

A 5. ENVIRONMENTAL PROBLEMS

The human race counts on solar energy to maintain the earth's temperature within the narrow range within which life as we know it is possible. It now appears fairly certain that humanity is producing a small amount of global warming by polluting the ozone layer. Our lives are not endangered yet, but huge economic and social adjustments may need to be made in the long run as a consequence. What we do not know is what the consequences may be if the habitats of many plants and animals are destroyed by the maximum economic and population growth the earth can support. Should we ignore this when it seems not to hurt us? Let us examine in more detail our environmental situation & problems.

ENERGY: We do know that eventually the human race will face an energy problem because producing most things requires energy. It was ages ago that human energy began to be supplemented by animal power. Then energy came from burning wood and later by energy from water wheels and windmills, and finally by combustion of fossil fuels to increase labor productivity greatly. Now the more developed countries are heavily dependent economically upon using up fossil fuels at a prodigious rate. The earth does not have an unlimited supply of fossil fuels. The most plentiful, coal, is at best a serious air pollutant. Meanwhile there is ground for worry about a potential greenhouse effect from the use of fossil fuels. To avoid heat buildup and its impact on climate it may be necessary to learn to make use of the solar energy (in its many forms) now absorbed by the earth system.¹ This will be necessary in any case when the fossil fuel age ends.

When will we run out of oil for both fuel and petrochemicals? People have cried wolf before, saying oil will run out in 35 years, so now forecasts of oil running out are dismissed by many. But when one discounts the earnings from oil sold more than 35 years hence, its present worth is not as great as the present cost of searching for more oil. That is why we expect to exhaust known reserves in about 35 years. Economists say more oil will always be available as its price rises to cover the increasing cost of finding and extracting more. But the earth's supply of oil is not inexhaustible. The day will come when it will take more energy to get oil or other fossil fuels than the energy they yield. That is exhaustion of supply. How can we shift to a non-oil and indeed a non-fossil-fuel world?² It will be a huge technological problem, given the present pattern of energy sources and energy uses. The more research effort, private and governmental, devoted to it the better.

¹ See Sam H. Schurr et al, ENERGY IN AMERICA'S FUTURE: THE CHOICES BEFORE US, 1979 Johns Hopkins

² See Denis Hayes, RAYS OF HOPE: TRANSITION TO A POST-PETROLEUM WORLD, 1977, Norton.

The prospect of limitless cheap atomic power was a delusion. It is now clear that we judged it economical only by omitting some costs, especially the still unknown costs of storing "safely" for over 20,000 thousand years both dangerous wastes and the contaminated parts of decommissioned plants.

We need to learn how to use solar energy as cheaply as possible in its different forms: solar cells to convert direct sunlight, wind power, vegetation etc. Perhaps we can develop technologies to enable us to use the hydrogen we can extract from water.

It may also be possible to reduce the energy to GDP ratio especially in the U.S. where energy efficiency is much lower than in some other industrial countries. The energy problem calls for much greater energy efficiency in the future in buildings, appliances and transportation (much of which is possible now). Various publications over the years have dealt with some of these matters. Results of a Harvard Business School research project conducted by Robert Stobaugh and Daniel Yergin was published in 1979 under the title ENERGY FUTURE. With extensive documentation, it argued that investment in energy conservation would pay better than any available energy alternative. Much is still possible. A popular presentation on energy with colored charts appeared as a special report in The National Geographic magazine for February 1981. Much has been published since then.

POPULATION: The population problem is environmental problem number one. What may be humanity's hardest ecological problem to solve adequately is excessive population growth. If we fail completely to solve this one, we will not be able to solve any other economic or ecological problem satisfactorily. It is a relevant and undeniable fact that if world population continues to grow at anything like its present rate, it will add another 6 billion people to the planet in only a few decades.

The population problem is basically an ideological problem. If people do not face certain facts and then act sensibly, the problem will still be solved, but very unsatisfactorily. The earth is finite and simply cannot support continuous population growth. Population growth will be stopped by Malthusian checks of famine, disease and possibly wars unless stopped sooner by some more rational choices of restraints. The only question is whether the latter will stop population growth at a level at which technology can provide everyone a "decent" standard of living, or whether most people will survive only in economic misery. The fact of the matter is that beyond some point, every family that has more than 2 children places a burden on the community in which they live. If voluntary restraint does not then suffice, society may take over one of our most prized private rights, in order to prevent the long run Malthusian checks from operating eventually as they otherwise will.

