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THE "NEW" MONTREAL PROTOCOL AND THE FUTURE OF INTERNATIONAL LAW FOR PROTECTION OF THE GLOBAL ENVIRONMENT

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INTRODUCTION

In June 1990, representatives of sixty countries met in London to renegotiate an agreement that three years previously had been hailed as a landmark in international environmental diplomacy. That agreement was the Montreal Protocol for Protection of the Ozone Layer—a culmination of almost two decades work by state officials, scientists, public interest groups, and intergovernmental organizations. Despite its much-lauded control schedule, the Protocol had thus far failed in its central objective of halting further ozone depletion and repairing damage already sustained.

Few underestimated the crucial significance of this second meeting of Protocol parties. It was here, in the course of attempting to improve the agreement's effectiveness, that the pattern for future environmental negotiations between rich and poor countries would be set. The parties also recognized that if a solution to this relatively straightforward issue continued to elude the international community, there could be little hope of progress on much more intractable environmental threats yet to be addressed.

The purpose of this study is twofold. Part One will explore the problem of ozone depletion in its historical context from both a political and legal perspective. A brief overview of the subjects, scientific aspects, and the international community's response to the threat of ozone depletion will be followed by a detailed examination and critical evaluation of the 1990 amendments and adjustments to the Montreal Protocol. While all major changes are documented and analyzed in detail, particular consideration will be given to the strengthened reduction schedule, the newly created financial mechanism designed to encourage widespread and effective participation, and the improved monitoring and enforcement arrangements. Part One concludes the survey of current developments by looking towards 1992 and the fourth meeting of Protocol parties, at which time many remaining weaknesses in the agreement will present themselves for resolution.

In Part Two, several innovative features of the Montreal Protocol and the process of its creation will be examined within the broader context of international environmental law. In this way the author seeks first to identify those "weaknesses" of traditional international law which have prevented imaginative

and effective environmental regulation, and second, to draw tentative conclusions from the "ozone experience" as to how such deficiencies may be overcome in the future.

I. THE INTERNATIONAL COMMUNITY AND THE OZONE LAYER 1974–91

A. The Ozone Layer

Ozone is a simple, highly unstable molecule of oxygen containing three atoms (O_3). Ozone is found in varying concentrations throughout the atmosphere, principally in its lower two layers: the troposphere,[1] which extends upwards ten to twelve kilometers from the earth's surface, and the stratosphere, lying between the troposphere and fifty kilometers above sea level.[2] What is often referred to as the *ozone layer* is that region of the middle stratosphere containing a relatively high concentration of ozone molecules.[3] Stratospheric ozone performs two functions essential to life on earth. First, in the process of its creation and destruction,[4] ozone absorbs solar radiation wavelengths which are harmful to living organisms,[5] thereby preventing

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1. Ozone is found at ground level only in small quantities. Any excess of ground level ozone may have serious environmental and health effects. UNITED NATIONS ENVIRONMENT PROGRAMME, THE OZONE LAYER 9-10. UNEP/GEMS Env't Libr. No. 2 (1987) [hereinafter UNEP, THE OZONE LAYER].

2. Ozone distribution is also a function of latitude and season. Total ozone levels are lowest in equatorial latitudes with maximum ozone concentrations being found in the polar regions. Significant seasonal variations in total column ozone levels occur at higher latitudes in both hemispheres. AUSTRALIAN ENVIRONMENTAL COUNCIL, NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL, ENVIRONMENTAL, HEALTH AND ECONOMIC IMPLICATIONS OF THE USE OF CHLOROFLUOROCARBONS AS AEROSOL PROPELLANTS AND POSSIBLE SUBSTITUTES 17 (P.J. Fraser ed., 1988) [hereinafter AEC REPORT].

3. This layer is generally located between 20 and 25 km above sea level where ozone levels reach 1:100,000 per volume. UNEP, THE OZONE LAYER, *supra* note 1, at 9.

4. "A molecule of ozone (O_3) is created, when a photon of ultraviolet light strikes an oxygen molecule (O_2); a photon splits the oxygen molecule into two oxygen atoms (O). These atoms quickly combine with intact oxygen molecules to form ozone. Ozone readily absorbs ultraviolet light (UV) and dissociates into its component parts (O_2,O). The freed oxygen atom subsequently joins with another oxygen molecule, reforming ozone. The gas continues to dissociate and reform many times in a dynamic steady-state." Richard S. Stolarski, *The Antarctic Ozone Hole*, 258 SCI. AM. 30 (1988).

5. ANDREW LOTHIAN, SOUTH AUSTRALIAN DEPARTMENT OF ENVIRONMENT AND PLANNING, UNDERSTANDING OZONE 3 (1990).

such harmful radiation from reaching the earth's surface. Ozone also absorbs and emits thermally significant terrestrial infrared radiation.[6] It is therefore an essential trace gas for the maintenance of atmospheric temperature and global climate.[7]

Chemical reactions in the upper atmosphere create and destroy ozone molecules.[8] These continuous reactions ensure that ozone levels are naturally maintained in a state of dynamic equilibrium. Introduction of anthropogenically produced chemicals which speed up those processes responsible for the destruction of ozone has upset this balance.

A number of ozone-depletion theories were advanced and discarded[9] before 1974 when Molina and Rowland published their seminal article implicating chlorofluorocarbons (CFCs) in ozone depletion.[10] Since then, the international scientific community has subjected the complex chemistry of ozone depletion to rigorous scrutiny. While the dynamics are not yet fully understood, it is now widely accepted that the long-lived indus-

BAND	RANGE	EFFECT ON LIFE	ABSORPTION BY OZONE
UV-A	315-400 nm	harmless	some
UV-B	280-315 nm	harmful	most
UV-C	200-280 nm	lethal	all

Id.; *See also* NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL, HEALTH EFFECTS OF OZONE LAYER DEPLETION 8, 71-72 (1989) [hereinafter NHMRC REPORT].

6. *Id.* at 71.

7. *See infra* notes 22-24 and accompanying text.

8. *See* Stolarski *supra* note 4.

9. The issue of CFC-linked stratospheric ozone depletion was actually raised as early as 1964, but received little attention. *See* Sylvia M. Williams, *A Historical Background on the Chlorofluorocarbon Ozone Depletion Theory and Its Legal Implications, in* CEES FLINTERMAN ET AL., TRANSBOUNDARY AIR POLLUTION: INTERNATIONAL LEGAL ASPECTS OF THE CO-OPERATION OF STATES 267, 269 (1986). The use of supersonic jets and space shuttles was also implicated in causing significant future damage to the ozone layer. *See* Carl Q. Christol, *Aircraft and the International Legal and Institutional Aspects of the Stratospheric Ozone Problem*, 1 ANNALS AIR & SPACE L. 3 (1976). *See also* UNEP, THE OZONE LAYER, *supra* note 1, at 15. This issue has recently resurfaced in the wake of increasingly sophisticated knowledge of atmospheric chemistry, and for a discussion of current plans for a "post-Concorde fleet of supersonic transport aircraft." *See* John Gribbin, *Supersonic Plans 'Threaten Ozone Layer,'* 126 NEW SCI., Jun. 9, 1990, at 24.

10. Mario J. Molina & F.S. Rowland, *Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom Catalysed Destruction of Ozone*, 249 NATURE 810 (1974).

trially manufactured organochlorine and bromine chemicals, CFCs and bromofluorocarbons (BFCs or halons),[11] are chiefly responsible.[12] Because of their inherent stability,[13] these substances are not broken down in the troposphere but are transported slowly into the stratosphere where they gradually dissociate under the influence of ultraviolet radiation. This process produces the highly reactive chemicals (principally chlorine monoxide and bromine radicals) that catalytically destroy ozone.[14]

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11. The less abundant halons have not been considered as serious a threat to stratospheric ozone. However, halons are up to ten times more destructive of ozone than CFCs, and recent studies suggest that global emission levels are in fact much greater than previously estimated. *See* Ian Anderson, *Halons Hit New High Over Antarctica*, 122 NEW SCI., May 20, 1989, at 24.

12. A number of additional anthropogenic chemicals including methylchloroform (CH_3CCl_3) and carbon tetrachloride (CCl_4) have been identified as ozone destructive. *See also* NHMRC REPORT, *supra* note 5, at 10. Other naturally occurring trace gases, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (NO_2), may also indirectly affect levels of stratospheric ozone. *See*, AUSTRALIAN ENVIRONMENT COUNCIL, STRATEGY FOR OZONE PROTECTION 13 (1989) [hereinafter OZONE STRATEGY]. *See also* UNEP, THE OZONE LAYER, *supra* note 1, at 14; *Methane Extends its Icy Influence*, 122 NEW SCI., 29 Apr. 1989, at 38. CFCs are synthetic compounds containing both chlorine and fluorine. They are used extensively in refrigeration and air-conditioning, as aerosol propellants, in plastic foam production, and as solvents for cleaning and degreasing. The bromine-based synthetic compounds, referred to as halons, suppress combustion and explosions by interfering with chain reactions involving free radicals. For this reason they are an effective fire-fighting agent widely used in both fixed flooding systems and portable extinguishers. OZONE STRATEGY, *supra*, at 19-75; UNEP, THE OZONE LAYER, *supra* note 1, at 14-15.

13. Common CFCs and halons have atmospheric lifetimes of 75 to 110 years. UNEP, THE OZONE LAYER, *supra* note 1, at 14. As a result, any alteration in atmospheric ozone will not be repaired until a considerable period after emission of ozone depleting substances is curtailed or terminated. Watson, *Atmospheric Ozone, in* PROCEEDINGS OF THE WORLD CONFERENCE ON THE CHANGING ATMOSPHERE: IMPLICATIONS FOR GLOBAL SECURITY, WMO/OMM No. 710, 71-72 (1988) [hereinafter PROCEEDINGS: THE CHANGING ATMOSPHERE].

14. Chlorine destroys the natural balance of ozone in the stratosphere by "stealing" the ozone's third oxygen atom, converting ozone (0_3) into a chlorine monoxide radical (ClO) and oxygen atom (0). Radicals, which are molecules that have odd numbers of electrons, are highly reactive. When the chlorine monoxide encounters a free oxygen atom (ClO + 0), the oxygen in the chlorine monoxide molecule becomes highly attracted to the free oxygen atom and breaks away to form a new oxygen molecule (0_2, free Cl). The abandoned chlorine radical is free to begin ozone destruction anew. Stolarski, *supra* note 4, at 323. The rate at which ozone levels can be subsequently increased is also affected as the chlorine radical consumes available free oxygen atoms (O) which would otherwise combine with regular oxygen molecules (O_2) to form ozone (O_3). *The Chemistry of Ozone Depletion*, 13 HELIX 12 (CSIRO Austr., Mar. 1989).

Depletion of the ozone layer will have a serious impact on biological life and planetary processes. Any significant increase in the level of solar radiation reaching the earth's surface[15] is expected to cause a corresponding increase in the frequency and severity of various cancers, viral diseases, protozoal infections, and eye complaints.[16] While there is a wide variation in plant response to greater concentrations of solar radiation, it appears that the inevitable interference with photosynthesis will severely decrease agricultural productivity.[17] Scientists also expect more subtle effects on ecosystems.[18] Aquatic organisms, particularly phytoplankton and zooplankton, are especially sensitive to ultraviolet radiation. Diminished production would have serious implications for marine food chains,[19] leading to a serious decline in species diversity[20] and edible fish levels.[21]

Higher levels of solar radiation are only part of the problem. Destruction of the ozone layer or a chemically induced change in the vertical profile of ozone are both likely to affect the thermal structure of the atmosphere, thereby influencing global climate.[22] While the relationship between ozone and

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15. It appears that a 10% decrease in ozone concentrations will result in a 20% increase in surface UV-B radiation. UNEP, THE OZONE LAYER, *supra* note 1, at 27; *see also* AEC REPORT, *supra* note 2, at 75.

16. Most of these adverse effects result from the ability of UV radiation to alter the genetic message carried by cell DNA and to exert a "selective immunosuppressive effect" on the body's immune system. *See* AEC REPORT, *supra* note 2, at 80-83; NHMRC REPORT, *supra* note 5, at v-vi, 96, 114; and UNEP, THE OZONE LAYER, *supra* note 1, at 28.

17. *See* UNEP, THE OZONE LAYER, *supra* note 1, at 28; Roger Beckmann, *Plants in the Sun*, 68 ECOS. 28, 29 (1991).

18. For example, the balance of an ecosystem may be easily upset by the proliferation of UV tolerant organisms "at the expense of UV sensitive types." AEC REPORT, *supra* note 2, at 84.

19. Most single-celled aquatic plants (phytoplankton) and eggs and larvae of aquatic animals (zooplankton) are found near the water's surface, and are therefore particularly vulnerable to increases in solar radiation. Such increases would severely disrupt the reproductive capacities and shorten the lifespans of these crucial links in the marine food chain. *See* UNEP, THE OZONE LAYER, *supra* note 1, at 28; AEC REPORT, *supra* note 2, at 85; John C. Whitehead, *Letter of Submittal to President of the Vienna Convention for the Protection of the Ozone Layer*, Aug. 22, 1985, *reprinted in* 26 I.L.M. 1518.

20. AEC REPORT, *supra* note 2, at 85.

21. UNEP, THE OZONE LAYER, *supra* note 1, at 28. Fish represent 18% of total animal protein consumed globally. This percentage is significantly higher with respect to populations in poorer coastal States. *See* AEC REPORT, *supra* note 2, at 85.

22. On this, see generally Daniel L. Albritton, *Stratospheric Ozone Depletion:*

climate change is complex and not perfectly understood, it appears likely that a net surface warming will occur, particularly when the recent increases in tropospheric ozone and other potent greenhouse gases are considered.[23] These gases (including certain CFCs and BFCs) absorb infrared radiation and trap heat in the lower atmosphere, thereby interfering with Earth's "natural cooling mechanism."[24]

B. Global Ozone Trends

Despite several decades of observation and the utilization of increasingly sophisticated equipment, scientists have found it difficult to accurately measure past changes in global ozone. Considerable natural variations, due, *inter alia,* to cyclical changes in atmospheric motion and solar activity, have hindered efforts to assess net ozone losses.[25] In 1986, the National Aero-

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Global Processes, in OZONE DEPLETION, GREENHOUSE GASES AND CLIMATE CHANGE 10 (1989)(proceedings of a joint symposium by the Board on Atmospheric Sciences and Climate and the Committee on Global Change Commission on Physical Sciences, Mathematics, and Resources, National Research Council); Watson, *supra* note 13, at 71; UNITED NATIONS ENVIRONMENT PROGRAMME, THE GREENHOUSE GASES (1987) [hereinafter UNEP-GREENHOUSE].

23. The *greenhouse effect* is the process largely responsible for the development of Earth's present climate. However, recent sharp increases in the atmospheric concentration of certain trace gases is expected to enhance this natural process and result in a significant level of global warming. Carbon dioxide, principally a by-product of fossil-fuel consumption, land clearing, and soil wastage, is the most abundant of these gases. Its contribution to global warming is estimated to be about 50% of the total greenhouse effect. An ozone loss-induced reduction in phytoplankton (*supra* notes 19-21 and accompanying text) may very well increase the levels of atmospheric carbon dioxide, since phytoplankton, which constitutes 75% of marine plant mass and 25% of total global plant production, is extremely efficient at absorbing this particular trace gas. *See also* OZONE STRATEGY, *supra* note 12, at 13; UNEP-GREENHOUSE, *supra* note 22, at 13-16. Other greenhouse gases identified apart from CFCs, BFCs and tropospheric ozone include methane, nitrous oxide, and carbon monoxide. In addition, all of these gases contribute, either directly or indirectly, to depletion of stratospheric ozone. Watson, *supra* note 13, at 71. *See also* UNEP-GREENHOUSE, *supra* note 22, at 17; John Gribbin, *Greenhouse Gases Put the Chill on Arctic Ozone,* 122 NEW SCI. May 13, 1989, at 35; Hare, *The Global Greenhouse Effect, in* PROCEEDINGS: THE CHANGING ATMOSPHERE, *supra* note 13, at 60.

24. UNEP, THE OZONE LAYER, *supra* note 1, at 4, 10-13.

25. *See id.* at 25. A good example is provided by the 25% reduction in ozone levels recorded over Scandinavia during the first week of February, 1989. This depletion was later found to be caused by "complex weather dynamics" and did not in fact represent a net loss of ozone. Fred Pearce & Ian Anderson, *Is There an Ozone Hole Over the North Pole?,* 122 NEW SCI., Feb. 25, 1989, at 32.

nautical Space Administration (NASA), in conjunction with other national and international organizations, including the World Meteorological Association (WMO) and the United Nations Environment Programme (UNEP), conducted a major review and re-analysis of all available data relating to atmospheric ozone concentrations. A final report from NASA and the Ozone Trends Panel was released in 1988, and included results from the NASA-backed Airborne Antarctic Ozone Experiment conducted the previous year.[26] The Panel, after adjusting measurements to allow for natural geophysical variability, detected small but statistically significant changes in both total column ozone and its vertical distribution between 1979 and 1986.[27] The Panel concluded that such changes may well be due to the increased abundance of atmospheric trace gases—primarily CFCs.[28]

Of far greater magnitude were the levels of stratospheric ozone depletion measured over Antarctica during the 1987 Experiment.[29] The springtime "hole" has been observed since

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26. R.T. WATSON AND THE OZONE TRENDS PANEL, M.J. PRATHER AND THE AD HOC THEORY PANEL, M.J. KURYLO, AND THE NASA PANEL FOR DATA EVALUATION, PRESENT STATE OF KNOWLEDGE OF THE UPPER ATMOSPHERE 1988: AN ASSESSMENT REPORT (1988). *See also* NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ET AL, REPORT OF THE INTERNATIONAL OZONE TRENDS PANEL (1988) [hereinafter OZONE TRENDS PANEL REPORT]. NASA had previously issued a three volume report entitled, ATMOSPHERIC OZONE 1985, ASSESSMENT OF OUR UNDERSTANDING OF THE PROCESSES CONTROLLING ITS PRESENT DISTRIBUTION AND CHANGE. GLOBAL OZONE RESEARCH AND MONITORING PROJECT REPORT. No. 16, WMO (1986) [hereinafter ATMOSPHERIC OZONE 1985]. Another important report confirming many of the panel's findings was published in 1988 by the United Kingdom Stratospheric Ozone Review Group. THE UNITED KINGDOM STRATOSPHERIC OZONE REVIEW GROUP, STRATOSPHERIC OZONE 1988 (1988).

27. *Id. See also* NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, EXECUTIVE SUMMARY OF THE OZONE TRENDS PANEL REPORT (1988)[hereinafter EXECUTIVE SUMMARY], and summary of key panel findings in Watson, *supra* note 13, at 77.

28. Watson, *supra* note 13, at 76. *See also* C.B. Farmer et al., *Stratospheric Trace Gases in the Spring 1986 Antarctic Atmosphere*, 329 NATURE 126 (1987). More recently, scientists have been made aware of the heavy concentration of BFCs (halons) over Antarctica as well. Anderson, *supra* note 11, at 24.

