of economic transactions do not judge the social desirability of what was transacted. Hence; high GNP does not necessarily mean a better society even though some economists and many politicians have been taught to think so.

Preoccupation with stable economic growth; first with stability, then with growth, and then with prescribing a growth path and how to stay on it, has rightly or wrongly been the number one priority of the economic profession. A further breakdown of economic interests reflects a certain dedication to the trade-off between unemployment and inflation and the achievement of optimum growth. Furthermore, an almost blind faith in our econometric models and their capacity to predict the future of the economy; in the functions of the models and their steady refinement; in the capacity of the models; the impact on the economy of various kinds and degrees of stimulus and restraint appears to have created more problems than solutions.

Current political debates about the economy assume that the challenge lies in getting it moving faster, to speed up the levels of "busy-ness" reflected in more jobs, more investment and more consumption. "Development" has become a slogan to promote higher levels of activity which are believed to be ends in themselves. Yet it may be the consequences of the activities which should be matters of concern, such as over-exploitation of particular resources; forest resources are often a good case in point, or the destruction of neighbourhoods in our larger cities. When "development" becomes little more than a license for destruction as the public often perceive it to be, then "economics" which is so often invoked to justify it will come increasingly into disrepute.

There certainly appears to be an inability to recognize and to cope with the emerging issues in their full dimension; to consider the growing demand on the part of people and nations that values other than purely economic ones should rank and compete with the ethos of industrial
society; and so take into account the institutional changes, domestic and international, which create forces of compelling importance; both public and private, but which operate outside the market system and market logic.

Yet the Classical School, if one casts his mind back in history, did seek to bring within their purview, what were perceived to be the major social and political as well as economic challenges of the time: Adam Smith, Ricordo, Malthus, John Stuart Mill, Marx and more latterly Schumpeter. Even Alfred Marshall, the father of micro-theory clearly stated "The economist, like everyone else must concern himself with the ultimate aims of mañ." It has therefore, fallen largely to others to identify and endeavour to come to grips with these issues. True some of these 'others' appear to be cranks; but to use Joan Robinson's words cranks flourish "because the orthodox economists have neglected the great problems that everyone else feels to be urgent and menacing".

Without doubt, there are a number of emergent issues that must be dealt with. The major question at hand is how to do it? Perhaps the best approach is to deal with them one at a time.

Population growth is one of the great externalities which must be dealt with, not necessarily as part of the economic systems, but as a matter that will continue to have a major impact. The point is not to prescribe alternative population policies, but to apply economic techniques to problems like population growth.

By approximately the year 2000, a world population in excess of six and one half billion people is forecast. It would be extreme optimism - even irresponsible optimisim - to suggest that a population growth reflecting this order of magnitude can be adequately fed simply by hard work and hoping for the best. Forecasting new technological developments, new areas of land for agricultural production; success in the application of capital to land; success in the timing of these changes relative to the time of population increases, and success in
persuading the 'agri-powers' to transfer their food to the less fortunate people are all high priority considerations. Educational programmes and other incentives for population limitation have been and are being tried. Ünfortunately; these programmes have had limited success at best.

It must be immediately recognized that those factors outside the analytical system, yet disturbingly relevant all the same; have become the core of a different system of required thinking. This new approach can continue to be called "economics" only if the externalities are quickly internalized and a major effort is made to firmly grasp the criteria of fudgement that have been kept at arm's length because they were so messy, so hard to quantify, so loaded with politics of value and the value of politics; equity and fairness, employment and education, energy and environment, personal privacy and international security: a planetary perspective in national and local decision-making, and the interest of that ultimate silent majority, the future unborn generations.

Consideration must also be given to the limits of non-renewable resources including fossil fuels. The proposition is abundantly clear: if the rate of industrial growth continues unabated at the levels prior to the current economic difficulties and the population attains the levels mentioned earlier; there will simply not be sufficient non-renewable resources to go around.

Obviously, this is an area were economic methodology can make a sizeable contribution. After all, is not economics about the allocation of scarce resources? Furthermore, was it not the economist who described how growth came about - by the application of capital and labour to resources - and who developed the theories about how the market mechanism allocates capital, labour and resources to production.

There is a question to be asked here. Can the market mechanism in fact serve to regulate growth, resource use and pollution, given the population to be served by growth? One answer is no: The passion for
growth could lead to an overshoot in the uses of resources and production of pollution, and possibly to a collapse of the system.

A contrary view will say that the price mechanism will operate so as to increase the production of required resources - from newly discovered reserves; from lower-grade or less economic reserves; from the application of new technology to production and from recycling of waste. The same mechanism will operate in such a way as to bring about the substitution of lower cost resources (even new ones), the more efficient and more sparing use of scarce resources; and an increase in the durability of the goods produced from scarce resources.