WAR: Wars are environmentally damaging, both directly and in the resources used up. In the recent Persian Gulf war, deliberate environmental damage was itself a war objective. Even the war system into which the world appears to be locked as yet, and the preparation and training for war uses up large amounts of resources that could be better used. A fighter plane uses more fuel in two hours of flight training than a U.S. family car normally uses in a whole year. Now that wars are not just between armies but are directed also against populated cities, will wars keep populations down so that there will be no population problem? Perhaps if nations resort to biological warfare in the future, that might be the case. There is no way of knowing how much, if any, of the human race would survive a series of biological wars. We have by luck rather than by good sense avoided destroying the human race by a single all-out nuclear war. The Soviet & U.S. stockpiles of nukes were so large (presumably to defend two nations) that informed scientists debated whether any life would survive on the planet if all those nukes had been detonated in a war. Most of those nukes still exist, and many are not yet taken off from alert status and de-targeted. George Lee Butler, who for years was responsible for targeting the Soviet Union now says that the nuclear arms race was idiocy, and that nukes should all be abolished as a military danger rather than a military asset.

In any case, it is idiocy for human beings who do not even know each other to be regimented and sent to kill or maim each other by governments that should instead use them to promote each others' human well-being as they could be used. Avoidance of war requires basic changes in people's ideologies and in their war-making institutions, as explained in later essays.

RESOURCES: So let us talk about ecological problems that will exist even if the basic problems of population and war are resolved sensibly. The remaining problems deal with both depletable resources and renewable resources. Our ideologies need to adjust to the realities of the situation that will face the human race in the future, and indeed to some situations that need to be faced now. Social institutions need to adapt also, and new technologies will be needed in many cases.

The depletable resources are the minerals and metals of the earth that are in relatively limited supply. Examples are oil and natural gas, copper, iron ore and others that are vital though used in smaller quantities. It is not clear how long it will take to find suitable substitutes for resources whose supplies are limited, nor is it clear therefore how soon we should limit ourselves to their most valuable uses. When, for instance, should we consider any limitation on oil heating or on most petrochemicals if there are some important petrochemicals that we know no way to replace.

We are not very likely, so far as I can see, to ever run short of clay or rock, but we can run short of good topsoil, and so we should have some concern

about how much of it we pave over and how much of it we destroy otherwise, e.g. by washing it away in floods or blow away in dust storms or destroy by overcropping or overgrazing. Since it may take a thousand years to create a good thick topsoil again, soil conservation methods are very important. Fortunately that lesson has been learned, and there are several methods used, some for a long time, and others more recently, to conserve soil: leaving some land lie fallow for a time, certain crop rotations that restore fertility rather than repeatedly raising the same crops, contour plowing and planning of crops to reduce erosion, etc. Despite existent knowledge and some soil conservation practices, either some people with dire necessity or others with economic incentive are producing anew "tragedies of the commons" and in some cases degrading soils to the degree referred to as desertification.

Renewable resources can also be destroyed in particular regions if their sustainable yields are ignored and they are overloaded. But where the latter does not occur, they renew themselves indefinitely. In some regions we are currently overfishing and overforestry, but if we cut back enough, fisheries and forests have substantial sustainable yields.

Fish are no match for modern fishing technology, so overfishing is proceeding. Some international agreements, as on whaling, worked somewhat for a time, but the future is bleak. Driftnet fishing does not bode well for sustainable yields. The U.S. tried to do the only thing it could do to prevent dolphins from being destroyed by present methods of salmon fishing. It restricted imports of salmon using such methods. GATT & now the World Trade Organization prohibit such restrictions and allow the complaining country to retaliate against our exports. The WTO should not be allowed to make such a decision on the basis of the trade effect alone without full consideration of the other values and issues involved. But it presently has that power--a power that needs to be challenged and changed.

When hillsides lose their forest cover, the resulting floods and erosion are essentially man-made. Yet lumbering firms and their employees protest when any trees are put out of bounds for them. They will all be unemployed when they have deforested the world. But a few big companies are realizing that it is in their interest to manage the forests they own on a sustainable yield basis. It will be tragic if others are allowed to deforest everything they can. The end result will be terrible flooding and extremely expensive lumber.

The world's rain forests on which we depend even for oxygen are slowly being destroyed, along with the habitats of many rare animals and valuable plants, by mining and grazing business firms and by the need of farmers for land, although the soil is fragile and after a few years of tillage becomes almost a lateritic soil no longer usable for agriculture. But for the World Trade Organization which would prevent it, outside nations concerned could put prohibitive tariffs on the products produced by destroying rain forests

anywhere, thus destroying their markets and effectively making foreign products from rain forests unprofitable. Nations with rain forests could refuse to allow commercial purchase of the forests. As for the slash and burning of rain forests by farmers seeking land to till, it would require cooperation between the native government and other governments to employ in better jobs the labor that otherwise would seek their livelihood by invading the rain forests & destroying them acre by acre.

