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Perspective: Building the International Environmental Regime

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PERSPECTIVE

BUILDING THE INTERNATIONAL ENVIRONMENTAL REGIME: A STATUS REPORT

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I. INTRODUCTION

Most environmental problems are localized: domestic sources of environmental degradation bring about nearby effects for which solutions exist under domestic law. However, there are problems which national efforts cannot resolve, no matter how strong the political will to do so. For these problems, implementing solutions depends on the willingness and ability of the international community to act in concert, often through legally binding measures.

Commentators have recently written much about the greenhouse effect; the threat that the continued build-up of certain gases in the atmosphere will cause an increase in worldwide temperatures.[1] For example, some scientists speculate that a modest increase in global temperatures could reduce the structural integrity of the vast Western ice shelf of Antartica, which does not rest on solid land and could cause the shelf to collapse long before it would melt. If that were to happen, there would be a rapid—perhaps even sudden—increase in ocean levels by as much as six meters (19.7 feet).[2] Most harbors would be destroyed and valuable residential and commercial structures and agricultural land—including most of South Florida—would be submerged.[3]

The possibility, even if quite remote, of such catastrophic con-

1. Scientists suggest that if there were sufficient warming, in addition to other effects, a gradual melting of the two polar ice caps would occur. As a result, over a considerable period of time, low-lying coastal areas throughout the world would be flooded and other areas could be damaged by wave action and storm effects. This "global warming" problem is discussed in greater detail *infra* part II(A).

2. *Antartic Ice Potentially Unstable*, 137 SCI. NEWS 285 (1990).

3. U.S. GEOLOGICAL SURVEY MAP N2530-W 8000/30x60, Miami, Florida (1981).

sequences illustrates two important points. First, global international protection is a matter of major importance and deserves sustained, high-level attention by the international community. Second, harmful consequences may result from actions taken in jurisdictions far removed from the site of the damage.

International protection of the environment is too large a topic for one "perspective" to cover adequately. The purposes of this paper are accordingly far more modest: 1) to provide a brief overview on the status of some of the key international environmental problems; 2) to assess how well the international community is dealing with them; 3) to undertake a preliminary inquiry into the success of the international community in establishing the institutions, organizations, treaties, and norms of behavior needed to establish an effective international environmental protection regime; and 4) to suggest near-term courses of conduct which would make the regime more effective.

II. The Status of International Environmental Problems

For over a century, farsighted individuals, organizations, and, occasionally, governments have emphasized the dangers in wasting natural resources and have suggested conservation measures. At about the same time, doctors began to recognize the public health consequences of imprudent disposal of sewage and garbage and the impact of exposing workers to industrial chemicals. Unfortunately, while science was making rapid strides in such diverse fields as ecology, toxicology, epidemiology, and detection of trace quantities of contaminants, no general conception of mankind as a constituent element of "the environment" entered the public consciousness.

Beginning in the early 1960s, a series of severe environmental problems[4] and the publication of Rachel Carson's *Silent Spring*[5] galvanized the public in several developed countries. Nevertheless, even where environmental concerns did come to the forefront of

4. Among the problems which first raised public consciousness were rivers which foamed because of non-degradable detergents, "smog" in several countries, the impact of dichloro-diphenyl-trichloro-ethane (DDT) on birds of prey, and the recognition of serious health consequences from mercury contamination in Japan. For example, the Chiss Corporation dumped tons of mercury into one of the richest fishing grounds in Japan. Sanger, *Japan and the Mercury-Poisoned Sea: A Reckoning That Won't Go Away*, N.Y. Times, Jan. 16, 1991, at A3, col. 1.

5. R. Carson, Silent Spring (1962).

public discourse, policy makers generally considered the problems domestic matters, and not proper concerns of international law or diplomacy.

More recently, scientific inquiry has brought to light several potentially catastrophic global problems which can arise without obvious early symptoms. These problems and a greater public awareness of global interdependence have focused attention on human activities which cause adverse environmental consequences across national frontiers and which no nation acting alone can resolve.

One major consequence of the increased environmental awareness has been a newfound sense of urgency among affected publics and their leaders. Only a few years ago, it was nearly impossible to get world leaders to make more than passing reference to the need for international cooperation on the environment.[6] That posture has changed dramatically over the past three years. The last two Western Seven Nation Economic Summits placed the environment as one of their highest priority topics.[7] In addition, Soviet leader Gorbachev made the need for concerted action on the environment a key point in his highly publicized speech at the United Nations (U.N.).[8]

Much of the current attention at the international level is a spill-over from domestic environmental concerns which have elevated the environment to a central issue in recent elections in several Western countries[9] and are engendering a growing political

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6. There were occasional exceptions, such as the November 6, 1969 meeting of the Heads of State of the North Atlantic Council, which established the North Atlantic Treaty Organization (NATO) Committee on the Challenges of a Modern Society. *See* Train, *A New Approach to International Environmental Cooperation: The NATO Committee on the Challenges of Modern Society*, 22 U. KAN. L. REV. 167, 171 (1973).

7. *Summit of the Arch*, 89 DEP'T ST. BULL. 1, 15 (Sept. 1989); 1990 Western Seven Nation Economic Summit, *see Economic Declaration Issued by Group of Seven Industrial Nations at the Conclusion of Their Economic Summit in Houston July 11, 1990*, 7 Int'l Trade Rep. (BNA) No. 29, at 1127 (July 18, 1990).

8. *Gorbachev Proposes Emergency Unit to Provide Environment Assistance*, 11 Int'l Env't Rep. (BNA) No. 17, at 651-52 (Dec. 14, 1988).

9. Debate over environmental matters was important in the last U.S. presidential election. Governor Dukakis attacked then Vice President Bush's record generally and his support for off-shore oil drilling in particular. Meanwhile, Bush declared himself an environmentalist (on that issue creating a differing public posture from that of President Reagan), and attacked Dukakis for failing to clean up Boston Harbor. *See* Thompson, *The Environment: Cleaning up the Mess*, TIME, Sept. 19, 1988, at 23. Concern over the environmental impact of the U.S.-Canadian Free Trade Agreement was frequently raised in the Canadian national elections. *See Acid Rain Treaty to Top Agenda in Meeting with Bush, Mulroney*

movement in Eastern Europe and the Soviet Union.[10] One is tempted to reach the cynical conclusion that, like appointing a study commission, urging international cooperation is one means political leaders use to avoid making difficult decisions about domestic problems. Yet, taken too far, such cynicism blinds us to the new reality: a quagmire of recently recognized international environmental problems has come to the forefront demanding the action of the international community, which is beginning to respond.

The discussion in this part is not intended to be exhaustive, but rather illustrative of the problems which may require international solutions.[11]

A. Global Warming

A key global environmental problem is the risk of global warming due to the build-up of ever-greater quantities of carbon dioxide, methane, chlorofluorocarbons (CFCs), and other natural and man-made gases in the atmosphere. When the sun's radiant energy strikes the earth, much of it is converted to heat. "Greenhouse gases" cause the earth's atmosphere to retain more of that converted heat, thereby increasing the earth's average temperature.[12]

Says, 11 Int'l Env't Rep. (BNA) No. 17, at 666 (Dec. 14, 1988) [hereinafter *Acid Rain Treaty*]. Green (environmentalist) parties have recently captured considerable popular support in Western Europe and enough seats in the European Parliament of the European Community (EC) to establish a formal block. *Coalition of Greens, Other Leftists Gain Slim Majority in EC Parliament*, 12 Int'l Env't Rep. (BNA) No. 7, at 336 (July 1989).

10. Environmental matters received considerable attention in the debates of the Soviet Union's Congress of People's Deputies called to adopt a new governmental structure and elect members to a new Supreme Soviet. *See* Trimble, *Reform is Risky Business*, U.S. NEWS & WORLD REP., June 19, 1989, at 27. The Soviet Union is also forming the Ecology Committee of the Supreme Soviet, a parallel institution to our Environmental Protection Agency (EPA). News Briefing (Justice Dep't - Stewart), Fed. News Service, Aug. 17, 1990 (wire service).

11. Some major issues have been excluded due to length constraints and their similarity to issues which are discussed. For example, erosion and salination are serious problems which have many features in common with the problems of desertification and deforestation. Additionally, a narrow view is taken here on what is "environmental." Overpopulation, the protection of cultural and historical resources, indigent peoples' rights, and many other problems are closely allied with many of the world's environmental problems but are not included in this discussion.

12. Put more precisely, a temperature increase can occur because certain gases have the capacity to let ordinary light pass and to retain infra-red light (the wavelengths of radiant heat) in much the same way that glass in a greenhouse allows light to enter, but prohibits the resulting heat from escaping. *See* Matthews, *Under the Sun*, NAT'L GEOGRAPHIC, Oct.

Both the certainty of the greenhouse effect and the severity of its consequences are still subject to scientific debate.[13] Nevertheless, there is little doubt that the emission of greenhouse gases and their concentration in the atmosphere have increased over the past century. Moreover, there is evidence that global temperatures have already risen slightly.[14] Many scientists believe there will be significant further increases, on the order of two to five degrees Celsius (3.6 to 9 degrees Fahrenheit) within the next sixty years.[15]

Scientists have postulated that even modest further increases in global temperatures would have widespread consequences. Perhaps the most severe of these consequences is the likelihood that global climate patterns could be significantly altered.[16] If such changes occur rapidly, they are far more likely to be harmful than beneficial.[17] In some locations, the consequences might be severe.

Although science is not currently able to predict which climatic changes might take place in which locations,[18] greater dryness in some locations and an increase in the number and severity of floods and hurricanes in other locations is probable. It takes little imagination to foresee the effects of even a slight reduction in average humidity in the Sahel region of Africa or of additional flooding in the low-lying delta region of Bangladesh. In such places, even Herculean efforts might not be enough to prevent

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1990, at 66, 74-75. Without this greenhouse effect, the surface of the earth would be about 33°C (91.4°F) cooler than it presently is. Thus, the phenomenon is necessary for life as we know it on earth. Rowlands, *The Security Challenges of Global Environmental Change*, 14 WASH. Q. 99 (1991).

13. *See, e.g.*, Knox, *Sulfur-Climate Link Called Insignificant*, 134 SCI. NEWS 375 (1988).

14. *See* Nanda, *Global Warming and International Environmental Law—A Preliminary Inquiry*, 30 HARV. INT'L L.J. 375 (1989).

15. *See, e.g.*, Shabecoff, *Team of Scientists Sees Substantial Warming of Earth*, N.Y. Times, Apr. 16, 1990, at B7, col. 1.

16. One of the few points on which there seems to be unanimity is the improbability that a rise in average temperatures would be uniformly distributed across the globe, with no other consequences. *See Under the Sun*, *supra* note 12, at 82.

17. Over a long period of time (centuries), a change to new climatic conditions might not necessarily be disadvantageous. Given sufficient time, nature optimizes biological production (both in diversity of species and number of individuals) at a given location for a particular set of conditions. For that reason, change followed by protracted stability might yield new—but not necessarily worse—ecological conditions. Indeed, in individual cases, these consequences might be positive. For example, in some colder climates with adequate water, increased warmth might lead to greater agricultural production. Unfortunately, in the short run (decades), such positive benefits are more likely to be the exception than the rule. Moreover, subsequent additional warming would be likely to destroy any such benefits.

18. *Under the Sun*, *supra* note 12, at 82.

widespread suffering. Furthermore, if one of the world's major grain-producing regions were lost without corresponding favorable climatic changes taking place elsewhere, global food shortages would result. These changes would seriously aggravate current inadequate nutritional standards in much of the developing world, a problem made more difficult by an ever-increasing global population.[19]

Apart from changes in climate patterns, global warming might also cause the average level of the world's oceans to rise within the next half century by amounts variously estimated from several millimeters to meters (less than an inch to several feet).[20] An increase of a meter may not sound significant, but it would be enough to destroy valuable beach, harbor, and other economic assets, increase the damage and loss of life from hurricanes and typhoons in low-lying locations, and cause salt intrusions into fresh groundwater and surface waters. The resulting reduction in the availability of fresh water would have serious implications for agriculture and, in certain regions, for the adequacy of human water supplies.

According to current theory, global warming results from a combination of increased release of greenhouse gases and a relative reduction in their natural elimination from the atmosphere. While some of the causal processes occur in nature, the recent change is wholly due to human activity.

There are many culprits responsible for the increased release of these greenhouse gases. First, the widespread burning of fossil fuels creates large quantities of carbon dioxide.[21] While there is ample blame for the over-use of these fuels, the worst offenders are primarily the developed countries, particularly the U.S.[22] Second,

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19. The U.N. Population Fund's 1990 report argues that environmental degradation is now the greatest threat posed by over-population. World population has now passed 5.3 billion and is expected to stabilize at 11 billion. These estimates are higher than the U.N.'s previous predictions. Schoon, *The Weight of Humanity: Population Growth Has Alarmingly Overshot UN Projections*, Independent, May 21, 1990, at 17, col. 1; Hughes, *No Banner Year for Despots*, Christian Sci. Monitor, Jan. 3, 1991, at 18, col. 4. For a discussion of the population growth and global resources, see Passell, *Economists Start to Fret Again About Population*, N.Y. Times, Dec. 18, 1990, at C1, col 5.

20. *Is The World Heating Up? Well, Just Listen*, Bus. Wk, Feb. 4, 1991, at 82.

21. After water vapor, carbon dioxide is the most abundant heat-absorbing gas. Carbon dioxide has a residence time of up to 100 years in the atmosphere. *Under the Sun*, *supra* note 12, at 79.

22. According to a U.N. sponsored study, the World Resources Institute reported that in 1987 the U.S. accounted for 17.6 percent of important greenhouse gases, the U.S.S.R. for 12.0 percent, and Brazil for 10.5 percent. They were followed by China, India, Japan, West

CFCs are released by the breakdown or repair of air conditioners and refrigerators, from the solvent cleaning of clothes and electronic parts, and from the production and use of foam insulation and objects.[23] The industrial countries are disproportionately responsible for these releases of CFCs.[24] Finally, methane (the primary component in natural gas) is being released as a by-product of farming (which includes deforestation) and landfills.[25]

While the release of these gases into the atmosphere grows, other human activities have reduced the capacity of the biosphere to remove the greenhouse gases from the atmosphere. Chief among these activities is deforestation, particularly in the tropics. Trees and other plant life absorb carbon dioxide from the air and convert it to hydrocarbons, such as cellulose. When forests are harvested (particularly without replanting), one result is to reduce the amount of carbon dioxide formerly removed from the atmosphere by the forests. Tropical rain forests are particularly adept at removing carbon dioxide from the atmosphere. Therefore, the rapid loss of these forests to logging and to slash-and-burn agriculture is most unfortunate.[26]

Toxic pollution of the oceans may also reduce the biosphere's ability to remove greenhouse gases from the atmosphere. While the causal evidence of oceanic degradation is more speculative than that of deforestation, modern industrial and agricultural activities release large quantities of heavy metals and persistent toxic chemicals into the oceans. As the releases are generally close to shore, the impact is felt most severely in coastal waters, especially in es-

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Germany, the U.K., Indonesia, France, Italy, and Canada. Palmer, *Due to Deforestation, Poor Cause Nearly Half Greenhouse Effect*, Reuters, June 7, 1990 (wire service).

23. *Under the Sun*, *supra* note 12, at 94; Regulatory Agenda, 55 Fed. Reg. 45,134 (1990).

24. Chlorofluorocarbons survive as long as 400 years and are up to 16,000 times more effective than carbon dioxide in absorbing infra-red heat. *Under the Sun*, *supra* note 12, at 79.

25. Methane has a residence time of up to only 10 years, but molecule for molecule it absorbs 20 to 30 times more infra-red heat than carbon dioxide. *Id.* at 76.

26. It is sometimes possible to replace the forests with agricultural crops which grow even more rapidly and which thus remove even more carbon dioxide from the air. Indeed, these crops would apparently do a better job of removing carbon dioxide from the atmosphere than existing tropical forests, since they grow far more rapidly than tropical hardwoods. However, if the bulk of the plants so produced is either burned or plowed under, the result is the re-release of the carbon dioxide or the generation of methane. In those cases, the net effect is an increase in atmospheric greenhouse gases when compared to reforestation. On a positive note, there are crops to which that scenario might not necessarily apply. *See infra* text accompanying notes 34-35.

tuaries and bays. Algae acts, much like trees, to remove greenhouse gases from the atmosphere.[27] If such toxic pollution is causing a global reduction in the supply of beneficial plankton, it may mean a global reduction in the capacity of the oceans to remove carbon dioxide from the atmosphere.[28]

To date, no binding steps have been taken to decrease the build-up of greenhouse gases *per se*.[29] Repeated efforts to reach agreement on long-range, mandatory reductions in carbon dioxide emissions have been blocked by the U.S.[30] However, responding to a report by the Scientists' Working Group of the Inter-Governmental Panel on Climate Change (IPCC), then British Prime Minister Margaret Thatcher, who with Japan had previously supported the U.S. position, committed the U.K. to freeze carbon dioxide emissions at today's levels by the year 2005.[31]

Unfortunately, it is not going to be easy to halt global warming. No nation can solve the problem acting alone. Even if several developed countries agreed to reduce the amount of fossil fuels they used, that would not halt the long-term build-up of greenhouse gases. Indeed, the resulting reduction in demand for fossil fuels in these countries would lower global prices, stimulating greater fossil fuel use in countries which did not cooperate in the conservation effort.[32]

Both developed and developing countries have a great deal to lose if significant warming takes place. Nevertheless, negotiating

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27. Photosynthesis by algae as well as other chemical processes, helps remove the dissolved carbon dioxide in the oceans. *Under the Sun*, *supra* note 12, at 74.

28. Scientists are currently speculating about the possibility of fertilizing the oceans around Antarctica to promote algae growth. This would result in an estimated one billion tons of extra carbon being pulled from the atmosphere. *Ideas for Making Ocean Trap Carbon Dioxide Arouse Hope and Fear*, N.Y. Times, Nov. 20, 1990, at C4, col. 1.

29. The Montreal Protocol restricting the use of CFCs, discussed *infra* notes 48-55 and accompanying text, should have the side-benefit of slowing the increase of that portion of the greenhouse effect attributable to CFCs in the upper atmosphere. At best, that represents a modest contribution to the resolution of the problem.

30. Most recently, the U.S. played the key role in blocking efforts at the Western Seven Nation Economic Summit to develop a plan to combat global warming. Lauter, *Decision on Global Warming and Ozone Show 2 Sides of Bush*, L.A. Times, July 11, 1990, at A10, col. 1.

31. Leggett, *The Cut Thatcher Does Not Want to Make*, Independent, May 28, 1990, at 14, col. 1. *See also* Laroi, *Japan Suggests Ecology Steps, Stops Short of Curbing Industry*, Reuters, May 18, 1990 (wire service).

32. Population increases and greater industrialization in developing countries are likely to bring about significant increases in their release of greenhouse gases. For a few countries to reduce their emissions while others increase them would hardly be an effective control strategy.

concrete measures that effectively reduce greenhouse gas releases and increase carbon dioxide removal will be no small task, given the many nations whose cooperation in this matter is essential. Any solution will involve significant sacrifices by the parties concerned.[33] This does not mean there are no technically feasible solutions; it does mean that the global political will and our sense of common interest and reciprocal obligation will be severely tested.

Consider the following example.[34] There are several families of plants, including bamboo, rattan, and rice, which grow very rapidly in the tropics and which produce a fiber capable of being manufactured into paper. Planting these as cash crops could reduce the need to harvest timber for paper pulp in more northerly countries and also reduce the amount of carbon dioxide in the atmosphere.[35]

Even if paper products from these new sources proved to be economically competitive with existing supplies, there would be significant barriers to overcome. Developing countries are not likely to undertake the considerable human, capital, and infrastructure investment involved in planting, processing, and bringing these crops to the market without financial aid. Some assurances from the prospective purchasing countries that the sellers will have reliable access to markets for such paper would be required. It is uncertain whether the governments of the developed countries will be willing to provide the capital resources. Even if they are it is not clear whether they will guarantee that the resources they provide for this use are a net increase in financial aid. The developing countries are likely to resist any program if it accompanies a reduction in funding for other matters on which they were relying and which have a higher priority for them. Will the general public of developed countries be willing to support expanded funding

33. In addition to the considerable expenses (and the attendant reduction in economic growth) which may be involved in the reduction of the emissions of greenhouse gases, there could be other consequences. We might be compelled to accept the lesser of two evils by, for example, approving large-scale nuclear and hydroelectric generation schemes which environmentalists and others previously resisted on environmental grounds.

34. The example discussed in the text is neither the most important problem nor one for which the political difficulties involved are uniquely difficult. It is merely one example of the many dilemmas that the international community will need to face if it decides to get serious about global warming.

35. Indeed, these crops would apparently do a better job of removing carbon dioxide from the atmosphere than existing tropical forests, since they grow far more rapidly than tropical hardwoods. Telephone interview by Michelle De Wald with Chris Rollins, Director of the Preston B. Bird & Mary Heinlen Fruit and Spice Park, in Homestead, Florida (Mar. 1990).

when faced with competing domestic demands? Will their willingness to do so erode if their own standards of living are somewhat reduced by domestic measures to curtail the emission of greenhouse gases? Will they support such funding even if it means serious harm to domestic pulp and paper production?[36] Will environmental organizations support such crop development even if it results in the loss of additional tropical rain forest and the concomitant loss of habitat for endangered species?[37] Will their enthusiasm flag if lower-cost pulp and paper from developing countries reduces the domestic incentives to recycle newspapers? Although these difficulties may not prove to be insurmountable, the questions illustrate the complexity and the need for strong political will inherent in the global warming problem, which dwarfs all previous international environmental protection issues.

As discussed more thoroughly later, it may be better, when looking for models to emulate to obtain international agreement on global warming, to examine other complex and politicized international legal and diplomatic approaches, rather than to just consider recent environmental protection efforts. The international community has considerable experience with such difficult issues as regulation of international trade, slowing the spread of nuclear weapons, and the law of the sea. Lessons learned from the law and diplomacy of these issues should be studied as we enter into negotiations on global warming or any other critical and intricate environmental problem.

B. Depletion of the Ozone Layer

There is now a general consensus that free chlorine in the stratosphere (the upper atmosphere) can cause a serious depletion

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36. Paper is an important industry in many of the countries which are the most vocal about global environmental protection, including the U.S., Canada, Sweden, and Finland. *See* 21 ENCYCLOPEDIA AMERICANA 382 (1990).

37. These crops might reduce carbon dioxide more efficiently than untouched tropical hardwoods, since they grow faster. They would not provide the uniquely rich habitats found in tropical rain forests. *See infra* part III(*F*)(4). This does not mean there is always a conflict between efforts to reduce global warming and profitable use of tropical lands. For example, there are already millions of acres of the Amazon which were cleared for pastureland but were subsequently abandoned. Their reforestation and ultimate logging would reduce carbon dioxide in the atmosphere and provide employment and profit. *See* C. Uhl, D. Nepstad, R. Buschbacher, K. Clark, B. Kauffman, & S. Subler, *Studies and Ecosystem Response to Natural and Anthropogenic Disturbances Provide Guidelines for Designing Suitable Land-Use System in Amazonia*, in ALTERNATIVES TO DEFORESTATION 35 (A.B. Anderson ed. 1990).

of its ozone and that further depletion of the ozone layer would result in large increases in ultra-violet (UV) radiation reaching the earth's surface.[38] Most scientists believe that greater UV exposure would greatly increase the amount of skin cancer and eye disease.[39] Some scientists also believe that increases in UV light reaching the earth's surface would harm agricultural production and might even interfere with the reproduction of aquatic microorganisms on which the entire aquatic food chain (and possibly our best protection from global warming) rests.[40]

In contrast to the global warming problem, there has been tangible progress toward protection of the ozone layer. The depletion of the ozone layer has been blamed primarily on the release of CFCs,[41] halons,[42] and a few other chemicals.[43] In 1978, the U.S.,

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38. When an UV ray strikes a CFC molecule, it releases a chlorine atom. That chlorine then breaks an ozone molecule (which is made up of three oxygen atoms) into ordinary oxygen (two atoms of oxygen). The chlorine atom then combines with the freed oxygen atom to form chlorine monochloride. However, this bond is easily broken by another free oxygen atom. Thus, the chlorine atom is freed to conduct its destructive activities—which it may do 100,000 times before it is finally neutralized. Protection of Stratospheric Ozone, 52 Fed. Reg. 47,489 (1987); *Under the Sun*, *supra* note 12, at 91.