This position is theoretically sound as long as there is available an unlimited supply of low cost energy. Clearly this supply will not come from fossil fuels. Whether the energy shortages of the late 70's were real or not; no thinking person can doubt that the end of useable fossil fuels will be reached in time. The last ton of coal; the last barrel of oil; the last cubic foot of natural gas, will never be utilized. Long before that point is reached, it will be found that several more tons of coal will have to be mined to produce an additional ton; and it will take much more than an additional barrel of oil or a cubic foot of natural gas to replace themselves: So in real (not monetary) terms it will no longer be feasible to produce fossil fuels. There is of course the possibility (not probability) that technology will lead to to a breakthrough, which will provide us with the much needed supply of cheap energy. The question here is at what cost? Not in monetary terms but in the utilization of scarce resources to accomplish this utopian concept.

It should also be noted that the market mechanism, as long as it runs smoothly and the assumptions on which its based remain unchallenged, will function well. However, it has to be realized that institutional and behavioural change can force on us adjustments which are far from smooth; adjustments which are beyond those anticipated by the market
model - a model which by its very nature does not incorporate institutional and behavioural changes of a large magnitude.

In short, the problems of population growth and the rate of use of resources involve institutional and behavioural issues, along with choices between economic and non-economic values. Efforts will have to be made to relate the discipline to, and indeed adapt it in such a way as to take into account of these fundamental issues.

Over the years the economist has been trying to do this, but the market model endures as the basic analytical tool, and studies of non-market forces often tend to resemble the market model - the bedrock of theory - rather than the real world.

Another major issue raised by those who are looking at a new or different concept of growth - and indeed a great many others - is pollution. A simple statement of the problem is, high rates of industrial growth exact a heavy price in pollution - pollution of the air, of water, and of soil, as well as, sight, sound and smell. In the face of this situation a growing controversy is under way. One school of thought argues for solutions from the perspective of conventional economic and political wisdom and those who see solutions based on a more holistic position that is an amalgam of social science, politics and ecology.

William Ophuls has dubbed these two factions, "Optimists" and "Pessimists" respectively, in his book Ecology and the Politics of Scarcity: "the so-called optimists belleve that (1) the current situation in general is not quite so bad as the doomsayers make out; (2) continued scientific and technological ingenuity will keep the ecological wolf from the door indefinitely, and (3) there are many negative social feedback mechanisms, such as the economic marketplace, the impact of media-propagated information on values, and the political process itself, that will promote gradual human adjustment to physical limits when and if
this becomes necessary." Thus; to put it crudely, business as usual can continue for the foreseeable future.

Of course, "the so-called pessimists believe, to the contrary, that (1) the situation is more urgent than most are willing to admit; (2) limits to our scientific and technological ingenuity or to our ability to apply it to the problems we confront are already discernible, and (3) the negative feedback mechanisms on which the optimists would rely have already begun to fail. Thus, say the pessimists, time is short, and far-reaching action by the current generation is imperative to avoid overwhelming the earth's capacity to support us in dignity;...".

There are strong arguments indicating that the intellectual foundation of conventional economic thinking is inadequate in its non-consideration of environmental resources and approach to the nature of the economic process. On the other hand, is the widely-held view of the biosphere, ecosystems and society as dynamic, evolving and organic wholes; whose evolution necessarily dictates the evolution of its component parts if the whole is to continue as a healthy, functioning, total organism. The major root of the controversy seems to lie in the apparent unwillingness of man to apply the rules that govern every other life form in nature to his own actions and existence.

Wherever one's views may fall in this spectrum, it appears that both sides have perhaps overstated their case. However, a great service has been done by this debate. Industrialized nations have been forced to face up to the social costs which are inherent in industrial growth, and have brought them to seek a better balance between the value of quality of life and the value of economic growth.

It certainly should be mentioned, that over the years considerable economic consideration has been given to coping with the social costs which are generated by industrial production - the so-called externalities - costs which are borne not by the producers of pollution
or the consumer, but by the community generally. There is no question that it has been perceived that there are forces at work outside the pure market model that must be dealt with. Values other than economic growth have been identified - call it quality of life - choices have to be made, weighing these two major issues and this has been done by determining the relative cost of each alternative and by identifying who would benefit and who would pay under each. Once these decisions were made, there were different public policy mechanisms for bringing about solutions.

The basic problem is, however, that the theorists got off the track. They tried to bring the whole thing into the market model - to make the whole system look as much like the neo-classical economic system as possible: This approach has three shortcomings: it diverts the social scientist from the explicit recognition that competing values are involved; it blurs the fact that the choices are not economic but normative ones - irrespective of how much of the costs of the options may be measured in economic terms; and attention is deflected from the fact that choices which are finally made will be influenced primarily by changing attitudes, institutions and the community.

