

## Grassroots Coalition Bulletin # 18

This Bulletin begins a series which focuses on the environment apart from Climate Change, which is also in dire straits. Virtually everything in these initial Bulletins is taken from *Red Sky at Morning* by Gus Speth, Dean of the School of Forestry and Environmental Studies at Yale University.

### *Red Sky at Morning*

As we begin this new century, human activities are disrupting the great ecological systems and natural cycles that make our planet inhabitable, bountiful and wondrous.

In the last century human society left the moorings of its past and launched itself upon the planet in an unprecedented way. Population increased from 1.5 billion to 6.4 billion. In the past 25 years, population increased by 50%, from 4 to 6.4 billion, with virtually all of this growth occurring in the developing world. In the past century, world economic output increased 20-fold. The economy grows by 6 trillion dollars every 5-10 years. Energy use rose 16-fold in the 20<sup>th</sup> century.

Four consequences of this expansion:

1. Gains in standard of living have come at a huge cost to the environment. Soot, sulfur oxides and sewage grew to huge quantities. Chemical and nuclear industries emerged, giving rise to a vast armada of new chemicals and radioactive substances, accumulating in biological systems or in the atmosphere. Hazardous waste sites requiring cleanup increased from 2,000 to 10,000. Pesticides skyrocketed – 6 billion pounds are released each year. There have been severe losses to the world's natural resource base – forests (half gone), mangroves (half gone), usable land (one-fourth degraded), marine fisheries (75% fished to capacity or overfished), loss of biodiversity, meaning damage to ecological systems – between 100 and 1,000 times the normal rate.
2. 20<sup>th</sup> century expansion has pushed the human enterprise and its effects to a planetary scale: the globalization of environmental impacts and economic activity; the depletion of the ozone layer; and Climate Change, threatening much of life. Industrial processes and other activities now double the amount of nitrogen transferred from the atmosphere into biologically active forms, with consequences that include the creation of dead zones in the oceans. Humans are now appropriating, wasting or destroying 40% of nature's net photosynthetic product, not leaving enough for other species. We extensively appropriate freshwater supplies and marine life. 80 countries with 40% of the world's population experience serious water shortages. Carbon dioxide in the atmosphere, the primary cause of Climate Change, is now at its highest level in 420,000 years. Climate Change for this century will make it impossible for half the American land (or more) to sustain the current types of plants and animals. A huge portion of America's protected areas is threatened. Jane Lubchenco: "We are modifying physical, chemical and biological systems in new ways, at faster rates and over larger spatial scales than ever recorded on Earth." The majority of Nobel scientists: "The earth is finite. Its ability to absorb wastes and destructive effluents is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the Earth's limits. Current economic practices which damage the environment cannot be continued without the risk that vital global systems will be damaged beyond repair."
3. The world economy's forward momentum is large. Population is growing, people are striving to better themselves, governments are willing to take extraordinary measures to sustain high levels of economic expansion, with the result that the world economy will double and double again in

the lifetime of young people. Pressures to persist with environmentally problematic technologies are enormous. The projected increase in carbon dioxide is 60% between 2001 and 2025. The projected increase in cars in those years is 40%. The demand for food is growing, extending agriculture into once-forested lands and onto fragile lands, causing the loss of another 15% of forests by 2020. The supply of clean, fresh water is diminishing. One-fifth of people lack fresh water. Between 1970 and 1990, water supplies decreased by a third globally. Over the next two years, the water supply per person will drop by a third, increasing hunger and disease. Humanity's demands for water will threaten natural ecosystems.

4. Human society controls the planet, producing rapid, novel and substantial changes. We need to minimize our interference with the great life-support systems of the planet. IPAT: environmental Impact is a product of the size of human Populations, our Affluence and consumption patterns, and the Technology we deploy to meet our perceived needs. But this obscures the effects of poverty and the vast and rapidly growing scale of the human enterprise. In the past 20 years:

- Global population – up 35%
- World economic output – up 75%
- Global energy use – up 40%
- Global meat consumption – up 70%
- World auto production – up 45%
- Global paper use – up 90%
- Advertising globally – up 100 %

World economy is poised to quadruple by 2050. We have entered the endgame in our relationship with the natural world.

### **Lost in Eden**

The two megatrends in environmental deterioration are increasing pollution and biological impoverishment. Loss of genetic and species diversity will take millions of years to correct. We have ethical duties to non-human life. Humans and nature are ecological equals. Nature has rights, just as we humans do.

Entire plant and animal communities are under assault. Aldo Leopold: “A thing is right when it tends to preserve the integrity, beauty and stability of the biotic community. We have obligations to land over and above those dictated by self-interest. The life that evolved with us here should be allowed to live.”

Biodiversity is shorthand for the great variety of plant and animal communities and their interactions. Instead of focusing on species extinction, we are now looking to ecosystem change and the loss in the ability of these systems to meet human needs. Ecosystems are the productive engines of the planet – communities of species that interact with each other and with the physical setting they live in. They surround us as forests, grasslands, rivers, coastal and deep-sea waters, islands, mountains, even cities. Ecosystems sustain us. But they are declining everywhere. Ecosystem services: food products, nutrient cycling (the breakdown and recycling of dead plants and animals into materials that enrich soils), pollination, air and water purification, climate control, drought and flood control, regulation of atmospheric chemical composition, and fresh water, forest products, nice climates, the great outdoors, good air, protection from ultraviolet radiation.

We have a fundamental emotional, physical, intellectual dependence on nature and living diversity. Personal encounters with nature yield huge nonmonetary benefits in human development, communication, well-being and fulfillment. We have a deep and enduring urge to connect with living diversity.

Biodiversity has direct economic benefits – employment in agriculture, fishing and forestry, tourism and recreation. Many oils, chemicals, rubber, spices, nuts, honey and fruits are harvested in the wild. Many prescription drugs are derived from chemical compounds originally found in nature. Many other medicines come from nature.