39. Middle and long wavelenghts of UV are responsible for the most prevalent forms of skin cancer. *Id.* at 95.

40. *See* 52 Fed. Reg. 47,489, 47,495-96 (1987) (proposed Dec. 14, 1987). Increased UV radiation reaching the earth does not correlate exactly with an increase in human exposure, given changes in leisure-time activities and the public's willingness to take protective measures. Other environmental factors can also have an impact. In the U.S., for example, 74% of the public is concentrated in urban areas. 20 WORLD BOOK ENCYCLOPEDIA 102 (1990). Localized pollution of urban air may actually provide some protection from the increased UV levels. *See* Luoma, *SO_2, UV, Vitamin D, and Calcium: The Acid Rain—Cancer Connection*, AUDUBON, July 1988, at 28; *Global Smog: Newest Greenhouse Projection*, 135 SCI. NEWS 262 (1989). Even if true, the adverse health effects of urban air pollution greatly outweigh the benefits of reduced UV exposure.

41. Chlorofluorocarbons are a class of chemical compounds containing only carbon, chlorine, and fluorine atoms. These substances are non-toxic, non-explosive, very difficult to burn, and have high solvent power. As a result, despite their relatively high expense, they have been widely used in air conditioning and refrigeration, solvent cleaning, production of foam insulation, aerosol propulsion, and numerous other applications. *See* Reinhold, *Frustrated by Global Efforts, City Fights Ozone on Its Own*, N.Y. Times, July 19, 1989, at A1, col. 5. Worldwide, the production of CFCs and goods which rely on them is a multi-billion dollar enterprise. Apart from their economic value, CFCs make important non-economic contributions, particularly to refrigeration, which significantly increases the safety of the world's food supply.

42. Halons are a class of chemicals containing bromine, like chlorine a halogen capable of ozone depletion. They are used largely for fire-fighting and fire-prevention. Halon releases are tiny when compared with CFC releases, but molecule for molecule, halons are far more effective depleters of ozone. 56 Fed. Reg. 2420 (1991); Bradsher, *The Danger of a Fire Fighting Wonder*, N.Y. Times, Aug. 9, 1989, at D1, col. 3; FUNDAMENTALS OF CHEMISTRY 848 (J.E. Brady & J.R. Holum 3d ed. 1988) [hereinafter FUNDAMENTALS].

43. Two other chemicals, carbon tetrachloride and methyl chloroform have also been

based on the evidence available at that time, barred the use of CFCs for aerosol propulsion.[44] Only a few countries followed suit.[45] At that time the U.S. constituted a high percentage of the global CFC market. For several years, the elimination of this single use in a few countries resulted in a worldwide reduction of total CFC releases. More recently, as non-aerosol uses grew in the U.S. and as CFC uses grew even more rapidly elsewhere, global releases of CFCs approached and then passed the pre-ban levels.[46]

In the meantime, scientific evidence continued to mount that depletion of the ozone layer was actually taking place and that free chlorine could be detected in the stratosphere. In response, the international community negotiated the Vienna Convention,[47] which established the goal of protecting the ozone layer and constructed a framework for further international cooperation. The Vienna Convention did not require any reductions in CFC releases. In 1987, the Convention parties negotiated the Montreal Protocol.[48] The Protocol requires a freeze in CFC production (with certain exceptions) followed by a gradual phase down of CFC use.

Additional scientific evidence led many environmentalists to charge that the Montreal Protocol's provisions were inadequate to prevent serious harm to the ozone layer from taking place. Faced with such a charge, both the U.S. and the EC (the two largest producers and users of CFCs) announced domestic measures which went well beyond the requirements of the Montreal Protocol.[49] On

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implicated as ozone layer depleters. The former is no longer used in significant quantities in the U.S., except as an intermediate in the production of other substances, but is in common use as a solvent in other countries. Methyl chloroform (also called 1,1,1-Trichloroethane) is one of the most common industrial chemicals and is also used in some consumer products. *Ozone Treaty Will Force Changes in Consumer Goods*, Gannett News Service, July 11, 1990 (wire service).

44. Parallel bans were adopted by the EPA, the Consumer Product Safety Commission (CPSC), and the Food and Drug Administration (FDA). 43 Fed. Reg. 11,301 (1978). The primary ban was by the EPA. 40 C.F.R. pt. 762 (1988).

45. Among the countries which banned aerosol uses of CFCs were Canada, Sweden, and Norway. *See* 53 Fed. Reg. 30,566 (1988). These countries are all northern latitude states which would be particularly vulnerable to ozone depletion. The EC and Japan decided against a CFC ban but did agree to limit the growth of new CFC production facilities. *See Council of European Communities Decision Concerning Chlorofluorocarbons in the Environment*, O.J. EUR. COMM. (No. 90) 80 (1980).

46. 52 Fed. Reg. 47,490 (1987).

47. Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, 26 I.L.M. 1516 (1987).

48. Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, 26 I.L.M. 1541 (1987) [hereinafter Montreal Protocol].

49. The U.S. passed a tax on Ozone Depleting Chemicals effective Jan. 1, 1990. 26

the other hand, China, India, and other large developing countries, on whom the success of the Montreal Protocol approach largely depends, made clear they were not prepared to become parties to it, unless the developed countries provided assistance in the development, manufacturing, and use of substitutes.

At the Second Meeting of the Parties to the Montreal Protocol during June 20-29, 1990, the provisions of the 1987 Montreal Protocol were tightened. In addition, the parties agreed to establish a fund which will assist developing countries.[50] Nevertheless, some environmentalists still do not believe these changes will adequately solve the problem of ozone depletion.[51]

While the negotiation of the Montreal Protocol and its subsequent strengthening are major accomplishments, the ultimate success of the Protocol's approach will depend primarily on whether the newly adopted fund[52] is sufficient to attract the adherence and active cooperation of the developing countries, which worry that their development could be significantly harmed if CFCs become unavailable. This is hardly a theoretical issue. Among the most desired goods in developing countries are refrigerators, which make major contributions to standards of living and public health. Manufacturers of refrigerators use CFCs both as the refrigerant gas and in the production of the refrigerator's insulation. Substitutes will

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U.S.C.A. §§ 4681-4682 (West Supp. 1990). The tax was intended to suppress CFC demand and, by recouping excess profits, provide greater incentive for the development of ozone-safe alternatives. Because these temporary regulations are affecting persons other than manufacturers and importers of ozone-depleting chemicals, the tax can be interpreted as a revenue raising device. 56 Fed. Reg. 18 (1991). The European Community is likely to phase out CFCs by 1997, three years ahead of the international deadline. *Council of Ministers Favor Regulation to Phase out Chlorofluorocarbons by 1997*, 14 Int'l Env't Rep. (BNA) No. 1, at 3 (Jan. 1, 91).

50. The parties agreed that the five CFCs regulated by the 1987 Montreal Protocol will be phased out by the year 2000, with cuts in consumption below the 1986 levels of 50% by 1995 and 85% by 1997. Additionally, methyl chloroform and carbon tetrachloride were added to the Montreal Protocol. Whereas the 1987 Montreal Protocol merely froze consumption of halons at 1986 levels by 1992, the new agreement will completely phase them out by the year 2000. Meadows, *New Ozone Accord is One Giant Step for Mankind*, L.A. Times, July 8, 1990, at M2, col. 4; Chynoweth, *Tougher CFC Rules are Adopted*, CHEMICAL WEEK, July 4-11, 1990, at 12.

51. Brice, *Critics Say New Ozone Agreement Not Strong Enough*, Christian Sci. Monitor, July 2, 1990, at 3, col. 1.

52. The U.S. agreed to provide money towards the fund to enable Third World nations to phase out CFCs. Set up under the auspices of the United Nations Environment Programme (UNEP), this CFC fund may be folded into the broader environmental fund the World Bank (or International Bank for Reconstruction and Development-IBRD) is trying to establish. *U.S. to Take a Kinder View of World Bank's 'Green Fund,'* vol. 14, Bank Letter, No. 27, 4, July 9, 1990 (wire service).

almost certainly be more expensive, thereby making refrigeration less widely available. Moreover, developing countries fear the developed countries will use their patent position and know-how to oligopolize the production of substitute products.

The developing countries were right in pressing for a fund and ultimately prevailed over Luddites on the White House staff. Nevertheless, it would be a tactical error for the developing countries to overplay their hand on this issue. They should not seek to use it to obtain additional concessions on matters unrelated to their concerns about the direct impact of a CFC ban on their development.[53] For reasons discussed more fully later, it would be a severe blow to the interests of both the developed and the developing countries if the North-South debates of the recent past were to continue, resulting in confrontations over this issue.

The international fund to help developing nations came about primarily because the Bush Administration suddenly reversed its stance on this issue. Prior to this decision, the U.S. had rejected an EC plan for a $100,000,000 fund, arguing that the World Bank could handle the need through existing programs. Observers roundly criticized that stance as insensitive to the developing countries' legitimate needs and cynical, given the World Bank's anti-environmental reputation. Moreover, the U.S.'s share would have been only $20,000,000, a trivial fraction of the several billion dollars in tax revenues the U.S. Treasury will receive from the new CFC tax.[54] Key factors in causing a reversal in the President's position change were lobbying efforts by U.S. chemical firms which reason that money can be made by producing new products to replace those regulated by the Montreal Protocol and by Secretary of State James Baker's warning that dogged resistance to a Third World Aid Fund was upsetting relations with European allies.[55]

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53. The Montreal Protocol contains a powerful sanction, ultimately requiring parties to forbid the importation of products containing CFCs or products produced through the use of CFCs, from non-Montreal Protocol parties which are not in compliance with the Montreal Protocol's provisions. Montreal Protocol, *supra* note 48, art. 4. Additionally, though conceptually simple, the efficient production of CFCs requires special equipment to handle extraordinarily toxic and corrosive fluorine gas. Export controls imposed by developed countries on CFC production equipment could render the indigenous production of CFCs risky and considerably more expensive.

54. *See supra* note 46.

55. Lauter, *supra* note 30. Sadly, the merits of the case for a fund, which were quite compelling, were reportedly not a significant factor in the change.

C. *Acid Deposition*

Europe and North America have recently experienced a widespread decline in the biological productivity of many lakes. Some lakes have become sterile, with fish and other life forms literally disappearing. The loss of functional lake ecosystems is the result of increasing acidity from rain and snow which have a low pH level.[56] In Europe, this "acid rain" is implicated in the wide-spread destruction of forest regions. While some scientific controversy on this point remains, the acidity of the precipitation on both continents is primarily the result of fossil fuel use, especially coal and oil. Upon combustion, fuels containing sulfur form sulfur dioxide, which, when combined with water, becomes sulfuric acid. High temperature combustion can also create various nitrogen oxides which form nitric acid. Researchers have collected rain samples in Canada and the Northeastern portions of the U.S. that have pH levels close to that of vinegar (pH of approximately 2.8).[57] Most aquatic organisms cannot reproduce in water that acidic; consequently the entire food chain of a lake or stream can be disrupted,[58] effectively rendering the water "dead."

While this explanation of the causes of acidification is generally accepted in the scientific community, its details are still the subject of controversy.[59] There is a lively debate, for example, as to how much of the natural buffering capacity of certain lakes has been used up.[60] (If largely exhausted, the situation could rapidly worsen.) Scientists also differ on how much of the acidifying agents are released by coal-fired power plants, and how much from more diffuse sources such as automobiles (which are harder to do anything about).[61] Finally, there is some uncertainty as to the amount of reduction in sulfur and nitrogen oxide emissions which will be needed in order to bring the problem back under control. This last

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56. On the pH scale (which reflects the concentration of hydrogen ions), 7.0 is neutral, and numbers below this figure are acidic. The scale is logarithmic, meaning that relatively small changes in the index number represent large shifts in relative acidity. FUNDAMENTALS, *supra* note 42, at 601-07.

57. *See Scientists Study Mountain Tree Deaths*, Proprietary to United Press Int'l, Aug. 10, 1986 (wire service).

58. Raloff, *Acid Rain: Lowdown on Health of Lakes*, 135 SCI. NEWS 311 (1989).

59. *See McMillan Highly Critical of U.S. Report, Calls It Scientifically Flawed, Misleading*, 11 Int'l Env't Rep. (BNA) No. 1, at 8-9 (Jan. 13, 1988).

60. Krug, *Fish Story: The Great Acid Rain Flimflam*, POL'Y REV., Spring 1990, at 44.

61. *Inventory of Sulfur Dioxide Emissions Issued*, 20 Env't Rep. (BNA) No. 34, at 1430 (Dec. 22, 1989).

issue is particularly important, as controls are going to involve multi-billion dollar costs, which are likely to be borne largely by the electric utilities and, ultimately, their rate-payers.[62]

Despite these uncertainties, the problem is similar to most other domestic pollution situations.[63] What makes acid deposition different from most domestic pollution issues is the very long distances from the source of the pollution to the point of impact.[64] As a result, acid deposition has become an international issue to a far greater degree than most other air and water pollution problems.[65]

To date, relatively little of a concrete nature has been accomplished internationally to combat acid precipitation. To be sure, an agreement was recently negotiated under the auspices of the U.N.'s Economic Commission for Europe (ECE),[66] in which the parties

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62. The overall cost of environmental compliance may be as high as $25 billion. Shabecoff, *Bush Presses Conferees to Accept Compromise on Clean Air*, N.Y. Times, Sept. 27, 1990, at B8, col. 1.

63. As with most domestic pollution problems, acid rain control involves judging potential tradeoffs between economic well-being and other interests such as the enjoyment of nature; balancing competing economic interests (power plants and their customers versus tourism, fishing, and forestry interests); and determining the optimal control strategy and technologies, the pace of change, and the allocation of financial responsibility for the required pollution abatement measures.

64. Ironically, in both North America and Western Europe, these long-range effects are largely the consequence of the installation of "tall stacks" in an earlier decade as a way of eliminating local effects of pollution from factories and power plants. Prevailing thought at the time believed these huge smoke-stacks eliminated the harm at a relatively low cost. As often happens, the solution to one problem simply became the cause of the next problem. It suggests strongly the undesirability of simply dispersing persistent pollutants as an environmental protection strategy, or of proceeding with any control strategies whose consequences are not understood.

65. Acid rain has been a major irritant, indeed, perhaps *the* major irritant, in recent U.S.-Canadian relations. *See Acid Rain Treaty*, *supra* note 9. However, the Bush Administration consistently supported a modification of the U.S. Clean Air Act that will bring about a 10 million ton per year reduction in the amount of sulfur dioxide emitted by the year 2000 and a 2 million ton reduction in nitrogen oxides. INSIDE EPA, June 16, 1989, at 7. Interestingly, in the U.S.-Canadian case, acidified precipitation flows across both borders. Most often, the pollutants have their origins in electric power plants located in the U.S. Midwest, precipitating out over Quebec, the Maritime Provinces, and the U.S. New England States. However, with other wind conditions, it can begin at power plants and smelters in Canada, particularly on the Niagara peninsula, and precipitate over New York, Pennsylvania, New Jersey, or New England. Acid precipitation has also been a political problem in Europe, where Germany, whose forests have been particularly severely hit, believes that the problem has its origins largely in the U.K., and, to a lesser extent, Ireland, France, and the Benelux countries. *See generally* G. WETSTONE & A. ROSENCRANZ, ACID RAIN IN EUROPE AND NORTH AMERICA 79-89 (1983) for an interesting but dated description. *See also CEGB to be Responsible for Compliance with new Targets to Reduce SO_2 Emissions*, 11 Int'l Env't Rep. (BNA) No. 7, at 389-90 (July 13, 1988).

66. 1 YEARBOOK OF INTERNATIONAL ORGANIZATIONS 1988/89 713-15 (25th ed. 1988) [here-

agreed to freeze nitrogen oxide emissions at 1987 levels by December 31, 1994.[67] Nitrogen oxide emissions pose health risks and are worth controlling for that reason. However, this agreement makes only a modest contribution toward that goal. Its contribution to the solution of the acid rain problem is more modest still. In Europe, the far more important but nettlesome issue of long-range transport of sulfur dioxide has not been resolved by the states concerned.[68]

In North America, the subject has been on the agenda of U.S.-Canadian negotiations for years. To an outside observer, the Canadians appeared to have the stronger arguments. To be sure, once fully implemented, the Clean Air Act (CAA) revisions will significantly reduce acid rain in Canada.[69] Also promising are the plans to negotiate a bilateral accord on transborder air pollution.[70] However, concrete U.S. steps before the Clean Air Act revisions consisted primarily of foot dragging, coupled with a modest amount of research on clean coal technology and an even more modest (commentators claim highly politicized) National Acid Precipitation Assessment Program (NAPAP).[71]

Ironically, the most useful measures actually implemented to date to control sulfur dioxide in North America have been between

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inafter YEARBOOK].

67. *See* Comment, *The Convention on Long-Range Transboundary Air Pollution: Meeting the Challenge of International Cooperation*, 30 HARV. INT'L L.J. 447, 473 (1989) (citing the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution Concerning the Control of Emissions of Nitrogen Oxides or Their Transboundary Fluxes, Oct. 31, 1988, 28 I.L.M. 212 (1989) [hereinafter Nitrogen Oxide Protocol]).

68. The ECE sponsored an earlier effort to agree on sulfur dioxide reductions, but several key countries, including the U.K. (which may be the single worst offender in Western Europe) refused to become a party. *See* Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent, July 8, 1985, 27 I.L.M. 707 (1988) [hereinafter Sulfur Dioxide Protocol]. For all practical purposes, until the British reverse their position, the Protocol is a virtual dead letter.

69. Clean Air Act of 1990, Pub. L. No. 101-549, §§ 401-416, 104 Stat. 2399 (1990).

70. The U.S. and Canada announced that negotiations of a formal air quality agreement between Canada and the U.S. will start Aug. 28, 1990, aiming for a framework to manage a wide range of transboundary pollution issues. The accord would require the development of coordinated research and monitoring programs and would put in place a joint dispute resolution mechanism. *US-Canada Air Quality Talk to Begin in August*, Proprietary to United Press Int'l, July 16, 1990 (wire service).

71. 42 U.S.C. §§ 8901-8912 (1988). Originally the NAPAP had a 10 year mandate to study acid rain. Yet, after eight years and $535 million spent on programs, the Bush Administration shut it down. Raloff, *Mapping the Benefits of Acid-Rain Controls*, 138 SCI. NEWS 165 (1990). The Congress, however, did not agree and ordered that the NAPAP be continued, with some modifications. *Id.*

the U.S. and Mexico. Concerned with the enormous amounts of sulfur dioxide expected to be emitted by the new Narozari copper smelter in Mexico and its potential impacts on the U.S. side of the border, the U.S. began to press the Mexican government to reduce emissions. To the considerable embarrassment of the U.S., the Mexican government pointed out that U.S. smelters, such as the one in Douglas, Arizona, often deposited excessively high levels of sulfur dioxide on Mexican territory.[72] These excessive emission levels were continuing because of a special legislative break Congress gave copper smelters,[73] coupled with shamefully inadequate enforcement actions. This story has a happy ending, however, for one offending U.S. smelter shut down its operations rather than undertake the expenditures to lower sulfur dioxide emissions, and the special congressional break lapsed. At the same time, the Mexican government agreed to lower the emissions from its smelter.[74]

Virtually nothing has been done elsewhere to curtail acid precipitation, because nations believe their level of development does not warrant action, they believe their country's geography does not require it, or they simply lack consciousness of the issue.[75] It will be interesting to see how the problem is handled as it becomes a political issue in other regions.

D. Pollution of the Marine Environment

The oceans constitute seventy-one percent of the world's surface.[76] Their vastness has led mankind to act as if the marine environment has an infinite capacity to absorb pollution, but that is

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72. The reader is left with the task of deciding whether American hectoring of other nations about matters on which the U.S. does not have clean hands is merely a bad habit or a congenital deformity of the national body politic. In any case, it is a common practice of the U.S. press, industry, public interest organizations, Congressional members and staff, and executive branch agencies to indulge in this classic double standard.

73. *See* 42 U.S.C. § 7419(b) (1988) (providing for the issuance of permits to those smelters that are unable to afford the cost of meeting sulfur dioxide emission limitations in applicable state plans).

74. *See* Morris, *U.S., Mexico Finally Agree to Cut Copper Smelter Pollution Along Arizona Border*, L.A. Daily J., Apr. 23, 1986, at 6, col. 1; *cf.* Agreement of Cooperation Between the U.S. and Mexico Regarding Transboundary Air Pollution Caused by Copper Smelters Along Their Common Border, Jan. 29, 1987, U.S.-Mexico, 26 I.L.M. 33 (1987).

75. This lack of consciousness does not mean there is no problem. For example, Africa has ozone pollution and acid rain at levels comparable to industrial countries, largely due to man-made fires. Simons, *High Ozone and Acid-Rain Levels Found Over African Rain Forests*, N.Y. Times, June 19, 1989, at A1, col. 1.

76. 20 ENCYCLOPEDIA AMERICANA 611 (1990).

certainly not the case for several classes of pollutants. The international community has made progress on some marine pollution problems, while others of potentially greater importance have been ignored.

1. Oil Spills

One problem which the world community has addressed is oil spills from tankers.[77] The matter is regulated extensively by domestic law,[78] and also by several international agreements.[79] Existing domestic and international law are both a blessing and a curse. These laws are at least partially to blame for the large number of spills, insofar as they place ceilings on ship owner liability.[80] If ship owners become liable for all the harm they cause, they would have a powerful incentive to shift to the use of vessels and operating practices inherently less likely to cause spills.[81] Unfortunately, adopting such a requirement will not entirely resolve the

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77. The risk of spills from oil exploration and exploitation are a major concern, raising many of the same issues as tanker spills. However, with a few exceptions, these raise domestic or bilateral issues, and will not be further discussed here.

78. There are a number of such provisions in U.S. law, including those at 33 U.S.C. § 407 (1988); 33 U.S.C. §§ 1251-1387 (1988); 33 U.S.C. §§ 1471-87 (1988); 33 U.S.C. §§ 1501-1524 (1988); and 33 U.S.C. §§ 1901-1912 (1988). In light of the *Exxon Valdez* incident, perhaps the best known is 43 U.S.C. § 1653(c)(3) (1988), which limits tanker owners' liability to $14,000,000 for spills incident to transport of oil from the Alaska pipeline, with certain exceptions, and limits the liability of the special fund created for such spills to $100,000,000. Needless to say, the Prince William Sound clean-up shows how trivial those limits are when compared with the damage a major spill can cause. *See infra* note 81.

