

GLOBAL ENVIRONMENTAL TRENDS

● Pressures on Global Ecosystems

The global population has increased from 1.7 billion in 1900 to about 6.4 billion today. Industrial production has grown even more rapidly. There is evidence from around the world of increasing stress on the environment. In many regions, there has been over-harvesting of fisheries, croplands, rangelands, or forests.¹ For example, the cod fishery off the New England coast has had such dramatic declines in annual catch that fishing bans have been imposed. It is not the only depleted fishery: in the early 1990s, the U.S. Food and Agricultural Organization found that 9 of the world's 17 fisheries were in a state of decline due to over-harvesting.²



Croplands in Northern China, India, the southern Great Plains of the U.S. and elsewhere are threatened with lower yields, due to a mounting problem accessing water as aquifers are drawn down, that is, as pumping exceeds aquifer recharge from precipitation. It is estimated that about 480 million of the world's 6.1 billion people are being fed with grain produced by over-pumping aquifers.³ Already, yields in Northern China have dropped. Rising grain prices and food shortages can be expected as the competition between population, industry and agriculture for water heightens.



Higher temperatures (see accompanying "Climate Change") would exacerbate the problem of agricultural shortfalls that regions such as water-stressed Northern China have been experiencing. Estimates by the U.S. Department of Agriculture and researchers at the International Rice Research Institute (Philippines) are that a 1^o Celsius (1.8^o Fahrenheit) rise in temperature above the optimum during the growing season leads to a 10% drop in yields of rice, wheat and corn.⁴

Notes

1. Brown, Lester. 2001. *Eco-Economy: Building an Economy for the Earth*. New York: W.W. Norton. 8-76. Available on-line at www.earth-policy.org. Brown, founder of the Earth Policy Institute, documents falling water tables and eroding soils, dying coral reefs, declining farmland, disappearing species, melting glaciers, and rising carbon dioxide levels. He concludes that the world economy is out of sync with the ecosystem on which it depends. He is not alone. A 1992 document signed by over 1,600 scientists from 70 countries, including 102 of the 196 living Nobel Prize recipients, warns "No more than one to a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished".
2. Brown 2001:51-54. See also the Union of Concerned Scientists at www.ucs.org.
3. Brown 2001: 57.
4. Brown 2001: 27-77 and Lester Brown, "Wakeup Call on the Food Front," 12/16/03, update 31 - printable. htm at same website.

● Climate Change

Climate change has become a public and scientific concern. In response to the threat of global warming, governments around the world have begun to take steps to reduce the emission of greenhouse gases, largely through shifting towards greater use of non-carbon energy sources. The U.K., Germany and the Netherlands are among the countries in Europe that have completed plans to reduce emissions by 50% or more within the next 40 to 50 years (Gelbspan 2004). The U.S. has set no deadline for the reduction or stabilization of emissions, but stricter emission regulations are gradually being phased in for various industries, and alternative energy sources are being developed.



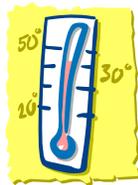
Why so strong a response to a slight increase in global temperatures (on the order of 1^o F) during the past several decades, which may be

due only in part to human activity? The problem is that, over time, an upward trend in global temperature would have severe consequences, impacting agricultural yields, weather patterns, ocean currents, sea levels and the ability of flora and fauna to survive in their current locations. Among recent changes that may be associated with climate changes are the melting of glaciers in the Northern Hemisphere, rising sea levels and changing seasonal patterns in northern regions (OTA 1993 and CIESIN 2003). The fear is that, if greenhouse gas emissions continue at current or greater levels, a continuing increase in global temperature is likely, and climate changes are inevitable.



While there are policy disagreements about what should be done to limit or reduce greenhouse gas emissions, there is considerable agreement about the nature of the problem. Scientists agree that the concentration of greenhouse gases in the atmosphere is increasing, that they absorb infrared radiation from the sun and that they retain some of that energy in the atmosphere. Some of these gases occur naturally in the atmosphere, like carbon dioxide, water vapor and ozone, while others result from human activities.