The major threats to biodiversity:

1. Land use conversion. Tropical forests are converted to agriculture and tree plantations. Forest richness is reduced by habitat fragmentation, fires and other factors. Draining and filling of wetlands has greatly reduced natural habitats. At least one-third of the world's original forest cover has been cleared, and about half the wetlands have been destroyed. More than a third of the world's land surface has been converted to human use, and an additional third could be converted this century. Even much of the 'protected' area, which is 12% of the world's land, is threatened by logging and development. The conversion of agricultural lands, wetlands and forests to urban and suburban uses is occurring rapidly. In 1900, there were 16 cities with over a million inhabitants; today there are 400.
2. Land degradation. Productivity of crop and grazing land is threatened by water and wind erosion, by the salinization and waterlogging of irrigated lands, and by overgrazing and devegetation. The effects are called desertification. About three-fourths of the world's drylands are degraded, and a fourth of all land is degraded enough to reduce its productivity.
3. Freshwater shortages. As freshwater is diverted from watercourses for agricultural, urban and industrial uses, natural in-stream habitat is lost or diminished, and water supplies that feed forests and other systems decline. 20% of normal river flow globally is now extracted for human use. Water withdrawals climbed six-fold in the 20<sup>th</sup> century, twice the rate of population growth. Freshwater withdrawals for irrigation and other purposes will grow by 40% by 2020. Forty percent of the world's people now live in countries that suffer from serious water shortages. 90% of California's wetlands have disappeared.
4. Watercourse modifications. Natural waterways are often damned, channeled or diverted. Swamps and wetlands are drained. 60% of the world's major river basins have been severely or moderately fragmented by dams and other construction.
5. Invasive species. Non-native invasive species are the second most serious threat to biodiversity. They now cover 100 million acres in the US.
6. Overharvesting. Most serious threat to marine fisheries, birds and wildlife.
7. Climate Change. Linked to the decline of coral reefs, amphibians, polar species, fish, trees.
8. Ozone depletion. Increased ultraviolet radiation destroys life. It can change the composition balance in ecosystems and reduce the production of marine phytoplankton.
9. Pollution. Toxins, oxygen-demanding wastes, nitrogen, carbon dioxide, phosphorus overfertilization, acidification, all degrade the structure and functioning of ecosystems.

These nine direct, immediate causes of biotic impoverishment are operating on a global scale, stressing natural systems, homogenizing and simplifying them, and reducing biological diversity at a rate and scale not experienced for millions of years.

1. The global fish catch has declined every year since 1988, due to overfishing and nutrient pollution. A high percentage of fish are at risk of extinction.

2. Natural forests in the tropics are disappearing at a high rate – an acre a second. 20% of total tropical forest cover was lost between 1960 and 1990 – fire, drought and fragmentation. Much of what is left is set for logging.
3. 60% of coral reefs and their life are at medium to high risk due to coastal development and pollution, tourism, global warming and destructive fishing practices.
4. The sixth great wave of extinction since life began on Earth is being caused by humans.

What we've done to America:

1. Original tallgrass prairie – 99% transformed
2. Original primary forests in contiguous US – 95% lost
3. Old-growth forest of the Pacific Northwest – 90% cleared
4. Original US wetland area – 50% drained or drilled
5. Original US species endowment – 500 may be extinct

The Brazilian Amazon is home to 40% of the remaining tropical forests. It is the planet's greatest storehouse of biodiversity: 2.5 million species of insects, tens of thousands of species of plants, 2,000 bird and mammal species.

It is now the scene of both economic and ecological disaster. 15% has been lost to deforestation. 5,000,000 acres are cleared every year, most illegally. It's also a storehouse of huge quantities of carbon. 5,000,000 acres are impoverished every year by logging and surface fires. The Brazilian government, by tax breaks, handouts and other subsidies, is pushing highways, railroads, mining, road building, gas lines, hydroelectric projects, power lines, river channeling – leading to deforestation of 30-40% of the Amazon.

Drivers of deforestation:

1. Agriculture. Pressures are generated by large populations of the poor looking for places to live, grow crops and harvest wood. There is an extreme concentration of landholdings in the hands of the rich and the powerful, and lagging employment opportunities.
2. The central government, not local communities, now controls large forest areas. Centralization has opened the forests to heavy political and economic pressures. There is much cronyism and corruption.
3. Deforestation is also the by-product of well-intentioned but misguided policies. Timber concessions have been granted at below market rates, without requirements for good management. Government subsidies for road building lead to timber harvesting and settlement. Another favorite policy of forest-rich countries is to promote agriculture and ranching in previously forested areas..
4. The World Bank, controlled by the U.S., promotes dams, highways, power development, transmigration, all to the detriment of forests. The World Trade Organization promotes expanded logging by encouraging high levels of foreign investment, along with weaker domestic regulations in the face of international competition, and the loss of local community controls.

The only solution is to allocate responsibility for managing and protecting forests to the local groups and communities that depend on their healthy survival.

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### **Chapter III: Pollution and Climate Change in a Full World**

Today, pollution is occurring on a vast and unprecedented scale. With increases in population and economic activity came huge changes in the volume of pollutants released. Increased use of fossil fuels means more sulfur dioxide and nitrogen oxide emissions, among the principal sources of smog and other urban air pollution, and they give rise to acid rain. Between 1900 and 2000, annual sulfur dioxide emissions grew 7-fold, nitrogen oxide more. Carbon dioxide emissions have tripled since 1950.

The generation of hazardous wastes has grown 60-fold since 1945. In the US, garbage and other solid waste grew by 50% between 1980 and 2000, and now exceeds 230 million tons annually. 2.5 billion pounds of toxic waste are released annually in the US.

Since 1970, the volumes of some major pollutants have declined in industrial nations. The discharges of both chemical wastes and sewage into waterways have been reduced in OECD countries. The banning of lead in gasoline reduced human exposure to lead. Emissions of sulfur oxides and particulates, two air pollutants, are down significantly. Between 1980 and 2000, sulfur dioxide emissions declined by 37% in the US and by 16% in Europe. But they increased by 250% in Asia. The Clean Air Act reduced nitrogen oxide emissions greatly from what they would have been, but the overall increase in fossil fuel use has offset these gains. In 2002, the EPA said that more than a third of surveyed rivers and half of lakes and estuaries are too polluted for fishing or swimming.