79. *See, e.g.*, International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 9 I.L.M. 45 (1970); Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Dec. 18, 1971, 11 I.L.M. 284 (1972); 1990 Convention on Oil Pollution Preparedness, Response and Cooperation, [Reference File] Int'l Env't Rep. (BNA) Supp. No. 103, at 17 (Jan. 1991).

80. *See, e.g.*, 33 U.S.C. § 1321(f)(1) (1988) (setting a ceiling of $250,000 dollars in the case of oil or hazardous materials spill, absent full liability on other grounds); 33 U.S.C. § 1517(d) (1988) (limiting liability for discharge of oil in a deep water port to $20,000,000 or $150 per gross ton of the polluting vessel, whichever is lesser, except in cases of gross negligence or willful misconduct).

81. In response to the *Exxon Valdez* and other spills, Congress passed the Oil Pollution Act of 1990. Oil Pollution Act of 1990, Pub. L. No. 101-380, 104 Stat. 484 (1990). The Act, while not ideal from the perspective of forcing tanker operators to bear all the risks they throw on society, does increase the cap on liability to $10,000,000 dollars, with no cap in cases involving gross negligence or willful misconduct. Oil Pollution Act of 1990, §§ 1004 (a)(1)(B)(i) & (c)(1)(A). More significantly, the Act requires double hulls for tankers by the year 2010, and allows states to enact laws with even more stringent requirements with respect to liability. Oil Pollution Act of 1990, §§ 1018(c) & 3703(a). For a more thorough discussion, see Edelman, *The Oil Pollution Act of 1990*, N.Y.L.J., Sept. 7, 1990, at 3, col. 1.

problem, given the financial weakness of some tanker owners.[82]

A more far-reaching solution would be to borrow a concept from U.S. domestic law regulating hazardous waste treatment, storage, and disposal facilities, which imposes stringent "financial responsibility" requirements on the owners or operators of such facilities.[83] If states were to reach an international consensus that the owners, operators, and charterers of petroleum tankers (and perhaps other classes of ocean-going vessels) demonstrate similar financial responsibility before they could use the ports and cross the territorial waters of a state, the long-standing doctrine of the right of innocent passage may not become an issue. If several littoral states adopted this approach, it will be available for any clean-ups which become necessary and would provide the economically optimal incentive for safety and pollution prevention. Indeed, it would be far more effective and efficient if the principle were adopted internationally.[84]

2. Transport of Hazardous Materials

The safe transport of oil and other petroleum products is still well beyond our grasp, as evidenced by several spectacular spills over the past two decades.[85] Oddly, the international rules on the

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82. Some tanker owners and operators are undercapitalized. Others have acted to limit their liability by creating separate corporate entities for each ship they own or operate.

83. In order to obtain a license to operate a facility for the storage, treatment, or disposal of hazardous waste, the owner/operator must prove to the EPA's satisfaction that sufficient financial resources are available, should the facility subsequently be closed and require corrective action incident to its closure. 42 U.S.C. §§ 6924(a)(6) & (t) (1988).

84. Some progress on oil spills continues to be made by the international community. The International Maritime Organization (IMO) has agreed upon a draft convention for oil spill response worldwide (WLR 039/4), designed to promote the establishment of national response centers and to stockpile equipment and materials needed to cope with major spills. *See IMO Says Oil Pollution Convention Should be Ready for November 1990 Action*, 12 Int'l Env't Rep. (BNA) No. 11, at 531 (Nov. 8, 1989); 1990 Convention on Oil Pollution Preparedness, Response and Cooperation, *supra* note 79. While such actions are better than nothing, they are not a substitute for holding tanker owners and operators fully liable and requiring them to post adequate financial security. An international convention to that effect would guarantee rapid progress while avoiding the greater risks and costs to tanker operations if individual littoral states impose duplicative or even inconsistent requirements.

85. There is a separate question growing out of the Prince William Sound spill as to whether there should be better standards for tanker construction and equipment. Whether the best of today's tankers is good enough to provide the optimal level of environmental protection is a matter well beyond the author's area of expertise. However, it would be astonishing if all existing tankers are equally well constructed, equipped, and maintained. If some tankers are deficient, international minimum standards could be very helpful, provided they do not preempt the right of individual nations to require more. Congress must

ocean transportation of hazardous substances other than petroleum represent a quiet success for the international community. Working under the auspices of the IMO,[86] international standards for shipping containers, their storage aboard ship, and their labeling and manifesting have been established for a wide variety of hazardous materials. The IMO's work and similar work on the air transport of hazardous materials by the International Civil Aviation Organization (ICAO)[87] are sophisticated and well received. The IMO and ICAO recommendations are routinely accepted by the competent, national authorities in the U.S. and other countries.[88]

3. Plastic Pollution

A marine environmental issue of major concern is the growing amount of plastic debris. There are several sources of this plastic pollution. The largest source is the international fishing industry, which yearly looses untold thousands of kilometers of plastic net and monofilament line, as well as tens of thousands of plastic crustacean traps. Historically, the fishing industry carried out its activities with biodegradable materials whose loss posed no long-term environmental risk. After World War II, the industry shifted to nylon and other non-degradable polymers for nets and traps because of their durability, strength, and low cost. This trend coincided with a shift in fishing from small, often local activities to very large-scale operations involving huge nets, sophisticated fish-locating techniques, at-sea factory processing, and a world appetite which grew progressively more voracious even as over-fishing depleted many fishing grounds.

A particularly reckless and irresponsible part of this global fishing industry uses drift nets to catch its prey. These nets are often over fifty kilometers (thirty-one miles) long. Portions of them

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have thought the design of certain vessels was inadequate considering it passed the law requiring double hulls on those vessels. Oil Pollution Act of 1990, § 3703(a); *see supra* note 81 and accompanying text.

86. The IMO formerly went under the name International Maritime Consultative Organization (IMCO). The IMCO went into effect in 1958. Convention of the Intergovernmental Maritime Consultative Organization, Mar. 6, 1948, 9 U.S.T. 621, T.I.A.S. No. 4044, 289 U.N.T.S. 3. Currently over 125 nations belong to the IMO.

87. *See* YEARBOOK, *supra* note 66, at 57.

88. *See, e.g.*, 54 Fed. Reg. 954 (1989) (U.S. Department of Transportation adopts ICAO standards for the safe transport of dangerous goods by air); 50 Fed. Reg. 5781 (1985) (Panama Canal Commission proposes to adopt standards set forth in various IMO conventions).

are routinely lost. Because they do not degrade and because they are of neutral buoyancy, these "ghost nets" go on trapping fish, whose numbers are thereby depleted without providing benefit to anyone. These nets also trap marine mammals, turtles, and sea birds, some of which are endangered species.[89] According to one estimate, over 21,440,000 kilometers (13,292,800 miles) of drift net are used in the North Pacific annually, and 13,950 kilometers (8,649 miles) of that net are lost.[90] Even where the nets are not lost, their use can kill marine mammals.[91]

Most of the drift net problem is caused by fishing fleets from Japan, South Korea, and Taiwan. These nations have argued that drift nets are highly efficient and that it would be uneconomical for them to shift to the less environmentally harmful netting and hooking techniques used by other nations. This argument is flawed. Technologies which indiscriminately kill endangered species and remove from the global commons more fish than can adequately regenerate are not economically efficient.[92] They are rapacious. Use of drift nets is merely a "beggar thy neighbor" act, by which a few reap enormous gains at the expense of other nations. Worse yet, because these materials will not degrade for centuries,

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89. Such ghost nets are considered the most likely explanation for the continued decline of the North Pacific fur seals. North Pacific Fur Seal-Pribilof Island Population; Designation as Depleted, 51 Fed. Reg. 47,156, 47,159 (1986). In times past, these seals received some protection under the North Pacific Fur Seal Convention, whose stated purpose was to protect future exploitation by setting limits on present takings. *See* Interim Convention on Conservation of North Pacific Fur Seals, Feb. 9, 1957, 8 U.S.T. 2283, T.I.A.S. No. 3948, 314 U.N.T.S. 105, *as amended by* 15 U.S.T. 316, T.I.A.S. No. 5558 (1963); 27 U.S.T. 3371, T.I.A.S. No. 8368 (1976); 32 U.S.T. 5881, T.I.A.S. No. 10020 (1980). That Convention has now lapsed, and its revival faces stiff opposition from environmental groups. Greater protection of these seals and other pinnipeds is afforded by the operation of the U.S. Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1407 (1988). Despite a virtual end to all sealing, the North Pacific fur seals' numbers continue to decline. The ghost nets (and possibly also nets in active operation) have a particularly pernicious impact on the intelligent seals, which may be mistaking the long semi-translucent nets for kelp beds, their natural hunting grounds. Being naturally curious, they cannot avoid coming into contact with the nets, and sometimes become entangled and drown.

90. The NMFS estimate published in The Defenders of Wildlife Newsletter by its staff biologist, Dr. Al Manville (in press).

91. Nets in active use for tuna fishing in the eastern tropical Pacific continue to be the cause of the greatest marine mammal slaughter on earth. McCarthy, *Saving the Elephants: This Year's Cause*, Wash. Post, Aug. 19, 1989, at A19, col. 5.

92. Expressed in the terms of an economist, the viability of drift net use depends on uncompensated "externalities" (*i.e.*, drift net users throw costs, which the users should reasonably be expected to bear, onto others in international society). If current drift net fishers were required to compensate the international community for all the costs of their activities now and for the future costs of their lost nets, the practice would prove to be extremely uneconomical and would immediately cease.

if ever, the users of the nets also profit at the expense of future generations.

Fortunately, there has been progress in dealing with the drift net problem. The story is a good illustration of how changing international values can change the behavior of nations. In 1989, under growing criticism of its practices, South Korea announced its intention to forbid the use of drift nets in the South Pacific tuna fishery.[93] On December 22, 1989, the U.N. General Assembly adopted Resolution 44/225, sponsored by the U.S., Canada, and other states, calling for a ban on all drift net fishing in the South Pacific by 1991 and globally by 1992 unless ways can be found to prevent the harmful effects of drift net fishing.[94] Japan subsequently stated that it would go along with the ban in the South Pacific pending further research. Then, surprising many environmentalists, Japan announced it would halt drift netting in the South Pacific for the 1990-91 fishing season, a full year earlier than required by the U.N. Resolution. Japan's decision followed an announcement by three major U.S. tuna canners to sell only "dolphin free" tuna[95] and the capture of a dozen Japanese vessels in Soviet waters trying to disguise themselves as North Korean vessels.[96] Japan's decision came on the eve of the next meeting of the South Pacific Forum, with whom Japan's stance had become a major political irritant.[97] Initially, Taiwan refused to budge, but it has since told the South Pacific Nations it would not use drift nets for tuna fishing in the South Pacific next season.[98] Taiwan also agreed to allow U.S. observers on its drift net boats, which should provide

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93. *South Korean Efforts*, N.Y. Times, Sept. 23, 1989, at 22, col. 5.

94. *See* Egan, *New Evidence of Ecological Damage Brings a Call to Ban Drift-net fishing*, N.Y. Times, Nov. 14, 1989, at 24, col. 1; Scott, *Drift-net Fishing to be Banned in S. Pacific*, Christian Sci. Monitor, Jan. 10, 1990, at 6, col. 1.

95. Although the "dolphin free" requirement imposed by Starkist, Bumble Bee, and Van Camps will affect drift netters, it was aimed primarily at the practice of purse seining. *Tuna: A Tasty Order*, Miami Herald, Apr. 18, 1990, at 16A, col. 1. In purse seining, vessels exploit a unique symbiotic relationship in the South Pacific between yellowfin tuna and porpoises; for some unknown reason, tuna follow schools of porpoises. Purse seining vessels will surround schools of porpoises in order to capture the tuna underneath, drowning many porpoises in the process.

96. Jones, *Japan's Fishing Fleet Trims Sails*, Christian Sci. Monitor, July 25, 1990 at 4, col. 2.

97. *South Pacific Leaders Debate Chemical Weapons Plans*, Proprietary to United Press Int'l, July 29, 1990 (wire service).

98. *World in Brief; Japan: Fishing to be Suspended Early*, L.A. Times, July 18, 1990, at A9, col. 1.

some constraint against the most egregious behavior.[99]

The problem of drift net fishing is still not solved and action is urgently needed to prevent it in the North Pacific and other areas.[100] If necessary, the littoral nations should agree among themselves to forbid access to their ports and passage through their territorial waters, keeping in mind the doctrine of the right to innocent passage to avoid controversy, of any drift net fishing vessel unless the vessel in question can prove it is using only degradable materials.[101] The littoral nations should also refuse to import fish from non-cooperating nations and close their own fishing grounds to them.[102]

While the drift net problem has not been completely resolved, the progress recently achieved should not be taken lightly. It illustrates that a combination of changing global norms, good diplomacy, and tough domestic legislation can bring about significant reforms, even where there are powerful economic interests at stake.

Another area where the international community has made progress in curbing plastic pollution—with far more harmony and less fanfare—is prohibiting the discard of plastics from merchant

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99. *See* Lachica, *Taiwan to Let U.S. Check DriftNet Use in North Pacific*, Wall St. J., Aug. 28, 1989, at A6, col. 2.

100. The NMFS prohibits the use of drift nets for certain types of fish in the exclusive economic zone (EEZ). 55 Fed. Reg. 14,833 (1990) (final rule Apr. 19, 1990). Taiwanese drift nets, after presumably leaving the Pacific, are now appearing in the Atlantic Ocean. Stevens, *Large Drift Nets Move to Atlantic*, N.Y. Times, Aug. 14, 1990, at A1, col. 1. To keep the pressure on the Taiwanese drift net fishers in the South Pacific, Australia and New Zealand military aircraft will patrol the South Pacific during the fishing season in order to spot fishing boats using the "wall of death" nets. *Fighting Drift-Net Fishing*, Wall St. J., Nov. 5, 1990, at A11, col. 2.

101. Both Australia and New Zealand have announced they will refuse to refuel drift net fishing vessels. *Taiwan to Halt Drift-net Fishing Next Season*, Kyodo News Service, Feb. 21, 1990 (wire service).

102. The U.S. Senate recently voted to ban the use of drift nets more that one mile in length from U.S. waters and prohibited their use by American fishing fleets anywhere on the high seas. Gorman, *Senate Votes for U.S. Drift-net Ban*, Proprietary to United Press Int'l, Oct. 11, 1990 (wire service). United States law provides that the Secretary of Commerce may close U.S. fishing grounds to vessels which do not abide by restrictions of the Marine Mammal Protection Act. *See* 16 U.S.C. § 1824(12) (1988). Unfortunately, as more fishing grounds are closed to foreign fleets for other reasons, the threat of this sanction decreases. Nevertheless, if all nations closed their fishing grounds to offending nations, the pressure to halt the practice would be considerable. It might be argued that if they lacked official sanction, the drift net fishers would increase "pirate" fishing, as has happened with illegal whaling. The solution to that problem is the same one used to halt piracy and the slave trade: the naval ships of any nation should be free to seize or scuttle the vessel in question and place the officers and crew under arrest. In a rational world, an international agreement to that effect would be easy to reach.

marine vessels into any marine waters. Annex V of the MARPOL Convention has recently come into force.[103] It prohibits the disposal of various classes of garbage near coastlines. Consequently, vessel operators must insure that the garbage is incinerated at sea, transferred for disposal at port, or disposed of at greater distances from the shore, where there will be more time for the refuse to degrade. Of greater importance to the long-range well-being of the oceans, Annex V imposes a nearly absolute prohibition on the disposal of plastic substances anywhere at sea.[104]

While the success of Annex V will depend on vigorous national enforcement, the entry into force of the agreement is a salutary—if tardy—accomplishment. This positive step serves to help build the international consensus against further degradation of the marine environment and establishes binding requirements that few nations would have imposed unilaterally for fear of placing their shipping interests at a competitive disadvantage.[105]

4. Sensitive Marine Areas

Effective international environmental protection must address two marine environments of special concern: areas which are especially sensitive by their nature (such as estuaries, coral reefs, and breeding grounds) and areas which have been badly degraded and are thus in need of special remedial measures. As to the former, most action to protect estuaries and near-shore areas has been national, since sovereign states are armed with ample legal authority

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103. The International Convention for the Prevention of Pollution from Ships, Nov. 2, 1973, Annex V, 12 I.L.M. 1319, 1434 (1973) (codified at 33 U.S.C. §§ 1901-1912 (1988)) [hereinafter MARPOL Convention].

104. *Id.* at 1435. The dumping of plastic waste generated by a vessel is forbidden anywhere in the marine environment. The Annex does not address plastic waste generated on land and dumped at sea, nor does it regulate plastics which reach the sea from rivers, beaches, or other terrestrial sources.

105. In terms of national compliance, the U.S. has made a commendable beginning by passing implementing legislation which goes beyond the minimum requirements of the treaty in several important respects. *See* MARPOL Convention, *supra* note 103. The Coast Guard has also adopted stringent enforcement regulations. *See* 33 C.F.R. §§ 151.01-159.205 (1989). Another favorable development has been the unexpected willingness of the U.S. Navy, working with groups of environmental organizations under the umbrella of the Entanglement Coalition, to solve the problem posed by naval warships, which generally have little or no room for the storage of waste or the safe installation of incinerators. To deal with the situation, the Navy is investigating changing to degradable materials wherever possible and installing incinerators on supply ships so that unavoidable waste plastic can be transferred back during re-supply operations.

to protect their own shore lines from indigenous pollution. However, those aspects of Annex V of MARPOL which deal with garbage other than plastics are a useful international supplement to national authority in protecting shore regions. Little has been done to protect those uniquely valuable ocean environments which are not within a nation's territorial sea.

More has been accomplished in designating bodies of water requiring special remedial measures. The UNEP has a special Regional Seas Programme, under which it has designated eleven bodies of water (including the Mediterranean and the Caribbean Seas, both of which are in deplorable condition) as deserving of special attention.[106] The consequence of the designation is primarily to focus international attention on the problems of the designated body of water. Acting under UNEP auspices or, in a few cases, the auspices of regional organizations, an "action plan" is then developed and occasionally carried out.[107] Finally, there are some legal consequences flowing from the designation. For example, under Annex V, some classes of garbage cannot be released at all from a vessel into certain specially designated bodies of water.[108]

5. Pollution from On-Shore Sources

An aspect of marine environmental protection about which the international community has done too little is the protection of the oceans from terrestrial pollution. The London Dumping Convention[109] proscribes the offshore ocean disposal of various dangerous materials. Thus, it is illegal under the Convention to use the oceans for the disposal of radioactive wastes, as done in the past.[110] Nevertheless, there are serious weaknesses in the Convention. Far greater quantities of undesirable materials are dumped into the world's oceans than is generally considered prudent. While there may be a few cases where ocean disposal is the best alternative,[111]

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106. *See* YEARBOOK, *supra* note 66, at 709-10.

107. For a thorough, if somewhat uncritical, overview of the various regional efforts to control marine pollution, see Edwards, *Review of the Status of Implementation and Development of Regional Arrangements on Cooperation in Combating Marine Pollution*, in INTERNATIONAL ENVIRONMENTAL DIPLOMACY 229-72 (J.E. Carroll ed. 1988).

108. MARPOL Convention, *supra* note 103, at 1436.

109. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, 26 U.S.T. 2403, T.I.A.S. No. 8165, 1046 U.N.T.S. 120 [hereinafter London Dumping Convention].

110. *Id.* at 2465, T.I.A.S. No. 8165, at 62, 1046 U.N.T.S. at 203.

111. There is a body of opinion which holds that some ocean dumping is essential for a

the oceans should not be used for deliberate disposal of sewage sludge, garbage, medical waste, industrial waste, and contaminated soils. In addition to its adverse impact on aesthetics (a non-trivial consideration since the shore is often exceptionally valuable for tourism and recreation), ocean dumping can harm public health, fishing, and other important interests. Unfortunately, there is currently little international pressure to amend the London Dumping Convention to forbid such practices.

A separate problem is pollution of the marine environment by terrestrial sources such as industrial dischargers, sewage treatment plants, farm and mine run-off, and so forth.[112] This terrestrial pollution can result directly from discharges to marine waters, indirectly from the discharge of persistent pollutants to fresh water, or even from the air transport of pollutants.

Beyond question, the vastness of the oceans and their high oxygen content give the oceans a considerable capacity to absorb and destroy many pollutants. Certainly the open oceans are far more resilient than other bodies of water, such as rivers, lakes, estuaries, and bays. The oceans' absorptive capacities, however, are not without limits.

Untreated or inadequately treated sewage is a source of contamination in marine waters adjacent to both developed and developing countries.[113] Sewage has historically been thought of as a domestic issue on the theory that the sewage poses a threat to bathers and shellfish consumers in the country of release but generally not to persons in other countries, except in areas near international borders. Nevertheless, as international commerce in seafood continues to grow, consumers in one country will need greater

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few highly specialized circumstances. For example, in the case of dredged materials from shipping channels, there is often no satisfactory on-land alternative. Ocean disposal of dredged materials is clearly not good for the receiving environment. It may, however, be the least of all possible evils. The issue then becomes how to dump it while minimizing the adverse consequences by avoiding breeding grounds, shell fishing areas, and other sensitive spots.

112. For example, tourism in Italy suffered because a carpet of yellowish algae slime washed up on the shores of the Adriatic Sea. Scientists believe the slime is caused by farm run-off and sewage pollution of the Po River. *Italy Unveils Research Drive into Adriatic Sea Slime*, Reuter Library Report, Sept. 26, 1989 (wire service).

113. A new UNEP study reported serious health problems from the discharge of sewage, both to exposed bathers and from eating contaminated seafood, which can cause gastrointestinal diseases and infectious hepatitis. *see* Johnson, *Oceans Threatened by Development*, Proprietary to United Press Int'l, Mar. 20, 1990 (wire service) (discussing the State of the Marine Environment (UNEP Regional Seas Reports and Studies No. 115)).

assurance that the seafood they import from other countries does not carry diseases from sewage discharges.[114]

Toxic substances are another category of pollutant posing risks for the marine environment. Of primary concern are those toxic chemicals which are highly persistent (*i.e.*, resistant to degradation) or highly capable of bioconcentration,[115] and especially those which are both. Included in this last category are certain heavy metals and their organic compounds,[116] such as methylated mercury and organo-tin compounds. These can be toxic to aquatic organisms even in low concentrations of parts per trillion.[117] Also included are several non-degradable or very slowly degrading pesticides, such as DDT.[118] A few classes of industrial chemicals (*e.g.*, polychlorinated biphenyls or PCBs) and by-products from industrial production (*e.g.*, chlorinated dioxyns and dibenzofurans) also

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114. Domestic law commonly gives governmental authorities the power to preclude the importation and sale of tainted fish and shellfish. However, inspection and testing resources are so limited as to make it better practice to establish that the seafood was not taken from tainted waters. There are no international conventions which assure this outcome.

115. Bioconcentration is a process by which substances enter into aquatic organisms through the gills or by ingestion. The aquatic organism, over time, builds up a higher concentration of the foreign substance within its flesh than is present in the surrounding water. *See* Tharpes, *International Environmental Law: Turning the Tide on Marine Pollution*, 20 U. MIAMI INTER-AM. L. REV. 579, 587 n.48 (1989).

116. Toxic metals present a particularly severe disposal problem, since they are elements and cannot be destroyed. However, they can be isolated or transformed into relatively less toxic forms.