“Although these gases make up only 0.25% of the atmosphere by volume, they are responsible for increasing the average temperature of the earth from 0° Fahrenheit (the temperature it would be without these natural greenhouse gases) to 59° F,” explains OTA (1993:71), thus enabling the development of life on earth. Since the beginning of the industrial revolution, atmospheric concentrations of three greenhouse gases has grown rapidly, due in large part to the burning of fossil fuel and deforestation: carbon dioxide levels have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide



concentrations have risen by about 15% (EPA). Scientists using models to project future trends estimate that, even if emissions stabilize at current levels, concentrations of greenhouse gases will continue to rise and the average global surface temperature will increase 1-4.5° F in the next fifty years, (CIESIN).

There is disagreement, however, as to when and how the effects of the increasing concentration of greenhouse gases will be felt, and also with regard to what should be done now. The U.S. Office of Technology Assessment (1993) has made several proposals for preparing for possible effects of climate change, including revamping the National Flood Insurance Program, taking steps to impose water-use efficiency (should droughts become more common), revising farm commodity support programs to increase the ability of farmers to switch crops, and preparing for changing boundaries of natural regions, such as wetlands and deserts. It can be noted here that the Mississippi River delta is one of the earth’s flood plains that is especially vulnerable to rising sea levels, which are generally forecast by models of global climate change. Rising sea levels would bring erosion of coastal areas, increased salinity and movement of marshlands inland.



The desire to reduce greenhouse gas emissions has resulted in new industries based on the development and use of alternative energies. The Center for International Earth Science Network at Columbia University (www.ciesin.org) has extensive information on these subjects. The U.S. has been active in the drafting of international agreements such as the Kyoto Protocol on Climate Change (<http://unfccc.int/resource/convkp.html>), which is aimed at reducing the emission of greenhouse gases, although the U.S. no longer supports the Protocol’s approach.²

In addition to the initiatives to reduce emissions undertaken by several countries, several companies such as Citibank and DuPont also have platforms and programs aimed at reducing greenhouse emissions.³

Notes

1. See IPCC, OTA and Brown. Each gas differs in its ability to absorb heat. HFCs (hydrofluorocarbons) and PFCs (perfluorocarbons) are the most heat-absorbent. Nitrous oxide, for example, absorbs 270 times more heat per molecule than carbon dioxide. Factors influencing temperatures include also El Nino, volcanic eruptions, sunspots and increases in acidic air pollution.

2. This Protocol rests heavily on the concept of trading emission allowances: for example, if country A exceeds its allowed quantity of carbon emissions, it can buy emission credits from country B that emits less than its permitted quantity. There are severe problems with monitoring, enforcement and equity. An alternative World Energy Modernization Plan of the Institute for Policy Studies is summarized at www.fpiif.org. Under this plan, a country would be required to use, say 5% less carbon fuel per year, or produce 5% fewer goods. Technologies are available to decarbonize fuel supplies, the plan argues, but the playing field must be leveled, so that all fossil fuel producers face the same competitive pressures. Oil and coal producers would find the new \$300 billion market for decarbonized fuel a lucrative one. This plan would also reduce subsidies for fossil fuels, which in the U.S. now include corporate tax write-offs and direct payments to oil, gas, and coal companies (for research and development, and oil purchases for the Strategic Petroleum Reserve, for example).

3. Citigroup committed to report the greenhouse-gas emissions released by Citi-financed power-sector projects, to work with its clients to reduce their emissions, and to increase its investments in clean-energy power sources. This change comes after years of bankrolling several enterprises which drew severe criticism from environmentalists.