Since WWII, new chemicals and radioactive substances have been introduced, many of which are highly toxic in minute quantities and some of which persist and accumulate in biological systems and in the atmosphere. Between 1950 and 1985 the annual US production of the synthetic organic chemicals industry grew from 24 billion to 235 billion pounds. Over the past 50 years, tens of thousands of synthetic organic compounds have been introduced into the environment as pesticides, plastics, industrial chemicals, medical products, detergents, food additives and other commercially valuable products, new products that are harmful to people, nature or both.

Today, several hundred new chemicals are introduced commercially each year. Of roughly eighty thousand chemicals in trade today, about half are thought to be definitely or potentially hazardous to human health. Few toxicity data are publicly available for most of these chemicals, most of which are synthetic organic chemicals. The EPA has reviewed the data available on 2, 863 commercial-scale synthetic chemicals. For 43% there was a complete absence of basic toxicity data. Full testing and data were available for only 7%.

Pesticides, a major product of the modern chemical industry, are released into the environment precisely because they are toxic. In the last century, several hundred billion pounds have been produced and released into the global environment. Nearly 5 billion pounds of DDT since 1939. And DDT is only one of 600 pesticides in use. By 1969, almost sixty thousand different products were sold containing some combination of pesticides. Now, an additional 5-6 billion pounds of insecticides, herbicides, fungicides, rodenticides and other biocides are added to the world's environment each year, one-quarter in the US. Still, 25-50% of global crop production is lost annually due to pests and spoilage. Insects and mites and plant pathogens have become resistant to various pesticides.

Today, nearly every person on earth harbors detectable levels of persistent organic pollutants (POPs). The long-term health consequences of POP mixtures are a mystery. We are all involuntary subjects in a vast worldwide experiment in which each day we are exposed to hundreds of chemicals, many of which have been shown to cause harm, and many of which have never been tested.

Inorganic chemicals, notably heavy metals, are receiving attention. Mercury's threat to human and wildlife has led to an international plan to limit mercury releases, most of which come from coal-burning power plants. Mercury is a potent neurotoxin that persists and accumulates in the environment. Public exposure to mercury occurs primarily from consuming contaminated fish.

Early concern about toxic chemicals centered on cancer, respiratory ailments and disease-causing pathogens. But recently attention has been called to other categories of more subtle effects, such as impairment of the reproductive and immune systems. One new concern is the disruptive impact that plasticizers, pesticides and other industrial chemicals might be having on hormones in both humans and wildlife. Focus on endocrine-disrupting substances: many act like the female sex hormone estrogen. Exposure in males can lead to feminization, lowered sperm count and hermaphroditism.

There is also concern over developmental and neurological toxins that contribute to learning disabilities, birth defects, attention deficit disorder, retardation and autism. Twelve million American children suffer one or more developmental learning or behavioral disabilities. Nearly three-fourths of the 20 most used toxic chemicals are known or suspected neurotoxicants.

We know little about the cumulative, long-term consequences of chemical exposures on people, and even less about natural systems.

All of this applies to the developing world, too. Air pollution is growing, especially in mega-cities which have the worst water pollution today. Often there is little or no sewage treatment. Expansion of the chemical industry. Increasing use of pesticides. Environmental spills and accidents – Union Carbide in Bhopal, India – great loss of life.

Air pollution. Global use of fossil fuels, and the resulting emission of traditional pollutants such as sulfur and nitrogen oxides that result from it, continue to climb. Acid rain and smog on a regional scale are damaging plant and animal life over much of the globe. Depletion of the ozone layer continues to reveal itself in the Antarctic hole. The buildup of greenhouse gases continues.

Acid rain. Air pollutants are transported hundreds of miles before coming down. During the transport, the atmosphere acts as a complex chemical reactor, transforming the pollutants as they interact with other substances, moisture and solar energy. Emissions of sulfur dioxide and nitrogen oxides from fossil fuel combustion are transformed chemically in the atmosphere into sulfuric and nitric acids. Attention is paid mostly to damage to natural environment – lakes and streams. Little recovery so far, in spite of three decades of efforts. Deep cuts in emissions needed for recovery in the next 25 years.

Other air pollutants, including smog, can join in contributing to crop damage and forest problems. Large-scale forest die-offs in China. Huge increase in fossil fuel use in South and East Asia.

Ozone layer. Absorbs harmful wavelengths of ultraviolet radiation. CFCs add chlorine to stratosphere and reduce the amount of stratospheric ozone. 1987 Montreal Protocol produced international agreement to cut production of CFCs. Most of current production of CFCs comes from developing countries. Note: Dupont, largest producer of CFCs in U.S., refused to halt production for several years until it found an equally profitable substitute. Aerosol industry collaborated with Dupont.

Global Warming. Kyoto Protocol: Around 2010, industrial countries are to reduce their greenhouse gas emissions to 5% below 1990. National Academy of Sciences report:

1. 1 degree F rise in 20<sup>th</sup> century and predict 2.5 to 10.5 degree rise in this century.
2. Warming and sea-level rise will continue into next century.
3. Caused by carbon dioxide from fossil fuel burning and deforestation, methane from fossil fuels and agricultural activities, nitrous oxide from agricultural activities and the chemical industry, and specialty chemicals including CFCs.

Damage: Loss of salt marshes, mangroves, coral reefs, permafrost, glaciers, Arctic icecap, West Antarctic Ice Sheet. Real danger from surprises, sudden shifts, drastic upheavals in global climate and its impacts. Recent scientific evidence shows that major and widespread climate changes have occurred with startling speed. Greenhouse warming and other human alterations of the earth-system may increase the possibility of large, abrupt and unwelcome regional or global climatic events. May be more like throwing a light switch that turning a dimmer.