117. Mercury, in addition to causing serious adverse human health effects, is considered a potential toxic risk to aquatic organisms in saline waters in concentrations above 25 parts per trillion. Ambient Water Quality Criteria Document, 1984 (Mercury), EPA 440/5-84-026 (Jan. 1985). Organic compounds of tin, such as tributyl-tin (TBT), are used in paints on ocean going vessels to prevent a build-up of barnacles. Tributyl-tin is toxic to fish at 0.2 parts per billion (ppb); bivalves at 0.02 to 0.05 ppb; gastropods at 0.05 ppb; crustaceans at 0.14 to 0.19 ppb; and algae at 0.1 to 2.5 ppb. Scientists have found at least 30 sites in the U.S. with TBT concentrations of 0.02 ppb or above. *See* 53 Fed. Reg. 39,025 (1988).

118. Dichloro-diphenyl-trichloro-ethane was once used worldwide as a broad spectrum insecticide and is still used in some developing countries. Originally thought to be non-toxic to humans, it is now considered a carcinogen. Dichloro-diphenyl-trichloro-ethane is unusually capable of bioconcentrating. Organisms can build the level of DDT in their bodies to amounts much higher than the levels to which they were exposed. In the case of DDT, this is particularly severe, because it goes through many steps in the food chain, with its concentration increasing greatly at each step. Graham, *DDT Is Alive and Well*, AUDUBON, Nov. 1984, at 36. The end result in the U.S. was concentrations of DDT in eagles, falcons, and other birds of prey which were so high as to interfere with their reproduction. Peregrine falcons and bald eagles were threatened with extinction because of the use of DDT. Dichloro-diphenyl-trichloro-ethane itself will degrade slowly, but its degradation products (metabolites) are themselves highly toxic and capable of bioconcentrating. Researchers have found DDT and its metabolites virtually everywhere, including trace quantities in the tissues of all humans.

meet the three critical tests of being toxic, highly persistent, and capable of bioconcentrating to a high degree. Their release *anywhere* could pose risks to human health and the environment at very great distances from the point of release.[119]

We need an international agreement that prohibits the manufacture, use, and release of such substances, whether heavy metals, pesticides, or industrial chemicals. Where this is not feasible, the convention should alternatively establish use restrictions and disposal practices which minimize the risk that the substances would build-up globally. To date, there has been virtually no progress on this score.[120] Indeed, scientists are conducting relatively little research as to what substances are building up in the global environment.

E. Deforestation and Desertification

Overpopulation has combined with poor forestry and agricultural practices to bring about major changes in the global landscape, virtually always for the worse. Massive losses of timbered areas to agriculture and commercial logging, subsistence scavenging for firewood, and conversion of farm and pasture lands into desert are currently taking place.

The loss of tropical rain forest is especially severe in the Amazon Basin and in Southeast Asia. Clearing land for agriculture and commercial logging are the primary culprits.[121] Slash-and-burn agriculture presents a particularly problematic issue in tropical rain forests such as the Amazon for three reasons. First, these lands often provide invaluable habitat. If lost, numerous species will be-

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119. Of course, such substances are most likely to be of concern to the state which uses and releases them, since its citizens and the environment within its borders are the most likely victims. Nevertheless, these substances can be transported to other locations, bringing about adverse effects in foreign countries, thereby making their release a proper matter of international concern.

120. The Convention for the Prevention of Marine Pollution from Land-Based Sources, Feb. 21, 1974, 13 I.L.M. 352 (1974), recognizes the criteria of persistence, toxicity, and tendency to bioconcentrate as particularly important. Unfortunately, only twelve European countries and the EC are parties to the Convention. Additionally, its geographic coverage is limited to the northeastern part of the Atlantic. While the Convention has done useful work on mercury and cadmium, it is otherwise a dead letter. Largely hortatory and ineffective, this Convention is emphatically not a model for a global agreement.

121. Clearing for large-scale ranching is the primary cause of deforestation in some tropical countries. *See* Venant, *Drama in the Amazon*, L.A. Times, Oct. 29, 1989, at E1, col. 2.

come extinct or endangered. Second, since tropical rain forests make a vital contribution to the removal of carbon dioxide from the atmosphere, their loss exacerbates the global warming problem. Third, the burning of the cleared vegetation adds to the amount of atmospheric carbon dioxide.

On the other hand, slash-and-burn agriculture rarely makes a sustainable contribution to economic growth. The cleared timber, though often valuable, is frequently not harvested because of inadequate equipment and transportation. Moreover, soils in tropical rain forests are typically poor, and use of the land to raise crops quickly depletes the soil. Frequently, the land is abandoned after approximately five years and reverts slowly back to jungle.[122] Without human assistance, the land cannot become productive rain forest again for decades.[123]

Although the trade-off between economic benefit and environmental protection is exceptionally poor even in the short run,[124] halting slash-and-burn agriculture will be very difficult. The farmers in question often have no money or possessions, and thus nothing to lose and something to gain. Most often they are squatters, clearing a space on public land or large estates on which to scratch out a living. Their conduct is thus already illegal. Use of more repressive methods to prevent their activities will greatly increase

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122. *See* Ware, *Sucres or Cecropias*, AUDUBON, Jan. 1985, at 30.

123. The situation is even worse when cleared land has been used for large-scale pasture land. Once abandoned, the land may take centuries to become tropical rainforest again unless there is human intervention. For a discussion of the problems and the potential for reforestation, see D. Nepstad, C. Uhl, & E. Serrão, *Surmounting Barriers to Forest Regeneration in Abandoned, Highly Degraded Pastures: A Case Study from Paragominas, Pará, Brazil*, in ALTERNATIVES TO DEFORESTATION 215 (A.B. Anderson ed. 1990).

124. It is chic in some circles in developed countries to reject the concept of a trade-off between economic growth and protection of the environment. Even in these countries, trade-offs cannot be avoided, but often the conflict is not particularly severe, and environmental and economic interests can readily coexist. Annual expenditures for environmental protection in developed countries, while enormous, are still a very small fraction of their gross national products (GNPs). These costs are partially recovered by tangible benefits of environmental protection, particularly medical expenses avoided and lost work time forgone. Intangible benefits to the quality of life more than justify these modest net costs.

The balance may be quite different in developing countries. The funds available for the environment are limited and the same level of environmental expenditures would constitute a dramatically higher percentage of the GNP. Moreover, some of the genuine benefits of environmental measures in the developed countries may be less compelling in the context of a developing country. For example, a developing country with a low average life expectancy might conclude that reducing the incidence of cancer from environmental exposure is a relatively low priority if expenditures on agricultural production, population control, or disease eradication would save more lives than would expending the same amount to reduce exposure to carcinogens.

human suffering. Quick solutions do not exist. In the long run, halting population growth and providing greater economic opportunities elsewhere in these societies will help. Yet, these are already key goals of most developing countries, the attainment of which they often find elusive.

Logging of tropical hardwoods is the primary cause of deforestation in Southeast Asia and is an important problem in the Amazon. Demand from developed countries makes tropical hardwood logging profitable.[125] Two aspects of the logging problem merit special mention. First, the international financial institutions were—and to some extent still are—a part of the problem, rather than a part of the solution. They have financed logging operations or the infrastructure for logging, with little or no prior assessment of the immediate and long-range environmental effects. They have generally not required the recipient countries to lessen the environmental impact during timbering operations, nor have they required scientific replanting as a condition of assistance.[126] The World Bank has been the target of widespread criticism for its environmental failures. In response to the resulting pressure from Western governments, the IBRD created an Environment Department.[127] Its efforts to date have gotten mixed reviews.[128] On the other hand, the record of the Asian Development Bank[129] and the Inter-American Development Bank[130] in accelerating the loss of tropical rain forests may be even worse than that of the World Bank (whose failures have been greater in the areas of industry, mining, and energy projects). These regional banks have done nothing of note to remedy the situation and are important causes of global environmental degradation.[131] Having said that, the recipient governments have also done very little to minimize adverse impacts and assure adequate replanting, a failure they cannot blame entirely on market demand or imprudent lending by the in-

125. In contrast to slash-and-burn agriculture, logging at least presents short-term economic benefits. *See* Booth, *Saving Rain Forests by Using Them: Long-Term Harvesting of Amazon Yields More Profit, Experts Say*, Wash. Post, June 29, 1989, at A1, col. 2.

126. *See* Grieves, *Poverty as Pollution*, FORBES, Nov. 14, 1988, at 204.

127. *See* Holden, *World Bank Launches New Environmental Policy*, 236 SCIENCE 769 (1987).

128. *See, e.g.*, Schwartz, *Global Warming Singes World Bank*, Wash. Post, Sept. 12, 1989, at A26, col. 1.

129. See YEARBOOK, *supra* note 66, at 811.

130. *Id.* at 853.

131. *See, e.g., Bank Balance: Economy and Ecology*, 132 SCI. NEWS 238 (1987).

ternational financial institutions.[132]

Deforestation in the rest of Asia and in Africa has some of the same causes, but is characterized primarily by the gathering of wood for fuel. Real progress on this problem will be difficult, given ever rising population pressures. As with the problem of slash-and-burn agriculture, the "perpetrators" are often among the planet's most impoverished people, who need wood for building, cooking, and heating—in short, for their literal survival. They will not halt the cutting of trees so as to benefit future generations or to avoid global warming. Nevertheless, the situation is not hopeless, given enough international political will.[133] For example, pilot programs in Nepal[134] (which has a particularly severe deforestation problem) and Kenya[135] have demonstrated that even very poor people will take an active role in replanting and preserving trees if conditions are favorable for them to do so. Specifically, they need an ownership interest in the trees, adequate technical and financial assistance, and an alternative source of fuel for a period of years while the trees grow. India, for example, has invented more efficient wood stoves which can be built at prices affordable in the Third World.[136] Because nearly all the heat value from wood heating and cooking stoves currently used throughout the developing world is wasted, widespread use of more efficient stoves would bring about sharp reductions in the demand for wood.[137]

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132. There are, of course, U.S. and European environmental organizations which would like to see all timbering operations in the tropics halted. They are correct in pointing out that there are significant differences between tropical and temperate forests, the former being far more important as habitats. Moreover, because of their greater rate of growth, tropical rain forests are more important for the removal of carbon dioxide from the atmosphere. Nevertheless, the implicit premise that developed nations can continue to obtain economic benefits from their forests but developing countries cannot is politically unpalatable to developing countries.

133. *See* Grieves, *supra* note 126.

134. *See* Claiborne, *Erosion Is Laying Waste to Life in Shadow of the Himalayas*, Wash. Post, July 18, 1983, at A15, col. 1.

135. The Green Belt Movement began in Kenya during 1977. For every tree that survives more than three months outside the nursery, the woman who planted it receives 50 Kenya cents (approximately 2.5 American cents). More than 10 million indigenous trees have been planted and the movement has spread to more than 30 other African countries. Perlez, *Skyscraper's Foe Draws a Daily Dose of Scorn*, N.Y. Times, Dec. 6, 1989 at 6, col. 1.

136. *See* Dutt, *India: Popularizing a Smokeless Stove that Could Spare Forests*, Inter Press Service, Jan. 7, 1986 (wire service).

137. *See Energy: A New Era*, Am. Banker, Oct. 7, 1981, at 23; Brooke, *Some Gains in West Africa's War on the Desert*, N.Y. Times, Sept. 13, 1987, at 22, col. 2 (Burkina Faso, which deforests 230 square miles per year but replants about 85 square miles per year, now actively promotes energy-efficient stoves).

An equally tragic problem is desertification, the conversion of productive crop and pasture land to non-productive desert. The U.N. estimates that .96 million hectares (2.4 million acres) of productive land are lost each year.[138] There are many causes including long-term climatic changes.[139] A key contemporary cause is overgrazing, particularly in the Sahel region of Africa.[140] The victims of desertification are also the perpetrators: nomadic tribes, sometimes turned villagers, eking out a marginal existence during the best of times. Twice in less than two decades there has been a major drought in the Sahel,[141] leading to extensive and expensive rescue efforts on the part of more fortunate nations to halt widespread starvation. Yet, with reduced pasture land, each family has a strong incentive in better years to increase the size of its herd, which brings about further desertification.[142]

There are plant species which effectively hold moisture, and their widespread planting and a period of respite from grazing might actually reverse the trend, reclaiming useful land from the desert. However, it is difficult to see how such a program could be carried out on a sufficient scale without massive resources, which the Sahelian nations lack.[143] Such resources seem unlikely to be forthcoming: to date generous Western publics and their governments have opened up their hearts and pocket-books to alleviate starvation, but not to prevent its causes.[144] Additionally, political strife, including wars or insurrections in or involving Mali, Mauri-

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138. Spotts, *10 Years Later: No Plan to Halt Spreading Deserts*, Christian Sci. Monitor, Feb. 25, 1987, at 3, col. 1.

139. For example, much of the existing Sahara desert was arable land two thousand years ago. *See* A. GRAINGER, DESERTIFICATION 37 (1982).

140. The Sahel is a region south of the Sahara desert but north of the coastal jungles of West Africa, running in a band from Mauritania and Mali on the West Coast of the Atlantic eastward to Ethiopia and Somalia on the Red Sea. The worst desertification problem may be in Mauritania, where the desert advances about six kilometers (3.72 miles) a year. Blackburn, *Death of a Culture?*, Christian Sci. Monitor, June 9, 1987, at 24, col. 1.

141. *Variations on a Pacific Theme*, 131 SCI. NEWS 377 (1987).

142. *Cf.* Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1244, 1244-45 (1968).

143. It is possible that genetic engineering will allow development of drought resistant crops which can thrive in low-moisture regions like the Sahel. *Bioengineers' Quest: Drought-Safe Plants*, Wash. Post, July 23, 1990, at A3, col. 1. Whether these will be successful without creating serious side effects, and affordable by Sahelian nations remains to be seen.

144. *See* A. GRAINGER, *supra* note 139, at 39-52. In 1977, 94 nations met in Nairobi, under UNEP auspices, and agreed to an ambitious plan to halt desertification by the end of the century. The results are mixed. Certainly, far more land has been lost than reclaimed in the past decade. *See, e.g.*, Brooks, *New Famine Sweeps Ethiopia as Civil War Keeps Taking its Toll*, Wall St. J., Jan. 17, 1990, at A1, col. 1.

tania, Burkino Faso, Chad, the Sudan, Ethiopia, and Somalia have made the environmental problems dramatically worse.[145]

F. Protection of Endangered and Threatened Species

Lacking fangs, horns, and claws, humans might not have seemed a likely candidate for ascendancy over other species a million years ago, or even 10,000 years ago. Yet we long ago reached the point where most animals pose no threat to us, and those which still do are microbes and vermin, not ferocious beasts. Today our own numbers and activities have become a threat to many species.[146]

In the past two centuries, species commonly disappeared by reason of over-hunting and over-fishing. More recently, pollution and destruction of habitat have become the primary causes of species extinction. It is no exaggeration to say that we have become (if we were not all along) the stewards of the planet, with the capacity and the obligation to determine whether our fellow creatures survive.[147] Of course, there are homocentrics who believe the measure of any action is its impact on our own species. For them, there are ample utilitarian bases for concern over widespread further loss of species, many of which may prove useful to our well-being or even essential to our survival.[148]

1. The Convention on the International Trade in Endangered Species of Wild Fauna and Flora

Governments that want to protect endangered species have learned that preventing poaching is impossible unless the market for them dries up. To that end, world governments concluded the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES),[149] which forbids international

145. *See, e.g.*, Brooks, *supra* note 144.

146. *See, e.g.*, White, *The Historical Roots of Our Ecological Crisis*, 155 SCIENCE 1203 (1967).

147. *See* A. LEOPOLD, A SAND COUNTRY ALMANAC (1974).

148. To cite but one example, genetic diversity assures us the capacity to adjust to climate change, such as might be brought on by global warming. For any given set of conditions, there is a plethora of species which could fill the ecological niches brought on by change. It has taken millions of years to build up this vast genetic pool; we are fools if we throw it away.

149. Convention on the International Trade in Endangered Species of Wild Fauna and Flora, Mar. 3, 1973, 27 U.S.T. 1087, T.I.A.S. No. 8249, 993 U.N.T.S. 243 [hereinafter CITES].

commerce in endangered species or products from them.[150]

While CITES is invaluable,[151] its procedures for designating species as endangered are cumbersome. There is no international investigative force which could aid in locating and exposing violations, and membership in CITES is not universal.[152]

Even among the CITES parties, the willingness and resources necessary to engage in vigorous enforcement vary considerably. Enthusiasm is greatest in those developing countries which recognize that the protection of certain large game species serves to enhance tourism and among the conservation-conscious public of some developed countries, especially in North America and Northern Europe.

The case of the African elephant shows that, under the right circumstances, real international progress is possible. Widespread publicity on the plight of the African elephant, coupled with some adept diplomacy, led CITES to list that species as endangered. The listing alone would not have been enough, but combined with the action of several nations to halt ivory imports[153] and the courageous efforts of the Kenyan government to battle poaching,[154]

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150. For a recent and very thorough discussion of CITES, see D. FAVRE, INTERNATIONAL TRADE IN ENDANGERED SPECIES: A GUIDE TO CITES (1989).

151. CITES is not the only international agreement whose purpose is to protect terrestrial species from excessive exploitation. *See, e.g.*, Convention on the Conservation of Migratory Species of Wild Animals, June 23, 1979, 19 I.L.M. 15. Bilateral and multilateral agreements to protect waterfowl, such as the U.S.-Canadian agreement, were among the first uses of international law to aid conservation. Convention for the Protection of Migratory Birds in United States and Canada, Aug. 16, 1916, United States-Canada, 39 Stat. 1702, T.S. No. 628. The 1902 European Convention concerning the Conservation of Birds Useful to Agriculture was apparently the first such agreement at the multilateral level. *See* L.K. Caldwell, *Beyond Environmental Diplomacy*, in INTERNATIONAL ENVIRONMENTAL DIPLOMACY 17-18 (J.E. Carroll ed. 1988).

152. Mexico is a particularly unfortunate holdout from membership, as it is responsible for the harvesting of many endangered sea turtles. Hair, *U.S. Leverage Can Halt Destruction of Sea Turtles*, San Francisco Chron., May 29, 1990, at A19, col. 1. However, some sources conclude the Mexicans have done a good job of protecting the turtle nesting grounds at Rancho Nuevo. Abramson, *Shrimp Boats Kills 44,000 Turtles, Scientists Say*, L.A. Times, May 18, 1990, at A20, col. 1.

153. *See* Perlez, *Ivory Trade Is Banned To Save the Elephant*, N.Y. Times, Oct. 17, 1989, at C13, col. 2. China recently announced that it will join the worldwide ban on the trade of ivory next January. Since Hong Kong's reservation from CITES lapsed in mid-July, China has been the only country officially permitting the import of ivory. McCarthy, *China Closes Last Ivory Loophole*, Times (London), Sept. 6, 1990, at 24, col. 4. The price of ivory in East Africa has plummeted since the trading ban went into effect. *Id.*

154. *See* Henry, *Kenya Burns Tusks To Dramatize Effort To Wipe Out Ivory Trade*, Wash. Post, July 19, 1989, at A19, col. 1. Kenya burned tons of captured ivory and issued

there is greater cause for optimism than many would have predicted only three years ago. One can only hope that this success will stimulate even greater international efforts to strengthen the protection of endangered species through CITES.[155]

2. Habitat Protection

Efforts to protect endangered species have also taken the form of preserving unique habitats. In contrast to fighting deforestation generally, international efforts to preserve the habitats of specific endangered species have been successful in several important cases, even though the rate of extinction has been rapidly increasing. Perhaps the best known of these efforts has been the World Wildlife Fund's (WWF) Project Panda, created to preserve the forest habitat of the Great Pandas.[156] Also of note have been the efforts of the African Wildlife Foundation and the WWF to preserve the home ranges of gorillas and chimps.[157]

Despite these individual successes, unless the protection of particular species becomes a far higher priority for the international community, many more species will be lost.[158] Governments need to acknowledge their obligation to preserve critical habitats, and developed countries must agree to make the resources available to less wealthy governments. Even then, acceleration of the loss of specific endangered species may be inevitable because of severe human population pressures in the vicinity of many critical habitats.

"shoot to kill" orders to combat well-armed poachers. For a discussion of conservation and preventive efforts in Africa, see Jones, *Farewell to Africa*, AUDUBON, Sept. 1990, at 49.

155. Some environmentalists fear that the ban on elephant ivory will increase demand for walrus tasks, endangering that species, unless it is also included in the ban. Cousteau, *Ivory Hunters Raise Sights at The Eskimo and the Walrus*, Miami Herald, Oct. 1, 1989, at 3C, col. 4. The U.S. Fish and Wildlife Forensics Laboratory is currently investigating who may have killed and mutilated hundreds of walruses in Alaska. It is thought that some Eskimos sold the raw ivory. Knickerbocker, *On the Trail of Wildlife Crime*, Christian Sci. Monitor, Sept. 11, 1990, at 12, col. 2.

156. *See* Miller, *The Perils of Pandas: Where Has all the Bamboo Gone?*, 125 SCI. NEWS 52 (1984).

157. *See* McBee, *Great Apes Get New Lease on Life*, U.S. NEWS & WORLD REP., June 9, 1986, at 74.

158. A number of nations have engaged in purely domestic efforts to preserve unique environments, such as the efforts of the Indian government to preserve the last remaining domestic habitats of the Bengal tiger and three species of crocodile. *See Saving India's Wildlife*, FUTURIST, Jan.-Feb. 1986, at 43-44.

3. Marine Mammal Protection

Different issues are raised by efforts to protect marine mammals. While the preservation of species from extinction *per se* is still the primary goal, some organizations pressing for the preservation of whales and other cetaceans wish to prevent killing individuals of the species even where the species is not endangered or threatened. The reasoning, to the extent it is articulated, is partly ethical—since the marine mammals as a class are very intelligent, it is inappropriate to kill them.[159] Whatever the motives, international legal protection of marine mammals, while incomplete, has gone much further than the international protection of most terrestrial animals. Important among these efforts is the work of the International Whaling Commission (IWC),[160] which sets limits on the taking of whales. The original purpose of the IWC was to foster whaling by preventing short-term over-whaling. By the 1970s, the IWC shifted to a more preservationist stance. Nevertheless, these efforts have been only partially successful, largely because of the attitude of the Japanese government, which has tried to maintain an economically marginal whaling industry by all possible means, including a fraudulent "research whaling" program.[161]

The Law of the Sea Convention also contained a very helpful provision on whaling.[162] However, invoking the Convention has

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159. Others concerned about whaling oppose killing non-endangered species on the pragmatic grounds that only a categorical ban can be enforced; and, if non-endangered species are allowed to be taken, then, in practice, other species which are threatened or endangered will be taken as well.

160. For a brief overview of the IWC and its activities, see Synopsis, *Recent Developments in the Law of the Sea 1984-1985*, 23 SAN DIEGO L. REV. 701, n.94 (1986).

161. *See* Conrad, *Save the Whales! Japan Would Kill Hundreds of them for "Research,"* Wash. Post, Jan. 12, 1988, at A21, col. 1. Japan is by far the least protective nation on whaling issues (as on many other international environmental matters), but the list of generally unhelpful nations includes Iceland, Norway and, in the recent past, the Soviet Union. In addition, there is some "pirate" whaling, most of it out of Taiwan. These ships do not have the official sanction of their government (though it strains credulity that they could operate without at least tacit governmental support). As discussed *supra* note 102, their activities should be treated the same as would be accorded pirates (*i.e.*, any naval vessel of any nation should be free to bring their activities to a halt).