The market will not likely reduce production of renewable resources to sustainable levels, so political controls by nations may need to be developed and used if some renewable resources are not to be overloaded and destroyed.

The other major environmental problem is pollution of the air, of water and of the land. Production (byproducts) and consumption (discarding used products) necessarily pollute, that is, put waste products into the environment. Different parts of the environment have different absorptive capacities for different pollutants. Those are easily exceeded, and then the effects are often very undesirable. Pollutants are classified as degradable, persistent and non-degradable.

Air is polluted chiefly by particulates, hydrocarbons and oxides of carbon, sulfur and nitrogen. In the past, smoke from industry smokestacks and from household chimneys were major sources of air pollution, and sometimes resulted in acid rain that damaged even distant forests. Changed fuels and new technologies have reduced but not eliminated the problem. Now automobile exhausts in some cities produces serious urban smog at times and adds to greenhouse gases. Human life depends on maintenance of an ozone shield. that is being damaged by chlorofluorocarbons (used in refrigeration and air conditioning). Clearly we must replace them and reduce greenhouse gases such as carbon and nitrous oxides. Cars with more miles per gallon are a first step, then substitutes for every global warming fuel, including perhaps hydrogen fuel for cars. This is a major global environmental problem requiring action by all nations.

All sorts of pollutants have historically been dumped into rivers that carried them away at no cost to the polluter. But those downstream often suffered from impure water or bore the cost of trying to reduce the pollutants. Human sewage dumped untreated into streams is perhaps the oldest problem. Now at least some treatment is usually required, but when storm sewers are not separated, sewage treatment plants can be flooded and overwhelmed. Other organic wastes from farms or meat processing operations, though biodegradable, are also a problem even to the extent of killing off fish if the biochemical oxygen demand is too high. Especially in some less developed countries people bathe, wash their clothing and drink water that is not free from sewage and that breeds bacteria, so they suffer from a high incidence of water-borne diseases. It will take a major effort to correct this situation. In addition

river water is polluted by chemicals discharged by industry and by run off from chemical fertilizers used on farmland. Lakes often suffer eutrophication from the above pollution problems. The UN Environmental Program did get nations bordering the Mediterranean to agree to some restrictions on polluting that sea, but a firmer commitment is needed. And wherever rivers enter a sea, there may be problems. The oceans are too big to notice pollution problems yet, but will they forever?

The Law of the Sea Treaty needs to be ratified universally (the U.S. is still a holdout). The concept that the wealth of the seabed was the common heritage of mankind should be reinstated, and the resources of the seabeds, when it becomes profitable to mine them, should be used to finance environmental protection on a larger scale. The desire of the powerful and wealthy technologically advanced nations to take over that seabed wealth for themselves is unworthy of them, given the present large disparities between the well-being of the peoples of the wealthy and the poor nations. Vital international straits and canals should be put under the control of a world governmental body to prevent political interference in access to them and to protect them against pollution. The easiest part of the pollution problem came when some industries discovered that they could make a profit by collecting and using or selling some wastes they had been discarding.

For good health, humans need to consume daily several glass fulls of pure water, but in large parts of the world there is no water that is as pure as it should be for good health. Barbara Ward in the later years of her life championed the cause of pure water, and the UN declared the decade of the 1960s as the decade to advance water purification worldwide. Whatever progress was made in that decade, there is still unfortunately a long way we need to go toward that desirable pure drinking water goal.

Land is no longer free from local pollution problems. We discard many waste products, including some durable goods that outlive their useful lives, into dumps. Many city dumps have filled up, and the search is for new dumps. In the long run it may be necessary to require firms to reclaim their products after their useful lives and reuse the materials.

The chemical industry produces yearly hundreds of new chemicals for many purposes. We do not know what effects they will have upon the natural ecosystem. We do know that many now in use can have bad effects. Some toxic materials from households or industry are also put into city dumps, and the danger is leakage from the dumps. Some are now dumped in other than their countries of origin. If possible, technologies need to be developed to convert hazardous chemical wastes or to find safe disposal methods.

We need to develop international standards for pesticides and food trade, and introduce international controls when the standards are not met. It should be a violation of international rules for firms to sell outside their country

products they are forbidden to sell in the country or those, like cigarettes, that are known to damage human health.