29. In August 1987, Antarctic stratospheric ozone measured a thickness equivalent to 3.0 mm at sea level. By early October, this had been reduced to 1.3 mm. At the heart of the ozone layer, that is, at an altitude of approximately 16.5 km, more than 97% of the ozone had been consumed. *See* ATMOSPHERIC OZONE 1985, *supra* note 26; Andrew Bell, *Chlorine Blamed for Growing 'Ozone Hole,'* 56 ECOS 3 (1988). Importantly, the 1987 springtime hole persisted much

the early eighties,[30] each year growing progressively deeper, despite what appeared to be explicable turnarounds in 1986 and 1988.[31] Some think the unique winter/spring Antarctic meteorology permits the creation of an isolated air-mass (polar vortex) with temperatures sufficiently cold to perturb the critical composition of the upper atmosphere.[32] Within this vortex, the anthropogenically influenced processes by which ozone is destroyed are hastened and intensified.[33]

In 1989, NASA launched another expedition, this time an investigation of the winter Arctic stratosphere. The expedition's final report[34] revealed that the chemistry responsible for Antarctic ozone depletion was also present in the atmosphere above the North Pole.[35] The Arctic ozone layer, it appears, is "primed for destruction."[36] Parallel investigations conducted by a Canadian research team using specially filled balloons confirmed the NASA group's findings.[37]

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longer than in previous years. NHMRC REPORT, *supra* note 5, at 14.

30. F. PEARCE, TURNING UP THE HEAT: OUR PERILOUS FUTURE IN THE GLOBAL GREENHOUSE 13-14 (1989). However, it was not until 1985 that the first reports of significant decreases in springtime ozone were published. J.C. Farman et al., *Large Losses of Total Ozone in Antarctica Reveal Seasonal ClO_x, NO_x Interaction*, 315 NATURE 207 (1985).

31. This turnaround was particularly noticeable in 1988, a year after the most serious depletion ever recorded. The 1988 hole was the weakest since 1983, representing a net spring total ozone loss of less than 15%. Mark R. Schoeberl, *Dynamics Weaken the Polar Hole*, 336 NATURE 420 (1988). This change may be due to a cyclical alteration in dynamic activity. *Id. See also* NHMRC REPORT, *supra* note 5, at 18. Measurements of 1989 Antarctic ozone levels indicated a loss equal to or slightly greater than that recorded in 1987. LOTHIAN, *supra* note 5, at 5. The theory of a two year ozone depletion cycle has, however, been placed in serious doubt after measurements indicated that stratospheric ozone losses over Antarctica in 1990 were at least as great as those experienced the previous year. Personal communication with Dr. Paul Fraser, Division of Atmospheric Research, Commonwealth Scientific and Industrial Research Organization [hereinafter CSIRO Australia] (July 3, 1991).

32. NHMRC REPORT, *supra* note 5, at 14-15.

33. "[T]he weight of scientific evidence strongly indicates that man-made chlorine species are primarily responsible for the observed decrease in ozone within the polar vortex." EXECUTIVE SUMMARY, *supra* note 27, at 17. *See also infra* note 38.

34. 17 GEOGRAPHICAL RES. LETTERS 313.

35. Pearce & Anderson, *supra* note 25.

36. *Id. See also* Roger Milne, *Arctic Hole Eludes Ozone Investigators*, 121 NEW SCI., Jan. 21, 1989, at 24; John Gribbin, *Why Arctic Ozone has Survived So Far*, NEW SCI., Apr. 14, 1990, at 11.

37. Leigh Dayton, *Data from Canadian Balloons Signal Early Destruction of*

Rapid advances in the field of polar atmospheric photochemistry helped explain the large decreases in Antarctic ozone and confirmed the existence of Arctic conditions indicating potential for a similar level of destruction.[38] What remains unclear is whether this phenomena forebodes ozone thinning elsewhere in the stratosphere,[39] whether the processes responsible could be important at other latitudes, and whether a hemispheric depletion of ozone is possible through dilution of the wider layer.[40]

The search for answers to these questions is becoming increasingly urgent. The 1990 springtime hole over Antarctica was far deeper and persisted for considerably longer than expected.[41] In April 1991 NASA completed analysis of data collected by its total ozone mapping satellite over a period of eleven years and seven months. The Agency confirmed that ozone depletion in the northern hemisphere is occurring between two and five times faster than previously predicted by theoretical models and is extending further away from the polar regions.[42]

Ozone, 121 NEW SCI., Feb. 25, 1989, at 32.

38. "The hole at high altitude develops because of chemical reactions which take place on the surfaces of icy particles during the polar winter. These so-called heterogeneous reactions drain nitrates from the atmosphere and leave behind chlorine, originally from chlorofluorocarbons, in a very reactive form. In spring, the return of sunlight triggers photochemical reactions, involving chlorine, that destroy ozone; the trademark of this process at work is the presence of large quantities of chlorine monoxide exactly where ozone is depleted." *Antarctic Ozone Disappears in Lower Stratosphere*, 121 NEW SCI., Feb. 11, 1989, at 34. *See also* W.H. Brune et al., *The Potential for Ozone Depletion in the Arctic Polar Stratosphere*, 252 SCIENCE 1260 (1991); Owen B. Toon & Richard P. Turco, *Polar Stratospheric Clouds and Ozone Depletion*, 264 SCI. AM. 68 (1991).

39. Bell, *supra* note 29, at 3; UNEP, THE OZONE LAYER, *supra* note 1, at 24.

40. *See* Roger J. Atkinson et al., *Evidence of the Mid-Latitude Impact of Antarctic Ozone Depletion*, 340 NATURE 290 (1989). *See also* Report of Dr. Robert Watson *in* U.N. Doc. UNEP/OzL.Pro.1/5 of May 6, 1989; NHMRC REPORT, *supra* note 5, at 17.

41. Communication with Dr. Paul Fraser, Division of Atmospheric Research, CSIRO Australia (July 3, 1991).

42. *See Ozone Cancer Risk Rises*, NEW SCI. Apr. 13, 1991, at 7 (confirming that these results mean that 12 million cases of skin cancer and 200,000 fatalities from the disease may be expected over the next 50 years in the United States alone). Later reports have suggested that NASA, in its latest figures, is still underestimating the problem, and that a 10% total winter-time loss of ozone has occurred since 1969, in latitudes above 30° (all of Europe, most of

C. The 1985 Vienna Convention for Protection of the Ozone Layer

A study of the policy responses to the ozone threat accurately reflects the scientific uncertainty and resulting controversies which have surrounded this issue for the past two decades. The theory linking CFCs to stratospheric ozone depletion was first advanced in 1974.[43] In the United States a year later, Oregon banned the use of these substances as propellants.[44] This was the first in a series of legislative and executive actions in the United States on both the state and federal levels[45] that paved the way for a similar response from a handful of Western industrialized nations.[46] These unilateral efforts were a minority response to the ozone threat as the overwhelming majority of states, including several major "culprits," displayed little or no interest in regulating either consumption or production of these allegedly ozone-destructive chemicals. A "middle" group supported research, while relying on the scientific uncertainty

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North America, Northern Africa, and the Soviet Union). *See* Robert Pool, *Ozone Loss Worse than Expected,* 350 NATURE 451 (1991). *See also Ozone Loss 'Worse than Thought'*, CANBERRA TIMES, Apr. 18, 1991, at 7 (reporting testimony of F. Sherwood Rowland before the U.S. Senate Subcommittee on Science, Technology and Space).

43. *See supra* note 10 and accompanying text.

44. John W. Kindt & Samuel P. Menefee, *The Vexing Problem of Ozone Depletion in International Environmental Law and Policy,* 24 TEX. INT'L L.J. 261, 272 (1989).

45. Regulations issued in 1977 by the United States Consumer Product Safety Division (CPSD) and the Food and Drug Administration (FDA) sought to encourage voluntary consumer disuse by requiring all CFC-based aerosol sprays to carry a warning label. The following year a federal ban was imposed on bulk manufacturing of CFCs for "non-essential uses." From April 1979, CFCs could no longer be introduced into interstate commerce. In October, 1980, the Environmental Protection Agency (EPA) declared a production freeze on all permitted CFCs. Kindt & Menefee, *supra* note 44, at 274; Kenneth J. Vandevelde, *International Regulation of Fluorocarbons,* 2 HARV. ENVTL. L. REV. 474, 476 (1977).

46. On action taken in Sweden, Norway, Canada, Denmark, West Germany, and the Netherlands, see Thomas E. Stoel, Jr., *Fluorocarbons: Mobilizing Concern and Action, in* ENVIRONMENTAL PROTECTION: THE INTERNATIONAL DIMENSION 45, 60-61 (David W. Kay & Harold K. Jacobsen eds., 1987); REPORT 7/89 OF THE FEDERAL ENVIRONMENTAL AGENCY (FEDERAL REPUBLIC OF GERMANY), RESPONSIBILITY MEANS DOING WITHOUT: HOW TO RESCUE THE OZONE LAYER (1989) [hereinafter FRG OZONE REPORT]. *See also* Ivor Elrifi, *Protection of the Ozone Layer: A Comment on the Montreal Protocol,* 35 MCGILL L.J., 387, 411 (1990).

surrounding ozone depletion and atmospheric photochemistry to justify their own decision not to legislate.[47] This wait-and-see approach was encouraged by the affected (or potentially affected) industries that joined together to launch a full-scale campaign against "precipitous action."[48]

Arguments against unilateral action gained momentum in the early 1980s as "conscientious" states acknowledged that their self-imposed restrictions were both inadequate and inequitable.[49] Support grew for a truly international response, and the United Nations Environment Programme (UNEP) reacted by accelerating its work towards a global agreement.[50] After lengthy negotiations and repeated revisions of its draft text, the Vienna Convention for Protection of the Ozone Layer was adopted by forty-three nations in March 1985 and entered into force on September 22, 1988.[51]

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47. FRG OZONE REPORT, *supra* note 46. This group included the United Kingdom, Australia, France and Japan, all having high production/consumption levels of CFCs.

48. Kindt & Menefee, *supra* note 44, at 271. *See also* Diane M. Doolittle, *Underestimating Ozone Depletion: The Meandering Road to the Montreal Protocol and Beyond*, 16 ECOLOGY L.Q. 407, 413-16 (1989); Williams, *supra* note 9, at 273.

49. Economic and trade consequences of unilateral legislation were of particular concern to the United States as it is United States industries that stand to suffer the greatest losses should further unilateral action proceed in the absence of global regulation. *See* Annette M. Capretta, *The Future's So Bright, I Gotta Wear Shades: Future Impacts of the Montreal Protocol on Substances that Deplete the Ozone Layer*, 29 VA. J. INT'L L. 211, 221 (1988).

50. *See* Peter Usher, *The Montreal Protocol on Substances that Deplete the Ozone Layer: Its Development and Likely Impact, in* OZONE DEPLETION: HEALTH AND ENVIRONMENTAL CONSEQUENCES 115 (Robin R. Russell Jones & T. Tom Wigley eds., 1989) (giving a history of UNEP's involvement in the ozone depletion issue, and on the agency's role in promoting and coordinating an international response); UNITED NATIONS ENVIRONMENT PROGRAMME, ACTION ON OZONE (1989); Iwona Rummel-Bulska, *The Protection of the Ozone Layer under the Global Framework Convention, in* FLINTERMAN, *supra* note 9, at 281-82; *see also* UNEP'S WORLD PLAN OF ACTION ON THE OZONE LAYER, U.N. Doc. UNEP IG/83/F28 of January 28, 1985. *See also Final Report of the Ad Hoc Working Group of Legal and Technical Experts for the Elaboration of a Global Framework Convention for the Protection of the Ozone Layer*, U.N. Environment Programme, U.N. Doc. UNEP/IG.53/4 (1985) (for an overview of the ad hoc working group, established by U.N. Doc. UNEP/GC/9/13B (1981) (mandate extended by U.N. Doc. UNEP/GC/12 (1984)).

51. As of June 7, 1990, 65 States and the EEC had ratified, acceded to, approved, or accepted the Convention. U.N. Doc. UNEP/OzL.Pro.2/2/Add.1, June 7, 1990. By August 1990, six others had done so, which increased the total at

All parties to the Convention accept an obligation to work towards the protection of human health and the environment against the adverse effects of human activities which modify or are likely to modify the ozone layer.[52] States must therefore control, limit, or prevent such activities occurring under their jurisdiction or control.[53] The general obligation for parties to take "appropriate measures"[54] which are "in accordance with the means at their disposal and their capabilities"[55] supplement specific provisions requiring cooperation in defined areas of research and scientific assessment.[56] The Convention mandates cooperation in the exchange of relevant scientific, technical, socioeconomic, commercial, and legal information, with particular consideration to the needs of developing countries.[57] The Convention establishes a two-level institutional arrangement,[58] with a secretariat functioning as the permanent administrative body,[59] and a regularly convened[60] Conference of

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that time to 72 States. *See* RICHARD E. BENEDICK, OZONE DIPLOMACY: NEW DIRECTIONS IN SAFEGUARDING THE PLANET 265-69 (1991).

52. Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, art. 2(1), S. TREATY DOC. No. 99-9, 99th Cong., 1st Sess. (1986), *reprinted in* 26 I.L.M. 1516 (1987).

53. *Id.* art. 2(2)(b). This provision articulates what is now generally accepted to be a rule of customary international law that States have "the responsibility to ensure that activities within their control or jurisdiction do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction." Declaration of the United Nations Conference on the Human Environment, June 16, 1972, Principle 21, *reprinted in* 11 I.L.M. 1416, 1420 (1972) [hereinafter Stockholm Declaration]. On the matter of this principle's status in customary international law, see generally Charles Kiss, *The International Protection of the Environment, in* R. ST. J. MACDONALD & D.W. JOHNSTON, THE STRUCTURE AND PROCESS OF INTERNATIONAL LAW, 1069, 1074 (1983); Gunther Handl, *International Liability States for Marine Pollution*, 21 CAN. Y.B. INT'L. L. 85, 94 (1983).

54. Vienna Convention, *supra* note 52, art. 2(1).

55. *Id.* art. 2(2).

56. *Id.*, art. 3. Areas subject to research and observation are further detailed in Annexes 1 and 2 to the Convention. These annexes also contain a list of substances thought to possess high ozone-depleting potential.

57. *Id.* art. 4. See also Annex 2, which elaborates on parties' information-exchange obligations.

58. *See* Rummel-Bulska, *supra* note 50, at 292-94 (discussing the institutional arrangements of the Convention).

59. Vienna Convention, *supra* note 52, art. 7(2). UNEP was requested to carry out secretariat functions on an interim basis, pending the appointment of a permanent Secretariat at the first ordinary meeting of the Conference of the Parties.

60. *Id.* art. 6(1). Parties may convene extraordinary meetings by making a

the Contracting Parties with a broad mandate to consider and undertake any additional action that may be required for the achievement of the Convention's purposes.[61] Importantly, the Conference is empowered to adopt protocols[62] "through [which] . . . any coordinated measures which might in the future be considered necessary for the protection of the ozone layer would be implemented."[63]

The Convention, with its conspicuous lack of specific regulatory measures, was never meant to be the definitive legal response to changes in atmospheric ozone. In the tradition of a substantial body of international environmental law, it is in fact a framework treaty representing a core of common agreement, to be strengthened and refined with subsequent annexes and protocols, thereby evolving in response to improved knowledge and changing policy options.[64]

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written request, provided such request is supported by at least one-third of all contracting parties. *See id.* art. 6(2).

61. *Id.* art. 6(4)(k). The Conference of the Parties is also specifically charged with, *inter alia*, facilitating the transfer of information and technology, considering and adopting protocols and additional annexes as well as amendments to the Convention, establishing such bodies as may be necessary to the Convention's implementation, and cooperating with competent international organizations and scientific committees. *Id.* arts. 6(4)(a), 6(4)(e)-(j).

62. *Id.* art. 8(1). *See also id.* art. 6(4)(h).

63. *Letter of Transmittal from the President to the Senate, reprinted in* 26 I.L.M. 1518 (1987).

64. A considerable number of international environmental conventions have been framework agreements supplemented by more detailed provisions adopted separately. *See* Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Nov. 25, 1986, *reprinted in* 26 I.L.M. 38 (*entered into force* Mar. 8, 1987); Conference of Plenipotentiaries on the Protection and Development of the Marine Environment of the Wider Caribbean Region, Mar. 24, 1983, S. TREATY DOC. No. 13, 95th Cong., 2d Sess. (*entered into force* Oct. 11, 1985); Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment, Feb. 14, 1982, *reprinted in* 22 I.L.M. 219; Conference of Plenipotentiaries on Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, Mar. 31, 1981, U.N. Doc. UNEP/IG.22/7 (1981) (*entered into force* Aug. 5, 1984); Convention on Long-Range Transboundary Air Pollution, Oct. 22, 1979, U.N. Doc. ECE/HLM.I/R.1 (1979) (*entered into force* Oct. 29, 1984); Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment, Apr. 24, 1978, *reprinted in* 17 I.L.M. 511; Convention for Protection of the Mediterranean Sea Against Pollution, Feb. 16, 1976, *reprinted in* 15 I.L.M. 290 (*entered into force* Feb. 12, 1978); International Convention for Prevention of Pollution from Ships, Nov. 2, 1973, I.M.C.O. Doc. MP/CONF/WP.35 (*entered into force* Dec. 31, 1988).

The working group responsible for the Convention's elaboration recognized the need for a protocol to control production, emission, and use of ozone-depleting substances (ODS).[65] Nevertheless, general political inertia, a high level of scientific uncertainty, and disagreement as to suitable control measures combined to ensure that efforts to adopt such a Protocol simultaneously with the Convention were soundly defeated.[66] By 1987, the climate was a little different. Scientific understanding of the chemistry of ozone depletion and its possible environmental consequences was advancing rapidly. Few disagreed that control measures were necessary to prevent anthropogenically-induced destruction.[67] Even industry recognized that its opposition to a protocol was no longer feasible.[68] The hole over Antarctica, although not at this stage demonstrably attributable to human activity, galvanized communities into action and provided influential governments with further incentive to push for effective regulation.[69] On September 17, 1987, twenty-three states and the EEC signed the Montreal Protocol on Substances

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65. *See Final Report of the Ad Hoc Working Group of Legal and Technical Experts for the Elaboration of a Global Framework Convention for the Protection of the Ozone Layer*, U.N. Doc. UNEP/IG.53/4, January 28, 1985.

66. *See* Kindt & Menefee, *supra* note 44, at 279-80; Lammers, *Efforts to Develop a Protocol on Chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer*, *in* FLINTERMAN, *supra* note 9, at 225-30.

67. *See generally* ATMOSPHERIC OZONE 1985, *supra* note 26. *See also* Usher, *supra* note 50, at 123.