162. One of the author's colleagues relates that while the Law of the Sea Convention was under negotiation, Ambassador Elliot Richardson, then head of the U.S. Delegation, became interested in the plight of whales and put considerable efforts into obtaining international agreement on what became Article 65. United Nations Convention on the Law of the Sea, Dec. 10, 1982, art. 65, 21 I.L.M. 1261, 1282 (1982). When agreement was finally reached, Richardson called a news conference to announce the accomplishment, of which he was justifiably proud. The senior international reporter for one of the major U.S. newspapers, upon hearing what had been agreed, exclaimed: "Oh Elliot! Is that all? Nobody gives a

been hampered by the decision of the U.S. (which was the driving force behind the provision) not to accede to the Convention.

To date, legal measures to protect marine mammals other than whales, such as porpoises and seals, have been accomplished largely under domestic law. For example, the NMFS refuses to allow the importation of tuna unless the tuna are taken under circumstances which prevent widespread killing of porpoises.[163] While many tuna fleets have cooperated with the U.S. rather than lose the right to export to the U.S. market,[164] an international agreement to minimize the incidental taking of porpoises would greatly improve the situation. Similarly, the Marine Mammal Protection Act[165] has considerably reduced the taking of some classes of pinnipeds,[166] but international protection would be far more desirable.[167]

4. Preserving Genetic Diversity

In theory, there is no difference between the preservation of genetic diversity and the preservation of endangered species. In practice, there are important differences in outlook, method, and emphasis. The protection of endangered species has focused on preventing the extirpation of specific species, especially very large mammals and other species which are exotic, magnificent, or cute and whose demise would be an emotional loss. The focus on genetic diversity, in contrast, begins with the premise that nature has developed an extraordinary array of combinations of genetic material, which should be preserved for ethical reasons and because many species or their individual genes have extraordinary utility for crops, pharmaceuticals, and other purposes. The species of in-

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damn about whales." It is a measure of rapid changes in international consciousness that a similar reaction today would be highly unlikely.

163. *See, e.g.*, 53 Fed. Reg. 39,743 (1988), action by the NMFS barring the importation of yellowfin tuna from Ecuador, Panama, Vanuatu, and Venezuela.

164. The U.S. government's efforts were greatly strengthened when three major U.S. tuna canners announced they will accept only "dolphin free" tuna. *See supra* note 93.

165. *See supra* note 87.

166. Pinnipeds include seals, sea lions, and walruses. 22 ENCYCLOPEDIA AMERICANA 118 (1990).

167. Existing international law has provided some protection, such as the listing of some manatees and seals under CITES. *See* CITES, *supra* note 149, 27 U.S.T. at 1122, T.I.A.S. No. 8249, at 35, 993 U.N.T.S. at 259. Seals and porpoises also benefit from the recent Annex V ban on marine dumping of plastics from vessels. *See* MARPOL Convention, *supra* note 103. *See also* the discussion of drift nets, *supra* notes 89-102 and accompanying text.

terest from this perspective are often plants, but also include fungi, insects, and other unlovable organisms.

Habitat preservation is the primary solution to this problem.[168] Certain tropical rain forests are particularly important because of the extraordinary genetic diversity they contain and the many unique species that have established ecological niches in those habitats. Unfortunately, the Brazilian government has taken offense at some of the external pressures which have been brought to bear upon the government to preserve rainforests in the Amazon basin. This was a predictable reaction and one which could probably have been avoided with a modicum of diplomacy and tact. Brazilian feeling was so strong on this issue that the Brazilian government sought and obtained a resolution of the parties to the 1978 Amazon Pact Treaty[169] condemning the "interference."[170] Meanwhile, other governments have done far more to preserve unique tropical environments, including some countries in a much less favorable economic and financial position to do so than Brazil.[171]

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168. In addition, efforts of zoos and seed-banks to preserve genetic material for the future could be seen as a part of the overall approach. *See* Shell, *Seeds in the Bank Could Stave Off Disaster on the Farm*, SMITHSONIAN, Jan. 1990, at 94; *see also* Note, *Genetic Ark: A Proposal to Preserve Genetic Diversity for Future Generations*, 40 STAN. L. REV. 279 (1987).

169. Treaty for Amazonian Cooperation, July 3, 1978, 17 I.L.M. 1045 (1978).

170. *See It's Our Forest To Burn if We Want To*, ECONOMIST, Mar. 11, 1989, at 42 [hereinafter *It's Our Forest*]. This is not to suggest that there is merit to the charges of several Brazilian politicians that the effort to halt the destruction of the forests is an international plot to steal Brazilian resources. *See* Simons, *Brazil, Smarting from the Outcry over the Amazon, Charges Foreign Plot*, N.Y. Times, Mar. 23, 1989, at A14, col. 1. Nevertheless, it was the silliest kind of political naivete on the part of the U.S., French, and other critics of the Brazilian government not to have anticipated a xenophobic reaction. Many Brazilians are engaged in a rapidly growing indigenous effort to protect the environment. They have made progress despite the clumsiness of their foreign "friends." Furthermore, several of the problems Brazilian environmentalists face are not susceptible to easy resolution, as can be seen by the killing of Francisco Mendes, a leading Brazilian environmentalist and Indian rights spokesman, apparently at the hands of ranching interests. *See It's Our Forest*, *supra*.

171. Rwanda, one of the smallest and poorest countries in Africa, has set aside literally 10 percent of its land as a national park, in order to preserve a unique ecosystem. *See* Perlez, *Wildlife Park Seeks New Species: Tame Tourists*, N.Y. Times, Dec. 28, 1988, at A4, col. 2. Another example of far-sighted leadership is Costa Rica whose Guanacaste park preserves numerous unique species. *See* Holden, *Regrowing a Dry Tropical Forest*, 234 SCIENCE 809 (1986). In a few cases, debt swaps have been used to support or establish wildlife preserves. For example, the WWF purchased, at a substantial discount, one million dollars of Ecuador's foreign debt held by commercial lenders. The debt was converted by the Central Bank of Ecuador into local currency bonds held by Fundacion Natura, Ecuador's leading private conservation organization. *See $1 Million Debt-For-Nature Swap Accord with Ecuador Made by World Wildlife Fund*, 11 Int'l Env't Rep. (BNA) No. 1, at 31 (Jan. 13,

G. International Commerce in Pesticides, Toxic Materials, and Hazardous Waste

1. Pesticides

A particularly contentious issue, split largely along North-South lines, is the continued willingness of developed countries to allow their companies to sell pesticides, banned from use at home, to developing countries. The developed countries have argued that the problem is one which is entirely within the authority of the developing countries to resolve, as they are under no obligation to allow any particular pesticides into their country. Moreover, several developed countries, by law or practice, notify developing countries of the shipment of pesticide substances which cannot be used in the country of manufacture[172] and provide developing countries with information when pesticides lose their eligibility for domestic use.[173]

Developing countries consider these actions insufficient. They would like to see, at a minimum, a requirement for prior *consent* (as opposed to notification) and an international registry of the toxicological properties of pesticide substances. Such measures should not be necessary, and by engendering delay, may be an impediment to commerce. But they are hardly a serious blow to the legitimate interests of pesticide-exporting countries. For that reason, most developed countries have been willing to accommodate the developing countries, but the U.S. refused. This refusal was short-sighted and should be reversed in the interest of fostering a climate for greater cooperation on other issues.[174]

There are those (primarily in the U.S.) who would like to go even further and forbid the export of pesticides which are not li-

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1988). It remains to be seen how widespread the opportunities will be to trade sovereign debt in favor of greater wildlife and habitat protection, particularly given the desire of many developing countries to use such debt swaps for other worthwhile purposes such as education, health, and development projects. *See* Whitefield, *Banks 'Donate' Bad Debt*, Miami Herald, Sept. 3, 1989 at 1F, col. 5.

172. *See, e.g.*, Section 17(a) of the Federal Insecticide, Fungicide, and Rodenticide Act, Pub. L. No. 92-516, 86 Stat. 973, 995 (1972) (codified as amended at 7 U.S.C. §§ 136-136y, 136o(a) (1988)) (requiring notice prior to export) [hereinafter FIFRA]. The Commission of the EC has proposed an export notification program conforming to the UNEP and the Organization for Economic Cooperation and Development (OECD) recommendations. *See* S. JOHNSON & G. CORCELLE, THE ENVIRONMENTAL POLICY OF THE EUROPEAN COMMUNITIES 213-15 (1989).

173. *See, e.g.*, 7 U.S.C. § 136o(b) (1988).

174. *See infra* parts V & VI.

censed for use in the producing country, even if the recipient country urgently needs them. Two rationales are put forward for such a ban. First, on occasion, food containing residues of banned pesticides has entered the U.S. market—the so-called "circle of poison." Secondly, it is asked, how we can ethically expose less fortunate peoples to pesticides we have banned?

Neither of these arguments is convincing after careful analysis. As to the first, the U.S. government has the legal authority to prevent such incidents by barring the importation of goods with residues above allowed limits. What the government lacks, however, is is enough qualified inspectors.[175] Still, if the U.S. were the sole supplier of the pesticides found in the imported food, there might be some merit to such a ban. In fact, the pesticides banned in the U.S. but sold abroad are also manufactured in other developed countries, and in some cases in developing countries. Without a worldwide ban on production, a U.S. ban on exports would accomplish nothing. Indeed, it could encourage U.S. companies or their affiliates to produce the same pesticides abroad. As to the ethics rationale, unsolicited paternalism does not sit well with developing countries, many of which have made sound decisions that the benefit-to-harm ratio of a particular pesticide in their country is higher than it is in the U.S.[176] Few developing countries favor such a ban, though there is virtual unanimity that the U.S. is not doing enough short of a ban.[177]

A better solution to the global control of pesticides would have three elements. First, an internationally-binding agreement is needed on notification, prior consent, and information requirements largely along the lines desired by developing countries. Sec-

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175. *See* Ingersoll, *Gone Bad: Tide of Imported Food Outruns FDA Ability to Spot Contamination*, Wall St. J., Sept. 27, 1989, at A1, col. 1.

176. The FIFRA is a cost-benefit statute. *See* 7 U.S.C. §§ 136a(c)(5)(C) & (D) (1988). Pesticides can maintain their registration if the benefits (not counting the benefits of sales to the producing company) exceed the harm. It takes no great imagination to see that, even under U.S. legal doctrines, the balance might legitimately be drawn differently in another country. The problem a given pesticide is intended to address (malaria, for example) might not exist in developed countries or the harm from the pesticide's use in the developed country may be more severe than it would be in the developing country because of differences in life expectancy, climate, soil types, and other factors. The opposite may also be the case. For example, a pesticide considered, on balance, beneficial in the U.S. may not be appropriate for a particular developing country. Pesticide export controls which are based exclusively on whether a pesticide is registered for use in the U.S. can thus be either overly protective or insufficiently protective of the interests of the developing countries.

177. In any event the U.S. Congress just rejected a proposed ban. Gugliotta, *Farm Pact Cuts Outlays 25 Percent*, Wash. Post, Oct. 17, 1990, at A1, col. 6.

ondly, there should be a categorical ban on pesticides which pose a threat to the global commons, or where that is not feasible, the most stringent possible restrictions on their use. Third, concerned international organizations and developed countries need to expand assistance to developing countries for alternatives to the heavy use of chemical pesticides.[178] The alternatives include greater use of biological control measures,[179] greater use of pherimones and other non-lethal control approaches,[180] and crop rotation. These methods do not eliminate the need for chemical pesticides but do allow their use to be sharply reduced. Several international organizations have modest programs along these lines. Far more needs to be done.[181]

2. Other Toxic Materials

Internationally, very little has been done to regulate toxic materials other than pesticides. Most chemicals are toxic in some concentration, and it is accordingly not possible to state which are "toxic." Nevertheless, the U.S. and the EC have identified a few substances which pose special threats to human health or to the environment. These substances can be used, if at all, only with special protective measures. Unfortunately, most developed countries allow these same substances to be sold for use abroad.[182] This

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178. Taken collectively, these approaches are called "integrated pest management." The need for approaches which minimize chemical pesticides is based in part on the harmful effects of pesticides in excessive quantities on human health and the environment and in part on the fact that insects develop resistance and ultimately immunity to the effects of the pesticide, requiring that ever greater quantities be used. In addition to the adverse environmental effects, this greatly increases the costs of pesticides, a matter of great concern to developing countries.

179. A way to do this is to introduce the predators of the pests into the fields. One problem with many chemical pesticides is that they kill both pests and the insects which help keep the pests under control. When the pests develop resistance to the pesticide, the situation can become worse than when no pesticides were used.

180. Pherimones are the natural odors given off by organisms, such as insects, to lure mates. Spraying pherimones interferes with reproduction, thereby minimizing the numbers of pests. An analogous technique is the deliberate release of sterilized pests, thereby similarly interfering with successful reproduction. The International Atomic Energy Agency (IAEA) has had considerable success with this approach with certain pest species. *See* A. KRAMISH, THE PEACEFUL ATOM IN FOREIGN POLICY 139 (1963).

181. However, according to the FDA the American food supply is freer from pesticide residues than previously thought. According to a new report, 96 percent of imported food from 88 countries was free from pesticides or had residues within tolerance limits. *Ninety-Nine Percent of U.S. Food Tested by FDA Found to Be Free From Illegal Residues*, 14 Chem. Reg. Rep. (BNA) 1024 (Oct. 5, 1990).

182. For example, in the U.S. the Toxic Substances Control Act, Pub. L. No. 94-469, 90

is not currently a contentious international issue. The topic is ripe for international negotiation, in the interest of protecting the global commons and working out a common consent scheme which will protect trade secrets.[183]

3. Cross-Border Shipments of Hazardous Waste

Recently, there have been several disturbing incidents in which hazardous waste has been shipped across international frontiers without the informed consent and, in some cases, without the knowledge of the receiving government.[184] As with commerce in pesticides, each nation possesses theoretical authority to deal with this problem by forbidding the importation of substances whose contents are disapproved of or unknown. In practice, recipient countries have been incapable of preventing these incidents. First, countries differ considerably in the degree to which the central government is actually in control of its territory. One serious incident occurred in Lebanon, when approximately 2,400 tons of hazardous waste were dumped in an area thought to "belong" to one militia, but which was temporarily occupied by another.[185] Second, many—perhaps virtually all—countries lack enough literate, honest, trained customs inspectors who can recognize a hazard and are willing to do something about it. Because of this problem, incidents occurred in Nigeria, where authorities found large volumes of chemical wastes, which originated in Italy, improperly stored and misleadingly labeled.[186]

Stat. 2003 (1976) (codified as amended at 15 U.S.C. §§ 2601-2671 (1988)), allows the export of chemicals which are manufactured exclusively for export without meeting most of the requirements of the Act. *See id.* § 2611(a)(1). On the other hand, the Act does require notification to the recipient country if the substance is one for which the EPA requires the submission of data or which has been (or is proposed to be) banned or restricted under the Act. *Id.* §§ 2611(b)(1) & (2).

183. As previously mentioned, those toxic substances which pose threats to the global commons should be banned or their uses severely restricted. A notification and consent scheme, coupled with sharing information on toxic effects, should suffice for the remainder of such hazardous materials.

184. *See Waste-Watching*, ECONOMIST, Feb. 18, 1989, at 43-44.

185. *Chemical Waste Dumped on Top of Lebanon's Woes*, Miami Herald, Nov. 17, 1988, at 3C, col. 1; *see* Abu-Nasr, *Shipments of Tainted Meat, Toxic Waste Threaten War-Weary Lebanon*, L.A. Times, July 10, 1988, at A10, col. 1.

186. *See Waste-Watching*, *supra* note 184, at 44. The wanton irresponsibility of the Italian companies involved in shipping the waste to Nigeria was fortunately countered by the quick action of the Italian government to get the 8,000 leaking drums returned to Italy at considerable cost for proper disposal. *See id.*; Shutt, *Pollution Turns into Hot Issue for Italy*, Christian Sci. Monitor, Dec. 27, 1988, at 7, col. 1.

A partial solution would be an international agreement which requires that shippers everywhere truthfully label all hazardous waste shipments—domestic and international—and that the hazards be correctly identified on the shipper's manifest. A further requirement would be for the country of origin to impose harsh penalties for incorrect manifesting.[187] Finally, recipient governments should be given accurate and advanced notification.[188] The recently concluded Basel Convention,[189] negotiated under UNEP auspices, contains some of these features and a number of other useful provisions. After an inordinate delay, the U.S. finally signed the Convention.[190] The Basel Convention is a major success, both because of the complexity of the subject and the difficulty of the international politics involved. The U.S. foot-dragging in signing was incomprehensible since the agreement imposes few significant obligations on U.S. exports of hazardous wastes which are not already contained in domestic legislation.[191] Yet, the delay cost the U.S. a significant loss of reputation in the environmental field.

There is a body of opinion in the U.S. that would go further and prohibit the export of any hazardous waste.[192] Indeed, in the author's view changes in U.S. domestic law are needed (i) to provide a guarantee that extremely hazardous wastes, if exported, will pose no risk to the U.S. or the global commons, and (ii) to assure that with respect to other forms of waste, the receiving government really is giving its *informed* consent. In the absence of international pressure for a ban (which had little support at Basel), a general prohibition on the export of hazardous waste does not make

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187. *See Waste-Watching*, *supra* note 184, at 44.

188. *Id.*

189. Convention on the Control of Transboundary Movements of Hazardous Wastes, Mar. 22, 1989, 28 I.L.M. 649 (1989) [hereinafter Basel Convention]. The Basel Convention, unlike many early environmental agreements, which were largely aspirational statements, is very specific, with numerous obligations binding under international law. The Convention may be the harbinger of stronger more precise international agreements in this field.

190. *Briefly*, L.A. Times, Mar. 22, 1990, at D2, col. 1.

191. The Resource Conservation and Recovery Act, Pub. L. No. 94-580, 90 Stat. 2795 (1976) (codified as amended at 42 U.S.C. §§ 6901-6992 (1988)), already controls exports of hazardous waste from the U.S. Such export can take place only where there is an international agreement with the receiving country regulating shipments of hazardous waste (as in the two agreements the U.S. has with Mexico and Canada) or where there is advanced consent to the shipment by the receiving government. *Id.* § 6938(a). Proper labels are also required. *Id.*

192. The EC has already banned the export of hazardous waste as defined by the Basel Convention (*see supra* note 187, art. 1) to the 68 developing countries party to the Lome IV Convention. 29 I.L.M. 809, 819 (1990) (signed but not ratified by the requisite number of countries as of June 1990).

sense for all substances.[193]

H. Trans-Border Air and Water Pollution

One common international environmental problem is pollutants originating in one country which travel across international frontiers and cause harm in a neighboring country.[194] International efforts to deal with this problem have had modest success. Among these are the U.S.-Canadian cooperation on water pollution in the Great Lakes;[195] U.S.-Mexican cooperation on smelter releases previously discussed;[196] and the various actions pursuant to a Convention for the protection of the Rhine River.[197] There is also no shortage of pious declarations on the subject at the international level.[198]

III. THE CURRENT STATUS OF INTERNATIONAL ENVIRONMENTAL TREATIES AND INSTITUTIONS

The international community has done more to build the necessary legal and organizational institutions for international environmental protection than might be supposed. True, there is no over-arching international organization with authority to set standards which would minimize harm to the global environment or harm to the environment of neighboring countries or which could compel the world's nations to comply. Nevertheless, it is difficult to point to international organizations with such super-national powers on any global issue. Certainly, the U.N. rarely plays such a coercive role in maintaining international peace; the response to Iraq's invasion of Kuwait is a notable exception, and even in that situation, the U.N.'s effectiveness depends primarily on the forces

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193. *See* 40 C.F.R. § 261.3 (1989). As a consequence of the "mixture rule" and other peculiar features of U.S. environmental law, a substance may be obliged to carry the label "hazardous waste" and yet pose no hazard. *Id.* Such silliness is a U.S. domestic problem and should not trigger unreasonably stringent export rules.

194. The problems under consideration here are conceptually different and require different solutions than the long-range transport problems such as acid rain.

195. Agreement Between the United States and Canada on Great Lakes Water Quality, Nov. 22, 1978, United States-Canada, 30 U.S.T. 1383, T.I.A.S. No. 10798.

196. *See supra* notes 70-72 and accompanying text.

197. Convention on the Protection of the Rhine Against Chemical Pollution, Dec. 3, 1976, 16 I.L.M. 242 (1977).

198. *See* The Declaration of the Hague of March 11, 1989, *reprinted in* 12 Int'l Env't Rep. (BNA) No. 4, at 215 (Apr. 12, 1989); The Stockholm Declaration of June 16, 1972, 11 I.L.M. 1416 (1972).

of one superpower and the tacit support of the other. The International Monetary Fund (IMF),[199] while quite important, is a less significant player in international currency and debt matters than the seven major Western industrial countries. The World Health Organization (WHO)[200] does useful work, but lacks the authority to play more than a minor role in halting the spread of a major international epidemic such as Acquired Immune Deficiency Syndrome (AIDS). Indeed, there are only a few cases where an international organization, rather than a key nation state, is the single most important player on a vital international issue.[201]

Fortunately, establishment of a super-national organization is not the only means of addressing the problems discussed above. Granted, international environmental problems are severe and probably getting worse, yet the process of building the international legal institutions necessary to handle these problems is further along than many would suspect. Beginning shortly after World War II and accelerating in fits and starts after the 1972 Stockholm Conference, a web of international and regional organizations, treaties, and arrangements were quietly put in place to handle international environmental problems.[202]

A. International Organizations

1. United Nations Environment Programme

A global-level environmental organization was first established in 1972 with the founding of the UNEP, headquartered in Nairobi, Kenya.[203] In terms of focusing international attention on global environmental issues, the Nairobi location was almost certainly a

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199. See YEARBOOK, *supra* note 66, at 878-79.

200. *Id.* at 130-34.

201. The only clear exception which occurs to the author is the International Telecommunications Union (ITU), one of the U.N.'s specialized agencies. The ITU is responsible for the allocation of electromagnetic broadcast frequencies, upon which radio and television broadcasts and much of the world's telephone and data transmission systems depend. YEARBOOK, *supra* note 66, at 98-101. It is arguably more important on that issue than any single nation-state.

202. There were some international environmental protection measures well before the war. Many of them were thought of as conservation measures, such as those designed to protect wildlife from extinction so that they could continue to be harvested in the future.

203. YEARBOOK, *supra* note 66, at 710. The decision to locate in Nairobi was in response to Third World criticism that all the headquarters of the U.N. specialized agencies—and the considerable employment and indirect benefits which they provide—were located in developed countries.

mistake.[204] On the other hand, it has served to increase awareness of environmental issues in the Third World. This may partially explain why the North-South conflict on environmental issues has been less severe than the conflict over trade, financing, aid, and many other issues.

The UNEP has virtually no standard-setting functions,[205] though, as previously noted, the same could be said for most international organizations.[206] Despite these limitations, the UNEP has done valuable work. It disseminates information, brings experts together, funds research, and maintains a data bank on the state of the world's environment.

By far, the UNEP's most important activity has been to serve as a catalyst for and facilitator of international conventions in the environmental field.[207] The UNEP performed that role for the Vienna Convention and its Montreal Protocol on the Protection of the Ozone layer. Stratospheric ozone protection is arguably the most difficult environmental issue the international community has come to grips with. The UNEP played a similar role in bringing together nations for the negotiation of the important, new Basel Convention that regulates international transport of hazardous

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204. From the perspective of press attention, one of the cities commonly used for international organization headquarters, such as Geneva or Vienna, would almost certainly have been a better choice.