GENERAL ENVIRONMENTAL POLICY ISSUES: Our environmental crisis is global. What can be done?³ Homo sapiens, somewhat misnamed, has not learned, even from the historical records, that a civilization does not survive if the society overloads its local biological life support system and degrades its economic base. Now the problem of the relation of population to resources must be viewed on a global scale as well as on a regional and a local scale.⁴

We humans are utterly dependent upon what may be called our life-support system in nature. We need to live in harmony with it, and not harm it seriously. We depend upon the continuous inflow of solar energy that supports the entire food chain and the forests. The human population with its present economies operate on a scale that can affect the food and fiber chain in some respects. We may now be inadvertently affecting some aspects of it adversely. We need to become conscious of how we affect it, and how damage to it may affect us. We have learned, for instance, that persistent pesticides useful near the bottom of the food chain may become concentrated as they move up the food chain and in the end affect our very health adversely. Global warming is a global problem. Environmental protection or lack of it often affects the entire human race.

The UNA-Sierra Club briefing booklet, ONE EARTH, MANY NATIONS, distinguishes between trans-boundary problems and global ecological problems. The former includes such things as acid rain, toxic waste disposal, and drift net fishing, shared rivers and regional seas. The latter involve the global commons such as oceans, and include the ozone and global warming problems. The tropical rain forests, species preservation and land degradation all have global implications. The problems of organizing international attacks upon these different problems are somewhat different. The problem is how regional communities can manage the trans-boundary ecological problems and how the world community can manage the global ecological problems.

³ Lester Brown SAVING THE PLANET: How to shape an environmentally sustainable global economy, 1991, Norton. Lester W. Milbrath ENVISIONING A SUSTAINABLE SOCIETY: Learning Our Way Out, 1989, State University of New York Press, emphasizes the need to transform agriculture to save our topsoil. See also Norman Walbek, SAVING THE PLANET: THE POLITICS OF HOPE, 1988, Northland Press.

⁴ See OMINOUS TRENDS AND VALID HOPES: A Comparison of Five World Reports, by Magda Cordell McHale, 1981, University of Minnesota. The American public seemed largely unaware of the problems until Rachel Carson wrote SILENT SPRING, 1962, Houghton Mifflin; the attacks upon Rachel Carson that resulted are documented in Frank Graham jr. SINCE SILENT SPRING, 1970, Houghton Mifflin. Lewis Thomas write more recently that humans are THE FRAGILE SPECIES, 1992, Scribners. See also Vice-President Al Gore's, EARTH IN THE BALANCE 1992, Houghton Mifflin; Todd Sandler GLOBAL CHALLENGES: An approach to environmental, political, and economic problems, 1997 Cambridge, & Frances Cairncross GREEN, INC.: A guide to business and the environment, 1995 Island Press

Some trans-boundary problems, as when rivers run across national borders (or are national borders) or when pollution travels by air across borders can be handled by negotiation and cooperation among the directly affected and the problem generating parties or countries. That is likely to be easier than saddling wider bodies with full responsibility and decision-making power (although an organization like UNEP (United Nations Environmental Program) may be able to initiate negotiations and may greatly facilitate a solution). This also avoids the representation problem at this level. That is a major reason for negotiating international treaties, broad as well as narrow, wherever possible. Even for regional problems, however, it may be necessary to move to a structure with delegated power if cooperation in a treaty framework does not work well enough.

International negotiation and cooperation are also needed but usually does not take place whenever damage occurs to a country (or its standard of living is affected adversely) by any actions (e.g. sudden imposition of high tariffs) taken by another country without the harmed country having any voice in the matter (called "taxation without representation").

There are also times when a nation must protect itself by international trade regulations so some other countries do not gain a trade advantage by attracting capital to their "pollution havens". Otherwise the nation's own environmental protections will be undercut. This has become a critical issue, given the powers that have been delegated to the World Trade Organization, powers that enable it in effect to override some environmental legislation democratically passed by sovereign nations.

Rich nations and poor nations will continue to differ in environmental protection, the poor claiming correctly that the rich pollute and deplete much more than do the poor, and that the rich can afford to pay for more environmental protection as well. The trouble is, as some of the poor nations have learned, that their development is already being hampered by damage to the environment, and in any case, as their populations grow, if they succeed in industrializing, they will be responsible for very much more environmental damage than those now rich, even if they have the same protections in place as the rich now have.

What the world needs, among other reforms, is to develop a non-depleting and non-polluting technology. That is stating the matter too simply, but we need to work at moving as far as we can in that direction. In addition, we know that new technologies have made productive what were previously considered unproductive resources. We need to continue that and learn how to make better use of less scarce materials. For example, we now substitute glass fiber for copper wires. We gain by further miniaturization also.

Anti-pollution policies need both to try to prevent further damaging pollution and to try to clean up from past pollution. It is necessary to identify each type and source of pollution and their individual harmful effects, find

alternative pollution prevention measures, estimate their costs and benefits, and evaluate clean-up possibilities.