68. Indeed, industrial producers and users of CFCs and other ozone-depleting chemicals soon recognized that a Protocol could in fact provide the economic and regulatory incentives necessary for the development of suitable substitutes. *See also* Morisette, *The Evolution of Policy Responses to Stratospheric Ozone Depletion*, 29 NAT. RESOURCES J. 793, 815-16 (1989). Of course, the absence of global regulation also worked against those industries located in States with strong unilateral controls. Capretta, *supra* note 49, at 221.

69. The ozone hole was first reported in 1985. *See supra* note 30 and accompanying text. Increased losses in Antarctic ozone were recorded between 1985 and 1987, losses not foreseen by predictive-model data. While scientific opinion was divided as to the probable cause, the magnitude of Antarctic stratospheric ozone depletion, it was argued, justified a precautionary approach. *See* Usher, *supra* note 50, at 123. *See also* Stolarski et al., *Nimbus 7 Satellite Measurements of the Springtime Antarctic Ozone Depletion*, 322 NATURE 808 (1986).

that Deplete the Ozone Layer.[70] In accordance with its schedule, the Protocol entered into force on January 1, 1989.[71]

D. The 1987 Montreal Protocol—Overview of Substantive Provisions

The Montreal Protocol is a complex instrument, the original provisions of which have been examined in detail elsewhere.[72] Rather than repeating that exercise, the following sections will provide a general overview of the 1987 agreement with particular emphasis on consideration of those provisions affected by the 1990 amendments and adjustments.

1. Controlling Production and Consumption

The original Protocol imposed controls on two groups of chemicals acknowledged to possess high ozone depleting potential.[73] The production and consumption of those fully halogenated CFCs included in Group 1 was to freeze at 1986 levels from July 1, 1990,[74] be cut twenty percent by 1994,[75] and

70. U.N. Doc. UNEP/002565 (1987), *reprinted in* 26 I.L.M 1550 (1987) [hereinafter 1987 Montreal Protocol]. As of June 21, 1991, 71 States and the EEC had ratified, acceded to, approved, or accepted the Protocol. *Report of the Third Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, U.N. Doc. UNEP/OzL.Pro.3/11, June 21, 1991 [hereinafter U.N. Doc. UNEP/OzL.Pro.3/11].

71. This date was provisional upon ratification by at least 11 states representing at least two-thirds of the estimated global consumption of controlled substances in 1986. 1987 Montreal Protocol, *supra* note 70, art. 16(1).

72. *See, e.g.*, J. BRUNEE, ACID RAIN AND OZONE LAYER DEPLETION: INTERNATIONAL LAW AND REGULATION 236-42 (1988); Somerset, *An Attempt to Stop the Sky from Falling: The Montreal Protocol to Protect Against Atmospheric Ozone Reduction*, 15 SYRACUSE J. INT'L L. & COM. 391, 399-420 (1989); Ogden, *The Montreal Protocol; Confronting the Threat to Earth's Ozone Layer* 63 WASH. L. REV. 997, 1003-09 (1988); Usher, *supra* note 50, at 127-37; Doolittle, *supra* note 48, at 422-29; Capretta, *supra* note 49, at 222-43.

73. The ozone depleting potential allocated to listed substances is determined by consideration of two factors: (1) the rate at which the substance is removed from the troposphere and released into the stratosphere, and (2) the efficiency of the substance in destroying ozone. *See* Davidson, *The Montreal Protocol—The First Step Toward Protecting the Global Ozone Layer*, 20 N.Y.U. J. INT'L L. & POL. 793, 798 n.33 (1988). The ozone-depleting potential attached to each substance is measured relative to CFC11 (which is rated at 1) and is included for the purposes of calculating base levels of production and consumption. Calculated levels of production, for example, are determined by multiplying each substance's annual production by its ozone depleting potential. The resulting totals are then added together to produce a final figure for each group. *Id.*

74. *Id.* at 797 (citing 1987 Montreal Protocol, *supra* note 70, art. 2(1)).

further reduced to fifty percent of 1986 levels by June 30, 1999.[76] The principle halons (or BFCs) listed in Group 2 were not subject to a reduction schedule, although production and consumption of these substances was to be frozen at 1986 levels by January 1, 1992.[77] The Protocol allowed production of both groups to rise by a stipulated percentage for purposes of "industrial rationalization" or to satisfy the "basic domestic needs" of developing state parties.[78]

2. Controlling Trade with Nonparties

The fixed-date reduction schedule in Article 2 was designed to encourage early ratification of, and compliance with, the Protocol.[79] Provisions restricting trade with nonparties is the

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Production is defined as the amount of controlled substance produced less the amount destroyed by approved technologies. The equation for consumption is: production (as calculated above) plus imports minus exports.

75. 1987 Montreal Protocol, *supra* note 70, art. 2(3).

76. *Id.* art. 2(4).

77. 1987 Montreal Protocol, *supra* note 70, art. 2(2).

78. The term *basic domestic needs*, which is not elaborated upon in the Protocol, was initially thought to have included export as well as domestic demands. However, by a decision of the First Meeting of the Parties on May 6, 1989, it was established that this term should be "understood as not to allow production of products containing controlled substances to expand for the purpose of supplying other countries . . . ." *Report of the Parties to the Montreal Protocol on the Work of their First Meeting*, United Nations Environment Programme, at 11, U.N. Doc. UNEP/OzL.Pro.1/5 (1989) [hereinafter U.N. Doc. UNEP/OzL.Pro.1/5]. *Industrial rationalization* is defined as "the transfer of all or a portion of the calculated level of production of one Party to another for the purpose of achieving economic efficiencies or responding to anticipated shortfalls in supply as a result of plant closure." 1987 Montreal Protocol, *supra* note 70, art. 1(8). At the first meeting of the Parties, this definition was clarified: "In interpreting the definition of industrial rationalization, it is not possible for one country to increase its production without a corresponding reduction of production in another." U.N. Doc. UNEP/OzL.Pro.1/5, *supra*. See also Article 2(5), which permits small producing countries not coming within Article 5 to engage in production transfers with another party for the purposes of industrial rationalization. If Australia, for example, wished to produce a greater quantity of CFCs than permitted under Article 2, it might purchase the quota rights of another state "provided that the total combined calculated levels of production of the Parties concerned does not exceed the production limits set out in [Article 2]." 1987 Montreal Protocol, *supra* note 70, art. 2(5).

79. This provision acts as an incentive to early ratification and implementation as any delay necessarily "compresses the compliance schedule." Somerset, *supra* note 72, at 402. Parties joining the Protocol after the date of its entry into force must still comply with the reduction schedule as set out in

main incentive structure for participation.[80] Article 4 of the original Protocol (substantially unchanged by the 1990 amendments) sets out a three-step import control program. Step One involves a ban on the import of controlled substances from nonparties. In step Two, parties draft a list of products *containing* controlled substances. Those subsequently accepting the list as an additional annex to the Protocol undertake to ban or restrict the import of these products from nonparties. The final step involves a determination of the feasibility of extending trade restrictions on nonparties to products *manufactured with* but not *containing* controlled substances.[81]

The original Article 4 discouraged (although did not prohibit) parties from exporting to nonparty states any technology useful in the production or utilization of controlled substances.[82] Financial support for exports facilitating production of controlled substances in nonparty states is also to be withheld.[83] However, Article 4 encourages trade with nonparties in the case of products, equipment, plants or technology designed to promote the purposes of Protocol.[84]

3. Special Concessions for Developing Countries

Although several provisions of the 1987 Protocol accommodate the special needs of particular groups of states,[85] the

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Article 2. 1987 Montreal Protocol, *supra* note 70, art. 17.

80. *See infra* note 249 and accompanying text.

81. 1987 Montreal Protocol, *supra* note 70, art. 4(3), (4). Some electronic equipment is manufactured with CFC-based solvents. Certain CFCs are used as blowing agents in the manufacture of plastic foams for insulation, packaging, and structural applications. CFCs are also employed as cooling agents during the manufacturing process to prevent thermal degradation of the plastics. UK DEPT. OF TRADE & INDUSTRY, CFCs AND HALONS—ALTERNATIVES AND THE SCOPE FOR RECOVERY RECYCLING AND DESTRUCTION 41 (1990) [hereinafter UK RECOVERY, RECYCLING AND DESTRUCTION REPORT]. Some of these products do, however, retain an amount of CFC, and for this reason should be considered to *contain* the controlled substances and thus fall within Article 4(3).

82. 1987 Montreal Protocol, *supra* note 70, art. 4(5).

83. *Id.* art. 4(6).

84. *Id.* art. 4(7).

85. The Soviet Union for example, extracted a concession permitting the completion of CFC production facilities in the planning or construction stages. Capretta, *supra* note 49, at 233. Production from such facilities will be counted as part of that Party's 1986 production levels for the purposes of the Protocol freeze and reduction schedule. 1987 Montreal Protocol, *supra* note 70, art. 2(6). Another group given special consideration is the European Economic Community

major concessions were and remain reserved for low-consumption,[86] developing states.[87] These "Article 5 parties" may delay compliance with the Article 2 freeze and reduction schedule for ten years. Article 5 parties may even increase their consumption during this period by as much as 0.3 kg per capita. In addition, these parties may ignore 1986 figures as a basis for their compliance with the control measures. Instead, base levels are to be calculated at either 0.3 kg per capita or on the annual consumption figures for the period from 1995 to 1997, whichever is lower.[88]

Developing state parties are to be permitted access to environmentally safe alternative substances and technology.[89] They are also the beneficiaries of a pledge from the industrialized countries to facilitate the provision of financial support for the use of alternative technology and substitute products by way of subsidies, aids, credits, guarantees, or insurance programs.[90]

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as a "regional economic integration organization." As they have all ratified the Protocol, members of the Community may now choose to fulfill their Article 2 consumption obligations jointly. Davidson, *supra* note 73, at 813. The total combined figure for the Community is not to exceed the sum total of allowable consumption limits for individual members. 1987 Montreal Protocol, *supra* note 70, art. 2(8). By treating all EEC states as a single entity, the Protocol allows EEC member nations to take advantage of the other members' reductions "to offset their failure to make similar reductions." Davidson, *supra* note 73, at 813.

86. Low consumption is defined as an annual calculated level of production of controlled substances less than 0.3 kg per capita. 1987 Montreal Protocol, *supra* note 70, art. 5(1).

87. The Protocol does not define developing countries. By its Decision 12E, the First Meeting of the Parties declared that all current members of the Group of 77 (126 states), as well as Albania, the People's Republic of China, Namibia, and Mongolia were to be considered developing countries for the purposes of the Montreal Protocol. U.N. Doc. UNEP/OzL.Pro.1/5, *supra* note 78. As of 1991, four developing countries that report annual calculated production levels of controlled substances greater than 0.3 kg per capita (Bahrain, Malta, Singapore, and United Arab Emirates) have been "temporarily categorized" as not operating under Article 5, Paragraph 1. *See* Decision 111/3 of the Third Meeting of Protocol Parties, U.N. Doc. UNEP/OzL.Pro.3/11, *supra* note 70, at 16; 1987 Montreal Protocol, *supra* note 70, art. 5(1).

88. 1987 Montreal Protocol, *supra* note 70, art. 5(1).

89. *Id.* art. 5(2).

90. *Id.* art. 5(3).

4. Assessment and Review of Control Measures

The Protocol provides for the periodic assessment of control measures in light of current scientific, environmental, technical, and economic information.[91] On the basis of such information, both the control schedule for production and consumption and the allocated ozone depleting potentials may be adjusted.[92] Any such adjustments should be agreed upon by consensus. If consensus is not reached, the proposed amendments may be adopted as binding on all parties by a two-thirds majority vote, provided such majority accounts for at least fifty percent of total party consumption of controlled substances.[93] Any amendment or addition to the annexed list of controlled substances will become effective with a simple two-thirds majority vote of Protocol Parties present and voting.[94] Protocol parties may adopt control measures for newly added substances with an identical majority.[95]

5. Other Provisions

The Protocol reaffirms and extends the obligations of cooperation set out in the Vienna Convention. Taking into consideration the special needs of developing countries, parties are to:

(1) promote research, development, and exchange of information on emission-reduction technologies, environmentally safe alternatives, and costs and benefits of various control strategies;[96]
(2) cooperate in fostering public awareness of the threat posed by ozone depletion;[97] and,
(3) facilitate participation in and implementation of the Protocol by provision of technical assistance.[98]

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91. *Id.* art. 6.
92. *Id.* art. 2(9)(a), (c).
93. *Id.* art. 2(9)(c).
94. *Id.* art. 2(10).
95. *Id.*
96. *Id.* art. 9(1).
97. *Id.* art. 9(2).
98. *Id.* art. 10(1).

Article 7 requires parties to submit statistical data on production, import, and export of controlled substances to the Secretariat on a regular basis.[99] Reports of measures taken in the areas of research, development, public awareness, and information exchange are also to be made at prescribed intervals.[100] The Protocol, in both original and amended form, is otherwise silent on the monitoring or supervision of obligations, apart from a provision deferring consideration of mechanisms for determining and dealing with noncompliance.[101]

E. "Only the first step . . . ." Scientific and Political Developments 1987–90

The 1987 Montreal Protocol was presented as a preemptive solution to a potential problem.[102] No significant ozone destruction had yet been observed apart from the inexplicable springtime losses over Antarctica.[103] The Protocol's control measures would, according to theoretical predictions, be sufficient to maintain the status quo, that is, curb the growth in atmospheric concentration of CFCs and halons likely to result in substantial ozone depletion.[104]

Within several weeks of adoption, this basic premise, upon which negotiations had been conducted, was shattered as the springtime ozone hole of 1987 was revealed to be "the most extensive and deepest to date,"[105] and total column ozone over

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99. *Id.* art. 7.

100. *Id.* art. 9(3) (Stating reports shall be submitted to the secretariat within two years of the entry into force of the Protocol and every two years thereafter).

101. *Id.* art. 8.

102. The Executive Director of UNEP, Dr. Mustafa Tolba, remarked at Montreal that "[n]ever before in the history of science and law has the international community agreed to take such radical steps to avert a problem they anticipate before that problem has begun to take its toll." *See* Capretta, *supra* note 49, at 211. This sentiment was echoed by a number of delegations attending the Conference. *Id.* Nineteen months later at the First Meeting of Protocol parties held in Helsinki, Dr. Tolba admitted that, "[t]he Montreal Agreement seems, retrospectively, a modest one. But if we had known in September 1987 what we know in April 1989, we would have drawn up a much stronger treaty . . . ." 6 UNEP, ASIA PAC. NEWSL., Apr.-June 1989, at 9.

103. *See supra* note 69 and accompanying text.

104. *See* Explanatory Memorandum, Proposal for a Council Regulation (EEC) on Substances that Deplete the Ozone Layer, 1990 O.J. (C86) 4, COM(90)3 Final, at 2-3 (Explanatory Memorandum Text printed in COM document only).

105. LOTHIAN, *supra* note 5, at 17.

Antarctica plummeted to the lowest levels ever recorded.[106] The Ozone Trends Panel report,[107] issued several months later, contained conclusive evidence implicating CFCs and halons in ozone depletion—depletion which was occurring at a rate much faster than predicted by model data.[108] The problem was no longer confined to Antarctica, as significant ozone losses were subsequently recorded over Southern Australia,[109] the middle to high latitudes of the Northern hemisphere,[110] and in the Arctic polar vortex.[111] Other studies released in 1988 confirmed the significant contribution made by controlled substances (and many of their proposed substitutes) to global warming.[112] This was a dimension of the ozone problem seriously underestimated by decision-makers at Montreal.

At a conference convened in London in March 1989, 112 nations unsuccessfully attempted to grapple with the implications of these alarming findings on the future of the Protocol.[113] During the First Meeting of the Parties, held in Finland just five months after the Convention entered into force, signatories formally agreed that control measures presently in place were woefully inadequate.[114] Even assuming global participation and total compliance, atmospheric levels of chlorine and bromine were expected to increase substantially and eventually to stabilize at levels too high to repair damage already done.[115] Scientific evidence presented at the meeting indicated that a total phaseout of all controlled substances was necessary along with a widening of the Protocol's scope to include other ozone destructive compounds such as carbon tetrachloride and methyl chloroform.[116] Another report suggested certain sub-

106. *Id.*
107. *See* OZONE TRENDS PANEL REPORT, supra note 26.
108. *Id. See also* EXECUTIVE SUMMARY, *supra* note 27 and accompanying text.
109. Atkinson, *supra* note 40, at 290-93.
110. U.N. Doc. UNEP/OzL.Pro.1/5, *supra* note 78, at 6.
111. M.R. Profitt et al., *Ozone Loss in the Arctic Polar Vortex Inferred from High Altitude Aircraft Measurements*, 347 NATURE 31 (1990).
112. T.M.L. Wigley, *Future CFC Concentrations under the Montreal Protocol and their Greenhouse-effect Implications*, 335 NATURE 333 (1988).
113. *See* Debora MacKenzie, *Countries Agree to More Help for the Ozone Layer*, 122 NEW SCI. 25 (1989); Doolittle, *supra* note 48, at 440-41.
114. U.N. Doc. UNEP/OzL.Pro.1/5, *supra* note 78, at 7.
115. *Id.* at 6.
116. *Id.* at 7.

stances hailed as safe substitutes could aggravate the greenhouse effect by trapping solar radiation.[117]

In a declaration adopted at this first meeting,[118] over eighty governments, representing both contracting and noncontracting states, agreed in principle to phase out Group 1 CFCs as soon as possible, but no later than the year 2000. They also agreed to phase out halons, and to control and reduce other substances with significant ozone-depleting potential as soon as feasible—and for these purposes to tighten up the timetable. The declaration also reaffirmed the states' commitment to develop environmentally safe alternatives, to facilitate the access of developing countries to such alternatives, and to create the appropriate funding mechanisms for providing necessary technology and information to these countries at minimum cost.

F. 1990 Adjustments and Amendments

Despite the "in principle" agreement reached at Helsinki,[119] and the fact that a number of major producer/consumer states had already implemented measures going beyond those strictly required,[120] the practical task of modifying and strengthening the Protocol proved to be a difficult one. Informal

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117. *Id.* at 6-7. *See also* Debora MacKenzie, *Substitute CFCs Will Stoke Global Warming*, 122 NEW SCI. 25 (1989).