205. The UNEP does have Secretariat responsibilities under article XII of the CITES Convention. CITES, *supra* note 149, 27 U.S.T. at 1106-07, T.I.A.S. No. 8249, at 19-20, 993 U.N.T.S. at 252-53. Additionally, the UNEP temporarily (and likely permanently) has Secretariat responsibilities under the Basel Convention. Basel Convention, *supra* note 189, 28 I.L.M. at 673. While Secretariat functions are largely administrative, the Secretariat does perform minor roles in the verification of treaty compliance under article XVI of the Basel Convention. *Id.* at 672. With these exceptions, the UNEP has no enforcement responsibilities.

206. There are important exceptions. With respect to standard-setting, the ITU allocates broadcast frequencies. The ICAO sets standards for aircraft and for international practice in air transport. The IMO designates sea lanes.

207. It might be argued that international organizations are not necessary to the negotiation of international conventions. After all, throughout the 19th century, and on occasion in the 20th, large international conventions have been gathered for specific purposes without international organization backing or support. Having said that, it is dramatically more difficult to handle the practical arrangements and avoid political difficulties inherent in holding a major international conference unless some near-universal membership organization takes an active role. For that reason, it is likely that more progress has been made in negotiations under UNEP auspices than would have resulted without its sponsorship. In addition, the periodic meetings of the UNEP at senior levels (*e.g.*, Ministers of the Environment) serve to bring the key players in the various nations together, thereby helping to foster a climate in which future negotiations are productive.

waste.[208]

2. International Atomic Energy Agency

The IAEA is best known for its roles in promoting the peaceful uses of atomic energy and for its "safeguards" (inspection) system, designed to detect—and thus deter—any diversion of nuclear materials to non-peaceful purposes.[209] Nevertheless, from its inception, the IAEA has undertaken useful activities in environmental and related matters including radiation protection, disposal of nuclear waste, and use of radiation to sterilize and thereby help to eradicate insect pests without chemical pesticides.[210]

The IAEA greatly expanded its environmental and public health-related activities following the fire at the Chernobyl nuclear reactor in the Soviet Union. The IAEA's most significant accomplishment was sponsoring the negotiations which led to the agreement on the obligation to notify other countries of cross-border releases of radiation[211] and the agreement to provide mutual assistance in the case of such an emergency.[212] Due largely to the intransigence of the Soviet Union, the IAEA was not able to obtain universal agreement on an international obligation to compensate in the event of harm from such releases.[213] Such a provision, binding even on the superpowers, would not have been unprecedented.

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208. *See* Basel Convention, *supra* note 189.

209. YEARBOOK, *supra* note 66, at 51-52.

210. *See supra* note 180.

211. Convention on Early Notification of a Nuclear Accident, Sept. 26, 1986, 25 I.L.M. 1370 (1986).

212. Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, Sept. 26, 1986, 25 I.L.M. 1377 (1986).

213. The Vienna Convention on Civil Liability for Nuclear Damage, May 21, 1963, 2 I.L.M. 727 (1963) and the Paris Convention of July 29, 1960, on Third Party Liability in the Field of Nuclear Energy, *reprinted in* 55 AM. J. INT'L L. 1082 (1961) are in force. Neither the U.S. nor the U.S.S.R. are a party to either. These conventions make recovery of monetary damages easier by holding power plant operators strictly liable for cross-boundary damage (*i.e.*, without a need to show negligence.) On the other hand, the conventions place severe caps on total liability. The Convention of 31st January 1963 Supplementary to the Paris Convention of 29th July 1960 on Third Party Liability in the Field of Nuclear Energy, 2 I.L.M. 685 (1963) [hereinafter The Brussels Convention] which supplements the Paris Convention, raised the liability ceiling to 120 million ecu (US$165,144,000 million). The Chernobyl accident showed such a figure to be preposterously low. Recently, the IAEA negotiated a joint protocol designed to link the Vienna and Paris agreements into a more broadly-based scheme. Joint Protocol Relating to the Application of the 1963 Vienna Convention and the 1960 Paris Convention, 1989, CMND. SER. MISC. 12, No. 774 (not in force); *see 96 Countries Agree to Link Conventions on Compensation for Nuclear Accidents*, 11 Int'l Env't Rep. (BNA) No. 10, at 519 (Oct. 12, 1988).

For example, the Outer Space Treaty[214] holds a state which launches objects into outer space liable for any damage which such an object may subsequently cause to any other party to the Treaty or any of its "natural or juridical persons."[215]

3. Other U.N.-Related Agencies

The UNEP and the IAEA are not the only organizations within the U.N. system dealing with the environment. For example, the IMO was responsible for the negotiation of the London Dumping Convention[216] and the MARPOL Convention,[217] both of which are invaluable to marine pollution issues. The WHO has an active program on pesticide residues in food[218] and publishes information of the effects of environmental pollutants on human health. The Food and Agriculture Organization (FAO) has adopted an International Code of Conduct on the Distribution and Use of Pesticides[219] and has performed important work on conservation of tropical forest ecosystems. Some of the scientific data on ozone depletion was collected and analyzed under the auspices of the World Meteorological Organization, which also runs the Background Air Pollution Monitoring Network. The ICAO has adopted standards for the regulation of aircraft engine emissions and adopted specifications for the transportation of dangerous goods by air. In short, many U.N.-specialized and related organizations have some role to play in international environmental protection.

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214. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205.

215. *Id.* 18 U.S.T. at 2415, T.I.A.S. No. 6347, at 6, 610 U.N.T.S. at 209. We thus face the following anomalous situation: if a nation launches a satellite containing a small thermoelectric nuclear power source, the launching nation would be liable for any damages it caused if the satellite were to de-orbit and release radioactivity. The same nation's enormously larger power reactors, however, can leak radioactivity across national frontiers causing widespread damage and loss of life without comparable liability.

216. London Dumping Convention, *supra* note 109.

217. MARPOL Convention, *supra* note 103.

218. The WHO funds extensive research on pesticide residues. For an example of the WHO's efforts to control diseases from contaminated water, see Kraft, *W. Africa Gains Hope of Ending River Blindness*, L.A. Times, Apr. 23, 1988, at A1, col. 4.

219. *See* 54 Fed. Reg. 29,524, (1989) (citing Food and Agriculture Organization of the United Nations, *International Code of Conduct on the Distribution and Use of Pesticides*, Rome, 1986.)

4. Non-U.N. Organizations

In addition to the U.N. and its specialized agencies, other international organizations (either wholly outside the U.N. system or only very loosely affiliated with it) have important responsibilities in some aspects of environmental protection. For example, despite its weaknesses, the IWC is the critical institution for the protection of whales.[220] The OECD[221] has prepared several influential reports on air pollution and adopted guiding principles on trans-frontier movements of hazardous waste. The OECD has also established common testing requirements for toxic chemicals, which have facilitated global knowledge of the toxicological properties of chemicals in commerce, while reducing the adverse economic impact which would result from conflicting testing requirements.

B. Regional Institutions

Regional organizations have, in some cases, performed useful work in environmental protection. For example, the U.N. regional economic commissions have sponsored the negotiation of treaties which foster regional environmental protection.[222] The most notable of these is the ECE. The ECE was the sponsoring organization for the agreement on reducing air emissions of sulfur dioxide[223] and the more recent agreement on nitrogen oxides.[224]

Probably the most important regional organization in the environmental field is the EC, in part because it has many of the powers normally held only by nation-states. Evaluating the envi-

220. The IWC administers the International Convention for the Regulation of Whaling, Dec. 2, 1946, 62 Stat. 1716, T.I.A.S. No. 1849, 161 U.N.T.S. 72.

221. See YEARBOOK, *supra* note 66, at 240-42.

222. There are U.N. Economic Commissions for Africa, Latin America, and Europe. In addition, there are Economic and Social Commissions for Asia and the Pacific and Western Asia (basically, the Middle East). Several countries are members of more than one commission (*e.g.*, the Soviet Union is a member of both the European and Asian commissions, and the U.S. is a member of the Commissions for Latin America and Europe). YEARBOOK, *supra* note 66, at 711-15. Despite their names, the Economic Commissions have often dealt with matters which go beyond economics.

223. *See* Sulfur Dioxide Protocol, *supra* note 68 and accompanying text. The Sulfur Dioxide Protocol is largely moribund for lack of participation by key countries.

224. *See* Nitrogen Oxide Protocol, *supra* note 67 and accompanying text. As explained more thoroughly in Regional Issues, *infra* part V(*A*)(2), the nitrogen oxide agreement is conceptually flawed, and the ECE would have been better advised, all things considered, to have focused its attention on a narrower group of countries. Nevertheless, the 1988 Protocol was entered into force on February 14, 1991. [Reference File] Int'l Env't Rep. (BNA) Supp. No. 103, at 27 (Jan. 1991).

ronmental role of the EC to date is difficult. It can be argued that the EC's institutions have spurred environmental protection in Western Europe by adopting common minimum standards in many areas.[225] In addition, cooperation on other matters has made the Europeans more aware of environmental issues, spreading the political impetus for more effective domestic controls. Having said that, a case can also be made that the EC, with its cumbersome decision-making processes and its requirements for unanimity on most major issues has actually been an impediment to more effective environmental protection in that region. According to this theory, the EC has restrained the more environmentally-minded Danes, Germans, and Dutch, while putting little pressure on the more development-oriented Southern European nations.[226] The establishment of a truly common internal market in 1992 may make these conflicts substantially worse.

The Organization of American States (OAS)[227] has played a modest role in disseminating information on common environmental challenges in the Western Hemisphere, but its efforts have been severely hampered by recent budgetary problems.[228] The NATO's Committee on the Challenges of Modern Society has done a great deal by way of studies and demonstration projects, some of them involving non-NATO countries. Most other important regional organizations, such as the Organization of African Unity (the OAU),[229] the Association of South East Asian Nations (ASEAN),[230] and the League of Arab States (LAS)[231] can point to activities they have engaged in with respect to some aspect of the environment, but none could be said to play an important role.[232]

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225. The EC has issued directives in most areas of environmental protection, including air, water, hazardous waste, toxic substances, and marine pollution. For a thorough but deliberately non-analytical discussion, see S. JOHNSON & G. CORCELLE, *supra* note 172.

226. One example of the kind of problem which has arisen was the dispute over auto-emission standards. The desire of the Danes, Dutch, and Germans to impose stronger emissions standards for passenger vehicles was resisted for years within the EC, largely under pressure of the Italians and French, on the accurate but environmentally irrelevant ground that they were an impediment to intra-EC trade. As a result, European auto-emission standards have lagged far behind those of the U.S. and Japan. *See id.* at 124-34; Sullivan, *EC Moves on CFCs, Other Air Pollutants*, CHEMICAL & ENGINEERING NEWS, June 27, 1988, at 6.

227. See YEARBOOK, *supra* note 66, at 427-30.

228. *Cf. Slim-line State*, ECONOMIST, Oct. 24, 1987, at 30. The OAS has given consideration to establishing a nature conservancy for the Hemisphere. OEA/Ser. G. CP/doc. 2036/89.

229. See YEARBOOK, *supra* note 66, at 426-27.

230. *Id.* at 310-12.

231. *Id.* at 421-22.

232. The conclusion in text is intended merely as a statement of fact not as an implied

C. *Treaty Law*

Negotiation of numerous international, regional, and bilateral treaties has substantially advanced the field of international environmental law.[233] Indeed, it is difficult to point to much progress in the field except through the use of the treaty instrument.

IV. Assessing Current International Environmental Efforts

A. *Concerted International Action is Not Always Benign*

In an era of repeated calls for international action to save the global environment, it is worth recalling that the international community is capable of acting collaboratively in ways which do far more harm than good. International liability limits on oil tankers and nuclear power plant operators are significant *causes* of environmental risk. Similarly, as previously discussed, the international financial institutions have historically been far more a part of the problem than of the solution. That characterization is still a fair description of all of them except possibly the World Bank, which has substantially increased its environmental staff and has recently announced a policy to take environmental matters into account in all its activities.[234] Nevertheless, many environmentalists remain skeptical.[235]

Another example of how international action may not necessarily coincide with improved protection of the environment is the Antarctic Treaty[236] and related conventions. The original Antarctic

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criticism. Many existing regional organizations have enough problems already and may not be good candidates in terms of expertise and political composition to take on additional responsibilities in the environmental field. Nevertheless, there is a severe leadership vacuum on international environmental issues in some regions.

233. The most important of these agreements have already been discussed. A full listing of them—of which there are dozens to hundreds, depending on the breadth of the definition of the environment—is beyond the purposes of this article. For a listing of treaties and other agreements in the environmental arena, see *Register of International Treaties and Other Agreements in the Field of the Environment*, UNEP/GC.15/Inf.2 (May 1989).

234. *See World Bank Unveils Environmental Plan to be Integrated into All Its Activities*, 12 Int'l Env't Rep. (BNA) No. 10, at 486-87 (Oct. 11, 1989).

235. *See id.* The ill-considered remarks of World Bank President Conable at a conference in Tokyo, denigrating evidence that global warming poses serious risks (a scientific issue very far beyond the IBRD's competence) raised doubts in the minds of many—this author included—as to whether that institution has yet begun to take environmental issues seriously. *See World Bank President Links Economic Development, Environmental Protection*, 53 Banking Rep. (BNA) No. 11, at 407 (Sept. 18, 1989).

236. Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, T.I.A.S. No. 4780, 402 U.N.T.S. 71.

Treaty of 1959 came about in part because of the exceptional value of scientific research being carried out in Antarctica and the need to establish conditions which would encourage further research. One of the most compelling reasons to engage in scientific research in that forbidding location was its pristine character.[237] Ironically, the scientists involved have been imprudent in their waste disposal practices, polluting the very environment they were studying.[238] On the other hand, the parties have negotiated two useful supplemental conventions designed to conserve Antarctic seals and other living resources of Antarctica.[239]

A more difficult matter to assess is the recently concluded Antarctic Minerals Convention,[240] designed to allow exploration for and possibly exploitation of Antarctica's resources under carefully controlled conditions. If the alternative to the Minerals Convention is unrestrained exploitation by states with territorial claims to Antarctica, then the Minerals Convention represents a major step forward in environmental protection.[241] If, however, the Minerals Convention actually fosters exploitation that otherwise would not take place, we could be significantly worse off than at present. Certainly, the experience with oil drilling on the Alaskan North Slope is not entirely reassuring with respect to mankind's ability to exploit resources in fragile environments without environmental

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237. Nations have conducted important research in Antarctica on ozone depletion, global warming, and long-range transport of toxic substances. This research would have been more difficult, perhaps impossible, if the continent were more heavily polluted.

238. *See* Carpenter, *Opening the Last Frontier*, U.S. NEWS & WORLD REP., Oct. 24, 1988, at 65.

239. Convention for the Conservation of Antarctic Seals, June 1, 1972, 29 U.S.T. 441, T.I.A.S. No. 8826; Convention on the Conservation of Antarctic Marine Living Resources, Apr. 7, 1982, 33 U.S.T. 3476, T.I.A.S. No. 10240.

240. Convention on the Regulation of Antarctic Mineral Resource Activities, *opened for signature* Nov. 25, 1988, 27 I.L.M. 859 (1988) [hereinafter Minerals Convention].

241. The Minerals Convention contains a number of useful provisions designed to minimize environmental damage. The agreement, for example, makes the provision for closing certain areas of special scientific or environmental interest and establishes procedures whereby general environmental protection measures can be adopted. Whether such measures will be sufficient to prevent serious environmental degradation at the site of prospecting and exploration remains to be seen. The Minerals Convention's numerous safeguards will almost certainly be better than having the Antarctic Treaty regime break down, thereby leaving mineral exploitation in national hands. Many of the nations with territorial claims to Antarctica have appalling records for domestic environmental protection and can, therefore, be expected to do nothing to protect Antarctica outside the Minerals Convention context. For a more thorough discussion of the Minerals Convention, see Oxman, *Evaluating the Antarctic Minerals Convention: The Decision-making System*, 21 U. MIAMI INTER-AM. L. REV. 17 (1989).

damage.[242] In any event, no amount of site-specific environmental protection will serve to keep Antarctica pristine, as it now still largely is.[243]

France and Australia have proposed to make the Antarctic a "world park" free from exploitation. This proposal has been rejected by the U.S., the Soviet Union, and several other nations party to the Antarctic Treaty, but seems, nevertheless, to be gathering momentum.[244]

B. Selecting Standards for Evaluation

If the standard for judging the condition of international law and diplomacy in the sphere of international environmental protection is the implementation of effective binding measures to deal with each serious problem, then we are *very* far from that goal. As has been demonstrated, many environmental problems have not yet been effectively addressed at the international level, even though they are severe and promise to get worse. Moreover, even where there are agreements, many have vague or weak provisions, lack adherence by key states, or suffer from ineffective enforcement.

For example, the negotiation of the Montreal Protocol on

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242. It seems highly improbable that the international community will adopt measures more stringent than the U.S. imposed in Alaska for drilling on the North Slope. Despite these stringent requirements, there was damage, though not to the apocalyptic extent predicted by some. *See* Shabecoff, *Oilfield Practices Viewed As Threat to Land in Arctic*, N.Y. Times, Mar. 5, 1989, § 1, at 1, col. 3 (city ed.).

243. *See Argentine Ship Spills Diesel Fuel into Pristine Section of Antarctic Peninsula*, 12 Int'l Env't Rep. (BNA) No. 2, at 53 (Feb. 8, 1989); Joyner, *The Evolving Minerals Regime for Antarctica*, in THE ANTARCTICA LEGAL REGIME 147-48 (C. Joyner & S. Chopra eds. 1988).

244. Thirty-nine nations agreed to meet to attempt to replace the Minerals Convention with a new, more acceptable agreement. This may be a death-blow to the Minerals Convention. *See Antarctic Minerals Development Convention Encounters Major Obstacles at Paris Meeting*, 12 Int'l Env't Rep. (BNA) No. 11, at 529, 529-30 (Nov. 8, 1989). The Bush administration still hopes to resuscitate the Convention by seeking international agreement now on liability provisions for environmental damage if exploitation does take place. *Environment, U.S. Seeks International Accord to Extend Antarctica Convention*, Daily Rep. for Executives (BNA), at A3 (July 23, 1990). As noted, replacement of the Minerals Convention with a new agreement is desirable on environmental grounds only if (i) the new agreement is genuinely more protective and (ii) nations which intend to undertake exploitation of Antarctica's resources in conformance with the Minerals Convention agree instead to become parties to the new agreement. The first of these without the second would represent a step *backward*.

Ozone Depletion was a remarkable achievement.[245] Yet, it was not sufficiently stringent, by itself, to prevent very serious depletion of the ozone layer over the next several decades. The amendments to the Protocol reached at a conference in London to make further reductions in CFCs and provide a special fund—$240 million dollars over the next three years to help developing countries—illustrate the world's commitment to continue progress on this issue. Already, India and China have announced their intention to join this amended Montreal Protocol.[246] Unfortunately, unless enough states become a party to both the original Montreal Protocol and the recent amendments, the effort will fail.

A second possible method to judge the effectiveness of the international community on international environmental issues is to compare the rate of progress on those issues with the community's rate of progress on other politically intractable, nationalistically sensitive issues. From that perspective, one can conclude that the international community is doing quite well on environmental matters. The reasons for this relative success include the urgency and severity of the problems and the fact that practical solutions have been found which do not require basic changes in the international order.

A third approach would look not to results, but rather to the establishment of institutions and community norms on which future progress might be built. If this is the standard, the nations of the world have already laid down a substantial foundation, but a great deal remains to be done.

It may be worth noting at this point that these conclusions are relatively insensitive to the validity of any judgment about particular issues in the preceding parts. Desertification could become even worse than has been portrayed. The plastic pollution of the oceans

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245. *See* Montreal Protocol, *supra* note 48. Before the negotiations began, the author was pessimistic as to the prospects for successfully negotiating any international agreement which would halt the growth in the release of CFCs. The result achieved at Montreal was the product of a combination of good diplomacy, a responsible attitude on the part of U.S. industry, new scientific evidence which made the case for immediate action more compelling, and avoidance of the bitter North-South contention that has often characterized multilateral negotiations. The latter point was primarily the result of the very constructive roles played by several developing countries. This is remarkable since most developing countries had less at stake than did the developed countries. Ozone depletion is most severe closer to the poles, where the developed countries are located. *See* Zuren, *Studies on Ozone Destruction Expand Beyond Antarctic*, CHEMICAL & ENGINEERING NEWS, May 30, 1988, at 16-25.

246. Hemonick, *Letting the Earth Breathe Easier*, TIME, July 9, 1990, at 63.

might be far less serious than expected. Perhaps, the Asian Development Bank is actually helping the environment rather than harming it. Nevertheless, it is unlikely that all of the judgments are skewed in the same direction. Even if they were, they could be very far-off before one would come to the conclusion that everything is fine and no institutional changes are needed or to the contrary conclusion that no institutions and agreements worthy of retention have been established for international environmental protection.

C. The Improbability of Fundamental Structural Change

When compared with nation-states, the international community is notoriously slow, generally inefficient, and frequently ineffective. These undeniable facts have led some to argue that we need a new international "order," wholly new institutions which will have the power to force nations into measures more protective of the environment.[247] Such expectations are politically unrealistic. Nationalism is perhaps the single most powerful force in recent world history. Nations do not readily agree to any measure which will permanently curtail their sovereignty.[248] This statement can be made for virtually all international issues. It is unreasonable to expect the performance of the international community to be significantly better on international environmental issues than on even more critical matters—like reducing global risks of nuclear or chemical weapons proliferation—if the price is a significant derogation of national sovereignty.

For these reasons, there is no prospect that the international community will agree soon to establish new super-national institutions which can rapidly accelerate the pace of international rule-making and force recalcitrant nations to adopt environmentally protective policies. Even if such super-national structures ultimately evolve, they will not arise in the time frames needed to deal

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247. Creating a new international order is no small task. *Cf.* Rothstein, *Commodity Bargaining: The Political Economy of Regime Creation*, in POSITIVE SUM 15 (I.W. Zartman ed. 1987) (discussing the problems involved in creating a "New Economic Order").

248. Of course, in one sense, entering into any treaty restricts a nation's sovereignty, in the same way that any contract restricts the contracting parties' freedom with respect to the matters covered by the contract. Those seeking a new environmental order want measures adopted whereby nations agree now to be bound by rules created in the future, without a right to decline to be bound by those rules. Such measures are a far greater infringement on national sovereignty and are rarely agreed to. *See* Charney, *Technology and International Negotiations*, 76 AM. J. INT'L L. 78, 81 (1982).

with the problems identified above.

There was a recent attempt to create such a structure, but it failed for predictable reasons. The March 11, 1989 Declaration of the Hague called for the strengthening of U.N. institutions in the field of the environment or the establishment of new institutions. Early drafts of the resolution called for (i) establishment of a new organization with strong enforcement powers, (ii) a significant strengthening of the powers of the International Court of Justice, and (iii) economic sanctions against countries that do not comply. These proposals were all eliminated or very significantly watered down.[249] It is hard to know how serious the attempt to establish new super-national institutions at The Hague actually was. On the one hand, the number of countries represented by heads of state or heads of government was quite impressive, making the toothlessness of the final declaration (which is not a treaty) a compelling reminder of the unwillingness of governments to relinquish decision-making power. On the other hand, if it is true that the U.S., the Soviet Union, and China were not invited, it casts serious doubt on the genuineness of the endeavor. The organizers are sophisticated enough to know that these three governments are notoriously unwilling to support measures they have not participated in from the start. Without their ultimate participation, little by way of global institutional change is possible. Part of the failure at The Hague may ironically have been the result of earlier criticism of Brazil by organizations and politicians in the U.S., France, and elsewhere. Brazil reportedly resisted a stronger declaration, fearing interference in Amazonian matters.[250]

D. The Concept of an International Regime

International cooperation on the environment is not fundamentally different from other international endeavors. For that reason, it is subject to the same radically differing visions of inter-

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249. *See* Lovell, *World Edges Closer to Action with Hague Environment Treaty*, Reuter Library Report, Mar. 12, 1989 (wire service).