As long as air, water, and land provide free or inexpensive dumps, everyone has an economic incentive to pollute them. Pollution is what economists call an external cost (one not borne by the polluter). That the cost is external to a polluting firm gives us the impression that things are cheaper than they are. Some pollution costs may be more than we can afford. The most effective pollution controls require a governmental unit that includes both the areas that generate the pollution and the area of impact of the pollution. How should the costs of pollution prevention and pollution cleanup be allocated? Pollution policies need to be enforceable, effective, efficient, flexible and stimulative of research and technological progress in dealing with pollution.

Policy alternatives include taxes and subsidies, regulations, and giving people amenity rights to sue public nuisances. There is much debate over regulations versus "market" incentives and what sometimes are called "buying rights to pollute". It should be remembered that where one starts is not where one should end, so places free of pollution should not be allowed to pollute but should be kept pollution free, while the amounts of pollution allowed elsewhere are progressively reduced. It is often difficult to know how much is gained by a given reduction in pollution, so cost-benefit analysis is difficult, though it must be attempted. In some cases we may not know until it is too late what damage a pollutant may do. If irreversible damage cannot be ruled out, it is obvious where the burden of proof should lie.

OBJECTIONS TO ENVIRONMENTAL RESTRICTIONS: A few words may be said now about the basic principles that underlie society's regulation of activities of its members in general and in the field of environmental protection in particular, and about the misuse of some other principles as obstacles to and objections to environmental regulations which are in the public interest.

All social groups need to and have the right to protect themselves against dangerously anti-social activity by any member. Even proponents of individual rights recognize that the creativities of individuals need to be restricted when they do not harmonize with but undermine the well-being of others. The same is true when it is a matter of the rights of subgroups in conflict with the larger numbers in the wider community. Both wide and narrow groups make rules for their individual members and hold them responsible. The global community should not be at the mercy of sovereign claims by business firms or even by individual nations for any right to harm others or the community.

The earth and all its resources are not this generation's exclusive possession to do with as we may wish, however much destruction that may entail. The stewardship principle undeniably applies to us and our use of our

inheritance. Subsequent generations may not be able to hold us accountable to them, but we should recognize our responsibility to pass on to them an inheritance as good or better than that we received. In technology we can pass on better, but no individual and no sub-group has an inherent right to under maintain the soils from which later generations must derive their sustenance. We have no right to leave them a planet where most of the plant and animal species have been destroyed by our neglect or rapacious expansionism.

We must learn that the question is not whether environmental protection is compatible with business profit as usual, but whether business profit as usual is compatible with environmental protection. In the present context the issue probably needs to be expressed that way, but even where some short run profit needs to be foregone, maintaining the ecological balance is more profitable for all in the long run, and ignoring it too much can even bring disaster. The charge that environmental protection reduces productivity is based on statistics that count its cost but not its benefit. We can always afford some short run economic environmental protection costs in order to avoid larger pollution costs later. Short run economic gains by polluting do not pay if they create greater long run losses through damage done to the life-support system on which we must depend. It is not good enough for business to favor environmental protection only when it does not increase costs or reduce our narrow productivity measures. Of course marginal benefits decrease and marginal costs rise the more is spent for environmental protection, so justifiable environmental costs are not unlimited.

No individual and no group should object in principle to restrictions on its activity that are justifiable ecologically.⁵ The complaint that environmental protection destroys jobs on balance is more than naive. Its costs are largely labor costs. We need jobs that protect the natural systems on which we depend, not jobs that disregard them and so would be self-destructive in the end.

The 1992 UNCED international meeting (in Rio de Janeiro, Brazil) brought together representatives of over a hundred nations with diverse views as to the structures which will determine the future of international environmental regulations.⁶ Elliot L. Richardson, an American experienced in

⁵ Donella Meadows in a magazine article "Nature Bats Last" writes that "We don't get to choose which laws, those of the economy or those of the earth, will ultimately prevail. We can choose which ones we will personally live under---and whether to make our economic laws consistent with planetary ones, or to find out what happens if we don't." In March/April issue of *Timeline*, the magazine of the Foundation for Global Community, 222 High Street, Palo Alto CA 94301, an organization devoted to discussing ideas helpful to the development of the desirable or necessary degree of global community, or as they put it "to build a world that functions for the benefit of all life". A book review the following month says "Ironically, we are now engineering environmental changes that threaten to alter the very climatic regime whose origin brought our genus into existence".