118. U.N. Doc. UNEP/OzL.Pro.1/5, *supra* note 78, Annex 1.

119. *Id.*

120. On measures enacted by the European Community and a number of its Member States, see Davis, *The European Dimension*, *in* OZONE DEPLETION: HEALTH AND ENVIRONMENTAL CONSEQUENCES, *supra* note 50, at 109-13; David Dickson & Eliot Marshall, *Europe Recognizes the Ozone Threat*, 243 SCIENCE 1279 (1989); FRG OZONE REPORT, *supra* note 46, at 172-75; NETHERLANDS MINISTRY OF HOUSING, PHYSICAL PLANNING & ENVIRONMENT, CFC ACTION PROGRAMME—COOPERATION BETWEEN GOVERNMENT AND INDUSTRY 12 (1990) (discussing the Commissioner of the European Community's Proposal for a Council Regulation on Substances that Deplete the Ozone Layer). *See also* H. Ahmadzai & T. Hedlund, *A Profile of Measures Taken in Sweden to Protect the Stratospheric Ozone Layer*, 19 AMBIO 341 (1990). On United States amendments to the Clean Air Act introducing a phaseout schedule considerably stricter than that contained in the 1987 Protocol, see Clean Air Act Amendments, Pub. L. No. 101-549, 1990 U.S.C.C.A.N. (104 Stat. 2399) 2648-672 (text of amendments), 2760-3795 (legislative history). On Australian legislation also exceeding the requirements of the Montreal Protocol, see Tsamenyl & Bedding, *The Australian Legislative Framework for the Protection of the Ozone Layer*, 7 ENVT. & PLAN. L.J. 3 (1990); OZONE STRATEGY, *supra* note 12.

negotiations between states took place at a number of conferences and workshops, the majority of which were convened in accordance with decisions adopted by parties at their first meeting.[121] The UNEP Working Group on Review of the Montreal Protocol met four times between August 1989 and June 1990. Aided by reports of four recently established Assessment Panels, the Group prepared draft texts incorporating recommendations on adjustments and amendments. These drafts were formally circulated by the UNEP Secretariat to Protocol parties in December 1989.[122] Subsequent meetings allowed the various options presented to be addressed and their implications explored. Formal negotiations commenced in London on June 26, 1990. An examination of the comprehensive package of amendments and adjustments adopted at the conclusion of the two-day meeting[123] is necessary for a full understanding of its impact.

1. Accelerated Reduction Schedule

Significant adjustments in the control schedule for Annex A substances were adopted in accordance with the procedure set out in the 1987 Protocol.[124] Article 2A now requires Annex 1,

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121. *See, e.g.*, UNEP Meeting, *Scientific Review of the Depletion of the Ozone Layer*, the Hague, October 1988; *Asia and Pacific Seminar on the Protection of the Ozone Layer*, Tokyo, 31 May-2 June 1989; Regional Workshop No. 2, Mexico City, Mexico, 31 May-5 June 1990. A special ad hoc conference on "Saving the Ozone Layer" was held in London in March 1989. *See* MacKenzie, *supra* note 113 and accompanying text. Revisions to the Protocol were also on the agenda at the United Nations Conference on Sustainable Development held during May 1990 at Bergen, Norway. *See* Bergen, *Weak Declaration Adopted*, 20 ENVTL. POL'Y & L. 84 (1990). At an Interparliamentary Conference which convened in Washington from April 29 through May 2, 1990, more than 200 legislators from over 42 states adopted a detailed resolution on potential national and international legislative strategies for protection of the ozone layer. *See International Parliamentarians Discuss Environment*, 20 ENVTL. POL'Y & L. 87 (1990).

122. The drafts were circulated in accordance with the Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, art. 9(2), *reprinted in* 26 I.L.M. 1516; Protocol on Substances that Deplete the Ozone Layer, art. 2(9), *reprinted in* 26 I.L.M. 1541.

123. The amendments and adjustments are contained in *Report of the Second Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, U.N. Environment Programme, 2d Sess., Agenda Item 7, at 11-19, U.N. Doc. UNEP/OzL.Pro.2/3 (1990) [hereinafter U.N. Doc. UNEP/OzL.Pro.2/3].

124. Parties joining the Protocol after the date of its entry into force must still comply with the reduction schedule as set out in Article 2. 1987 Montreal Protocol, *supra* note 70, arts. 2(4), 2(a), and 17. As they are not amendments subject to formal ratification, these agreed adjustments will be binding on all

Group 1 CFCs to be phased out by the year 2000.[125] This will follow a freeze on production and consumption at 1986 levels from July 1991,[126] interim cuts of fifty percent by 1995,[127] and cuts of eighty-five percent by 1997.[128] The parties will review the situation in 1992 with the object of further accelerating this reduction schedule.[129] A group of eleven states preempted such a move by declaring during final negotiations their firm intention to phase out all controlled CFCs as soon as possible but not later than 1997.[130] Further, the Protocol's revised reduction schedule phases out halons by the year 2000.[131] The new Article 2B also provides for a freeze on production and consumption of halons at 1986 levels beginning January 1, 1992[132] and an interim cut of fifty percent by 1995.[133] The Article permits certain exceptions, provided they are necessary to "satisfy essential uses for which no adequate alternatives are available."[134] Parties also undertook, by way of a nonbinding resolution, to restrict nonessential production and consumption of other, nonlisted halons[135] "which are of

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parties, entering into force six months after official communication of the decision by the UNEP Secretariat.

125. 1987 Montreal Protocol, *supra* note 70, art. 2A(5). An Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer, Art. 2A(5), S. TREATY DOC. No. 102-4 102d Cong., 1st Sess. (1990) [hereinafter Revised Protocol].

126. *Id.* art. 2A(2). This article also operates to change the control period from July 1 through June 30 to January 1 through December 31. This was achieved by adjusting the allowable production and consumption percentages to reflect an initial 18 month control period. *Id.*

127. Revised Protocol, *supra* note 125, art. 2A(3).

128. *Id.* art. 2A(4).

129. *Id.* art. 2A(6).

130. Declaration by Australia, Austria, Belgium, Canada, Denmark, Finland, Federal Republic of Germany, Liechtenstein, Netherlands, New Zealand, Norway, Sweden, and Switzerland, U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, art. VI(A)(49). When challenged, the United Kingdom claimed that it had not been asked to sign the Declaration, but fully supported a 1997 phase-out date for CFCs with an exception for medical uses. F. WEIR, FRIENDS OF THE EARTH INTERNATIONAL, THE NEW MONTREAL PROTOCOL (1990).

131. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at art. 2B(3).

132. *Id.* art. 2B(1).

133. *Id.* art. 2B(2).

134. *Id.* art. 2B(2), (3). By January 1, 1993, parties are to have adopted a decision identifying essential uses, if any, for the purposes of paragraphs 2 and 3. *Id.* art. 2B(4).

135. *Resolution by the Governments and the European Communities Repre-*

such a chemical nature or such a quantity that would pose a threat to the ozone layer."[136]

2. Expanded Coverage

In an important development, the new "amended"[137] Protocol extends its coverage to other fully halogenated CFCs and two other major ozone-depleting chemicals—carbon tetrachloride and methyl chloroform.

During amendment negotiations, parties were made aware of the possibility that "designer substances" (chemical permutations of controlled CFCs) were not legally covered under the Protocol.[138] Inclusion of these additional CFCs in the amended protocol is intended to close off this potential loophole. Group 1 substances are to be phased out by the year 2000[139] following a twenty percent reduction in production and consumption (in relation to 1989 levels) by 1993,[140] and an eighty-five percent cut by 1997.[141]

Carbon tetrachloride is used almost exclusively as a feedstock for the production of CFC-11 and CFC-12.[142] During the manufacturing process it is chemically transformed and, for this reason, such feedstock "uses" are not subject to control by the Protocol as amended.[143] However, other marginal uses for

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sented at the Second Meeting of the Parties to the Montreal Protocol, U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex VII [hereinafter *1990 Resolution*].

136. *Id.*

137. Apart from the adjustments and reductions discussed above, all other changes to the 1987 Protocol are packaged together in a single instrument requiring formal acceptance by member states. Amendments will enter into force, between parties having accepted them, on January 1, 1992, provided at least 20 instruments of ratification, acceptance, or approval are received from states (or the EEC) parties to the Protocol. Revised Protocol, *supra* note 125, art. 2. Note that this provision is a deviation from the general rule laid down in art. 9(5) of the 1985 Vienna Convention, that, except as otherwise provided, Protocol amendments will only enter into force after being formally ratified, accepted, or approved by two-thirds of Protocol Parties. Vienna Convention, *supra* note 52, art. 9(5).

138. *Australian Delegation Report on UNEP Working Group on Review of the Montreal Protocol*, Geneva, March 8-14, 1990 [hereinafter *Geneva Report*].

139. Revised Protocol, *supra* note 125, art. 2(C)(3).

140. *Id.* art. 2(C)(1).

141. *Id.* art. 2(C)(2).

142. ICI CHEMICALS AND POLYMERS, THE OZONE ISSUE AND REGULATION—AN ICI APPRAISAL (1990).

143. An Amendment to Article 1 of the Protocol excludes from the definition

this high-ODP substance result in significant world-wide emissions which have been increasing each year.[144] Production and consumption of carbon tetrachloride is now to be completely phased out by the year 2000.[145] The Protocol mandates an intermediate cut of eighty-five percent (from 1989 levels) by 1995.[146]

Methyl chloroform is used principally as a metal degreasing agent and for other surface cleaning applications.[147] This chemical is produced in larger quantities than any other ozone depleting substance.[148] Its atmospheric concentration is increasing rapidly,[149] and despite a low ODP, this chemical now accounts for eighty percent of stratospheric chlorine levels not attributed to CFCs and halons.[150] The new Article 2(e) implements a four-step control process concluding with a total phase out of methyl chloroform by 2005.[151] Prior to this date, parties must observe a production/consumption freeze at 1989 levels from January 1, 1993,[152] a thirty percent cut by 1995,[153] and

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of production the amount of a substance entirely used as feedstock in the manufacture of other chemicals. Revised Protocol, *supra* note 125, art. 1. However, there is some concern that the increase in atmospheric concentrations of carbon tetrachloride is largely due to venting from those processes in which the chemical is used as a feedstock. If this is in fact the case, then the Protocol will not be controlling what may be considered a major source of atmospheric chlorine. *Geneva Report*, *supra* note 138.

144. MacKenzie, *supra* note 117, at 25. The nonfeedstock use of carbon tetrachloride is banned in many Western countries because of its toxic effect on humans. The chemical is, however, used in certain syntheses or as a solvent or extraction agent where such use is unavoidable for technical reasons. These applications are, nevertheless, insufficient to explain the increases in atmospheric levels of carbon tetrachloride, and it is widely suspected that the chemical is still being used as a solvent, fire extinguishing agent, and grain fumigant in East European and Third World countries. *Id. See also* FRG OZONE REPORT, *supra* note 46, at 156.

145. Revised Protocol, *supra* note 125, art. 2D(2).

146. *Id.* art. 2(D)(1).

147. FRG OZONE REPORT, *supra* note 46, at 153, 154.

148. R. Jones & T. Wigley, *A Fact Sheet About Ozone*, *in* OZONE DEPLETION: HEALTH AND ENVIRONMENTAL CONSEQUENCES, *supra* note 50, at xiii. [hereinafter *Ozone Fact Sheet*].

149. MacKenzie, *supra* note 117, at 25.

150. Usher, *supra* note 50, at 139.

151. Revised Protocol, *supra* note 125, art. 2E(4).

152. *Id.* art. 2E(1).

153. *Id.* art. 2E(2).

a further forty percent reduction by the year 2000.[154] The technical feasibility of even earlier phase-out dates is to be evaluated by the appropriate Review Panel prior to the 1992 Meeting of Protocol Parties.[155] As with Annex A substances, calculated levels of production of those chemicals listed in the new Annex B may rise by ten percent (fifteen percent in the final phase-out stage) in order to satisfy the basic domestic needs of parties operating under Article 5(1).[156]

Not included in the expanded list of controlled substances are a group of partially halogenated chemicals known as hydrochlorofluorocarbons (HCFCs). Most agree that HCFCs are essential to the early phase out of the more damaging CFCs.[157] HCFCs are not, however, environmentally benign, as they possess significant ozone depleting and global warming potential.[158] It is clear that uncontrolled growth in production and consumption of HCFCs could negate reductions in chlorine loadings achieved elsewhere.[159] In a compromise move, the parties adopted a code of conduct by way of a resolution setting out nonbinding guidelines on the selection, use, recycling, destruction and eventual replacement of HCFCs.[160] Article 7 subjects these Annex C substances to data reporting requirements,[161] review, and assessment procedures.[162] The obligation of cooperation set out in Article 9 is now extended to

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154. *Id.* art. 2E(3).

155. *Id.* art. 2E(5).

156. *Id.* arts. 2E(1)–(4). Apart from Article 2A(1), the provisions of which were applicable only up to June 30, 1990, all references to industrial rationalization have now been deleted from the provisions permitting production increases. *See supra* note 78 and accompanying text.

157. C.E. Tane, *Alternatives to CFCs, in* OZONE DEPLETION: HEALTH AND ENVIRONMENTAL CONSEQUENCES, *supra* note 50, at 235, 238-39; Jonathon Porritt, *Environmental Imperatives, in* OZONE DEPLETION: HEALTH AND ENVIRONMENTAL CONSEQUENCES, *supra* note 50, at 243, 247. *See also* Roger Milne, *U.S. Agrees to Extra Funds to Safeguard Ozone Layer*, NEW SCI., June 23, 1990, at 30.

158. *Ozone Fact Sheet, supra* note 148, at xi, xiv.

159. *Australian Delegation Report on UNEP—Ozone Layer—Working Group on Financial Mechanisms*, Feb. 26 – Mar. 5, 1990, at 7 [hereinafter *Australian Delegation Report*].

160. *1990 Resolution, supra* note 135. The resolution calls for a total phase out of transitional substances no later than 2040, and, if possible, by 2020.

161. Revised Protocol, *supra* note 125, arts. 7(2), (3).

162. *Id.* arts. 5, 6, and 11(4)(g).

include promotion of research, development, and exchange of information on emission reduction technologies for HCFCs.[163]

3. Financial Mechanisms

The 1987 Montreal Protocol commits parties to providing financial and technical aid to lesser-developed countries (LDCs) in order to facilitate their participation in and compliance with protocol obligations.[164] Formal institutionalization of this commitment was a key issue in negotiations leading to the 1990 amendments as it became clear that, without substantial assistance, adherence to the Protocol's provisions would, for many LDCs, remain a technical and political impossibility.[165] The question of funding proved in many ways to be the most controversial aspect of the revisions. Initially, the United States was strongly opposed to the creation of any funding mechanism.[166] Opposition was apparently based on fear of setting a precedent for the future resolution of more intractable and more expensive environmental problems.[167] Other major industrialized countries took a less trenchant position, agreeing in principle with the notion of institutionalized financial and technical support.[168] However, negotiations did not proceed smoothly, and few aspects of the proposed mechanism were settled prior to June 1990. As a result, four principal areas of contention between parties are:

(1) *Nature and Sources of Funding*: Were contributions to be voluntary or compulsory?[169] Additional to ordinary aid or provided from within normal aid budgets?[170] What scale

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163. *Id.* art. 9(1)(a).

164. *See supra* notes 89-90 and accompanying text.

165. *See* FRIENDS OF THE EARTH INTERNATIONAL, FUNDING CHANGE: DEVELOPING COUNTRIES AND THE MONTREAL PROTOCOL 19-20 (1990) [hereinafter FOE FUNDING REPORT].

166. Bergen, *supra* note 121, at 84.

167. *U.S. Opposes Protocol Funding*, ATMOSPHERE, June 1990, at 1, 7.

168. UNITED NATIONS ENVIRONMENT PROGRAMME, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, REPORT OF THE SECOND SESSION OF THE SECOND MEETING OF THE OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, U.N. Environment Programme, 2d Sess., at 10, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7 (1990) [hereinafter REPORT OF THE SECOND SESSION, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7].

169. *Id.* at 11.

170. The notion that funds must be additional to existing development assis-

of assessment should determine contributions?[171] Should the value of assistance required under the Protocol (Articles 2 and 10) be deductible from a party's funding obligations and, if so, to what extent?[172]

(2) *Extent of Funding*: Decisions on the projected size of a funding mechanism depended substantially on identification of costs and obstacles to subject countries in meeting their Protocol obligations,[173] and agreement as to which so-called incremental costs should be considered eligible for assessment.[174] Between 1989 and 1990, UNEP initiated a number of general and country-specific investigations in relation to the identification issue.[175] However, results

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tance was not expected to generate significant controversy. *Australian Delegation Report, supra* note 159, at 7. However, at the Working Group's May 1990 Meeting in Geneva, the United States delegation rejected the principle of additionality, arguing that funds for the envisaged mechanism could and should come from existing World Bank resources. Once again it appears that the monetary sums involved were of less concern to the United States than the possible precedent-setting effect on future environmental negotiations. *See also* FOE FUNDING REPORT, *supra* note 165, at 15.

171. At their first meeting, the parties set up a Trust Fund based on the UN assessment scale to provide financial support for the Protocol's administration. Voluntary contributions were to be cut off at the lower end (no contributions required where the United Nations scale provides for a contribution of less than one-tenth percent). U.N. Doc. UNEP/OzL.Pro.1/5, Annex II, of 6 May 1989. A similar arrangement was proposed for the envisaged fund, but met with opposition from those developing countries with assessments just above the cutoff mark. The only other seriously considered option was an assessment scheme using base year or current consumption figures for controlled substances, with possible adjustments to the formula for developing countries. This proposal was viewed with favor by a number of states and nongovernmental organizations as incorporating the *polluter pays* principle into the assessment procedure. *See Australian Delegation Report, supra* note 159, at 7.

172. A number of (mostly developing) countries argued that no such credits should be allowed. Other states suggested full deductibility on the basis that provision of bilateral aid in cash or kind would, by definition, diminish the need for additional monetary funding by an equivalent amount. *Australian Delegation Report, supra* note 159, at 9.

173. *Id.* at 8-9.

174. A list of eligible incremental costs was developed at the first meeting of the Open-Ended Working Group (Nairobi, 21-25 August 1989). It was further refined by a subworking group established at the Geneva meeting seven months later. The list was largely uncontroversial and only a small number of potentially contentious items, such as end user costs and increased import costs, became the subject of debate. *See* FOE FUNDING REPORT, *supra* note 165, at 20; *Australian Delegation Report, supra* note 159, at 5, 12-14.

175. *See, e.g.*, UNITED NATIONS, ENVIRONMENT PROGRAMME, OPEN-ENDED

were inconclusive,[176] and potential donors insisted that more studies were needed to establish the real costs involved before any hard decisions on funding were possible.[177] Many developing states perceived this as a delaying tactic by developed states,[178] and the UNEP Executive Director warned that inability to ensure collection of complete information should not and could not be used as an excuse for parties failing to decide on a funding mechanism.[179]

(3) *Entitlement and Control*: Clear differences in the position of developed and developing countries emerged on the issue of entitlement to, and control over, resources of the envisaged financial mechanism.[180] More specifically, questions

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WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, THE COSTS TO DEVELOPING COUNTRIES OF MEETING THE TERMS OF THE MONTREAL PROTOCOL, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/3, Jan. 29, 1990 (paper prepared by A. Markandya) [hereinafter COSTS TO DEVELOPING COUNTRIES]; UNITED NATIONS ENVIRONMENT PROGRAMME, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, STUDY ON THE ASSUMPTIONS AND METHODOLOGIES FOR ESTIMATING COSTS OF CONVERSION FOR DEVELOPING COUNTRIES TO SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES, U.N. Doc. UNEP/OzL.Pro.WG.11(2)/4, Jan. 30, 1990 (study prepared by H. Pargal & A. Kumar). Country-specific studies on costs of compliance with the Protocol were undertaken in Brazil, China, Egypt, India, Indonesia, Kenya, Malaysia, Malta, Mexico, Panama, Philippines, Tunisia, Uganda, and Venezuela. *Report of the Second Session*, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, *supra* note 168, at 8-9.