●Disappearance of Species

The most authoritative global assessment of species is that of the IUCN or World Conservation Union.¹

The report collects data on over 30,000 species of plants and animals. Of the 4,842 mammals described in *Mammal Species of the World* (1994), IUCN scientists evaluated 4,789 for the 2003 Red List, and of these 24% are considered to be



“threatened”. All of the 9,932 birds in the *World Bird Database* were evaluated, and 12% of these are listed as threatened. The percentage of fishes, reptiles, amphibians, plants and invertebrates

evaluated was much lower, but, for example, the IUCN estimated that as many as 3% of fish (largely freshwater) may be threatened. (Under the IUCN Red List system, species are classified into one of eight categories based on scientific criteria: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient and Not Evaluated. A species is classed as threatened if it falls in the Critically Endangered, Endangered or Vulnerable categories.)

As species disappear, the earth in effect is losing genetic libraries, each storing a wealth of genetic information developed over thousands of years. Most of the species threatened or lost are found in tropical rainforests. The National Cancer Institute notes that well over 50% of the estimated 250,000 plant species found on earth come from tropical forests, and it concentrates on these regions in seeking and testing plants that have potential for use in fighting cancer or AIDS.²



“We support the idea the world is on the breaking crest of the sixth great wave of extinction,” says Professor Georgiana Mace, Science Director of the Zoological Society of London. Dr. Richard Leakey, former head of Kenya’s wildlife service, estimates that the world is losing between 50,000 and 100,000 species each year. (BBC, 8/24/01 and 5/19/03, available at <http://news.bbc.co.uk>.)

In fact, seven out of ten biologists surveyed by the American Museum of Natural History in 1998 believe that a mass extinction is currently taking place. This mass extinction, the Museum reports, is the fastest in Earth’s

4.5-billion-year history and, unlike prior extinctions, is mainly the result of human activity.

But it is not only extinction that is of concern. The disappearance of fireflies, bees, and butterflies from urban localities is occurring with increasing frequency (see box on fireflies), which affects the quality of ecosystems in those areas, as well as the quality of life.



The loss of a species from a region, besides the adverse effect on quality of life, will typically reduce the productivity of that region's ecosystem. Some of the services provided by an ecosystem include the provision of food supplies, water purification, soil formation, flood and fire prevention, nutrient cycling, climate regulation, carbon sequestration (extraction of carbon dioxide from the air) and pollination. Greater diversity, measured in terms of richness (the number of species) and distribution (the proportion of each species in a given landscape), in addition, provides ecosystem insurance protection against catastrophic events or infections.³ The disappearance of species from a region increases the risk of imbalances, which can result in the spread of disease and other adverse impacts on remaining species and the overall ecosystem.

Notes

1. The International Union for the Conservation of Nature (IUCN), or the World Conservation Union, was founded in 1948 and brings together 77 states, 112 government agencies, 735 NGOs, 35 affiliates, and some 10,000 scientists and experts from 181 countries in a world-wide partnership. Its mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. Within the framework of global conventions IUCN has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. IUCN has approximately 1000 staff, most of whom are located in its 42 regional and country offices while 100 work at its headquarters in Gland, Switzerland. The IUCN has six global commissions, one of which is the Species Survival Commission. See the related Convention on Biodiversity, an international agreement which the U.S. helped to draft, at www.biodiv.org/doc/publications. The Congress has yet to ratify this convention.

2. According to one estimate, one-quarter of medicines owe their origin to rain forest plants and animals. (See Zimmerman and Zimmerman, *Nature's Curiosity Shop*, Contemporary Books, Chicago, 1995, 82. This source also notes that there is a tree in Brazil, the copaiba, which pours out diesel fuel when it is tapped, and 20% of Brazil's diesel fuel is now supplied by this source. "There are frogs so big they eat rats, flowers so large they hold several gallons in their nectarines, and other wonders such as a moth with an eight-foot tongue for collecting nectar, and a frog with a nearly transparent body and green bones.")

3. Brock and Xepapadeas 2003, and Heal 2000.

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