Scientists at Woods Hole: The most likely mechanism for abrupt climate change is disruption of ocean currents such as the Gulf Stream, which has shut down in the past, quickly, and plunged the North Atlantic region into a dramatically cooler era. Such a shutdown would produce winters twice as cold as the worst winters on record in the eastern US. Global warming and other factors are melting northern ice and causing a dramatic increase in freshwater released into the North Atlantic. This is well under way. We are experiencing “The largest and most dramatic oceanic change ever measured in the era of modern instruments.” The fresher water could block the Gulf Stream’s release of heat and disrupt the ocean currents that pull the warm waters of the Stream northward. Rivers are dumping 7 percent more freshwater into the Arctic Ocean than in the 1930s.

People of the Third World are more directly dependent on the natural resource base, more exposed to extreme weather events, and less capable economically and technologically of making needed adaptations.

Extensive ecosystem loss, extreme weather events such as extraordinary droughts, floods, heat waves and hurricanes, abrupt regional cooling, sea-level rise, coral bleaching, public health risks, and major new social stresses (environmental refugees) within and between countries – all are among the predicted consequences of climate change.

What’s needed?

1. Extraordinarily efficient, precise energy use. 19 of every 20 units of energy generated in the US go to waste. Much can be captured. Fuel efficiency in transportation can be increased several-fold with such available technology as hybrid cars, fuel cells, light but strong composite materials and aerospace-related integrated design that reduces the need for heavy steel frames. Heating and air conditioning needs in new buildings can be reduced by as much as 90% by modern insulation, triple-glazed windows with tight seals, and passive solar design. In power generation, efficiencies can be greatly increased through combined cycle (gas and steam turbines) and co-generation (combined heat and power) technologies.
2. Move from a mix of fuels that is carbon intensive (relying heavily on coal and oil) to one with very low emissions of carbon for every unit of energy produced. Several potential paths forward: 1) shift to natural gas; 2) shift to renewable energy sources – wind, solar thermal, photovoltaic cells, biomass and hydropower; 3) shift to nuclear power, fission and fusion.
3. Another path: carbon sequestration – extensive capture of carbon far beyond that possible by trees and other vegetation. Chemical processes are deployed to remove carbon from coal, from

smokestacks and even from the air. The resulting carbon compounds are then deposited, safely and permanently in the oceans, on land or underground.

No magic bullet, so all of these approaches are needed. Some environmental costs, but they are better than climate change. A wide array of renewable power technologies should be competitive with coal by the decade 2010-2020, even without policy measures to change their economic competitiveness.

Large potential for renewable energy in the US from: targeted R&D funding, tax incentives, vehicle fuel economy standards, energy efficiency standards for buildings and equipment, renewable energy goals for electric utilities, regulatory reform, and removal of subsidies supporting the fossil fuel and nuclear power industries.

Next great problem: nitrogen fixation. Earth's atmosphere is mostly nitrogen, bound together as  $N_2$  and not reactive. Bacteria such as those associated with legumes "fix" nitrogen, changing it to a biologically active form. But we humans have started "fixing" nitrogen too, industrially. Once fixed, nitrogen remains active for a very long time, cascading through the biosphere.

Two sources: 75% from fertilizers and 25% from fossil fuel combustion. Nitrogen fertilizers are often ammonia-based; their use is a huge global enterprise. 90% of this fertilizer is wasted, ending up in waterways and in the air and soil. High temperature combustion in power plants oxidizes the nitrogen to produce a variety of nitrogen oxides.

Nitrogen in waterways leads to overfertilization and, when heavy, to algae blooms and eutrophication – aquatic life simply dies from lack of oxygen. Nitrate in ground and surface waters is also a threat to human health.

Forty percent of the world's grain goes to feed livestock, which produce vast volumes of nitrogen-rich manure, much of which ends up in the water. All this extra nitrogen is also having effects on biodiversity and natural systems - shifting the species composition of ecosystems by favoring those that respond most. Absent corrective action, nitrogen added to waterways is projected to increase 25% in the OECD and 100% in the developing world between 1995 and 2020.

In the air, nitrogen oxide from fossil fuel combustion reacts with volatile hydrocarbons and sunlight to produce smog, a mix of photochemical oxidants, one of which is ozone. It can also become nitric acid and contribute to acid deposition. Ozone (from smog) and nitrous oxide (from fertilized soils) are greenhouse gases, so nitrogen fixation also contributes to global warming.

#### **Chapter 4: First Attempt at Global Environmental Governance**

Around 1980, there were numerous coherent agenda for international action. The reports stressed 10 principal concerns:

1. Depletion of the ozone layer by CFCs.
2. Climate change due to increase of "greenhouse gases".
3. Loss of crop and grazing land due to desertification, erosion, conversion of land to nonfarm uses.
4. Depletion of the world's tropical forests, leading to loss of forest resources, serious watershed damage (erosion, flooding and siltation) and other adverse consequences.
5. Mass extinction of species, principally from the global loss of wildlife habitat, and the associated loss of genetic resources.



6. Rapid population growth, burgeoning in Third World cities, and ecological refugees.
7. Mismanagement and shortages of freshwater resources.
8. Overfishing, habitat destruction, and pollution in the marine environment.
9. Threats to human health from mismanagement of pesticides and persistent organic pollutants.
10. Acid rain and, more generally, the effects of a complex mix of air pollutants on fisheries, forests and crops.

By the mid-1980s, the intellectual and policy leadership of the scientific community, the environmental community and UNEP had paid off: a new and international policy agenda had been established, one that governments would have to address collectively in some way to be credible. The case for major action was too strong to ignore.

The Montreal Protocol is the crowning achievement of global environmental governance. Diplomats, corporations, scientists and environmental leaders have succeeded in sharply reducing the release of ozone-depleting substances, to the point that it is possible to envision recovery of the earth's ozone shield.

Progress on ozone depletion gets an Honors, but what of the other issues? Population control and acid rain gets a Low Pass, but the other seven get a Fail, for two reasons. First, the threatening environmental trends highlighted a quarter-century ago have continued, so that today the problems are deeper and more urgent.