176. For example, the Indian Study, conducted by Touche-Ross, estimated the value of incremental costs from 1990-2010 at US$1 billion for that country alone. Overseas Development Administration, Reducing the Consumption of Ozone Depleting Substances in India—Phase 1: The Cost of Complying with the Montreal Protocol (1990) (draft report assessing the economic costs to India of phasing out ozone-depleting substances) [hereinafter Costs of Complying]. The Markandya Study, produced a more conservative estimate of US$240-300 million for the first three years of a global fund. COSTS TO DEVELOPING COUNTRIES, *supra* note 175. At the second meeting of the ad hoc Working Group on Financial Mechanisms, the Executive Director of UNEP quoted a range for the total identifiable costs of US$2 to US$10 billion or more over a 10-18 year period. UNITED NATIONS, ENVIRONMENT PROGRAMME, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, NOTE BY EXECUTIVE DIRECTOR, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/2, at 4, para. 18, Jan. 30, 1990 [hereinafter EXECUTIVE NOTE, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/2].

177. FOE FUNDING REPORT, *supra* note 165, at 13.

178. *Id.*

179. EXECUTIVE NOTE, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/2, *supra* note 176, at 7, para. 36.

180. *Australian Delegation Report*, *supra* note 159, at 6.

arose as to whether funds should be extended only to Protocol parties;[181] whether funds should act only as a safety net, taking care of those requirements not covered by bilateral or multilateral cooperation between the parties;[182] and, finally, whether funds should be made available to recipient countries unconditionally.[183]

(4) *Institutional Arrangements*: With its implications for decision-making power over allocation and distribution of finances, the question of appropriate administrative arrangements was a vital part of the negotiations. Initially, debate focused on whether the creation of a separate mechanism was in fact necessary. A number of parties argued that finance could be channelled through existing bilateral programs and established institutions.[184] As June 1990 approached, the principle of a funding mechanism that would be under the control of Protocol parties was generally accepted.[185] The question then became one of which agency or agencies could best lead the envisaged arrangement. Potential donors advocated substantial involvement of the World Bank[186]—a position strengthened by the Bank's creation in early 1990 of a new Global Environment Facility to address projects involving ozone, climate, biological

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181. Although there was general agreement that only parties to the Protocol would be deemed eligible for direct assistance, India, in particular, continued to argue for funding and other assistance to be extended to states *prior* to their becoming Protocol parties. *Id.*

182. *See* REPORT OF THE SECOND SESSION, U.N. Doc. UNEP/OzL.Pro.WG.II (2)/7, *supra* note 168, Annex II, at 17 (Proposal by the United Kingdom) [hereinafter UK PROPOSAL, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, Annex II].

183. *Australian Delegation Report*, *supra* note 159, at 9-10.

184. This position was adopted by the major potential aid donors—the United States, the United Kingdom, Japan, and the Federal Republic of Germany—at the 1989 Helsinki Meeting. The United Kingdom dismissed the notion of a new "Global Fund" as a "rather simplistic idea," questioning who would run it, how it would be run, and how long it would actually take to establish. FOE FUNDING REPORT, *supra* note 165, at 13.

185. *See* UK PROPOSAL, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, Annex II, *supra* note 168; *See also Report of the Second Session*, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, *supra* note 168, Annex I, at 16 (Proposal by China, Finland, the Group of 77, and the Netherlands) [hereinafter G77 PROPOSAL]; *Australian Delegation Report*, *supra* note 159, at 6.

186. *See, e.g.*, UK PROPOSAL, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, Annex II, *supra* note 182, cl. 7; *see also* FOE FUNDING REPORT, *supra* note 165, at 14; REPORT OF THE SECOND SESSION, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/7, *supra* note 168, at 13, para. 50.

diversity, and water resources.[187] A number of developing countries were less than enthusiastic about locating any fund within the Bank and lobbied strongly for a UNEP-only system.[188] From outside these two extremes, support slowly grew for the notion of a "joint or cooperative venture of the three lead agencies (UNEP, UNDP and the World Bank) to which other institutions could be attached."[189] The Working Group's comparative study of the operations of existing inter-agency cooperative arrangements reported favorably, lending further support to the proposal.[190]

With the inclusion of several new paragraphs in its preamble, the Revised Protocol announces its new commitment to developing countries and its recognition of the importance of financial and technical assistance in improving the world's ability to resolve the problem of ozone depletion.[191] By Deci-

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187. For background information on the Global Environment Facility, see discussion paper prepared by the World Bank entitled *Funding for the Global Environment*, April 10, 1990, *reprinted in* UNITED NATIONS ENVIRONMENT PROGRAMME, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, STATUS OF THE 1985 VIENNA CONVENTION FOR THE PROTECTION OF THE OZONE LAYER, U.N. Doc. UNEP/OzL.Pro.WG.II(2)/Inf.4, Feb. 20, 1990. *See also Report on World Bank Support for Environmental Programs*, 20 ENVT'L POL'Y & L. 3, June 1990, at 86.

188. *Australian Delegation Report*, *supra* note 159, at 6. *See also* G77 PROPOSAL, *supra* note 185, at cl. 7.

189. This proposal was put forward in: UNITED NATIONS, ENVIRONMENT PROGRAMME, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, INTERNATIONAL FINANCIAL AND OTHER MECHANISMS FOR ASSISTANCE TO DEVELOPING COUNTRIES UNDER THE MONTREAL PROTOCOL, U.N. DOC. UNEP/OzL.Pro.WG.II(2)/6, at 2, para. 8, Jan. 30, 1990 (study on the role that new or existing institutions might play in meeting the objectives of the Montreal Protocol in developing countries, prepared by R. Schmidt). A cooperative venture involving UNEP, the United Nations Development Programme (UNDP), and the World Bank would, according to the report, "harness their expertise and experience in their own field and ensure the support of their constituencies." *Id.*

190. Institutional arrangements identified as possible models for the funding mechanism were: (a) the Tropical Forest Action Plan; (b) the Energy Sector Management Assistance Programme; (c) the Global Programme on AIDS; and (d) the International Fund for Agricultural Development. *See The Proposed Tripartite Functions in the Funding Mechanism for Montreal Protocol*, U.N. Doc. UNEP/OzL.Pro.WG.IV/14, May 21, 1990.

191. Revised Protocol, *supra* note 125, pmbl. The revised Preamble also stresses that the effects of ozone destruction are well documented and the magnitude of required funds is reasonably predictable. This appears to be an attempt to isolate the problem of ozone depletion and its resolution by setting

sion 11/8, the parties established an Interim Financial Mechanism to operate for a period of three years pending the creation of a more permanent arrangement.[192] Its stated purpose is to provide financial and technical cooperation, including the transfer of technologies, to Article 5(1) parties to enable their compliance with the control measures of the Protocol.[193]

The Interim Financial Mechanism (IFM) consists principally of a Multilateral Fund and an Executive Committee.[194] It may also "include other means of multilateral, regional and bilateral cooperation."[195] The Fund is to operate under the authority of Protocol parties who are responsible for deciding its overall policies.[196] Fund capital for the three year period will be US$160 million, which could increase to US$240 million if other states, such as India and China, decide to join the Protocol.[197] The United Nations scale of assessment determines the amount of obligatory contributions to the fund,[198] adjusted only slightly to compensate for nonparticipants and the exemption granted most developing state parties.[199] All assessed contributions, whether monetary or in-kind, are to be additional to any other financial transfers made to Article 5(1) parties.[200] However, a cooperating state's bilateral or regional cooperation

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out criteria for funding, which arguably will not be satisfied when applied to the problem of global warming.

192. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123. The Interim Financial Mechanism was to be formally established at the next regular Meeting of the Parties, following entry into force of the amendment to the Protocol.

193. Revised Protocol, *supra* note 125, art. 10(1).

194. *Id.* arts 10(2), 10(5).

195. *Id.* art. 10(2).

196. *Id.* art. 10(4) (the "parties" referred to in that paragraph presumably include only those who have ratified the amendments package).

197. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex IV, Appendix IV (Terms of Reference for the Interim Multilateral Fund). Although China and India are not specifically mentioned, it is clear from the negotiations that additional funds are conditional upon these two states becoming parties to the Protocol. The participation of Brazil and Indonesia is also thought to be crucial to the Protocol's success. Milne, *US Agrees Extra Funds to Safeguard Ozone Layer*, NEW SCI., June 23, 1990, at 8. China acceded to the amended protocol on June 14, 1991, thereby increasing fund capital by $40 million. U.N. Doc. UNEP/OzL.Pro.3/11, *supra* note 70.

198. Revised Protocol, *supra* note 125, art. 10(6).

199. No Article 5(1) party is required to contribute to the funding. *Multilateral Fund for the Financial Mechanism: Scale of Contribution by the Parties*, U.N. Doc. UNEP/OzL.Pro.2/3 *supra* note 123, Annex IV, Appendix III.

200. Revised Protocol, *supra* note 125, art. 19(1).

may, in certain circumstances, be considered to represent up to twenty percent of the cooperating state's assessed contribution.[201]

The Protocol will utilize fund monies to meet all agreed incremental costs of Article 5(1) parties on a project basis in order to facilitate their compliance with the Protocol.[202] Fund monies will also finance clearinghouse functions designed, *inter alia*, to link project requests with available funding, both fund-based and external, and to provide information and practical assistance for the benefit of all developing state parties.[203] The Protocol rests responsibility for Fund administration and actual disbursement of resources in a fourteen member Executive Committee.[204] The Committee is also charged with overseeing the implementation of funded projects and associated administrative arrangements.[205] A loose, tripartite structure places the mechanism with the United Nations System through the allocation of specific tasks to UNEP, UNDP, and the World

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201. *Id.* art. 10(6). Such cooperation must, at a minimum: a) strictly relate to compliance with Protocol provisions, b) provide additional resources, and c) meet agreed incremental costs. *Id.*

202. *Id.* arts. 10(1), 10(3)(a). An indicative list of categories of *agreed incremental costs* was adopted by the parties and included as an annex to the final report of the second meeting. *See* U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex IV, Appendix I. Further costs may be added by a decision of the Executive Committee.

203. Revised Protocol, *supra* note 125, art. 10(3)(b). This paragraph directs the Fund to finance clearing house functions to:

(1) Assist Parties operating under paragraph 1 of Article 5 through country-specific studies and other technical co-operation in identifying their needs for co-operation;
(2) Facilitate technical co-operation to meet these identified needs;
(3) Distribute, as provided for in Article 9, information and relevant materials, and hold workshops, training sessions and other related activities, for the benefit of Parties that are developing countries; and
(4) Facilitate and monitor other multilateral, regional and bilateral cooperation available to Parties that are developing countries.

Id.

204. Revised Protocol, *supra* note 125, art. 10(5). Representation on the Committee is to be balanced between Article 5(1) parties and non-Article 5(1) parties, and all members are to be formally endorsed. *Id.* Terms of reference for the Executive Committee were adopted with the amendments and incorporated in an Appendix to the Report of the Second Meeting of Protocol Parties. *See* U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex IV, Appendix II.

205. Revised Protocol, *supra* note 125, art. 10(5).

Bank.[206] The Committee is enjoined to work with these and other appropriate agencies in the discharge of its functions.[207]

The financial mechanism outlined above will clearly be instrumental in facilitating technology transfers from developed to developing state parties. The Revised Protocol imposes upon this first group a specific obligation to ensure the expeditious and equitable transfer of environmentally safe substitutes and related technologies to Article 5(1) parties.[208] This provision replaces the original, vague "obligation to cooperate" with respect to technical assistance.[209] A further reference in the amended Preamble to the importance of transferring alternative technologies underlines the Protocol's new commitment to this ideal.[210]

4. Other Amendments:

(a) Trade restrictions

A number of amendments to Article 4 (control of trade with nonparties) were necessary following inclusion of other substances in the Protocol's Control Schedule. Worth noting is the extension of the export ban on controlled substances to *all* parties—not just those operating under Article 5(1).[211] The provision dealing with export of relevant technology to nonparties[212] has been strengthened—a provision that parties

206. *Id.* These implementing agencies are allocated the following tasks:
UNEP: to cooperate and assist in political promotion of the objects of the Protocol, as well as in research, data gathering and the clearing-house functions.
UNDP: to cooperate and assist in feasibility and pre-investment studies and in other technical assistance measures.
WORLD BANK: to cooperate and assist in administering and managing the program to finance agreed incremental costs.
See U.N. Doc. UNEP/0zl.Pro.2/3, *supra* note 123, Annex IV, Appendix IV. The Executive Committee may also invite other agencies, particularly regional development banks, to cooperate with, and assist it in carrying out its functions. *See id.* For details of the administrative and funding arrangements concluded between the World Bank and the three agencies, see U.N. Doc. UNEP/OzL.Pro.3/11, *supra* note 70, at 11.

207. Revised Protocol, *supra* note 125, art. 10(5).

208. *Id.* art. 10A.

209. *See* 1987 Montreal Protocol, *supra* note 70, art. 10.

210. Revised Protocol, *supra* note 125, pmbl. (acknowledging that special provisions are required to aid developing countries).

211. *See id.* art. 4(1).

212. Note that in the context of a particular substance, the term "non-party"

"shall discourage" such exports[213] was replaced by language requiring an undertaking to discourage exports "to the fullest practicable extent".[214]

(b) Reporting of Data

Reporting requirements[215] have been extended significantly. As with information relating to domestic production,[216] parties are obliged to submit statistical data on controlled substances used for feedstocks and those destroyed by approved technologies.[217] In an effort to monitor compliance with Article 4 trade restrictions, the Amended Protocol requires data on imports and exports to parties and nonparties respectively.[218]

(c) Developing Countries

As with Article 4, the amended control provisions necessitated a number of consequential amendments to that portion of the Protocol dealing with the special situation of developing countries.[219] Inclusion of new substances has not, however, affected the criteria by which parties shall be considered entitled to the special concessions of Article 5,[220] although *continuation* of such entitlement is now subject to a restriction on per capita consumption of Annex B substances.[221] The possibility that production cuts in industrialized countries could lead to crucial and expensive shortages has been addressed with the establishment of a communications procedure for those Article 5(1) parties unable to obtain an adequate supply of controlled substances.[222]

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includes a party to the 1987 Protocol who has not agreed to be bound by the control measures imposed subsequently on that substance. *Id.* art. 4(9).

213. 1987 Montreal Protocol, *supra* note 70, art. 4(5).

214. Revised Protocol, *supra* note 125, art. 4(5).

215. *See supra* notes 99-100 and accompanying text.

216. *See* Revised Protocol, *supra* note 125, arts. 7(1), 7(2).

217. *Id.* art. 7(3).

218. *Id.*

219. *See, e.g., id.* art. 5(3) (discussing methods of calculating baseline consumption levels for the newly included substances).

220. *See* Revised Protocol, *supra* note 125, art. 5(1).

221. *See, e.g., id.* art. 5(2) (restricting the maximum annual calculated consumption level of 0.2 kg per capita).

222. *See* Revised Protocol, *supra* note 125, art. 5(4). States so affected are required to notify the Secretariat, which in turn informs Protocol parties who

Other amendments strengthened the position of developing state parties by a formal acknowledgement that capacity to fulfill Protocol obligations depends upon effective implementation of Articles 10 and 10A.[223] Noncompliance procedures will not apply where inability to meet Protocol obligations arises from ineffective implementation of these financial and technical provisions.[224] Voting procedures have also been amended to reflect the Protocol's new level of concern with low-consumption, developing states. Absent consensus, decisions under Articles 5 and 10 require a two-thirds majority (present and voting) representing "a majority of the parties operating under paragraph 1 of Article 5 and a majority of the parties not so operating."[225] An identical procedure is now applicable to adjustments and reductions.[226]

(d) Noncompliance

An ad hoc working group of legal experts was established at the first meeting of the parties to develop proposals on procedures and institutional mechanisms for determining noncompliance with the Protocol and for the treatment of parties failing to comply.[227] The group's final proposals were not included in the Protocol, but instead adopted as a decision of the parties at the second meeting.[228] Briefly, the parties themselves will supervise obligations imposed by the Protocol, with a limited role assigned to the UNEP Secretariat.[229] An Implementation Committee will consider cases of suspected noncompliance and attempt amicable resolution of the matter.[230] Protocol parties may impose unspecified measures to bring about

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are to consider the matter and decide on appropriate action at the next meeting. *Id.*

223. *Id.* art. 5(5).

224. *Id.* arts. 5(6), 5(7).

225. *Id.* arts. 5(9), 10(9).

226. *Id.* art. 2B(9)(c). The original requirement for Protocol adjustment was that the necessary two-thirds majority represent at least 50% of total consumption of controlled substances by signatories to the protocol. 1987 Montreal Protocol, *supra* note 70, art. 2(9)(c).

227. U.N. Doc. UNEP/OzL.Pro.1/5, *supra* note 78, at Decision 8.

228. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at Decision II/5.

229. *Id.* Annex III, paras. 1-2 (Noncompliance Procedure).

230. *Id.* paras. 5-6.

compliance.[231] The interim nature of these proposals was recognized and it was decided to extend the working group's mandate, allowing it to elaborate further noncompliance procedures for consideration by protocol parties in 1992.[232]

G. A Critical Evaluation of the Amended Protocol

The complex interrelation of its various provisions, and the multitude of articulated and unarticulated goals towards which they are geared, makes a systematic evaluation of the Montreal Protocol difficult. Clearly, the Protocol's primary objective is to contain and eventually repair destruction of stratospheric ozone by controlling atmospheric levels of chlorine and bromine. Prima facie evaluation of its potential for achieving this goal involves objective consideration of the Control Schedule contained therein. However, measuring success or failure on this level alone is insufficient. The control provisions are the foundation of a complex incentive structure geared towards the achievement of what may conveniently be described as "secondary goals," that is, secondary prerequisites for realizing the Protocol's ultimate purpose. It is necessary therefore to expand the field of inquiry beyond the new Control Schedule and to examine the Protocol's effectiveness in encouraging, *inter alia*, widespread participation, effective implementation, and the development and utilization of environmentally safe alternatives.

1. The Amended Control Schedule

The 1987 Montreal Protocol failed to provide a Control Schedule within which it would be possible to slow, halt, and eventually repair destruction of the ozone layer.[233] How has the accelerated reduction timetable and expanded coverage introduced in June 1990 affected this situation?

Atmospheric chlorine levels (although unreflective of halon-bromine contribution) are considered a reliable indicator of the potential for ozone depletion and thus the efficacy of control measures.[234] The level at which the Antarctic hole first ap-

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231. *Id.* paras. 7, 9-10.

232. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at Decision II/5.

233. *See supra* notes 107-16 and accompanying text.