⁶ A good study preceded and some have followed after the RIO Conference: Robert Repetto, WORLD ENOUGH AND TIME, 1986 Yale, Richard Gardner, NEGOTIATING SURVIVAL, 1992, Council on Foreign Relations Press, Jim MacNeill, BEYOND INTERDEPENDENCE, 1991, Oxford.

international negotiations during the Law of the Sea conferences, wrote in the New York Times (Feb.7, 1990) before UNCED that one reason why individual national environmental regulations are not alone enough is that "The least responsible transnational corporations will seek out and encourage the most permissive regulatory environments. For maximum impact as well as equitable burden sharing, there will have to be universal standards universally accepted."

Finally, a word should be said about the major obstacles to handling environmental problems at the several levels and especially at the international level. It is usually said that self-interest is the biggest obstacle, and it can be a major one. People cannot ordinarily be expected to act against their self-interest. The answer is that carrot and stick need to be used to make environmental protection pay better than ignoring and damaging the environment. That means concretely the use of taxes and sometimes subsidies, regulations and penalties.

What may indeed be even more fundamental an obstacle is ideology. That begins with an ideology entailing frequent denial of the problem, or denial that one's contribution to it is significant. When environmental measures restrict the freedom of individuals or businesses to damage the environment, the restriction of any freedom is condemned on grounds of an individualistic ideology. But, as already said, there cannot be a right to harm the world's environment. At the international level the major obstacle is the ideology of national sovereignty. That is difficult to deal with even when, as is sometimes the case, the nation is hurting itself and is being hurt by others, but still resists actions it interprets as infringing national sovereignty. The only answer here is more education to enable people to understand that their long run interest is in environmental protection, and to understand what that may require.

WHO CAN DO WHAT? With respect to all the environmental problems of depletion and pollution, the difficulty is that all decision makers need to become involved, and now often none of them are. That means individuals, households, researchers and research outfits, various sorts of NGOs (non-governmental organizations) including environmental organizations, all types of businesses (especially transnational businesses), all local, regional and national governments and their agencies, and all international institutions--all need to include environmental considerations in their decision making. They all need to be well informed about possible environmental impacts when making decisions, need to be properly motivated, and in some cases regulated and held accountable. The first responsibility of each actor at each level is to refrain from actions that damage the natural or human environment. Beyond that there is a positive responsibility to do what can be done to resolve environmental problems, in cooperation with others where that can help.

Part of the individual and household problem is that they often have as yet no way to properly dispose of many of their wastes--that is a problem requiring business solutions. Business has a responsibility to stop opposing environmental protection, to embrace it, and do all it can to further it. Government is the main agency to promote the public interest, not special interests, and at many levels it is not doing well in that respect. The military-industrial complex is a major unnecessary depleter and waster of materials and energy as well as a polluter. That is inexcusable, since government could control all that if it chose. Since the Stockholm Conference in 1972, the principal route for and promoter of international environmental cooperation possibilities has been UNEP, the United Nations Environmental Program.

All environmental action needs to proceed on the basis of scientific studies and information. The information needs to be disseminated to the general public as well as to the appropriate national and international governmental agencies. More can be said about where non-governmental actors can fit in.

One might gather from the Brundtland report⁷ that it is the pressure of NGOs (non-governmental organizations) at various points that is of major importance in stimulating improved environmental action by others. For the U.S. that means environmental organizations putting pressure on the U.S. EPA (Environmental Protection Agency) and on UNEP in the UN system. Also putting pressure on policy makers and legislative bodies in government. These in turn supplement the business conscience by inducing, with carrot and stick, better environmental behavior. The Brundtland report properly emphasizes that what counts most is building environmental concern directly into basic decision processes in government and business.

What can individuals do if we are not scientists or basic decision makers in government or business?⁸ We can have an influence primarily by financial support of environmental protection organizations⁹ and by writing the letters and taking the other proper actions for which they call.

WHAT ABOUT GROWTH LIMITS? Yes there are certain physical growth limits in a finite physical world, so we need to change our ideologies in some respects and change some other things sooner or later.

The modern world seems to thrive on and almost worship growth. Every business seeks growth. Bureaucracies tend to grow. Local governments

⁷ OUR COMMON FUTURE, 1987 Oxford, The Report of the World Commission on Environment and Development, chaired by Gro Brundtland of Norway.

⁸ See THE GLOBAL ECOLOGY HANDBOOK: WHAT YOU CAN DO ABOUT THE ENVIRONMENTAL CRISIS, 1990, The Global Tomorrow Coalition. For the broader issue see Harlan Cleveland GLOBAL COMMONS, 1989, Humphrey Institute, U of Minn.

⁹ There are many such organizations, some active in this country and some active in other countries. Merely adding to their membership numbers adds clout, and financial contributions are also important.

promote internal growth to increase their tax base. The world is accustomed to "real" GNP growth and thinks in terms of its indefinite continuance. Economies are adjusted to growth and seem to prosper only with it. We sometimes complain about a slow GNP growth rate, and at other times we brag about whatever growth rate we happen to have.