The results of two decades of international environmental negotiations are disappointing. What has been agreed upon on climate, desertification, biodiversity or the Law of the Sea is not wrong or useless. These conventions have raised awareness among governments, provided frameworks for action, stimulated some useful national planning exercises, and had some modestly beneficial effects. The process of negotiating these agreements has both advanced basic principals of international law and instilled in governments a deeper appreciation of such key values as sustainability, reciprocity and commonality.

But the bottom line is that these treaties and their associated agreements and protocols do not drive the changes that are needed. The conventions are not protecting their respective conditions. Nor are they poised to do so in the immediate future. On the big issues the trends of deterioration continue. Our instrument of choice, international environmental law, is not yet changing them, and the hour is late. Even the Kyoto Protocol, which is beginning to drive important corporate decisions in Europe and Japan, is making progress that will likely be too little and too slow. We are far from a program to address the challenge of climate change.

In general, the issue with the major treaties is not weak enforcement or weak compliance. The issue is weak treaties. These agreements are easy for governments to slight because their impressive goals are not followed by clear requirements, targets and timetables. Underlying these shortcomings are debilitating procedures and an unwillingness to commit financial resources needed for real incentives.

We have wasted much of the twenty years we could have spent preparing for action. It would be comforting to think that all of the international negotiations, summit meetings, conference agreements, conventions and protocols at least have taken the international community to the point where it is prepared to act decisively – comforting but wrong. Global environmental problems have gone from bad to worse, governments are not yet prepared to deal with them, and at present many governments lack the leadership to get prepared.

## Chapter 5: Anatomy of Failure

Why has our first attempt at global environmental governance yielded so little? A highly threatening disease is threatening our patient, Mother Earth, and to cure it, we have brought medicine that is pitifully weak.

Three factors make the disease - global environmental deterioration - very difficult to reverse:

1) It is driven by powerful underlying forces. 2) It requires far-reaching international responses. 3) The political base to support these measures tends to be weak and scattered.

- 1) Powerful underlying forces: the steady expansion of human population, routine deployment of inappropriate technologies, near universal aspiration for affluence and high levels of consumption, widespread unwillingness to correct the failures of the unaided market, are indeed powerful and will not yield to half-measures.
- 2) Far-reaching, complex measures required. Consider the measures needed to address climate change: new energy policies, new transportation strategies, changes in agriculture and the management of forests around the world. International cooperation needed on a scale not seen before. Some actions will intrude on domestic affairs and challenge national sovereignty. Will consumers abandon their profligate energy habits?
- 3) Political base weak and scattered. Consider the differences between the domestic environmental agenda of the 1970s and today's global agenda:

### 1970 Domestic Agenda

understandable scientifically

highly visible impacts

current problem

us/here

acute problem

### Today's Global Agenda

complex, difficult to understand

remote or difficult to perceive impacts

future problem

them/there

chronic problem

Now the medicine. To confront these challenges, the international community framed and implemented an inadequate, flawed response. First, it opted for international environmental law as the primary means of attack while neglecting measures that would more directly address the underlying drivers of deterioration. And second, it never gave that approach a chance to succeed. International agreements will rarely solve major problems by themselves, and even less rarely will they succeed if their requirements are not clear and meaningful.

Why was this approach taken? The model was readily available – plenty of precedents. Words and regulations are cheap. The principal alternatives to regulations are spending and taxing, both politically difficult. In developing international laws, the public and public interest groups have very limited opportunities to participate. Lawyers prefer legal-policy approaches. Failure of imagination: the world fell easily into the treaty-protocol approach without much thinking either about alternatives or about how to make legal regimes succeed.

The real problems were and are poverty, weak and corrupt governments, fossil fuels, transportation, chlorine-based organic chemistry, but the conventions were framed to address the surface worries rather than the deeper problems. They did not go after the underlying causes or drivers of deterioration.

**Editor's Note: The primary real problem is the concentration of economic and political power in the hands of a relatively few who use that power to increase their wealth and power. Along with a majority of the population who are unwilling/unable to take the steps needed to shift power to themselves and use it to create a just society.**

Current international environmental treaties were forged in cumbersome negotiating processes that give maximum leverage to any country with an interest in protecting the status quo. Relatedly, the international institutions created in the UN to address global environmental issues are among the weakest multilateral organizations.

International negotiating procedures differ radically from both national legislative processes and even more radically from the rule-making processes of independent regulatory agencies. The processes we have been examining are full of opportunities for delay, indecision, unsatisfactory resolution of issues, and weak results.

Nations (especially the US) have not wanted to cede their sovereign control in this area to an international body.

The potential success of international environmental law in these areas has been undermined by the unfortunate tendency to neglect the social and political context in which international agreements are arrived at and then implemented. Consider the conditions within individual countries that would favor treaty success:

- Peace and stability.
- Favorable economic conditions and the absence of financial or other economic crises.
- An open, democratic society and an independent, effective media presence.
- A high level of public concern and active NGOs.
- The presence of rule of law and a culture of compliance with international law.
- The human and international capacities in government to participate meaningfully at all stages.

We are far from reaching these conditions in much of the world, including the U.S.

The international community has dealt poorly with the inevitable political opposition and conflicts that war against effective agreements. Three political fault lines surface repeatedly in international negotiations on the environment.

- The environment versus the economy. Governments side with economic interests. Moreover, the effective implementation of international environmental agreements requires the active cooperation of large multinational companies that possess adequate financial, technological and organizational resources to innovate and commercialize new technologies. Economic pressures can lead to political decisions that undermine even well-crafted treaties.
- The North versus the South. The poorer countries of the global South have perceived the global environmental agenda as the agenda of the wealthy North, and, indeed, international environmental regimes have typically been pushed by the richer countries. Poorer countries have feared that agreements would undermine their growth potential or impose high costs of compliance. We are unlikely to get effective international agreements engaging the South unless

the developing countries are dealt with in a way that recognizes their aspirations and special challenges.