234. *See* U.K. STRATOSPHERIC OZONE REVIEW GROUP, THIRD REPORT, STRATOSPHERIC OZONE 1990, EXECUTIVE SUMMARY (1990).

peared in the mid-1970s was approximately 1.5 to 2.0 parts per billion volume (ppbv).[235] Preliminary assessments of the Revised Protocol indicate that the tropospheric level of airborne chlorine (currently 3.6 ppbv and rising) should peak by 1997–2000 at 4.0 ppbv.[236] This compares favorably with a predicted rise to 6.1 ppbv by the middle of next century under the original Protocol.[237] As it is, it will be forty years before chlorine concentrations return to 1986 levels,[238] and by 2050, levels will still be 1.5 times greater than when the Antarctic hole first appeared.[239]

In terms relative to its predecessor, the revised Control Schedule is an unmitigated success. Under its provisions, future depletion may be avoided and past losses will, it is hoped, eventually be repaired. Nevertheless, serious uncertainties remain, and decision-makers have been accused of playing "ecological roulette" with the atmosphere in mandating a timetable which permits future chlorine concentrations to reach 4.0 ppbv.[240] In one sense at least, this is undoubtedly true. These inevitable and unprecedented increases in stratospheric chlorine loading carry a significant risk of triggering disproportionately larger ozone losses.[241] Such environmental "flip-overs" are not uncommon,[242] and this threshold effect has already been observed in the context of ozone depletion with the dramatic formation of a hole over Antarctica.

Beyond the Protocol's Control Schedule, another factor upon which repair of the ozone layer critically depends is "the speed at which certain substitutes are phased in and, in their turn, phased out as well."[243] The total failure of parties to set con-

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235. Peter Aldhous, *Warming to Global Agreement*, 346 NATURE 6 (1990).

236. *Id.* Chlorine loading in the stratosphere, and therefore its effects on the ozone layer, will lag behind by about five years. *Id.*

237. *Id.*

238. Paul Brown, *World Unites on Ozone Deal*, GUARDIAN (UK), June 30, 1990.

239. Geoffrey Lean, *Ozone Layer in Peril Despite New Controls*, OBSERVER (UK), July 1, 1990.

240. Leggett, *Playing Roulette with the Atmosphere*, NEW SCI., July 7, 1990, at 4.

241. Aldhous, *supra* note 235, at 6. *See also Failure is Not an Option*, UNEP-UK NEWS, Aug. 1990, at 2 [hereinafter *Failure is Not an Option*].

242. *Failure is Not an Option*, *supra* note 241, at 2. Another example that may be cited is the loss of South American fisheries. *Id.*

243. Roger Milne, *CFC Clampdown Eases Pressure on the Ozone Layer*, NEW

trols on production and consumption of HCFCs is likely to severely retard ozone layer recovery, despite decreases in chlorine loading made possible by imposition of stricter controls on other compounds.[244] A similar risk exists that potential reductions in the rate of CFC-induced global warming[245] will also be canceled by a rapid, uncontrolled growth in these potent greenhouse gases.[246]

It is not unreasonable to assert that all chemicals contributing to ozone depletion (or, *arguendo*, global warming) are intrinsically undesirable and should be regulated.[247] This position must nevertheless be reconciled with the fact that HCFCs have a critical, albeit transitional, role to play in weaning certain industries away from more damaging CFCs.[248] However, by failing to impose any legally binding controls on these substances, Protocol parties have given the relevant industries tacit permission to decide the extent to which utilization of such substitutes will be necessary to ensure the technical feasibility of phase-out dates for controlled compounds. By this clear abdication of responsibility, states have lost the opportunity to direct what must, by environmental necessity, be an interim step in the search for safe alternatives.

2. Trade Restrictions

The Protocol's trade restrictions were designed to encourage maximum participation in and compliance with the control

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SCI., July 7, 1990, at 9.

244. *See CFC Reduction—Technology Transfer to the Developing World, Hearings on H.149 Before the Subcommission on the Natural Resources, Agricultural Research and Environmental and International Scientific Cooperation of the House Commission on Science Space and Technology*, 101st Cong., 2d Sess. 79 (1990) (statement of Liz Cook, Ozone Campaign Director, Friends of Earth) [hereinafter Cook Testimony].

245. *See* Keith Shine, *Effects of CFC Substitutes*, 344 NATURE 492, 493 (1990); Milgrom, *Alternative CFCs Pose Problems Near the Ground*, NEW SCI., Mar. 31, 1988, at 33.

246. The amended Protocol mandating faster phase-out dates for fully halogenated CFCs is likely to have a significant effect on greenhouse gas-induced temperature changes. Less certain is the precise scope of this effect with a number of conflicting reports recently released. *See, e.g., Total CFC Ban Needed To Halt Global Warming*, NEW SCI., Sept. 8, 1990, at 15; Aldhous, *supra* note 235, at 6.

247. *See* Porritt, *supra* note 157, at 247.

248. *Id. See supra* notes 157-59 and accompanying text.

schedule contained therein.[249] More specifically, these provisions set out to remove, as far as possible, any competitive advantage of noncompliance, thereby operating to both protect the economic interests of state parties and discourage expansion of production facilities in nonparty states. Despite minor revisions agreed to as part of the 1990 review,[250] a number of fundamental problems remain. Not all of these are capable of ready resolution. Issues such as the possibility of trade restrictions conflicting with the GATT[251] cannot be properly addressed by Protocol parties alone, because they involve broader questions relating to world trade and environmental protection. Quite apart from these however, are discrete shortcomings in this section of the Protocol that warrant exposure.

First, trade in products containing controlled substances will remain unregulated for some time.[252] The erection of import barriers to products manufactured with controlled substances will take even longer and depends upon parties agreeing that such restrictions are in fact feasible.[253] For both categories, the envisaged additional annexes apply only to nonobjecting parties. States not wishing to commit themselves need only notify the Secretariat of an "inability to approve."[254]

A failure to effectively regulate trade in products containing or manufactured with controlled substances will seriously undermine the Protocol's carefully drafted participation/compliance incentive structure. Unless corrected, the weak-

249. *See* Capretta, *supra* note 49, at 238-48 (discussing trade restrictions as incentive structures); Doolittle, *supra* note 48, at 426 (noting that the Protocol provisions were designed to "create an incentive for broad participation"); Davidson, *supra* note 73, at 818-19 (noting that the Protocol contains incentive provisions to promote a global solution to the ozone problem).

250. *See supra* notes 211-14 and accompanying text.

251. For a detailed examination of whether provisions of Article 4 could in fact constitute barriers to trade in violation of the General Agreement on Tariffs and Trade (GATT), see Lawrence, *International Legal Regulation for Protection of the Ozone Layer: Some problems of Implementation*, 2 J. ENVTL. L. 17, 37-42 (1990).

252. *See* Fig. 2 on p. 364. In accordance with the article and timetable, a list of products containing Annex A controlled substances was adopted by Protocol Parties at their third meeting in June 1991. U.N. Doc. UNEP/OzL.Pro. 3/11, *supra* note 70, at Decision III/15.

253. *Id.*

254. *See* Revised Protocol, *supra* note 125, arts. 4(3), 4(3)^{bis}, 4(4), 4(4)^{bis}; Vienna Convention, *supra* note 52, art. 10(2)(b).

ness pointed out above will render these future controls over market end-use of little practical utility.[255]

Fortunately, the most obvious solutions do not appear to involve great administrative or technical difficulty. Negative effects of the delayed timetable for example, may be ameliorated somewhat by making certain that lists are drafted as soon as possible in order to put industry on notice, and hopefully stimulate research into alternative products and processes. Early drafting will also encourage rationalization of industry and help ensure that funds from the Financial Mechanism are allocated wisely to take account of the economic and social effects of trade barriers.

Even more essential is rapid clarification of the term "unable to approve." At least one commentator has suggested that the right to object be narrowly interpreted in that those asserting such a right should either demonstrate a genuine inability to comply with the ban or face penalties for noncompliance.[256] Another possible solution involves amending the Protocol (and/or Convention) to permit the adoption of additional annexes by majority decision in much the same way that the control schedule in Article 2 is subject to adjustment without the consent of all state parties.[257]

One final observation concerns the possibility of extending the application of trade restrictions to the movement of junk technologies, products, and production facilities. The blocking of nonparty access to these "undesirables" will become increasingly important as successful implementation of the control schedule renders obsolete entire systems and processes. Despite signs that industry recognizes the dumping temptation and is prepared to act responsibly in such matters,[258] self-regulation

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255. For example, most of the developing-world's demand for products manufactured with or containing controlled substances is satisfied by imports. FOE FUNDING REPORT, *supra* note 165, at 9. A significant incentive for participation by these countries would lie in the threat of having the supply of these products cut off. Armin Rozencranz & Reina Milligan, *CFC Abatement: The Needs of Developing Countries*, 19 AMBIO 312, 314 (1990). A similar incentive would operate in respect of those developing countries involved in or planning the export of such products, as a failure to join the Protocol would mean the loss of markets in party-states. *Id.*

256. Capretta, *supra* note 49, at 241-43.

257. *See supra* notes 91-95 and accompanying text.

258. Curtis A. Moore, *Industry Responses to the Montreal Protocol*, 19 AMBIO 320, 322 (1990). The major producers of controlled substances in Western

should not be considered a serious option. It is imperative that Protocol-sanctioned export bans be implemented to prevent the selling or dumping of junk to nonparticipants where such transfers could operate to facilitate production or utilization of controlled substances.

3. Less Developed Country Issues

(a) The Need for LDC Participation

Although representing over seventy-five percent of the world's population, developing countries account for less than sixteen percent of total global consumption of ozone depleting substances.[259] Per capita consumption is approximately one-tenth of that in developed countries.[260]

However, the importance of developing countries is far greater than these figures would suggest. Clear evidence exists that the Protocol's principal objective of halting and eventually reversing ozone depletion will not be achieved without the effective participation of developing countries.[261] The global participation imperative becomes more urgent in the face of rapid industrialization and escalating populations.[262] Demand for controlled substances and for products containing or produced with such substances is steadily increasing.[263] A num-

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Europe, North America and Australia have declared a joint commitment to refrain from selling or licensing CFC or halon chemical manufacturing technology to states not party to the Protocol. *Id.* This pledge has not, however, been extended to cover the dumping or selling of products or production facilities. *Id.*

259. Rozencranz & Milligan, *supra* note 255, at 312.

260. FOE FUNDING REPORT, *supra* note 165, at 9.

261. *Id. See also* U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at I.A.2 (stating that resources should be made available to developing countries so that they can participate effectively). A recent study suggests that an increase in the use of CFC-based aerosols in China, equivalent to one standard aerosol can per person per year, "would by itself produce as much CFC emissions as the US would reduce emissions in complying with the Montreal Protocol." Guy D. Phillips, *CFCs in the Developing Nations: A Major Economic Development Opportunity. Will the Institutions Help or Hinder?*, 19 AMBIO 316, 318 (1990).

262. For a detailed explanation of the link between industrialization, population growth, and increased utilization of CFCs and other ozone depleting substances, see Rozencranz & Milligan, *supra* note 255, at 313.

263. FOE FUNDING REPORT, *supra* note 165, at 9-11. According to the Touché-Ross study on the costs of India's compliance with the Protocol, an unconstrained growth projection anticipates this country's consumption of ozone-depleting substances doubling between 1990 and 1996, and increasing

ber of Third World countries have developed substantial production capacity to satisfy these new lucrative markets.[264] LDC consumption of CFCs, if unchecked, will rise dramatically.[265]

Regardless of whether they are producers or consumers, developing countries agreeing to phase out ozone depleting substances will incur considerable costs which, in relative terms, cannot be easily offset.[266] Certain provisions of the 1987 Protocol were drafted to reflect the fact that LDCs had contributed little to the problem and were now being asked to forego or "leapfrog" an important stage in the economic development process.[267]

Despite the existence of concessions inspired by such considerations, the 1987 agreement received little support from developing countries because it was generally viewed as an obstacle to much needed progress and economic reform.[268] By June 1990, little had been done to dispel this skepticism. Controlled substances were becoming scarcer and more expensive, while promised alternatives proved generally unavailable and pledges of financial and technical assistance were yet to be translated into practical action.[269]

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four-and-a-half-fold by 2010. Costs of Complying, *supra* note 176, EXECUTIVE SUMMARY, para. 8.

264. Chlorofluorocarbons are produced in the following developing countries: Argentina, Brazil, China, India, Indonesia, Mexico, South Korea, and Venezuela. *Australian Delegation Report, supra* note 159, at 3.

265. FOE FUNDING REPORT, *supra* note 165, at 9-11

266. *See* FOE FUNDING REPORT, *supra* note 165, at 19-20 (explaining the "costs of acceding to the protocol"); Stephen R. Seidel & Daniel P. Blank, *The Montreal Protocol: Pollution Prevention on a Global Scale*, 19 AMBIO 301, 303 (1990).

267. *See generally supra* notes 86-90 and accompanying text.

268. *See, e.g., China Attacks 'Unfair' Ozone Protocol*, NEW SCI., Mar. 11, 1989, at 26 (reporting comments of the Chinese delegation at the March 1989 London Conference on Saving the Ozone Layer); Paul Brown, *Third World Accuses West Over CFC Cash*, GUARDIAN (UK), June 28, 1990 (reporting the opening statement of the LDC group at the June 1990 conference in London).

269. WEIR, *supra* note 130. *See also Malaysian Response to the Global Issue of Ozone Depletion and Problems Encountered Complying with the Montreal Protocol*, February 20-23, 1990, at 6-8 (paper given at International Conference on Tropical Ozone and Atmospheric Change, Penang, Malaysia) (discussing similar complaints) [hereinafter *Malaysian Response Paper*].

(b) The Ozone Fund

In monetary terms, the Ozone Fund is unsatisfactory. Extra funds may well have permitted a reduction in the ten year grace period that Article 5 parties are allowed before complying with the control schedule. Nevertheless, by providing a major incentive for participation, the Interim Financial Mechanism (IFM) represents a significant step forward in the quest to protect stratospheric ozone. In theory at least, obligations enshrined in the New Protocol[270] will ensure that developing countries are assisted, both technically and financially, in adapting their industries and economies to environmentally safe alternatives.

A number of provisions contained in the new Article 10 give rise to cautious optimism that this "groundbreaking precedent"[271] will in fact realize its stated goal of facilitating compliance of Article 5 parties with the Protocol's control measures.[272] Funding of incremental costs will provide a strong incentive for early adoption of ozone-benign technologies.[273] The additional financing of clearinghouse functions indicates a recognition that effective aid is not a once-only donation but an ongoing process.[274] Provision of training and widespread distribution of information help ensure that recipients are equipped with the skills necessary to make optimum use of the assistance provided. By helping parties identify their own needs and matching these with the entire spectrum of available assistance,[275] the clearinghouse allows the fund to assume its rightful place as just one aspect of a much broader strategy of protection.

Equal participation in decision making of the Committee which administers the fund is a welcome departure from the weighted voting practices of those institutions through which development assistance is normally channelled.[276] Even the

270. *See supra* notes 191-210 and accompanying text.
271. Cook Testimony, *supra* note 244, at 10.
272. Revised Protocol, *supra* note 125, art. 10(1).
273. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex IV, Appendix I.
274. *See* Phillips, *supra* note 261, at 318.
275. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, Annex IV, Appendix I.
276. On weighted decision-making in the major economic and development assistance agencies, see Stephen A. Zamora, *Voting in International Economic*

interim status of funding arrangements[277] may be viewed positively. Given the unprecedented nature of the financial mechanism and associated administrative arrangements, a complete review of the fund after three years' operation may be a critical factor in ensuring its long term success.

It is not surprising that the establishment of an ozone protection fund has been hailed as a landmark achievement in international environmental diplomacy.[278] However, close examination of the IFM and of the negotiations leading to its creation reveal a number of unresolved and potential problems.

Within days of commencing operation, the Executive Committee effectively isolated itself from grassroots support networks by resolving to exclude Nongovernmental Organizations (NGOs) from its meetings.[279] This move was in direct conflict with the UNEP tradition (as exemplified in ozone negotiations) of allowing observance and even participation by accredited NGOs.[280] The decision was not well received.[281] In December 1990, at its second meeting, the Executive Committee moderated its earlier position by stating that in the future NGOs "qualified in fields relating to protection of the ozone layer" may be invited, on a strictly ad hoc basis, to attend meetings in the capacity of observers and/or to address the Committee.[282] This change in policy represents a significant concession—particularly when measured against the previous, total ban on NGOs. Nevertheless, the new observer/participation procedures are still far from satisfactory, especially given the importance of the Committee's work. As one NGO remarked, "the Executive Committee will determine what substitutes and

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Organizations, 74 AM. J. INT'L. L. 566 (1980).

277. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123. *See also supra* note 192 and accompanying text.

278. Brown, *supra* note 238. *See also Failure is Not an Option*, *supra* note 241; *infra* note 341 and accompanying text.

279. *Draft Report of the First Meeting of the Executive Committee of the Multilateral Fund under the Montreal Protocol*, Montreal, September 19-21, 1990, U.N. Doc. UNEP/OzL.Pro EX.COM 1/L2.

280. For example, at the June 1990 meeting of Protocol parties, over 40 organizations were represented. U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 213.

281. *See Fund Committee Shuts Out NGOs*, 3 ATMOSPHERE, October 1990, at 4 [hereinafter *NGOs Shut Out*].

282. *Report of the Second Meeting of the Executive Committee of the Multilateral Fund under the Montreal Protocol*, Montreal, December 17-19, 1990, U.N. Doc. UNEP/OzL.Pro/Ex Com/2/5/Rev. 1.

processes developing countries will use to eliminate ozone destroying chemicals . . . it is important that these discussions be carried out in a democratically open and accountable fashion."[283]

The crucial role played by NGOs in development of an international strategy to combat ozone depletion has been well documented.[284] With success so close at hand, this contribution should not be trivialized or forgotten, and it is essential that UNEP continue its efforts to negotiate permanent participation privileges for these organizations.

It has been pointed out that funding of Article 5 parties' incremental costs will provide a strong incentive for easy adoption of control measures. There are several ways in which the present arrangements could be strengthened and participation further encouraged. First, while additional expenses incurred through import of bulk substitutes will be subsidized, fund monies do not cover the increased costs of importing ozone-safe products reformulated not to contain controlled substances. Given that much of the rapidly increasing LDC demand for, *inter alia*, refrigeration and air-conditioning is satisfied by imports,[285] failure to assist in the purchase of these products will offset, to some degree, other Protocol provisions designed to discourage expansion of production capacity.[286]

There is another danger that the so-called second generation substitutes, including HCFCs, will be transferred under subsidy to LDCs, thereby "trapping them into uses of HCFCs which the industrialized world may soon abandon."[287] The Executive Committee must draft guidelines and criteria for assistance which adequately reflect the principle that funds will not be made available for the purchase of environmentally damaging substances, in terms of both ozone depletion and global warming, where other, safer alternatives are available.

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283. *NGOs Shut Out*, *supra* note 281, at 4.