What sort of growth and what rate of growth is a suitable objective or is likely in our prospective world?¹⁰

Real GNP growth is not a suitable long-run world economic objective partly because it may be merely growth of population. Even GNP per capita is not a good measure of economic well being. It could come from a rise in military hardware or in alcohol production and consumption and other things that do not represent improved human well-being. There is no good single MEW (measure of economic welfare). Better would be a profile that would show per capita improvements (with suitable distribution among income classes) of explicitly chosen human values, economic and non-economic.

A more suitable growth objective would focus on those types of material benefits that improve human well-being, and primarily upon their increased availability to those now relatively deprived. The faster serious deprivation is overcome the better. That pertains to mass poverty in the world's less developed countries and the lesser poverty of industrialized nations.

Improvement in what we call the quality of life is a suitable objective for the world now and in the indefinite future. Insofar as this involves improved living conditions and improved working conditions, it requires both material and non-material progress. But it is only continuous material progress that is limited.

What are its limits and what are the implications? This takes us back to the 1962 Club of Rome study¹¹ on the limits to growth. A computerized model of the world economy projected growth trends for five variables: population, food production, capital growth, pollution and resource depletion. The model was based upon statistical data on resource supplies and on relationships thought to exist among the five variables. The model showed that limits to growth of real GNP would be reached and overshot some time in the 21st century, and that the world economy would then "collapse" (i.e., suffer a serious decline in population and standard of living) and would thereafter have a lower real GNP ceiling. The study suggested that this outcome could be averted if proper steps were taken, but that averting collapse could not remove some limits to growth.

¹⁰ Harlan Cleveland and Thomas Wilson Jr. HUMAN GROWTH: An essay on growth, values and the quality of life, 1978 Aspen Institute for Humanistic Studies.

¹¹ Denis and Donella Meadows, THE LIMITS TO GROWTH, 1962, Universe Books. Club of Rome founder Aurelio Peccei in 100 PAGES FOR THE FUTURE, 1981, Pergamon Press, THE HUMAN QUALITY, 1981 Pergamon, and in other books speaks of the world problematique on which the Club focuses its attention.

The study was discredited by everyone who did not want to consider growth limits.¹² Poor data on resource supplies had been used (though some allowances had been made for this). The model was drastically over-simplified.

What are the limits to growth? Supplies of some natural resources on which the world economy depends are limited, and they are being depleted at an alarming rate. The Paley Commission in the 1950s showed that consumption of some of them after World War I had exceeded all prior world consumption. The rate of depletion has accelerated since then. Economists point out that as a resource becomes scarcer its price rises and this stimulates discovery of more of it (the earth's crust contains at least small percentages of all our resources) or stimulates the development of substitutes through technological progress, so some conclude that there are no resource limits. But it does not take a computer model to tell us that there are growth limits on a finite planet even if our technologists learn how to produce anything scarce out of anything abundant--what technologists could do in that regard would also likely have some limits.

Another argument rejects the notion of growth limits on the ground that the human mind has limitless possibilities. If this means that intelligence can overcome all material and energy limits on a finite planet, it is a faith not based on evidence of the degree of human rationality to date. If it means that we all have room to grow mentally as long as we live, that points to a type of type of growth our future world can continue to look forward to.

How soon should we worry about material limits to growth? We can't be sure how far away the limits are, so why worry until they hit us? Some actions now extend the limits or bring the limits sooner. To some extent the choice is between "living it up now" or leaving a better future for posterity.

What will a limited material growth world look like? For one thing, it may have either many people at low material standards of living or fewer at higher standards of living. Non-material growth need not be limited: the fine arts, knowledge, etc. (But the income distribution issues will not be softened as in the past by a generally rising material standard of living.) See the excellent analyses of the no material growth economy by Herman Daly and others.¹³ They show it is possible, and that cultural growth could still occur.

¹² MODELS OF DOOM, H.D. Cole, ed., 1973, Universe Books.

¹³ Herman E. Daly, STEADY-STATE ECONOMICS, 2nd ed. 1991, Island Press, and Herman E. Daly, ed., ECONOMICS, ECOLOGY, ETHICS: ESSAYS TOWARD A STEADY-STATE ECONOMY, 1980, Freeman, Daly and Kenneth Townsend, VALUING THE EARTH: Economics, Ecology, Ethics, 1993 MIT, and Daly and John B. Cobb FOR THE COMMON GOOD: Redirecting the Economy toward Community, the Environment and a Sustainable Future, 2nd ed 1994 Beacon Press, and Herman E. Daly BEYOND GROWTH: the Economics of Sustainable Development, 1996 Beacon Press.