- The United States versus the world. The one country most responsible for lack of progress on international environmental issues is the US. At the root of America's negative role is a persistent American exceptionalism, tinged with arrogance. The US has refused to ratify the Convention on the Rights of the Child, the Convention on the Elimination of all Forms of Discrimination against Women, the Land Mine Convention, the Convention on Biological Diversity, the Law of the Sea Treaty, the Kyoto Protocol and on and on. Benjamin Barber: "Business malfeasance is the consequence neither of systemic capitalist contradictions nor private sin, which are endemic to capitalism, and indeed to humanity. It arises from a failure of the instruments of democracy, which have been weakened by three decades of market fundamentalism, privatization ideology and resentment of government. The Bush Administration, which favors energy production over energy conservation, has engineered a reversal of a generation of progress on environmentalism that threatens to leave the Superfund program underfunded, air quality standards compromised and global warming unchecked. These policies can be traced directly to that proud disdain for the public realm that is common to all market fundamentalists. The US fails to see that the international treaties it won't sign, the criminal court it will not acknowledge and the UN system it does not adequately support are all efforts at developing a new global contract to contain the chaos. The ascendant market ideology robs us of the civic freedom by which we control the social consequences of our private choices."

## **Chapter 6: Ten Drivers of Environmental Deterioration**

What are the proximate or immediate drivers of large-scale environmental deterioration, and what is behind these drivers? What gives these forces such extraordinary power and forward momentum?

1. Population. Expansion in the 20<sup>th</sup> century from 1.5 billion to 6.4 billion. Global population went up 35% in the last 20 years and will go up another 25% in the next 20 years.

Most in the developing world. Generally, improvements in health and nutrition lead to reduced infant mortality and longer lives. Fertility rates do not immediately decline, so population grows rapidly. This is the demographic transition. Completed in the industrial nations. May be completed in the developing world around mid-century and global population may level off at 8-9 billion. And then maybe decline.

Birthrates are higher where women have the least power and control. Third World country women: high fertility, high rates of illiteracy, low share of paid employment and a high percentage of working at home for no pay. Children are needed as productive assets. The daily work of living off the land is labor intensive. Over two billion people lack access to modern energy supply. Children are needed for this work, and also provide security for old age. High infant mortality rates and customs and traditions push toward high fertility.

All of this is linked to low incomes and resource depletion in a mutually reinforcing way. As populations expand they place additional pressures on the resource base because other resources and options are not available to them.

2. Affluence - consumption. Rapidly rising household demand for good and services, particularly those that place a heavy burden on the environment.

In the 20<sup>th</sup> century, population went up four-fold and affluence increased five-fold, so that the world economy grew 20-fold. Per capita fossil fuel consumption went up 7-fold globally, while per capita industrial activity went up 12-fold.

Consumption brings us pleasure and helps us avoid pain, boredom and monotony. Consumption is stimulating, diverting, absorbing, defining, empowering, relaxing, fulfilling, educational, rewarding.

It also responds to artificially created needs. Goods and services are so available that a large expenditure on talented advertising and salesmanship is needed to persuade people to want what is produced. (There is no such abundance in the services available from the state.)

Private consumption that damages the environment is maintained at artificially high levels because of massive market and policy failure. The free market price of various goods and services typically does not incorporate the full environmental costs of production, use and disposal. The more an environmentally destructive product or service is underpriced, the more it will be consumed. Policy failure perpetuates and often exacerbates market failure. Governments typically fail to require producers to pay for all their environmental damage. And they subsidize many environment-destroying activities e.g. energy, water. At the behest of powerful interests, governments intervene in the marketplace to create annually \$860 billion in perverse subsidies (having negative economic and environmental effects) worldwide. This is a huge economic incentive for environmental destruction.

Even green consumers rarely have convenient, reliable information on which to base purchasing decisions.

Our values are preconsumerist. There's little by way of an anticonsumerist message.

3. Technology. Societies have been largely unable to assess new technologies and direct technological change in ways that avoid huge environmental costs. Habits of thought that have made it easy for new technology to escape rigorous public scrutiny and penetrate easily into the economy: trustworthiness of experts, the beneficence of technology, belief in the inevitability of progress.

Our society has encouraged technological virtuosity, equating it with progress. The material benefits have been irresistible.

But by the early 1970s, a new pessimism regarding technology was on the rise. Driven by concerns about nuclear power, environmental deterioration and invasion of privacy.

Examine IPAT. The only one of the three drivers that can reduce environmental impacts is technological change (T). If economic growth, coupled with population increase, is accomplished with the technologies now dominant in energy production, transportation, manufacturing, agriculture and other sectors, truly catastrophic effects are likely on global climate, human health and the productivity of the natural systems. Thus: "Environmental regulation needs to be overhauled to promote long-term innovation and pollution prevention; more effective economic incentives for investments in clean technologies are long overdue; current measures of industrial productivity need to be reconceptualized so they recognize environmental costs; and much more attention needs to be paid to how clean technologies can be transferred successively from country to country.

The control of technologies has been largely in the hands of large corporations that benefit from their deployment and are clearly in no position to be impartial judges of the public's best interests. The current market fails to guide technology toward good environmental choices, and governments have failed to correct poor market signals.

4. Poverty. Half the world's people get by on less than \$2 a day. Many live close to the land, putting great pressure on the resource base because good alternatives are not available to them. "Human activities are progressively reducing the planet's life-supporting capacity at a time when rising human numbers and consumption are making increasingly heavy demands on it. The combined destructive impacts of a poor majority struggling to stay alive and an affluent minority consuming most of the world's resources are undermining the very means by which all people can survive and flourish."

5 and 6. Market failure and policy and political failure. Our economic system does not work to protect environmental resources, and our political system does not work to correct the economic system.

"Markets generate and make use of a set of prices that serve as signals to indicate the value (or cost) of resources to potential users. Any activity that imposes a cost on society by using up some of its scarce resources must come with a price, where that price equals the social cost. For most goods and services, the market forces of supply and demand generate a market price that directs the use of resources into their most highly valued employment.

"There are, however, circumstances where a market price may not emerge to guide individual decisions. This is often the case for various forms of environmentally damaging activities. The absence of an appropriate price for certain scarce resources (clean air and water) leads to their excessive use and results in what is called 'market failure.'