284. *See generally* Elizabeth Cook, *Global Environmental Advocacy: Citizen Activism in Protecting the Ozone Layer*, 19 AMBIO 334 (1990).

285. FOE FUNDING REPORT, *supra* note 165, at 9.

286. *But cf.* COSTS TO DEVELOPING COUNTRIES, *supra* note 175 (arguing that although some increases may be expected, these will not be significant enough to justify compensatory funding except on a case-by-case basis for industries using CFC-based products as intermediate outputs).

287. Cook Testimony, *supra* note 244, at 12-13; *see also Nations Create Ozone Fund*, 3 ATMOSPHERE October 1990, at 1, 7.

(c) Technology Transfer

In 1990, the parties to the Montreal Protocol implicitly recognized that the extent to which relevant technology is transferred from North to South will have a great impact on the willingness and ability of Article 5 parties to implement the control schedule.[288] In practice, the technology transfer issue has proved to be complex and seemingly intractable. In the course of negotiations leading up to the 1990 revisions, LDCs expressed concern that they were being required to abandon certain technologies with no guarantee of access to, let alone ownership of, replacements.[289] Understandably, these countries would prefer to develop their own production capacity rather than rely on developed nations to supply them with substitutes at a higher cost.[290]

Industrialized countries have long demonstrated a great reluctance to commit themselves to providing unlimited guarantees of noncommercial access to technology over which they do not have rights of ownership and control,[291] and the ozone issue is no exception.[292] Such guarantees, it is argued, would encounter significant legal constraints[293] as well as operating

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288. *See* Revised Protocol, *supra* note 125, arts. 10 and 5(5).

289. Cook Testimony, *supra* note 244, at 11.

290. This issue threatened to hold up revision negotiations because the Indian delegation insisted that technology transfer provisions enabling lesser-developed countries to manufacture CFC substitutes be included in the agreement. A compromise was reached by way of the new article 5(6), *supra* note 224, which has been liberally interpreted by India to mean that if the relevant technology was not transferred, it "did not have to stop making CFCs." Brown, *supra* note 238.

291. *Transfer of Technology and the Financing of Global Environmental Problems: The Role of Users' Fee, Note by the UNEP Executive Director During Informal Consultations on Financial Mechanisms,* Nairobi, U.N. Doc. UNEP/OzL.Pro.WG. 11(2)/Inf.6. February 20, 1990.

292. *See, e.g.*, the new article 10A of the Revised Protocol, *supra* note 125. Although much more strongly worded than the 1987 provision on technology transfer (see *supra* note 89 and accompanying text), the section still falls far short of an unequivocal *guarantee* to provide ozone-friendly technologies.

293. For a useful discussion of the legal aspects of technology transfer in the context of the Montreal Protocol, see Peter Lawrence, *Recent Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer: Establishment of a Fund to Facilitate Technology Transfer, in* ENVIRONMENTAL LAW AND POLICY WORKSHOP PAPERS AND PROCEEDINGS: OUR COMMON FUTURE, 154, 154-58 (1991).

to remove the incentive that intellectual property protection provides for innovative research and development.[294]

Should these be matters for serious concern in the present context? It is not illogical to argue that, given the necessary financial resources, such legal and policy obstacles would not prevent technology, even if expensive, from becoming available. In addition, a significant portion of the relevant know-how and a number of possible substitutes do not involve property rights of realizable commercial value.[295] However, in respect to those technologies which *are* protected, availability is not, of itself, sufficient to guarantee successful transfer. Clearly, governments must negotiate further with each other *and* with industry if all relevant technologies are to be transferred successfully.[296] Particular care should be taken to ensure:

(1) that such funding does not operate, directly or indirectly, to subsidize industry in developed countries or otherwise encourage profit maximization;[297]
(2) that transfers are complete in that they include provision of the necessary skills, information, and industrial infrastructure to enable successful utilization of the technology provided;[298] and
(3) that quality control is exercised over all transfers in recognition of the fact that a small handful of multinational corporations presently control the bulk of ODS production

294. *Id.* at 166. *See also* M. BLAKENEY, LEGAL ASPECT OF THE TRANSFER OF TECHNOLOGY TO DEVELOPING COUNTRIES 87-89 (1989).

295. *See* Lawrence, *supra* note 293, at 12, 15-16.

296. The cooperation of industry will be particularly vital to successful technology transfers. Indeed, according to the Director General of the World Intellectual Property Organization (WIPO), governments will actually enjoy little leverage with industry in these matters and must use persuasion and incentives to forge the necessary alliances. *See Consensus to Commitment, Statement by the UNEP Executive Director to the second session of the second meeting of the Open-Ended Working Group of the Parties to the Montreal Protocol*, Geneva, February 26, 1990.

297. A problem of equity may arise in a situation where an application for funding of incremental costs involves the LDC-situated subsidiary of a multinational corporation based in a developed country. *See* Lawrence, *supra* note 293, at 14. On the chances of the Financial Mechanism inadvertently helping the private sector obtain high profits, see *Note by the Executive Director of UNEP*, U.N. Doc. UNEP/OzL.Pro. W.G.II(2)/2, Jan. 30, 1990.

298. Phillips, *supra* note 261, at 318.

and exert significant influence over the development and distribution of substitute technology.[299]

The parties are capable of dealing with the first two concerns in their drafting and implementation of assistance criteria. In relation to the last point, it is essential that, through the clearinghouse facility and other channels, sufficient and independent information is made available to both public and private sector decision-makers in lesser-developed countries.[300]

One last observation relates to the possibility that significant financial opportunities for LDCs now exist or will develop in ODS abatement and substitution.[301] Governments and organizations involved in the financial mechanism would do well to investigate, expose, and, through technical and financial support, actually facilitate such opportunities. Recognition of potential financial gains would provide LDCs with a strong incentive to join and adhere to the Protocol by shifting the entire basis of discussion from an emphasis on "community consciousness" to one of enlightened self interest.[302]

4. Industry and the Promotion of Substitute Development

"This author is absolutely convinced that if you give a clear-cut timetable it will stimulate industry to come up with substitutes. But if more time is allowed industry will surely take more time."[303]

Industry response to the Montreal Protocol's Control Schedule has been chronicled elsewhere,[304] and that exercise will not be repeated here. It is necessary, however, to emphasize the

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299. *Id.*

300. *Id.* at 317-18. *See also* Cook Testimony, *supra* note 244, at 12.

301. *See generally* Phillips, *supra* note 261; Rozencranz & Milligan, *supra* note 255. One promising proposal involves the launching of joint ventures between investors or technology holders from developed countries and LDC manufacturers. Perhaps this type of venture could be coordinated through the clearinghouse functions.

302. Phillips, *supra* note 261, at 317.

303. Glenn Frankel, *Governments Agree on Ozone Fund—Negotiations Speed Up Pace of CFC Ban*, WASH. POST, June 30, 1990, at A1, A26 (quote by West German Environment Minister, Claus Topfer).

304. *See generally* Moore, *supra* note 258, at 320-23; Meirion Jones, *In Search of the Safe CFCs*, NEW SCI., May 26, 1988, at 56-60; Hugo Steven & Andy Lindley, *The Race to Heal the Ozone Hole*, NEW SCI., June 16, 1990, at 48-51. Morrisette, *supra* note 68, at 815-16; Doolittle, *supra* note 48, at 412-14.

importance of industry to the ultimate success of efforts to protect stratospheric ozone, and for this reason to focus on those issues which may affect its ability or willingness to do so.

Environmental protection standards have traditionally been set with reference to "best available technologies."[305] In a radical departure from this approach, the Montreal Protocol laid down specific targets, "with full knowledge that the technologies for accomplishing these goals did not yet exist."[306]

The rapidity with which certain substitutes have been developed and marketed indicate that, provided regulation is, or is predicted to be, extensive enough to limit availability of products to less than market demand, such controls will act as a direct incentive to industry, stimulating the search for alternatives to existing products and production methods.[307]

The regulation-as-incentive debate continues and has taken on greater significance in the context of the *transitional substances* controversy.[308] As protected or potentially protected property, these substances represent a lucrative new venture for an industry which now recognizes that hard CFCs, halons, and their associated technology will soon be obsolete. Calls for Protocol amendments to ban or severely curtail these second generation substitutes provoked threats of an economic boycott by chemical companies involved in their production.[309] This

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305. *See, e.g.*, Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, art. 6, *reprinted in* 19 I.L.M. 830; 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, 1989, arts. 2, 3, 5, *reprinted in* 28 I.L.M. 214, 216-17. Similarly, environmental agreements will often require parties to adopt measures and standards utilizing the "best practicable means at their disposal and in accordance with their capabilities." *See, e.g.*, United Nations Convention on the Law of the Sea, Dec. 10, 1982, art. 194(1), *reprinted in* 21 I.L.M. 1261, 1308; Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Nov. 25, 1986, art. 5, *reprinted in* 26 I.L.M. 38, 44.

306. Richard Elliot Benedick, *The Montreal Ozone Treaty: Implications for Global Warming*, 5 AM. U.J. INT'L L. & POL'Y 227, 228 (1990).

307. On the rapid development of substitutes since implementation of domestic and international controls on consumption and production of ozone depleting substances, see generally sources cited *supra* note 304. *See also* Daniel J. Dudek et al., *Cutting the Cost of Environmental Policy: Lessons from Business Response to CFC Regulation*, 19 AMBIO 324 (1990); John S. Hoffman, *Replacing CFCs: The Search for Alternatives*, 19 AMBIO 329 (1990).

308. *See supra* notes 157-63 and accompanying text.

309. *See* David Nicholson-Lord, *Ozone Curb is Impossible*, INDEPENDENT (UK),

same highly organized lobby group eventually succeeded in persuading the majority of Protocol parties that the technical feasibility of a 2000/2005 phaseout date for controlled substances depended upon their sanctioning continued use of HCFCs at least until well into next century.[310] Dissemination of misleading information[311] and threats to undermine the continued viability of substitute development[312] are the two main ways in which industry has fought to accommodate those profitable, environmentally harmful, chemicals into the gap left by controlled substances. There is a very real danger that such methods will actually succeed in stifling research into environmentally acceptable, less commercially viable alternatives.[313]

How can industry be harnessed to work for the Protocol's primary objective instead of around it? First, it is apparent that the permanent solutions needed so urgently will only be developed commercially when the status of HCFCs and HFCs as interim substitutes is enshrined in the Protocol's control sched-

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June 24, 1990. According to ICI, a major CFC manufacturer now heavily involved in substitute research, "If HCFCs are designated as [c]ontrolled [s]ubstances in the revised Protocol, the effect will be counter-productive. The chemical industry will have no incentive to invest in production of these products . . . nor will user industries have any reason to adapt their processes for the use of HCFCs." ICI CHEMICALS AND POLYMERS, *supra* note 142.

The company announced that it would probably scrap plans to make HCFCs if an early phase-out date appeared likely. David Thomas & John Hunt, *Taking Aim at A Global Issue*, FINANCIAL TIMES (UK), June 21, 1990, at 23. Just prior to the London Meeting, another major manufacturer, DuPont, decided to freeze plans to spend US$350 billion on substitute production, announcing that, "if society decides it does not want these chemicals then we will not waste time producing them." Peter Marsh & David Thomas, *Dupont Shelves Plans to Make Some Substitutes for CFCs*, FINANCIAL TIMES, June 22, 1990, at 22.

310. Moore, *supra* note 258, at 323. *See also* Mary Fagan, *DuPont Plans CFC-Alternative Plants*, INDEPENDENT (UK), June 22, 1990.

311. Following the distinction made in the 1987 Montreal Protocol between the most ozone-destroying CFCs (controlled) and others (uncontrolled), major producer companies formally divided what had been one single category of chemicals into three groups: fully halogenated CFCs (CFCs); partly halogenated CFCs (HCFCs); and nonchlorine CFCs (HFCs). This reclassification allowed certain sectors of industry to develop and refine a strategy of wrongly promoting the latter two categories as non-CFC, and therefore, environmentally safe. *See also* Moore, *supra* note 258, at 321.

312. *See supra* note 309 and accompanying text.

313. *See generally* Debora Mackenzie, *Cheaper Alternatives for CFCs*, NEW SCI., June 30, 1990, at 14.

ule and not relegated to a nonbinding resolution.[314] Second, there is an urgent need for public sector involvement in substitute research and development.[315] Such involvement will have several positive effects, not the least of which will be to destroy the monopoly of information on, *inter alia*, costs of substitutes and the likelihood of future viability[316] currently enjoyed by a handful of multinational corporations. There is an inherent danger in making policy decisions on the basis of data that is generated and collected by entities with a vested interest in protecting their economic position.[317]

Governments also have an important role to play in the development and application of a defined criterion against which the acceptability of proposed substitutes may be judged.[318] While contribution to stratospheric chlorine or bromine loading will be the main consideration, the global warming potential of any substance is a vital consideration that cannot continue to be ignored. The weighing of other factors such as cost, performance, energy efficiency, and toxicity will inevitably involve trade-offs, "raising important public-interest issues that cannot be decided by industry alone."[319]

Governments are in a position to facilitate the testing and marketing process by removing bureaucratic and procedural obstacles to the rapid deployment of acceptable substitutes.[320] They should also be prepared to make a financial commitment to the acceleration of the search for environmentally safe alternatives where international and domestic concessions do not prove a sufficient incentive for private enterprise.

Recovery, recycling, and destruction programs should also receive the full support of national governments intent on reducing compliance costs, shrinking demand, and minimizing emissions from and additions to CFC/halon banks.[321] The op-

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314. *1990 Resolution*, *supra* note 135.

315. *See generally* Hoffman, *supra* note 307, at 333; Allan Miller, *The Development of Substitutes for Chlorofluorocarbons: Public-Private Cooperation and Environmental Policy*, 19 AMBIO 338 (1990).

316. *See* MACKENZIE-ALTERNATIVES, *supra* note 313, at 39-40; Moore, *supra* note 258, at 321.

317. Moore, *supra* note 258, at 323.

318. For a detailed examination of the various criteria upon which acceptability of substitutes should be evaluated, see Hoffman, *supra* note 307, at 339.

319. Miller, *supra* note 315, at 339.

320. *Id.* at 339-40.

321. On the economic and environmental desirability of regulating recovery,

portunity to develop a truly international strategy was forfeited with the Protocol's failure to impose controls over these aspects of the ODS cycle.[322] Absent the necessary reform, it will be the task of state parties to ensure that ozone saved with one regulatory technique is not destroyed through the absence of another.

5. Monitoring, Compliance, and Enforcement

The procedures adopted in June 1990 to deal with noncompliance[323] are in one sense at least, extremely weak. Punitive sanctions have been waived in favor of a system which emphasizes cooperation facilitating adherence to Protocol provisions over condemnation for failure to comply.

By deciding against or postponing the implementation of coercive measures for noncompliance, Protocol parties have created a situation apparently unique within a legal system ostensibly based upon consent. In its present form, the Montreal Protocol operates to impose greater penalties on nonparticipants than on those states failing to discharge their self imposed obligations.[324] Quite apart from its wider implications, which

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recycling, destruction, and transportation of ozone depleting substances, see GREENPEACE INTERNATIONAL, FIFTY PERCENT MORE PRODUCTION: THE FAILURE OF THE MONTREAL PROTOCOL 14 (1990) [hereinafter GREENPEACE PAPER]; Christopher Brühl & Paul J. Crutzen, *Ozone and Climate Changes in the Light of the Montreal Protocol: A Case Study*, 19 AMBIO 293, 294 (1990); Seidel & Blank, *supra* note 266, at 303. *See also* UK RECOVERY, RECYCLING AND DESTRUCTION REPORT, *supra* note 81 *passim* (especially at 261-74 discussing policy implications).

322. Recovery, recycling, and transportation of ozone depleting substances are not covered by or otherwise referred to in the Protocol. Under article 1 of the Protocol, destruction by "approved technologies" provides a credit, thus allowing additional production. While this provision may operate to encourage the development of safe disposal techniques, it also allows for the theoretical possibility that manufacturers may legally produce the same quantity of CFCs and halons beyond phaseout to equal the quantity that is destroyed. *See* UK RECOVERY, RECYCLING AND DESTRUCTION REPORT, *supra* note 81, at 266. On administrative arrangements for approving destruction technologies, see UNITED NATIONS, ENVIRONMENT PROGRAM, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, TERMS OF REFERENCE FOR A WORKING GROUP OR DESTRUCTION TECHNOLOGIES, U.N.Doc UNEP/OzL.Pro. 2/2/Add. 6/ Rev. 1, May 28, 1990 (Transformation/Decomposition Committee); Decision 111/10, U.N.Doc. UNEP/OzL.Pro. 3/11, *supra* note 70.

323. *See supra* notes 227-32 and accompanying text.

324. *See supra* notes 80-84, 212-14 and accompanying text.

are discussed elsewhere,[325] one may argue that as a matter of common sense, such an obvious paradox should be remedied as soon as possible. This would most easily be achieved by way of an amendment to the Protocol specifying that signatories failing to implement its provisions would be deemed nonparties for the purposes of Article 4 technical and trade restrictions.

Successful enforcement of Protocol provisions will nevertheless require more than a mere strengthening or extension of existing sanctions. For this reason, the current mechanism with its emphasis on cooperation and assistance should not be lightly dismissed as an interim compromise of little functional utility. For example, the success with which trade restrictions and the control schedule are implemented by the various methods available[326] will depend heavily upon the efficiency of national legal systems. The administrative apparatus of many Third World countries may well be incapable of discharging the responsibilities assumed upon ratification. Under such circumstances, a program of relevant technical assistance, possibly financed through the funding mechanism and administered by the Implementation Committee, would be of far greater practical value to an involuntarily errant party than the automatic imposition of harsh sanctions for noncompliance.

Setting aside domestic problems of implementation, adequate enforcement on the international level is necessarily premised upon the existence of efficient mechanisms for detecting violations. Recognition of this truism may be found in the Protocol's fairly stringent reporting requirements.[327] However, delays in submitting data,[328] the existence of so called

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325. *See infra* notes 373-74 and accompanying text.

326. The Protocol is result-oriented in that no specific manner of regulation is prescribed. On the various implementation options available to parties, see generally Peeyush Jain, *Proposal: A Pollution Added Tax to Slow Ozone Depletion and Global Warming*, 26 STAN. J. INT'L L. 549 (1990); Robert W. Hahn & Albert M. McGartland, *The Political Economy of Instrument Choice: An Examination of the US Role in Implementing the Montreal Protocol*, 83 NW. U.L. REV. 592 *passim* (1989); Ogden, *supra* note 72.

327. *See supra* notes 215-18 and accompanying text.