250. *See* Simons, *supra* note 170. A pale shadow of the Hague vision survived in an inter-parliamentary grouping called GLOBE, Global Legislators Organization for a Balanced Environment, which is pressing for more action by governments. *See* Percival, *Environment Parliamentarians Band Together for Globe's Protection*, Inter Press Service, June 1, 1990 (wire service). GLOBE recently met and announced plans to introduce parallel legislation dealing with climate change, deforestation, and other threats to the environment. Shabecoff, *Legislators Seek Laws to Aid Environment*, N.Y. Times, Nov. 17, 1990, § 1, at 7, col. 2.

national politics which characterize the academic study of international relations.

Some view the international community as a lawless arena governed only by *realpolitik*, where common problems are dealt with, if at all, only if doing so is in a state's interest. If the state's interests change, the state will cease to cooperate. Such a vision does not accord with the frequent willingness of states, within limits, to go along with needed measures in the common interest which do not match their narrow national interest. In economic terms, lacking a system of compulsion, many international environmental issues present nations with powerful "free rider" incentives. Consider ozone depletion: if a number of larger states reduce their CFC emissions significantly, a small nation could conclude that halting CFC use on its own territory would have little impact on the health of its people. The state could get the benefits of international cooperation without cooperating and without any adverse impact on its economy. A rational state would decline to cooperate. Of course, if all states think this way, there could be no effective control of CFCs. In fact, far greater cooperation has been achieved on CFCs and many other international environmental problems than such an extremely narrow vision of national interest analysis would predict.

The opposite extreme sees international society guided by international law. Some scholars will not flinch even when this vision is wildly inconsistent with reality. In environmental protection, for example, there are commentators who persist in finding a binding obligation under international law not to cause harm to one's neighbors.[251] It is highly doubtful there is such an obligation, and if there is, it is being violated *far* more frequently than it is being upheld.

In any event, viewing international environmental problems solely through the lens of international law is at best incomplete since many of the measures needed for effective international environmental protection do not meet the normal definitions of "international law."[252] For example, a great deal of the international en-

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251. Taylor, *International Legal Control of the Greenhouse Effect*, 20 VICTORIA UNIV. WELLINGTON L. REV. 45, 49-50 (1990).

252. While the essence and limits of that term are hotly debated, a common functional definition is the willingness of a nation to undertake or refrain from measures even if contrary to its preferences, because it considers itself obliged to do so (whether by treaty or custom).

vironmental field depends on the dissemination of information, both among governments and scientist-to-scientist. Similarly, success often depends on the sharing of approaches and the recognition of common problems among national political and regulatory personnel. In other cases, progress depends on finding external sources of funding, whose contributions are clearly discretionary and thus not legally compelled. In a few cases, diplomats have been able to work out common approaches which each nation will undertake unilaterally.[253] None of these approaches is "international law" within any sensible definition of the term.

Having made this point, it is clearly erroneous to think that international law is irrelevant. These days, many key international environmental protection measures are either required by or undertaken pursuant to treaty or occasionally by custom. Critical roles are played on a number of issues by UNEP and other international organizations. These measures fit nearly all definitions of international law.

A better conceptual framework for improving international efforts to protect the environment would be a variation on the concept, taken from international relations theory, of a "regime." Grasping the concept of a regime can be a bit of a challenge. Perhaps the best known definition is by Stephen Krasner: "Regimes can be defined as sets of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations."[254] This definition may be more theoretical than some readers will find useful. For present purposes, it should be sufficient to note that nearly all regimes involve some use of international treaties and organizations (and thus international law), but have other critical elements which are not legal.[255] They all exist at least in part because, as

253. These cases usually arise because one or more of the involved nations is not willing to become a party to a binding agreement, but is willing to act voluntarily, as was the case with the Nuclear Suppliers Group which agreed on a list of items that no member would export without IAEA safeguards. The "Suppliers Guidelines," which are not an agreement under international law but rather a series of parallel, identical declarations of national policy, are contained in IAEA document INFCIRC/254, Feb. 1987, *reprinted in* DOCUMENTS ON DISARMAMENT 7 (1978) [hereinafter INFCIRC].

254. S.D. Krasner, *Structural Causes and Regime Consequences: Regimes as Intervening Variables*, in INTERNATIONAL REGIMES 2 (S.D. Krasner ed. 1983).

255. Regime theorists predictably differ as to what a regime is, what its essential elements are, and which topics of international concern are governed by regimes. The description of the elements of a regime in text does not conform to any one theorist's description. For example, the author places somewhat greater weight on treaties and institutions and

Krasner notes, norms and principles are important and frequently succeed in inducing countries to behave in ways which differ from their abstract preferences, even though they cannot be compelled to abide by community norms. Regimes thus occupy a functional niche between informal undertakings and international law and a structural niche between ad hoc arrangements and an international "order." A world view in which regimes are important—but not the only feature of the international system—falls between a brutish Hobbesian vision of international affairs wholly dominated by self-actualizing power seekers and an utopian vision of an international community governed by law and equipped with sufficient power to head off all dangers on the horizon.

Good portions of the international community, including the U.S., Japan, the U.K., the Soviet Union, and several others are willing to create isolated, single-focus regimes to deal with selected environmental problems (though most leaders do not utilize the term). Proceeding by a series of wholly independent regimes—one for global warming, a second for desertification, a third for toxic chemicals, and so on—runs a serious risk of obtaining far less than could be accomplished by viewing the problem of international environmental protection as having important overlapping elements which should be addressed in concert.[256]

At the risk of creating even more jargon, what is needed is a new vision in which international environmental protection is seen as a "complex regime." While that terminology has not been used, some international arrangements which have been called regimes deal with a series of closely related problems (rather than a single area) and involve a series of interlocking institutional arrange-

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somewhat less on inchoate norms than does Krasner.

256. One key work on the subject, Oran R. Young's INTERNATIONAL COOPERATION: BUILDING REGIMES FOR NATURAL RESOURCES AND THE ENVIRONMENT (1989), takes the position that fostering a series of unrelated regimes is a sufficient response to the problem. The book is largely a reworking of Young's earlier work on regimes, but it utilizes examples from international resource allocation problems and, to a lesser extent, environmental problems. The work is not without its flaws. It virtually ignores the role of international law in international regimes. It has little to say on most of the currently critical international pollution problems and suffers from key factual inaccuracies. Its judgments on the relative negotiability of limiting CFC emissions and establishing a comprehensive liability regime for nuclear accidents have proven to be off by 180 degrees. Nevertheless, those interested in regime theory and its applicability to this field will find it an engaging and thought-provoking work. For a discussion of one regime with a more substantial legal focus, see Chopra, *Antarctica as a Commons Regime: A Conceptual Framework for Cooperation and Coexistence*, in THE ANTARCTIC LEGAL REGIME 163 (C. Joyner & S. Chopra eds. 1988).

ments (rather than a single institutional structure). They grow and change in time in a manner somewhat like customary international law.[257] While theorists have not used the vocabulary of complex regimes, the underlying notion has best been elaborated by Joseph Nye, Jr., Lawrence Scheinman, and others concerning the global nuclear nonproliferation regime.[258]

A complex regime covering a set of interrelated topics or problems arises as the international community, or major portions of it, adopts a series of interlocking measures (some binding, some not) toward a common (if not precisely agreed upon) goal, bolstered by shared values, norms, or fears. In the case of nonproliferation of nuclear weapons, these measures include two major treaties, the Nonproliferation Treaty (NPT)[259] and the Latin American Nuclear Weapons Free Zone Treaty;[260] an international organization, the IAEA, which accounts for nuclear materials;[261] a treaty and numerous ancillary measures dealing with the closely related issue of the physical protection of nuclear materials;[262] non-treaty agreements on export controls;[263] informal understandings that certain technologies of special concern will not be exported;[264] intelligence sharing among several countries; and a very active diplomacy carried out by many countries at several levels.

In the case of nuclear non-proliferation, the cumulative effect of these disparate measures has been to consolidate the interna-

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257. Many regime theorists emphasize the importance of custom and the dynamic changes which can occur in regimes. Young, for example, believes important regimes can arise spontaneously. *Id.* at 51.

258. *See* Nye, *Maintaining a Nonproliferation Regime*, in NUCLEAR PROLIFERATION: BREAKING THE CHAIN 15-38 (1981); Scheinman, *Nonproliferation Regime: Safeguards, Controls and Sanctions*, in THE NUCLEAR CONNECTION 179-210 (1985); Williamson, *Nuclear Nonproliferation* (Book Review), 232 SCIENCE 663-64 (1986).

259. Treaty on the Nonproliferation of Nuclear Weapons, July 1, 1968, 21 U.S.T. 483, T.I.A.S. No. 6839, 729 U.N.T.S. 161.

260. Treaty for the Prohibition of Nuclear Weapons in Latin America, Feb. 14, 1967, 22 U.S.T. 762, T.I.A.S. No. 7137, 634 U.N.T.S. 281, more commonly called the Treaty of Tlatelolco.

261. This IAEA "safeguards" system involves record-keeping, sampling, inspections, and other means of assuring that nuclear materials have not been diverted. These measures could be thought of as reducing the participating states' national sovereignty over their nuclear programs.

262. Convention on the Physical Protection of Nuclear Material, *referred to governments* Oct. 26, 1979, 18 I.L.M. 1419 (1979). The U.S. entered the agreement into force on February 8, 1987.

263. INFCIRC, *supra* note 253. *See generally* Van Doren, *Some Perspectives on Supplier Controls* in THE NUCLEAR SUPPLIER AND NON PROLIFERATION 17 (1985).

264. *See* INFCIRC, *supra* note 253.

tional consensus against the increased spread of nuclear weapons. That consensus has made it much easier for nations to become parties to the NPT, its near universal membership further strengthening the regime. The change in international norms has been, in turn, a primary reason why no additional nations have openly admitted the acquisition of nuclear weapons since the NPT was concluded in 1968. The four nearest "threshold nations" take care to hide their bomb capabilities "in the basement."[265] This consensus also helps explain why the number of countries that possess nuclear weapons or are on the verge of acquiring them is considerably less than every major past study had predicted.

A simple regime could not have brought about that result. The NPT, as vital as it is, was neither a sufficient response to the problem nor a universally accepted treaty. A stronger NPT would be even less acceptable to many countries and thus leave many states of potential concern wholly outside the regime, while an NPT weak enough to attain universal membership would be worthless.

Similar complex international regimes might be said to exist in the fields of international civil air transport,[266] international trade,[267] international currency and balance of payments adjustments,[268] and the law of the sea.[269] Complex regimes may also be-

265. The four nations in question are Israel, South Africa, India, and Pakistan. Each is believed to have enough highly-enriched uranium, plutonium, or both for one or more nuclear explosives, to be technically capable of designing a fission device, and to possess delivery systems capable of dropping a nuclear bomb several hundred kilometers from the point of launch or take-off. None of these four, however, has declared itself to be a nuclear weapons state, and none is known conclusively to have deployed an arsenal of readily usable nuclear weapons for its military forces. For an excellent discussion, see L. SPECTOR, THE UNDECLARED BOMB (1988). Discovery of an Iraqi plot to smuggle krytrons (nuclear triggers) and subsequent revelations of other steps to acquire a nuclear weapons capability are worrisome, but do not yet put Iraq in the same status as the other four. For a discussion of Iraq's nuclear program, see *id.* at 207-18. How close each of the four is to that capability is beyond the purposes of this paper and varies considerably among them.

266. International civil air matters are regulated by the ICAO, numerous bilateral agreements, and a host of special arrangements.

267. International trade matters are handled under the General Agreement on Tariffs and Trade (GATT), a treaty with a limited organizational structure; several common market or free trade zone arrangements; innumerable bilateral trade agreements; a U.N. entity, the United Nations Convention on Trade and Development (UNCTAD) dealing with the trade-development linkage; an unofficial organization regulating export controls by most Western nations, the Coordinating Committee on Multilateral Export Controls (COCOM); and a system for payments and resolution of disputes, much of which evolved through custom and other arrangements.

268. The IMF, the Bank for International Settlements, special arrangements for the EC, and numerous central bank to central bank arrangements all play interlocking roles in international currency adjustment.

gin to emerge to control the spread of chemical weapons, ballistic missile technology, and other advanced delivery systems. Some observers may see a complex regime emerging to prevent the worst human rights violations.

In each complex regime, there is no international organization armed with powers to force nation-states to undertake actions against their will. In contrast to a simple regime, there is rarely a single treaty instrument which purports to deal with every aspect of the problem. There is always less than unanimity among the members of the international community; indeed, the opinions and actions of some states are usually a significant part of the problem.

Instead, in a complex regime, there is a widespread but not universal perception of a problem and a basic goal to be attained. The problem is then attacked with a variety of means on different levels. Specific measures or problems are usually handled as if independent, but the participants recognize that they are interrelated. The effect of these common efforts is not only to strengthen prospects for success, but also slowly to make the goal itself more nearly universally accepted, gradually transforming pragmatic arrangements into normative constraints on behavior.

The international community has already set many of the elements in place to create such a complex international environmental protection regime. Indeed, some might conclude that a complex regime already exists in this field, though key nations may not yet recognize this fact.

V. Measures to Strengthen the International Environmental Regime

If indeed the states of the world have begun to establish a complex international environmental protection regime, it is clearly not yet strong enough to confront all the significant environmental problems facing the international community. To accelerate the pace of progress, the international community must take additional steps to nurture and strengthen the regime. Doing so will require specific understandings as to the level at which problems will be addressed, general acceptance of nations' recipro-

269. The law of the sea has arisen from both custom and treaty. It continues to evolve despite U.S. non-adherence to the Convention. Among recent changes are the entry into force of Annex V of MARPOL, major changes in fisheries, and new initiatives on oil transport. *See supra* note 103 and accompanying text.

cal obligations on environmental matters, and a willingness to better match rhetoric with action.

A. International Environmental Problems Must be Addressed at the Appropriate Level

For the regime to function effectively, environmental issues must be addressed to the proper level. There are four levels of environmental problems which need to be considered.

1. Problems Affecting the Global Commons

Global warming, ozone depletion, some marine pollution problems, the protection of many endangered species and of genetic diversity, and the halting of the release of persistent, bioconcentrating toxic substances are issues which will impact the entire global community. No nation, or even a handful of the most concerned nations, can successfully solve them. They should be handled through international conventions. The most complex issues, such as global warming, may require a series of agreements, understandings, and common actions, though the advantages of an "umbrella" agreement setting forth the primary goals and obligations should not be ignored.

2. Regional Issues

Acid rain, pollution of the oceans from terrestrial sources, and pollution of some rivers and seas are basically regional in character. They should be resolved through regional cooperation, utilizing existing regional institutions or *ad hoc* arrangements as appropriate.

Recent experience suggests the need for caution when considering regional approaches to a problem. There can be unfortunate results when the parties necessary to alleviate a regional problem do not coincide with the actual membership in a regional organization or regional treaty arrangement. The non-participation of a critical player may guarantee that the agreement reached will not be effective. Thus, for example, if the U.K. continues to reject measures to reduce sulfur dioxide releases in Western Europe, as it has done in the past, it will almost certainly condemn to failure the

existing agreement on sulfur dioxide emissions.[270]

On the other hand, having more participants than is needed can also yield unfortunate results. A prime, recent example is the new agreement on nitrogen oxide emissions.[271] The U.S. is a party to the underlying Convention and is a member of the sponsoring organization, the ECE. The U.S. was entitled to participate in the negotiations giving rise to the Protocol, did so, but should not have.

Everyone's interests were poorly served by U.S. participation. The U.S. had a much better record of reducing nitrogen oxide emissions than did most European countries. The Europeans wanted to require percentage reductions from current emission levels, on the theory that doing so would be a crude but easy and reasonably fair way to bring about reductions. The U.S. negotiators considered that proposal unacceptable because it would penalize the U.S. for its better past performance. In the end, after very protracted negotiations, the parties agreed to use an earlier year for the base on which reductions would be calculated, namely 1987, thereby partially meeting American objections. The resulting agreement was a typical international accommodation of differing interests and undoubtedly the outcome of good diplomacy.

The mistake was not the caliber of the diplomacy or the compromise reached, but rather having the U.S. participate in the first place.[272] The primary environmental problem was high levels of atmospheric nitrogen oxide in Western and Central Europe. Nitrogen oxide pollution causes health problems and is an aggravating factor for global warming,[273] acid rain, and ozone pollution. Nitrogen oxide levels are also a modest trans-border issue in North America, though less so than sulfur dioxide. This fact alone is an insufficient justification for a negotiation which attempted to deal with both the European and North American problems simultaneously. Neither region is a major contributor to the nitrogen oxide problems of the other.[274] The better approach would have been for

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270. *See* Sulfur Dioxide Protocol, *supra* note 68.

271. *See* Nitrogen Oxide Protocol, *supra* note 67.

272. The issue is not the right of the U.S. to participate, but rather the wisdom of its decision to exercise that right on this particular topic.

273. Nitrous oxide can last 180 years in the atmosphere and is 200 times as heat absorbent as carbon dioxide. *Under the Sun*, *supra* note 12, at 79.

274. There has been some discussion of the ECE sponsoring negotiation of a third protocol to deal with the ozone. Because of the short half-life of most ozone precursors, a single agreement dealing with ozone pollution in both Europe and North America makes even less

the Europeans to reach their own agreement without the U.S. and for the U.S., Canada, and possibly Mexico to have negotiated a second agreement.[275]

This is not simply a matter of theory; real harm to the interests of all parties resulted from this mismatch of problem and participant. The U.S. involvement significantly delayed agreement. Accommodation of U.S. concerns (which were quite legitimate) resulted in the choice of a lower baseline for reductions and thus apparently a less stringent agreement than if the U.S. had not been involved.[276]

The situation is also unfortunate from the U.S. perspective. The base year chosen means that the agreement will not force substantial improvement in U.S. air quality. The U.S. will not benefit in any significant way from the nitrogen oxide reductions brought about in Europe. In addition, there were significant opportunity costs. The negotiations diverted key State Department and EPA personnel from more important international environmental projects. Finally, the precedent set is an unfortunate one from the American perspective.[277] If, as seems likely, effective international

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sense than one dealing with nitrogen oxide.

275. There has already been some progress toward that goal. The U.S. and Canada planned to begin to negotiate a bilateral air quality accord on August 28, 1990. The purpose of this meeting was to seek an agreement on a framework to provide the means for addressing trans-boundary air pollution. The hoped-for results would include coordinated research and monitoring programs and a joint dispute resolution mechanism. *Environment, Talks on Bilateral Air Quality Accord Between U.S., Canada to Start in August*, Daily Rep. for Executives (BNA), at A3 (July 17, 1990).

276. The harm of U.S. participation has been partially offset by a pledge of 12 mostly Northern European countries to bring about a further 30 percent reduction beyond that required by the Protocol. *See 25 ECE Members Sign Protocol to Limit Emissions of Nitrogen Oxides*, 11 Int'l Env't Rep. (BNA) No. 11, at 581 (Nov. 9, 1988). Of course, one cannot be absolutely certain that a more stringent, legally binding agreement would have been achieved without U.S. participation. However, with U.S. participation, those nations which did not favor a stronger agreement found it easy to hide behind the U.S. position.

277. If the outcome is so unfortunate from the U.S. perspective, one might ask how the U.S. became involved. The explanation goes back to the 1975 Helsinki Conference on Security and Cooperation in Europe (CSCE). *See President Ford Visits Romania and Yugoslavia Following European Security Conference*, 73 DEP'T ST. BULL. 363 (1975). For an informative discussion on the CSCE see Bogdan, *Crossing the European Divide*, FOREIGN POL'Y, Summer 1989, at 56, 61-75. The Soviet Union originated the idea for the Conference, which the NATO countries resisted for some time and only agreed to in the larger context of the Berlin and related accords. There was, nevertheless, considerable interest in assuring that the Conference outcome served Western interests in such areas as human rights, economic cooperation, and the environment. The NATO allies also considered it essential that the U.S. and Canada not be excluded from participation. With the ECE likely to have a role in implementing measures that might be agreed to in Helsinki, the U.S. decided to join the

action on global warming can only be achieved by mandatory conservation of fossil fuels, the U.S. will have the most to lose from a precedent which takes other countries' past reductions into account.[278]

In terms of strengthening the international environmental regime, major reforms are needed to deal effectively with regional environmental issues. Necessary measures include (i) finding ways to energize regional level efforts where they currently do not exist or exist in name only (*e.g.*, in Latin America, Asia, and Africa) and (ii) bringing to a halt misguided efforts to find regional solutions when none are needed.

3. Bilateral Issues

The preponderant fraction of environmental issues with international implications is bilateral and should be handled as such. With few exceptions, bilateral negotiations are far more efficient than multilateral diplomacy. Moreover, the problem of states seeking compromises on unrelated issues as a condition of their cooperation, which can be the scourge of multilateral diplomacy, is minimized by bilateral negotiations. Other procedural and political problems common to multilateral diplomacy, such as contentious credential fights over the participation of unpopular governments, can be avoided through bilateral accords.

Occasionally, there may be situations where bilateral problems

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ECE. The author was in the European Bureau of the State Department at the time and drafted the options papers which recommended U.S. membership in the ECE. The Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, T.I.A.S. No. 10541, 18 I.L.M. 1442 (1979) (a harmless, toothless document), was subsequently signed in Geneva in 1979 by all signatories of the Helsinki Accord. *See* Fouere, *Emerging Trends in International Environmental Agreements*, in INTERNATIONAL ENVIRONMENTAL DIPLOMACY: THE MANAGEMENT & RESOLUTION OF TRANSFRONTIER ENVIRONMENTAL PROBLEMS 34-36 (J.E. Carroll ed. 1988). While this history may justify U.S. adherence to the Transboundary Convention, it does not follow that American participation in the subsequent Nitrogen Oxide Protocol was similarly justified. After all, the U.S. stayed out of the negotiations of the Sulfur Dioxide Protocol and is not a party to it.

278. The U.S. has the highest per capita energy use of any major country. Keller, *Science and Technology*, FOREIGN AFF., Fall 1990, at 123, 126. Other developed countries will argue that much of the problem of global warming would be resolved if the U.S. begins to use energy only at the lower levels already being achieved in Western Europe and Japan. Those countries may point to the Nitrogen Oxide Protocol as precedent. While that may be correct, it will make it that much harder to get the U.S. to the bargaining table on global warming.

can only be resolved in some larger context.[279] Nevertheless, the vast majority of bilateral environmental issues should be handled bilaterally.[280]

Although the negotiations themselves should be bilateral, international conventions may help by establishing general principles which all nations should follow in their bilateral relations dealing with pollution. For example, as discussed below, a convention which adopted the principle that states are liable for significant avoidable harm caused by trans-border pollution would be helpful.