"The source of this failure is what economists term an externality. E.G. a factory spreads smoke over an adjacent neighborhood. The producer imposes a real cost in the form of dirty air, but this cost is 'external' to the firm. The producer does not bear the cost of the pollution it creates as it does for the labor, capital and raw materials it uses. There's no incentive to control smoke emissions and thereby conserve clean air.

"Many of our environmental resources are unprotected by the appropriate prices that would constrain their use. Thus, it is hardly surprising to find that the environment is overused and abused. A market system simply doesn't allocate the use of these resources properly. In sum, economists make a clear and powerful argument for public intervention to correct market failure with respect to many kinds of environmental resources."

Political failure perpetuates, indeed magnifies, market failure. Typically, powerful economic and political interests stand to gain by not making appropriate corrections in the use of water, pollution, destruction of wetlands.

7. Scale of the global economic enterprise and its phenomenally rapid expansion. The world economy surges ahead while the development of international environmental law is painfully slow.

Small (but constant) increases fail to catch our attention, but they can degrade systems, stress the government's capacity to respond, and trigger threshold effects where change becomes difficult to reverse or systems fail catastrophically. Lack of understanding that even slow rates of change compound rapidly.

Social, moral and ecological ills are sustained in the interest of the quest for economic growth.

8. The nature of our economic system – the growth-at-all-costs imperative. Underlying structures of the modern world order – capitalism, the state, industrialism, nationality, rationalism - may be in important aspects irreparably destructive.

9. Values and habits of thought that war against effective environmental protection. Anthropocentrism – we are the lords and protectors of nature. Nature belongs to us. Contempocentrism discounts the future in favor of the present. We have no duties to future generations. Short-term self-interest: what’s good for me now.

### **Chapter 7: Globalization and the Environment**

Sustainable development: seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future.

Needs: 1) economic expansion in decades ahead. Needed to attack poverty. 2) environmental quality has been everywhere deteriorating as economic activity has expanded. Globalization processes and trends add to environmental deterioration, to diminishing control of environmental problems by modern institutions, and to the unequal distribution of environmental consequences and risks between different groups and societies. The dominance of economic globalization processes is said to be the root cause of these detrimental environmental effects. Global political institutions, arrangements and organizations and a global civil society are lagging behind.

The governments of the powerful countries serve their private commercial interests, down-grading the UN in favor of the World Bank and the WTO, promoting the competitiveness of their economies by minimizing environmental and other standards, and giving an increasingly global corporate sector free reign.

Nine reasons to suppose that globalization exacerbates environmental problems:

- Expansion of environmentally destructive growth.
- Decrease in the ability of national governments to regulate and otherwise cope with environmental challenges.
- An increase in corporate power and reach.
- The stimulation of particular sectors like transportation and energy that have largely negative environmental side effects.
- The increased likelihood of economic crises.
- The commodification of resources like water and the decline of traditional local controls on resource use.
- The spatial separation of action and impact from responsibility.
- The further ascendancy of the growth imperative.
- The rapid spread of invasive species and the resulting biological homogenization.

### **Chapter 8: Attacking the Root Causes**

Global environmental challenges are driven by powerful forces and will not yield to the efforts we have been mounting.

Need to apply major resources of time and money to the promotion of 8 broad linked transitions that seek to redefine and redirect growth. They will directly attack the underlying drivers of deterioration. They will greatly enhance the prospects for success of treaties and other agreements by altering the context in which the agreements are operating. They will facilitate a very different, more hopeful and powerful way of doing the business of environmental governance.

Transition 1: A stable or smaller world population. Approaches: empowering women socially and politically, making noncoercive family planning services available, providing maternal and child health care, education for girls, employment for women. This is the most advanced.

Transition 2: Freedom from mass poverty. The poor have no choice but to lean on an eroding resource base. Among the 4-5 billion people who live in developing countries, half live in communities without basic sanitation, a quarter are without safe drinking water and adequate housing, and a fifth are undernourished. Two billion lack modern energy services. Low levels of international aid; unfair trade regimes that restrict developing countries' trade access to the markets of rich nations and subsidize industrial agriculture against competition from developing countries; continuing burden of international debt; restrictions on access to technology.

Needed:

1. Growth.
2. Social safety nets like welfare or unemployment payments.
3. Investments in small-scale infrastructure reaching to the poor.
4. Very large investments in basic social services for the poor – health, education and family planning services.
5. Sustainable livelihoods for the poor – credit, land, training and upgrading skills, appropriate technology and energy services.
6. Sustain and regenerate the environmental resource base on which the poor depend.
7. Social and political empowerment of the poor. Integrate human rights with sustainable development. Empower local communities.

Transition 3: Environmentally benign technologies.

Rapid ecological modernization of industry and agriculture. Environmentally benign technologies that sharply reduce the consumption of natural resources and the generation of residual products per unit of economic output. Some examples: 1) Wind farm construction; 2) Wind turbine manufacturing; 3) Hydrogen generation; 4) Fuel cell manufacturing; 5) Solar cell manufacturing; 6) Light rail construction.

A cluster of environmentally critical technologies:

- Energy capture, including photovoltaics and wind.
- Energy storage and applications, including batteries, high-temperature superconductors, hydrogen storage and fuel cells.
- Special energy end-uses, including new technologies for superefficient vehicles and buildings.
- Improved agricultural techniques, including precision farming, which uses information technology to target inputs of fertilizers, pesticides and water, and alternative agriculture, which takes advantage of natural cycles, crop rotations and integrated pest management.
- Lean and intelligent manufacturing systems, which rely heavily on information and control technologies to minimize waste.



- Separations processes in manufacturing, including new membrane systems, supercritical fluid extraction, and affinity separation.
- Precision fabrication, including thin films and nanolithography.
- Materials design and processing, including new metals, polymers, ceramics and composites.

Transition 4: Environmentally honest prices.

Market forces are harnessed to environmental needs, particularly by making prices reflect the full environmental costs.