CONCLUSION: The mass media have a tremendous responsibility to help create the climate of opinion in which the ecological problems can be handled. Irresponsibility on their part could make the problems unmanageable because it could prevent leaders from leading in the right direction.¹⁴ The right ideas and values need to be reinforced constantly in order to make possible the transformation of actions and institutions, both voluntarily and by regulation and inducements. The public needs to choose its leaders more wisely and press them to lead responsibly in these matters.

Although the major part of the ecological problems is working out politically what will be done about them, part of the solution must be provided through the development of appropriate technologies. There is no simple technofix just by doing that, and indeed it is not clear how far we can go in developing non-polluting and non-depleting technologies. Various forms of solar energy, but not fossil fuels, will in the end have to be our main reliance for energy, and we will have to learn to convert it into the different forms in which energy is needed. We will need to make everything we make either recyclable or biodegradable, and for the latter we will need to provide the conditions in which it will biodegrade.

The problems look overwhelming now, but one can find a basis for much hope when one looks at how much change in the public outlook on environmental matters has occurred in a couple of decades and how much support there now is for environmental protection. The support has grown much more than could have been expected. The further changes needed will require still more than that support. But the failure on any major front will bring a worse rather than possibly a better future,¹⁵ and knowledge of all this may bring the changes needed.

Fortunately the 1992 Rio UNCED resulted in proposing at least some further action by nations individually and jointly,¹⁶ and proper pressures were brought to bear upon them by environmentalists. The environmentalist movement has grown substantially in recent decades but its biggest problems lie ahead. Follow up conferences were held, but it is not yet clear how much further

¹⁴ They are not now educating the public properly but are giving more voice to the backlash against environmentalism. For a rebuttal against the backlash see *BETRAYAL OF SCIENCE AND REASON* by Paul and Anne Ehrlich, 1996 Island Press.

¹⁵ See Johannes C.G. Boot *COMMON GLOBE OR GLOBAL COMMONS*, 1974 M. Dekker

¹⁶ The first UN environmental conference in Stockholm in 1972 was attended by only 2 heads of state, but the RIO conference in 1992 was attended by 103 heads of state and indeed by thousands of representatives of non-governmental organizations, an indication of the growth of environmentalism. Furthermore, in 1972 no country had an environmental minister, while by 1992 most countries did.

progress was sometimes made.¹⁷

The Kyoto Protocol in 1997 produced an agreement on an international plan of action, and many national leaders are supporting the program, although the U. S., led by George W. Bush and the Republican Party, has balked at ratifying the treaty, despite support for it in 1998 at Davos by CEOs of 1000 of the world's biggest corporations.

Two recent books are worth special attention. The first is *THE ECOLOGY OF COMMERCE* by Paul Hawken. The second I consider to be the most important economics book I have read. By Paul Hawken, Amory Lovins and L. Hunter Lovins, it is entitled *NATURAL CAPITALISM: Creating the Next Industrial Revolution*. I have long supposed that the effort to develop sustainable economies, while absolutely necessary in the long run, would be possible only with very substantial increases in the cost of doing business and hence only with substantial reductions in the standard of living in industrial nations. Natural Capitalism not only argues that the world must learn to live within the limits set by nature's life support system and learn to economize exhaustible natural resources and recycle them, it makes the argument, supported with many examples, that even present day technologies could be used in many cases to do just that, and do so at lower costs to business than at present. It will require a new industrial revolution, but it is possible to start it now, let alone by more technological development, and do so with lower business costs and more business profit. This is indeed very encouraging.

¹⁷ Not every conference makes progress, but failure do not mean that hope need die. A decade before, Norman Walbeck offered us hope in SAVING THE PLANET: THE POLITICS OF HOPE, 1988, Northland Press, but Warren Johnson suggested we would likely only muddle through, see his MUDDLING TOWARDS FRUGALITY, 1978, Sierra Club Books. Barbara Ward before she died gave us some examples that show we are indeed making some headway. See her PROGRESS FOR A SMALL PLANET, 1979 Norton. Others have been publishing on the ecological problems since the 1997 conference. See ECOSYSTEMS AND NATURE: ECONOMICS, SCIENCE, AND POLICY ed. R. Kerry Turner, K.J.> Button and P. Nijkamp, 1999., CARING FOR OUR FUTURE: ACTION FOR EUROPE'S ENVIRONMENT: 25 ISSUES AT A GLANCE by the European Commission and published by their office for official publications, 1999, and THE ECONOMICS OF GLOBAL WARMING, P.K. Rao ed., 2000.