4. National Level Problems

Most environmental problems are domestic in scope. Though there are ample exceptions, field research on actual harm from pollution shows that most pollutant releases have only local consequences. Effectively addressing pollution at the global or regional level is probably impossible, given strong nationalistic sentiments in nearly all countries and the inefficiencies of the international community. Even if it were possible to solve some domestic pollution issues through international action, attempting to do so routinely would be a mistake; the international consensus on most environmental issues is significantly less protective than the domestic consensus in countries with strong environmental movements. There are, however, three circumstances where domestic environmental protection should become a topic for international consideration.

a. Comparative Environmental Protection

Virtually every environmental problem faced by one country is faced by others as well. For example, all countries have serious problems with excessive biochemical oxygen demand (BOD) in

279. One common circumstance justifying raising the level of negotiations beyond that needed to resolve the problem is where countries do not have diplomatic relations, or if they do, the relations are poor. For example, given current political conditions, Syria, Lebanon, and Israel will never meet to discuss the particularly severe pollution problems of the Eastern Mediterranean, but they might participate in a conference of all the Mediterranean littoral states. All three countries are parties to the Convention for the Protection of the Mediterranean Sea Against Pollution, Feb. 16, 1976, 15 I.L.M. 290 (1976).

280. The point made in the text should seem so obvious as not to merit mention yet international environmental negotiating strategy frequently suffers from diplomatic dilettantism. There are strong pressures to regionalize or globalize problems which are inherently national or bilateral in scope, in the mistaken belief that doing so will accelerate progress.

their territorial waters from sewage and industrial pollution.[281] It does not follow that we need an international convention on BOD. The problems it causes can be severe but they are nearly always localized. In those few cases where BOD causes problems across international frontiers, bilateral negotiations are the appropriate solution.[282] However, precisely because the problem is ubiquitous, the nations of the world have much to learn from each other as to the technologies for BOD removal and the regulatory approaches which can be used. Fostering greater international contact among scientists and regulators would bear significant results.

b. Domestic Issues Requiring Outside Expertise and Financing

Developing nations often face environmental problems which require highly technical solutions or capital requirements which are beyond their financial capabilities. Bilateral aid programs, international organizations, and the international financial institutions have occasionally provided technical assistance or the financial wherewithal to attack the problems. Because effective international environmental protection requires the cooperation of all countries on some issues, it is essential to meet the special needs of developing countries when they seek to solve their own domestic environmental problems. Doing so will strengthen the complex international environmental regime in two ways. First, it will provide tangible benefits to developing countries, thereby giving them a greater stake in the regime. Second, it will help raise environmental consciousness, putting to rest the notion, once common in developing countries, that environmental protection is irrelevant to their needs.[283]

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281. Excessive BOD robs a stream of dissolved oxygen and in extreme cases can render the water lifeless. The problem rarely persists at great distances because surface waters are constantly taking additional oxygen from the atmosphere. *See* 10 ENCYCLOPEDIA AMERICANA 484 (1990).

282. There are a few cases, such as the situation concerning the Rhine, where a regional approach on BOD may be helpful.

283. As previously explained, developing countries are properly worried about the relationship between the benefits of specific environmental protection measures they are considering and the costs involved. Deciding on appropriate environmental policies is a difficult task for developing countries and a useful topic for future scholarship. Moreover, the lack of any environmental protection is a major impediment to development, particularly as it relates to the public health. Indeed, a number of the most serious disease problems still facing parts of the world are caused by inadequate or, more commonly, non-existent treatment of human sewage.

c. Domestic Issues Irresolvable Without International Cooperation

International transport of hazardous waste, commerce in pesticides and toxic substances, and protection of some endangered species are environmental problems having the following special characteristic: each nation possesses the theoretical authority to prohibit the outcomes it seeks to avoid, yet in practice, no nation can be successful solely by its own efforts. For these cases, international cooperation is essential.

B. Nations Must Recognize a Universal Obligation to Protect the Global Environment

The wealthier nations of the world frequently will be unable to resolve global environmental problems without the widespread cooperation of the other countries. All countries must acknowledge that they have a legal obligation to protect our common global heritage. This recognition, however, does not mean equal standards of protection should be expected of all countries without reference to the capacity to pay.

C. Developed Countries Must Recognize Their Obligation to Provide Financial and Technical Resources

The developed countries need to acknowledge the corollary to section *B* above: they must increase resources available to developing countries for environmental protection.

Observers may argue that the resources available in the developed countries for financial assistance to developing countries are already badly stretched and that additional funds cannot be made available. There are three answers to this objection. First, on many environmental issues, the greatest need is for technical assistance which may be less expensive to provide than cash and politically more acceptable. Second, a willingness to spend money on a problem is one of the key indicators of genuine concern.[284] Third, and perhaps most importantly, on some issues, measures taken by developing countries may often save developed countries from having to adopt even more stringent and costly measures at home. For

284. In colloquial terms, a developed country should "put its money where its mouth is."

example, a vigorous program of tropical rain forest conservation and replanting previously cleaned and abandoned land might substantially reduce the amount of carbon dioxide in the atmosphere, thereby forcing less drastic cuts in carbon dioxide releases in developed countries. The developed countries should be prepared to share those savings with cooperating developing countries. If additional moneys are not provided, it strongly suggests that the developed countries are only giving lip service to the need for effective international environmental protection.

D. Nations Must Recognize an Obligation to Try to Accommodate the Environmental Interests of Other Nations

If a complex international environmental protection regime is to emerge and take hold, the norm of mutual accommodation needs to go beyond monetary and technical assistance. The success of the regime will also require that countries agree to undertake some environmental measures that they would rather avoid, in order to have the support of other countries on environmental matters of special interest to them. Naturally, there are limits as to how far this can be expected to go. Countries will not undertake measures which are sharply in conflict with their vital, national interests.[285] Nevertheless, nations should be willing to support issues contrary to their individual preferences, if they want other nations to do so on environmental matters of concern to them.

Adoption of these principles does not mean there needs to be an explicit *quid pro quo* for each measure which a particular country may favor. To the contrary, the issues should not be tightly coupled, as doing so makes negotiations far more difficult. Instead, there should be a "grand bargain," in which all nations agree 1) that all nations must protect the common environment to the extent they are able and 2) that the developed nations must help the developing nations reach that goal.[286]

To see how such an approach might work, consider the following example. Taken in isolation, there was some merit in the Rea-

285. While one would like to think the international community could someday get to that position, it is distinctly contrary to the normal expectations of how nation-states behave.

286. It would be difficult, and probably pointless, to try to get this grand bargain established in binding treaty language. Given the characteristics of a regime, it is unnecessary for the principle to be adopted in a binding form, so long as it becomes a recognized norm of international relations.

gan administration's opposition to an international pesticide registry. If, however, the U.S. were animated more strongly by a desire to build an effective international environmental regime, it would have taken a different approach. For example, the U.S. could have made the following statement to the developing nations:

> We do not agree that the proposed measures are necessary or helpful. They will impose costs on pesticide producers which will be passed on to consumers, including those in developing countries. Nevertheless, we will go along with your proposal. We hope you will do the same for us as other environmental issues arise of special importance to us.

E. Nations Must Recognize and Begin to Implement an Obligation Not to Do Each Other Significant Environmental Harm

Closely related to the need for countries to assist each other is the need for them to halt trans-boundary environmental harm to the extent they are able to do so. At present, polluting one's neighboring countries is far more common than not doing so. The consequences of this pattern are palpable environmental damage and harm to the international environmental regime.

One closely related difficulty is the lack of a strong international framework for considering and resolving trans-boundary environmental problems. Such a framework need not be a new institutional superstructure; indeed, for reasons discussed more thoroughly above, that is politically non-negotiable and perhaps undesirable.[287]

The first needed change is international adoption of the principle that each nation has a binding legal obligation not to impose significant, actual environmental harm on neighboring countries or, at a minimum, an obligation to refrain from doing so if the harm could reasonably have been avoided, given the polluting country's level of development. Although this principle has been repeatedly asserted by commentators[288] and was articulated at the 1972 Stockholm Conference (in somewhat hedged terms), no court has based a decision on the theory that this obligation is a part of cus-

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287. *See supra* text at part IV(*C*).

288. *See* J. Lammers, *The Present State of Research Carried Out by the English-Speaking Section of the Centre for Studies and Research*, in TRANSFRONTIER POLLUTION AND INTERNATIONAL LAW 89, 94 (1985).

tomary international law.[289] Similarly, there is no binding international convention of broad applicability to that effect, though a few special purpose treaties contain the principle. The topic is rarely addressed in bilateral Friendship, Commerce, and Navigation treaties or other agreements by which countries lay out the basic conditions of friendly relations.

A global convention making each nation strictly liable for any environmental damages or risk of harm it caused in any other country, regardless of the feasibility of preventing the harm and irrespective of the nation's level of development, would be impossible to negotiate.[290] The alternative of setting global minimum pollution control standards which all countries must meet would probably also be impossible to agree upon and would not be worth much if achieved.[291] Most countries would also reject the proposition that their industries could be required to meet the pollution control standards of neighboring countries, particularly since many environmental statutes are designed to provide a wide margin of safety from the risk of harm, not merely prevent actual harm.[292]

A more modest proposal having somewhat better prospects for success would be a convention which established the principle that countries may not allow their industries to cause *significant actual* harm in neighboring countries, provided only that effective control measures were technically and economically feasible given the polluting country's level of development. Such a principle could be contained in a treaty of widespread application, either at the

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289. The Trail Smelter Arbitration between the U.S. and Canada held that recovery was possible on the facts of that case, where a single source of pollution caused damage in a neighboring country. Trail Smelter Case (United States v. Canada), 3 R. Int'l Arb. Awards 1911 (1938). As a matter of international law, the case is notable for its singularity. There are cases decided under domestic law where courts had jurisdiction over foreign defendants, but the number is remarkably small. Most cases today would not involve such clear facts as *Trail Smelter*. Far more commonly, cases will involve harm clearly attributable to upstream or up-wind sources of pollution, but with the damaged party unable to identify the guilty facility. The *Trail Smelter* decision is inapposite in such situations.

290. Would Mexico be willing to pay the U.S. damages for an elevated risk of harm even though no actual harm was shown? Given the differences in resources and political differences, would Zambia compensate South Africa, or North Korea compensate Japan, even if real harm were demonstrated?

291. Truly global minimum standards are likely to suffer severely from the lowest common denominator phenomenon. For pollution control, that lowest common denominator is no control at all.

292. Even with the U.S., that principle has been highly controversial. *See, e.g.*, Champion Int'l Corp. v. EPA, 850 F.2d 182 (4th Cir. 1988), and Oklahoma v. EPA, 908 F.2d 595 (10th Cir. 1990). In both cases, the polluting states strongly objected to effluent limits necessary to meet water quality standards of the downstream state.

global or regional level, with the details of the guarantees worked out in bilateral treaties or separate agreements among commonly affected countries.

A second, closely related need is for nations either to allow their courts to enforce foreign judgments for environmental damages caused by domestic industry or, where that is not possible for technical or political reasons, to assume the obligation themselves to pay the damages.[293]

A third need is to drop the requirement which some countries have that environmental standards in the downstream or downwind state must be as stringent as their own before harmful pollution can be abated, as the U.S. CAA does.[294] Such requirements encourage blatantly political determinations.[295] A possible solution is to have lower standards for reciprocity than are imposed domestically. Given differing levels of development, such minimum standards might vary considerably by region.

F. Consensus is Needed That Some Actions Must be Taken Before the Full Weight of Scientific Evidence is Available

Ordinarily, prudence dictates that one not act on potential problems until it is certain they exist. Otherwise, in a world where needs greatly outstrip the capacity of the international community to meet them, precious resources will be squandered and more pressing problems will not be addressed. However, experience with

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293. Except for especially close legal systems, such as the U.S. and Canada or within the EC, nation-states will not commonly allow foreign court actions in the environmental field to be given effect in their territories (*e.g.*, enforcing criminal judgments or specific performance orders). Far less severe restrictions on sovereignty would be involved, however, if civil judgments for monetary damages were enforced. Placing the obligation on governments to pay such judgments would have the welcome advantage of eliminating very difficult issues of proof that often arise in cross-border pollution problems. For example, if any of 30 plants on a river having its origin in country *A* are responsible for severe degradation of water quality in downstream country *B*, the government of country *A* could be held liable for actual harm caused to economic assets or human health even if the harmed parties in country *B* could not prove which plants were responsible. *See* R. FISHER, IMPROVING COMPLIANCE WITH INTERNATIONAL LAW 236-46 (1981).

294. The CAA, Pub. L. No. 95-95, § 115, 91 Stat. 685, 710 (1977) (codified at 42 U.S.C. §§ 7401-7642, 7415(c) (1988)). Note, there is a revamped CAA out. The CAA of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (1990).

295. An example of such a political determination was the refusal of the U.S. government to certify that Canadian air pollution controls were comparable to U.S. controls when a fair reading reported they were different, but on balance about as stringent. *Cf.* New York v. Thomas, 613 F. Supp. 1472, 1483-84 (D.D.C. 1985), *rev'd*, 802 F.2d 1443 (D.C. Cir. 1986), *cert. denied*, 482 U.S. 919 (1987).

several recently identified global environmental problems suggests we need to revise our thinking as to what constitutes prudent behavior. The international community has not been consistent on the level of scientific evidence needed to trigger action. On ozone depletion, the U.S. took the lead in convincing the international community of the need to act immediately as opposed to later when the ozone layer might already be seriously depleted. Nevertheless, on the acid rain and global warming issues, it was the U.S. which argued for restraint pending the outcome of additional research.

A global consensus is needed concerning the amount of proof necessary to initiate international action. There may be merit in a three-tiered approach along the following lines. First, even inconclusive or preliminary scientific evidence of adverse global effects should trigger a sharp increase in research. Second, substantial but inconclusive evidence of likely harm should set off those measures which should be done anyway for other reasons or which will be the most cost effective. Third, the most stringent, expensive, or disruptive measures should be adopted only when there is clear scientific evidence of the need to do so.

For example, in 1978 when the U.S. banned the use of CFCs for aerosol propulsion, the evidence was not as conclusive as it is now that CFCs cause ozone depletion. On the other hand, alternatives to CFCs were already available for use as aerosol propellants. The change brought about a substantial reduction in short term emissions with a minimum of economic disruption. That bought time, during which the evidence became compelling.

In this spirit, U.S. Secretary of State Baker has urged greater international efforts at energy conservation and tree-planting, arguing that these actions are inherently desirable and will help substantially on global warming.[296] More drastic steps, he argues, can await further research.[297]

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296. In his State of the Union Message of January 31, 1990, President Bush called for a program to plant one billion trees per year for the next ten years in the U.S. Schneider, *Bush Offers a Feel-Good Pep Talk*, L.A. Times, Feb. 4, 1990, at M1, col. 1. While estimates vary, such a program could reduce carbon dioxide in the atmosphere by an amount equal to one percent of total global carbon dioxide releases. The U.S. acting alone cannot solve the problem. However, other countries following suit can make a modest dent can be made in the problem. Even if global warming turns out to be less of a problem than most scientists now predict, the effort will have been worthwhile, as tree planting is relatively inexpensive, and most places would benefit from having more trees.

297. The author agrees with the principle but not the specific policy conclusions which

G. Key Governments Must Begin Acting in Accordance with Their Rhetoric

The ability of governments to make somber but carefully hedged encouraging statements on matters on which they have little or no genuine interest is a wonder to behold. Unfortunately, in their early stages, it is difficult to differentiate between issues involving nothing more than lip service and issues which the world community genuinely believes are important. The first non-binding steps are being taken on these latter issues which will lay the groundwork for more concrete measures later.

There are, fortunately, several tests which help determine whether governments consider an issue to be a "real" one.

First, *on important issues, governments are prepared to undergo detriments to their domestic well-being to foster their international diplomacy.* For example, in the interest of expanded world trade, nations have had to cut back on tariffs which prop up domestic industry. Similarly, the world was more willing to believe that the Carter Administration was genuinely concerned about nuclear nonproliferation once it took steps contrary to the interests of the U.S. domestic nuclear power industry.[298]

Second, as previously discussed, *on vital issues, governments are prepared to spend large amounts of money.*

Third, *senior government officials personally raise issues they care about.* The communiques of meetings between heads of state and foreign ministers are replete with language on matters the senior officials have not actually discussed or have only touched on for the record. Where senior officials actually raise matters with their counterparts, it is an indication that the issue is of concern to them. International human rights became a high-profile issue only

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the President and his advisors draw from it. Using Secretary Baker's reasoning, *far* more could be justified in terms of energy conservation than the Administration has proposed to date. Such energy conservation would reduce greenhouse gases and thus may help with global warming. Even if global warming proves to be an illusion, greater energy conservation is worth undertaking in any event given the reduced urban air pollution, acid rain, and energy use which energy conservation measures would automatically bring about. The same could be said for measures to greatly expand resource recycling.

298. *The Nuclear Industry is Aglow Over Reagan*, BUS. WK., Nov. 24, 1980, at 43 (Industrial ed.). Many countries thought those policies were misguided, but the sincerity was not seriously questioned once it became clear the U.S. was prepared to make domestic sacrifices in the interest of those policies.

after senior officials in several countries began discussing it personally.

Fourth, *on major issues, substantial governmental non-monetary resources are committed.* For years, the U.S. and the Soviet Union talked about preventing inadvertent nuclear war, but did little to avoid it. More recently, however, the "hotlines" between Washington and Moscow have been upgraded, crisis control centers were established, high level discussions were held between the senior-most U.S. military officials and their Soviet counterparts, agreements were reached on minimizing the risk of incidents.[299] The point is not the wisdom or the sufficiency of these measures but rather that they indicate that the respective governments finally are willing to take concrete steps to minimize the risks of accidental war.

Finally, *on the most important matters, high-level personnel are assigned to work exclusively on the problem.* Like establishing a study commission, creating offices and titles is sometimes a step governments take to create the illusion of action. Nevertheless, naming high-level personnel to handle a matter is important because governments rarely become seized of an issue without devoting the full-time attention of high-ranking officials. For example, the Carter Administration created a new Assistant Secretary of State position with a modest staff to devote full time to international human rights.[300] On the other hand, the dismal failures in U.S. efforts to halt the spread of ballistic missile technology could be predicted from the lack of even one senior official in the U.S. government for whom this was his or her primary responsibility. In making his proposal to raise the EPA to cabinet level, President Bush cited the need for the EPA Administrator to have a status equal to his counterparts in other governments.[301]

When measured against these standards, are international environmental protection efforts genuine or only a matter of lip service? The answer is that it is a mixed picture. Clearly on ozone depletion, the U.S. and some other governments were prepared to impair the economic well being of the multi-billion dollar CFC in-

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299. *Inside the Pentagon*, Proprietary to United Press Int'l, July 27, 1985 (wire service); *Cruise-Mishaps*, Reuters, Jan. 3, 1985 (wire service); *Soviet Chief of Staff Ends Visit to United States*, Tass, Oct. 6, 1990 (wire service).

300. Lardner, *Human Rights Spokesman Reported Chosen*, Wash. Post, Oct. 30, 1981, at A12, col. 1.

301. *See* Morgenson & Eisenstodt, *Profits Are for Rape and Pillage*, FORBES, Mar. 5, 1990, at 94; *Adding to the Cabinet Surplus*, ECONOMIST, Jan. 27, 1990, at 28.

dustry to protect the environment. On acid rain, the high level attention given by senior Canadian officials finally convinced the U.S. that political relations with Canada would deteriorate without U.S. action, but the lack of any concrete steps for years indicated that the U.S. was not serious no matter what U.S. officials said. Some nations appear to be ready to adopt expensive measures to reduce global warming, the U.S., however, is not among them. Hardly any nations are prepared to take major steps to reduce trans-border pollution outside the context of acid precipitation. A few care deeply about maritime pollution issues, but most pay no real attention to other global commons issues.

If the U.S. cares as much about international environmental problems as it proclaims, then the U.S. should act the part.[302] One hears around Washington that the President, the Secretary of State, and other top U.S. officials are virtually never the first to raise environmental issues, though they are interested enough to be prepared to respond. The U.S. government has not allocated sufficient resources to allow the U.S. to exercise greater leadership. Granted, at a time of budgetary reductions, finding money for research and "slots" for additional personnel is difficult, but they are somehow found for other pressing matters. Above all, it would be desirable for the President to name a Special Ambassador for International Environmental Protection, with the authority to coordinate all U.S. international efforts, and to undertake necessary steps domestically. The individual selected should preferably be someone the President personally knows, likes, and trusts and who would have direct access to him. The Administrator of the EPA has been attempting to perform that role but is not in a position to do so. On the emerging international environmental issues of greatest concern, many agencies, other than the EPA, have the neces-

302. The U.S. decided, for human rights reasons, not to invite China to a White House sponsored conference on Scientific and Economic Research Related to Global Change. This conference was billed as the centerpiece of the President's efforts on global warming. Those same human rights concerns did not interfere with the decision to let China launch U.S.-made communication satellites or to continue China's most-favored-nation trade status. Without Chinese participation and given the size of China's population and its plans to expand coal production, efforts to slow global warming by reducing the use of fossil fuels are probably pointless. *See* Rosenthal, *U.S. Bans China From Pollution Talks*, N.Y. Times, Apr. 16, 1990, at B7, col. 4. This is not the place to assess the merits of the Administration's China policy and its relationship to human rights. However, by its selection of which matters are important enough to warrant contact with China despite human rights concerns, the Administration demonstrates that environmental matters have a very low priority when compared with satellite launches or the importation of Chinese textiles.

sary expertise and regulatory powers.[303]

VI. CONCLUSION

As a global community, we face a long list of environmental problems. Some, like global warming, stratospheric ozone depletion, and desertification are potentially very serious, threatening global health, the adequacy of food-stocks, and much of the economic progress achieved by developed and developing countries alike. Others, like the loss of genetic diversity, plastic pollution of the oceans, and international traffic in hazardous waste do not conjure visions of a near-term Apocalypse, but nevertheless will determine the kind of world we leave to future generations.

On any particular global environmental problem, reasonable people can differ on the certainty of the risk, the seriousness of the consequences, and the appropriateness of the proposed remedies. Yet, when all global environmental problems are considered together, the only reasonable conclusion is that the response of the international community to date has been inadequate. This inadequacy has led some environmentalists and legal scholars to conclude that a fundamental change is needed in the international order. Nations, they say, must cede major portions of their sovereignty to new supra-national institutions armed with sufficient powers to compel adequate environmental protection everywhere.

If this view is correct, it is grounds for deep pessimism, for nations will not willingly cede sovereignty on this score, or any other. Even if we can move toward a new international order in which national sovereignty plays a substantially smaller role, progress toward that goal (if there is progress at all) will come very slowly. We do not have the time: most global environmental problems require significant progress by the international community before the end of the century.

Fortunately, there is a middle course between business as

303. For example, the Departments of Energy, Interior, and Agriculture, the Federal Energy Regulatory Commission, and the Nuclear Regulatory Commission all have roles on global warming at least as important as that of the EPA, if not more so. The Departments of Commerce, Interior, Transportation, and Treasury are all more involved with marine mammal protection, endangered species protection, and maritime pollution issues than the EPA. Merely elevating the EPA to cabinet status, as President Bush has proposed to the Congress, will accomplish nothing with respect to the capacity of the head of the EPA to represent the U.S. on those issues which will remain largely out of EPA's control.

usual and resting all our hopes on the remote prospects for a fundamental change in the nature of the international system: we can begin building a stronger international environmental regime within the confines of the existing international order. A good deal of useful groundwork has already been laid. Greatly strengthening the existing regime will require relatively modest increases in financial resources, in the strength and vision of leadership, in global political will, in diplomatic effort, and in the further development of international legal principles and institutions. These measures are within our grasp.