One further thought on the subject of internalizing externalities: there is a tendency to overlook the fact that; because of the true nature of the decisions to be made, and that are likely to be made in a Galbraithian planning system as opposed to the 'market system', those who wish to proselytize, whether they be community leaders or professional politicians, are in a position to effect changes in comunity values and attitudes if they wish, and thus to bring about the desired changes in corporate or government behaviour.

Until the 1970's, civilization was well served by the blooming of economic analysis - "the hardest of all soft sciences", which now and in the future has to come to terms with wider concepts of qualitative growth, social fairness, ecodevelopment. Maybe today thought should be moving in the direction of bioeconomics - a unified way of looking at the
economic process. The biological analogy stresses interdependence and evolutionary change. There is no need for the simplifying assumptions of static analysis, or "partial equilibrium". Indeed, the idea of "equilibrium" or ideal state, in which no change would benefit anyone, is foreign to the philosophy of bioeconomics. Bio-economists view the economic process as one of continuous change with no predictable end point or equilibrium, in sight.

Perhaps what really is needed, when it comes to choices between values, is a 'social model' of which the economic model is only a part. In this way, the social scientists may be able to better comprehend the total sweep of the social, political economic and environmental decision making which is involved with the myriad of issues facing us today.

Finally, the formulation of an economic policy for a move from a high growth oriented society is going to be a complex process. Old assumptions and guidelines will have to be replaced and the economic system will have to recognize the need to stabilize the relationship between humanity and the world's principal ecological systems. In effect, this means devising comprehensive policies and plans to limit offtakes or harvests from these systems to sustainable levels. The question is not whether harvests are to be limited. They will be limited - either through the exercise of foresight and careful management or through the eventual breakdown of the systems.

## Towards a Reformulated Perspective

The changes involved in accommodating earth's natural capacities and resources imply a far-reaching and mandatory social and economic transformation. The origins of change may be ecological, but the change itself will be social and economic, and the process for achieving it will be political. In recognition of this, our perspective on the future needs to be examined.

In recent years; the futures debate has become more reflective and at the same time less superficially exuberant. Self and society are the topics for re-assessment; the realities of difficult adjustments with inherent uncertainties are more readily acknowledged, and larger issues of political and economic power are less likely to be denied.

One positive response to these realizations takes the form of deliberate efforts at "imaging" of personal and social future. It is done through dialogues which acknowledge the role that our beliefs and attitudes, hopes and fears have in our expectations about what is likely to come and what it is possible to achieve. By acknowledging this, it enables people to relax and begin to talk more freely about what they would really like the world to become, and of the feasibility of bringing it about. While this approach too has its own assumptions, they are by no means so strained as to make such exercises futile. The major belief is that a strong and shared image of a preferred future for a society is necessary to mobilize the will and comitment to bring it about. It assumes that human destiny can be influenced through deliberate choice; that our history in some measure can be willed. It is suggested that, based on past accomplishments in science and technology as well as social and institutional change, that almost anything can be accomplished in 25 years if sufficient will and "staying power", is mobilized. And it recognizes that much of what will in fact emerge some 25 years from now, is already being decided today, but not always with vision or awareness of alternatives.

The "images" reported from a number of these exercises reflect a mix of commitments. Often traditional values are combined with not so traditional ideas as to how the values in question may be protected at home, in communities and society at large. The important point is the extent to which many traditional values are being questioned and the extent to which belief in established institutions appear to be on the wane. The economics profession is no exception. No one will argue that economics is unimportant but, what economists have to say about it may be
much less convincing. The same intellectual crisis pervades the social sciences, all of which now are faced with the need to re-examine the "Inherited certainty" of their prevailing theory and the assumptions upon which it has been built.

At the global level there has been a lot of attention given to re-thinking the concept of "development" itself on terms of what ideally it ought to be. There are many parallels with and exchanges of ideas from the futures debates in North America. The one aspect of all this that challenges resource economists; who in turn could contribute usefully to the debate, is the way in which enviromental considerations are now being used as prerequisites in successful development. Put simply any society worth having ought to be sustainable, hence it must not be based on developmental processes which systematically undermines its own continuance. This too is a mix of the traditional with the not so traditional views.

Resource management was founded in recognition of the need to manage renewable resources on a sustained basis for multiple uses. The "newness" of the sustainable development idea lies only in its extension from the "usable" components of natural environments to the ecological systems of which resources components are only a part. The need to reconcile ecology and economics is still there to be addressed at all levels from the most theoretical to the most practical. The rate of the transformation, which is now upon us, makes this reconciliation an urgent issue. As resource managers and economists we must make a major contribution to it.

NOTE: The author is deeply indebted to Dr. George Francis of the Faculty of Environmental Studies, University of Waterloo and Dr. Henry Webster, Chief Forester of the State of Michigan. Their wise counsel and constructive criticism contributed greatly to the paper.

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