Economic instruments: securing property rights to overcome the ‘tragedy of the commons’ problem (no one is responsible for what is held in common), tradable emission permits, pollution taxes, user fees, shifting subsidies from environmentally damaging activities to beneficial ones, and making polluters and others financially liable for the damage they cause.

Reform of national income and product accounts – measure GDP properly. Natural resources such as petroleum, minerals, clean water and fertile soils are assets of the economy. Consuming stocks of valuable subsoil assets such as fossil fuels or water or cutting first-growth forests is just as much a drawdown on the national wealth as is consuming wheat, forests etc.

Germany is shifting taxes from things that they want to encourage to things they want to discourage.

Sustainable development should require that natural capital be maintained intact – that we live off nature’s income and do not consume natural capital. Harvest rates should equal regeneration rates. Waste emission rates should equal the natural assimilative capacities of the ecosystems into which the wastes are emitted. Regenerative and assimilative capacities must be treated as natural capital, and failure to maintain these capacities must be treated as capital consumption, and therefore not sustainable. Use of nonrenewables requires that any investment in the exploitation of a nonrenewable resource must be paired with a compensating investment in a renewable substitute.

A ‘throughput’ is what we extract from the natural world to put through our economic system and what we return to the environment. Even full-cost, environmentally honest pricing will not get a society all the way to sustainable development. Other policy measures are still necessary to ensure that the rates of extraction of resources do not exceed regenerative capacities and to ensure that wastes do not exceed the environment’s assimilative capacities.

The mind-set of the present capitalist system might be summarized as follows:

- Economic progress can best occur in free-market systems of production and distribution where reinvested profits make labor and capital increasingly productive.
- Competitive advantage is gained when bigger, more efficient plants manufacture more products for sale to expanding markets.
- Growth in total output maximizes human well-being.
- Any resource shortages that do occur will elicit the development of substitutes.
- Concerns for a healthy environment are important but must be balanced against the requirements of economic growth, if a high standard of living is to be maintained.
- Free enterprise and market forces will allocate people and resources to their highest and best uses.

The possibility of a new industrial system is based on a very different mind-set and set of values:

- The environment is not a minor factor of production but rather is ‘an envelope containing provisioning and sustaining the entire economy.’
- The limiting factor to future economic development is the availability and functionality of natural capital, in particular, life-supporting services that have no substitutes and currently have no market value.
- Misconceived or badly designed business systems, population growth, and wasteful patterns of consumption are the primary causes of the loss of natural capital, and all three must be addressed to achieve a sustainable economy.
- Future economic progress can best take place in democratic, market-based systems of production and distribution in which all forms of capital are fully valued, including human, manufactured, financial and natural capital.
- One of the keys to the most beneficial employment of people, money and the environment is radical increases in resource productivity.
- Human welfare is best served by improving the quality and flow of desired services delivered, rather than by merely increasing the total dollar flow.
- Economic and environmental sustainability depends on redressing global inequities of income and material well-being.
- The best long-term environment for commerce is provided by true democratic systems of governance that are based on the needs of people rather than business.

#### Transition 5: Sustainable Consumption

Individual consumers can exercise enormous power in the marketplace and can shift their buying quickly. Farmers’ markets, worker cooperatives, healthy communities, land-use planning, socially responsible businesses, organic cotton, hybrid vehicles, barter networks, micro-enterprise, simple living, reduced TV watching, poetry, storytelling, dance, reconnection to wild places.

2003 report:

- Increase consumer awareness and choice. Buy environmentally friendly products.
- Promote innovative policies. Increase political support for sustainability initiatives.
- Accelerate demand for green products.
- Demand corporate accountability. Consumer campaigns, boycotts and shareholder advocacy.
- Encourage sustainable business practices. Urge companies to ‘green’ their products and services – map environmental footprints, rethink resource extraction, use and recycling, sustainable redesign of products, analysis of supply chains.

Transition 6: Knowledge and learning.

Transition 7 and Chapter 9: Taking “Good Governance” Seriously

JAZZ: people and businesses – environmental groups, consumer groups, NGOs, private businesses, state and local governments, foundations, religious organizations and investors create a world full of unscripted, voluntary initiatives that are decentralized and improvisational, like jazz. In the JAZZ world, information about business behavior is abundant, and good conduct is enforced by public opinion and consumer decisions. Governments facilitate more than regulate, environmental and consumer groups are very active, and businesses see strategic advantage in doing the right thing.

Some examples: smart growth movement, sustainable cities, state and local greenplans, state climate protection initiatives, green purchasing programs, environmental standards in building codes, lawsuits against the federal government, product certification, forest certification.

A long list of techniques – the US Toxics Release Inventory and other right-to-know” disclosures, third-party auditing, market creation by government entities and consumers, product boycotts and bad publicity – coupled with the Internet and the NGO community.

Green JAZZ by businesses and investors:

- Seven large companies agreed to reduce their greenhouse gas emissions to 15% below their 1990 levels by 2010. Many others have taken similar steps.
- Eleven major companies are developing markets for a thousand megawatts of renewable energy over the next decade.
- Several companies have agreed to sell wood only from sustainably managed forests.
- More than \$2 trillion resides in socially and environmentally screened funds.
- Major corporations are now routinely issuing “sustainability reports”.

GEOpolity. Transition in governance to capable, accountable and democratic governments is imperative.

Development progress in the poorer regions is essential. GEOpolity will never succeed unless development is succeeding. The only world that works is one in which the aspirations of poor people and poor nations for fairness and opportunities are being realized.

Basic international law principles:

- Fundamental human right: to an environment adequate for their health and well-being.
- Common concern: the global environment.
- Common but differentiated responsibilities: in view of their different contributions to environmental degradation, states have common but differentiated responsibilities.
- Duty not to cause environmental harm: states should not damage the environment of other states.
- Integration: to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.
- The polluter pays principle: national authorities should promote the internalization of environmental costs and the use of economic instruments, taking into account the principle that the polluter should pay.
- The precautionary principle: where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.
- Public participation: all concerned citizens should be involved in decision-making.
- Rights to development: must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.