328. The data on production, imports and exports for the base year 1986, required by article 7(1), is crucial to implementation of the Protocol because it forms the basis of compliance with the control schedule. As of June 1991, only 31 out of the 71 Protocol Parties had fulfilled their obligations under this section. Of the remainder, 19 reported incomplete data, 6 reported that none was available, 2 reported that their data was included with another party's, and

secrecy rights,[329] and total reliance on good faith reporting have made a mockery of the efforts to develop an effective scheme for the legal and technical verification of compliance and noncompliance. It is currently impossible to verify with certainty state or industry claims that the control schedule is in fact being implemented and other obligations observed.[330]

The problem of monitoring will not be resolved without the positive cooperation of all state parties. In the first place, it is essential that submission of statistical data be properly recognized as a positive protocol obligation. Failure to discharge this obligation should, of its own, be sufficient grounds to support a charge of noncompliance. Treating nonreporting parties in this way will also serve to identify a particular subgroup in need of special assistance—states unable to comply as the result of difficulties experienced in collecting and collating required information.[331]

Second, the opportunities for secrecy must be limited as far as possible. One method of circumventing the confidentiality provisions would be to implement the *polluter pays* principle by utilizing production figures as the scale of assessment for contributions to the fund. Irrespective of the method employed,

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13 failed to report at all. U.N. Doc. UNEP/OzL.Pro.3/11, *supra* note 70, at 10.

329. Protocol parties were initially assured that all data reported to the Convention Secretariat would be treated as confidential. UNITED NATIONS, ENVIRONMENT PROGRAM, OPEN-ENDED WORKING GROUP OF THE PARTIES TO THE MONTREAL PROTOCOL, REVISED REPORT ON DATA ON PRODUCTION, IMPORTS, EXPORTS AND CONSUMPTION OF SUBSTANCES LISTED IN ANNEX A OF THE MONTREAL PROTOCOL, U.N. Doc. UNEP/OzL.Pro.2/2/Add.4/Rev.1 (1990). This pledge was subsequently modified in principle—a move endorsed by parties at their second meeting when they confirmed that "any data on consumption of the controlled substances that are submitted to the Secretariat as required by Article 7 of the Protocol are not to be confidential." U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at 15. However, as production figures remain confidential, the Secretariat is currently the only body in possession of complete compliance verification records.

330. *See* GREENPEACE PAPER, *supra* note 321.

331. At their second meeting, Protocol parties established an ad hoc Group of Experts on the Reporting of Data, requesting that it "consider the reasons leading to the difficulties faced by some countries in reporting data . . . and . . . recommend possible solutions to the Parties concerned." Decision 11/9, U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123. In its report to the Third Meeting of Protocol parties, the Group recommended that developing countries be encouraged to inform the Secretariat of any reporting difficulties "so that suitable measures can be taken to rectify the situation." Decision 111/7, UN. Doc. UNEP/OzL.Pro.3/11, *supra* note 70.

all information submitted by parties and conclusions regarding compliance derived from these submissions must be open to public scrutiny. Publication could well become a powerful incentive for states to fulfill their obligations—particularly if the "sanction of world public opinion" is recognized and manipulated by influential nongovernmental organizations.[332] Secrecy is also a potential problem in relation to industry. The capacity of corporations, particularly those engaged in multinational operations, to manipulate Protocol restrictions must not be underestimated. For this reason alone, the arguments advanced in support of data confidentiality should be critically examined. Absent an as yet unarticulated justification, considerations of public interest would appear to demand that national statistics accurately reflect the contribution made by named industries to production and consumption of ozone-depleting substances.

Finally, a number of significant institutional changes must occur if noncompliance is to be efficiently detected and ultimately dealt with in a manner that promotes the objects of the Protocol. While it remains underfunded and is denied powers of investigation and inspection, the Convention Secretariat is destined to remain little more than a data depository. Protocol parties have the clear responsibility to transform the Secretariat into an effective monitoring agency.[333] This can only be achieved by ensuring that it is adequately resourced, capable of nonpartisan assessment, and vested with clear legal authority to verify submissions.

H. Conclusion—Toward 1992

The adjustments and amendments agreed to by Protocol parties in June 1990 represent a significant leap forward in the global effort to halt and eventually repair destruction of the stratospheric ozone layer. The tightened control schedule is important because it incorporates phaseout dates for a wide range of ozone depleting chemicals. Increasingly onerous restrictions on production and consumption of controlled substances have also functioned to stimulate research into development and marketing of environmentally safe alternatives. By

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332. *See also infra* notes 453-58 and accompanying text.

333. On monitoring issues, see generally *infra* notes 378-97 and accompanying text.

creating an innovative funding mechanism, the Protocol parties are attempting to address the participation problem at its source by facilitating the assumption and effective implementation of Protocol obligations on the part of developing countries. When measured against a host of other environmental protection agreements concluded at the international level, the amended Protocol appears every bit as formidable as the threat it was formulated to confront.

The battle is, however, far from over. Recently released reports indicate a significant increase in both global and polar ozone depletion.[334] Predictive models suggest that even under the revised Control Schedule, this trend is likely to continue with potentially catastrophic results.[335] The negative effects of inadequate controls can only be exacerbated by other weaknesses in the Protocol identified at length above. Of particular concern are the various problems associated with the funding mechanism[336] and the failure of Protocol parties to develop Article 8 of that agreement dealing with noncompliance.[337] Fortunately, many of these shortcomings lend themselves to resolution through the Protocol's amendment process. At this stage it is difficult to predict with any accuracy the range and extent of desired reform. Much will depend upon variables that cannot as yet be accurately assessed, such as the rate at which substitutes are created, and the extent to which problems of technology transfer are overcome. The agenda for reform will also rely heavily upon whether individual parties are willing to view Protocol obligations as a minimum standard. Unilateral action has played an important role in the evolution of an international legal response to ozone depletion,[338] and hopefully will continue to do so. A range of domestic initiatives could, for example, provide the much needed impetus for rapid development of alternative technologies, products, and processes. Such measures could include the imposition of a Control

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334. *See supra* notes 41-42 and accompanying text.

335. *Id.*

336. *See supra* notes 270-87 and accompanying text.

337. *See supra* notes 323-33 and accompanying text. *But cf. infra* note 340 (on the initiative taken at the third meeting of Protocol parties in regard to strengthening the non-compliance mechanism).

338. *See* John H. Chafee & Steven J. Shimberg, *Supplementing the Montreal Protocol: The Need For Domestic Legislation*, 19 AMBIO 311 (1990). *See also supra* notes 44-46, 120 and accompanying text.

Schedule stricter than that mandated by the Protocol[339] and the provision of additional administrative and financial assistance to facilitate research and development.

Despite such uncertainties, it is nevertheless apparent that extensive amendments will be necessary if the Protocol is to continue as an effective weapon in the war against ozone depletion. On the basis of current scientific evidence, phaseout dates need to be further accelerated and transitional substances included in the control schedule. Protocol parties should also seriously consider strengthening both trade restrictions and the institutional mechanisms for identifying and responding to instances of noncompliance. In these and other matters, decision-makers should utilize wisely the opportunity presented by the fourth meeting of Protocol parties, scheduled for late 1992.[340]

II. LESSONS FROM THE PAST: THOUGHTS ON LEGAL RESPONSES TO OZONE DEPLETION AND THE FUTURE OF INTERNATIONAL LAW FOR ENVIRONMENTAL PROTECTION

Scholars and decision-makers believe that the response to ozone depletion has been a victory for international law—heralding a new era in environmental diplomacy and international relations. The "ozone precedent" we are assured,

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339. A number of states have already taken this initiative. At the Third Meeting of Protocol Parties held in Nairobi from June 19th through 21st, 1990, the heads of delegations representing the Governments of Sweden, Finland, Norway, Switzerland, Austria, Germany, and Denmark issued a joint statement in which they declared their intention to phase-out carbon tetrachloride, controlled CFCs, and halons by 1997, to phase-out methyl chloroform by the year 2000, and to limit, by no later than 1995, the use of HCFCs to specific key applications where other alternatives were not available. U.N. Doc. UNEP/OzL. Pro.3/11, *supra* note 70.

340. It was understood at the second meeting of Protocol Parties that a substantive review of the Control Schedule and other provisions would not be attempted before 1992. *See* Revised Protocol, *supra* note 125, arts. 2A(6), 2E(5). This understanding was confirmed at the third meeting of Protocol parties held in Nairobi from June 19th to 21st, 1990, at which delegates paved the way for a strengthening of the Protocol by authorizing the creation of: (i) a Working Group to draft necessary adjustments and amendments in light of information received from the scientific and technical panels in a November 1991 report and (ii) a Legal Group to prepare recommendations on strengthening the Protocol's non-compliance mechanism. *See* U.N. Doc. UNEP/OzL.Pro.3/11, *supra* note 70.

will contribute mightily to the resolution of other, more intractable environmental problems, such as global warming and conservation of biological diversity.[341]

This mainstream optimism should be cautiously embraced, being misplaced in several important respects. First, a rigorous analysis of the various factors involved in reaching international agreement on resolution of a particular environmental issue[342] leads to the conclusion that the ozone convention was, in many respects, an accident of time and place, a fortuitous merging of complex variables sufficient to allow the formation of consensus

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341. The Revised Protocol was welcomed by the United Kingdom Environment Secretary as " . . . a major step forward in environmental diplomacy . . . a unique agreement . . . ." Paul Brown, *supra* note 238, at 1. *See also* Richard E. Benedick, *Ozone Diplomacy, in* ISSUES IN SCIENCE AND TECHNOLOGY, Fall 1989, at 43. In a speech to the Second Meeting of Protocol parties, the Executive Director of UNEP, Mostafa Tolba, declared that,

> [w]e are establishing a new political movement to deal with the environmental crisis, a movement not based on short term but on long term benefit for all; a movement that is rooted in respect for the value of human life and in respect for nature. In fact we are not only writing a much stronger treaty but a new chapter in international relations.

Failure is Not an Option, supra note 241, at 3.

342. A number of studies have in fact been done on this question. *See, e.g.*, Oren R. Young, *The Politics of International Regime Formation: Managing Natural Resources and the Environment*, 43 INT'L ORG. 349 (1989); Robert W. Hahn & Kenneth R. Richards, *The Internationalization of Environmental Regulation*, 30 HARV. INT'L L. J. 421 (1989). Young identifies the following factors as "determinants of success" in the creation of regulatory regimes for environmental protection: (i) ability to enter into a social contract on a particular issue (i.e., existence of a "specified zone of agreement"); (ii) availability of arrangements generally accepted as equitable; (iii) existence of salient solutions; (iv) availability of clear-cut and effective compliance mechanisms; (v) occurrence of *exogenous* shocks or crises (e.g., discovery of the Antarctic ozone hole); and (vi) emergence of effective leadership. For Hahn and Richards, the existence of previous, related agreements will enhance the likelihood of reaching agreement, as will increases in: (i) scientific consensus on the cause and scope of the problem; (ii) public concern; (iii) perceptions of equity among participants; and (iv) short term political benefits. Factors operating to lessen the likelihood of reaching agreement were identified as increases in: (i) costs of control; and (ii) number of (potential) parties. No definitive conclusion was reached in relation to the potential impact of other considerations identified by the authors, such as monitoring and enforcement, the particular negotiating forum utilized, and the breadth of issues addressed. While none of the above authors engages in a detailed analysis of the problem of stratospheric ozone depletion, it is evident that, when measured against either set of criteria, this particular environmental threat emerges as one especially amenable to an effective and relatively rapid solution. *See* Young, *supra*, at 366-75; Hahn & Richards, *supra*, at 431-40.

on both the scope of the problem and the means by which it should be addressed. It would be unwise to assume, without examining these variables carefully, that the exercise could be repeated in another context with a similar degree of success.

The second fault lies in a failure to take account of the fundamental weaknesses of the Protocol and to perceive that these weaknesses are manifestations of the inherent inability of traditional international law to provide an adequate framework within which effective control structures for environmental protection may be built.

Nevertheless, the Protocol[343] does represent a milestone for the reason that its particularly innovative features are the result of attempts to circumvent those very weaknesses of international law, both substantive and procedural, which have been the cause and necessary effect of its marginal relevance in the global environmental context.

The following section is devoted to a selective examination and evaluation of these innovations. How and to what extent have they enhanced the real effectiveness of ozone regulation? Perhaps more importantly, what implications may be derived from their utilization for the future of international environmental law?

A. Innovations in Rule Creation and Implementation

1. Creative Lawmaking

The traditional or classical response of international law to most new problems is "to treat the problem as an issue and to seek out the most appropriate principles or rules to apply to the situation."[344] In faithful accordance with this tradition, the search for suitable environmental protection norms has been conducted largely within the ambit of the doctrine of state responsibility and accompanying mechanisms of liability. While substantive legal obligations may be extrapolated in this way,[345] such efforts have, in a practical sense, remained large-

343. *See generally supra* note 233 and accompanying text.

344. Douglas M. Johnston, *Systemic Environmental Damage: The Challenge to International Law and Organization*, 12 SYRACUSE J. INT'L L. & COM. 255, 267 (1985).

345. *See supra* note 53 and accompanying text.

ly unrewarded. This is a reflection, not only of the complexity of the problems faced, but also of the inadequacy of existing principles seeking to limit freedom of state action, since they were formulated "from perspectives other than the specifically environmental."[346]

In addition, a number of major environmental issue areas, such as ozone depletion, are prima facie inappropriate subjects for this type of inherently reactive, as opposed to preventive, regulation. There does not yet exist a clear and widely accepted rule of customary law under which a state may bring a claim for environmental damage, as opposed to personal or property damage, to common areas or to the international community as a whole.[347] Even assuming that one *could* identify a universally accepted obligation to prevent ozone layer damage,[348] and reach agreement on what constitutes damage, the essentially bilateral nature of liability mechanisms[349] renders unsuitable their application to a problem which is truly global in cause and effect.

Other technical and legal difficulties abound and may well prove insurmountable. What is the standard of care upon which to affix liability? How are the consequences of ozone depletion to be quantified monetarily? Even in areas where application of these principles would appear more suitable and straightforward, such as accidental transboundary pollution, particularly that resulting in localized damage attributable to a specific cause, the obstacles, although fewer in number, appear similarly intractable. States are, in practice, extremely reluctant to contribute to the development of any rule of international law under which they could be held responsible, and thereby liable to pay compensation, for environmental injury.[350] Far from re-

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346. Jan Schneider, Note, *New Perspectives on International Environmental Law*, 82 YALE L.J. 1659, 1671 (1973).

347. SANDS & CAMERON, LONDON CENTRE FOR INTERNATIONAL ENVIRONMENTAL LAW, INTERNATIONAL LAW OF ATMOSPHERIC PROTECTION: A CRITIQUE OF THE EXISTING RULES 5 (1990).

348. On this and the question of state responsibility for ozone damage see generally Lawrence, *supra* note 251, at 23-30.

349. *See generally* Simma, *Bilateralism and Community Interest in the Law of State Responsibility*, *in* INTERNATIONAL LAW AT A TIME OF PERPLEXITY 820, 820-822 (Y. Dinstein ed., 1989).

350. *See* Kiss, *supra* note 53, at 1079; Henry C. Burmester, *Liability for Damage from Antarctic Mineral Resource Activities*, 29 VA. J. INT'L L. 621, 624-28 (1989).

sponding to repeated calls for development of an effective responsibility-liability regime,[351] states have studiously avoided participating in such development and invoking those rules which can be said to exist by exercising their discretion to litigate.[352]

It would be incorrect to dismiss these traditional rules of international law as wholly irrelevant to protection of the global environment.[353] However, the practical and theoretical difficulties outlined above have rightly led to a perceptible shift of emphasis away from the primary use of such doctrines and towards elaboration of highly specific treaty-based rules such as those embodied in the Montreal Protocol.[354]

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351. Principle 22 of the Stockholm Declaration urges states to " . . . cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such states to areas beyond their jurisdiction." Stockholm Declaration, *supra* note 53, at 1420. A significant number of conventions concluded since the Stockholm Conference have echoed this call. *See* Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, Nov. 13, 1972, *reprinted in* 11 I.L.M. 1294, 1302; United Nations Convention on the Law of the Sea, Dec. 10, 1982, U.N. Doc. A/Conf.62/122, *reprinted in* 21 I.L.M. 1261, 1315; Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Nov. 25, 1986, 26 I.L.M. 38, 49; Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, Mar. 22, 1989, U.N.E.P. Doc. IG.80/3, *reprinted in* 28 I.L.M. 657.

352. A clear example of state reluctance to invoke rules of responsibility and liability in the event of transboundary environmental damage is provided by the Chernobyl nuclear disaster of 1986. Despite general agreement on the existence of principles of customary international law sufficient to support a claim against the Soviet Union, no such claim was in fact lodged by any of the affected states. *See* CHERNOBYL: LAW AND COMMUNICATION: TRANSBOUNDARY NUCLEAR AIR POLLUTION—THE LEGAL MATERIALS 26-30 (Phillipe Sands ed., 1988) [hereinafter CHERNOBYL].

353. *See id.* at 6-33. *See also* Allen L. Springer, *United States Environmental Policy and International Law: Stockholm Principle 21 Revisited, in* INTERNATIONAL ENVIRONMENTAL DIPLOMACY: THE MANAGEMENT AND RESOLUTION OF TRANSFRONTIER ENVIRONMENTAL PROBLEMS 45, 51 (John E. Carroll ed., 1988) [hereinafter Carroll]; Handl, *supra* note 53 *passim*. For Handl, the concept of state liability, particularly in the content of accidental environmental injury, "remains a cornerstone of any international regime for the protection of the environment," by (i) providing an incentive for governments to prevent environmental damage; (ii) operating to effectively internalize costs between victim and offending state; and (iii) giving a sharper edge to rights and obligations of states. *Id.* at 85-89.

354. In relation to such treaties, traditional rules of state responsibility and liability will be of only secondary significance, theoretically capable of being

A simultaneous shift in the direction of international legal discourse is necessary. On a functional level, the practitioner or scholar, rather than pursuing the elusive goal of constructing or codifying international legal rules of necessarily peripheral relevance, may be better occupied analyzing implications of the new *standard-setting* approach to specific environmental problems and devising imaginative means of enhancing its effectiveness.[355] Consideration of the various treaty-based techniques utilized in the context of ozone depletion may well prove a useful starting point.

2. Procedural Strategies

The international community has adopted the framework or "umbrella" treaty approach to environmental regulation in relation to specific issues,[356] and will undoubtedly utilize the approach in the future.[357] The Vienna Convention provides a

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invoked by state parties to "vindicate their rights and enforce [their] contractual obligations." 1987 Montreal Protocol, *supra* note 70. *Cf.* Kim Smith, Book Review, 16 ECOLOGY L.Q. 857, 870-71 (1989) (reviewing BRUNEE, *supra* note 72) (discussing the United Nations' attempts to protect the ozone layer through the Vienna Convention and the Montreal Protocol). The political likelihood of this happening in the context of the Montreal Protocol (i.e., through the dispute settlement mechanism), would seem to be remote due to the peculiarly self-enforcing nature of the Protocol's control schedule. As similar mechanisms are built into other environmental protection treaties, even this function of responsibility and liability may well diminish or disappear.

355. This plea is only indirectly aimed at the International Law Commission, which has been engaged in the task of developing and codifying principles of state responsibility since 1949. The scope of the Commission's work is of course far broader than environmental protection, and, if ever completed, may well add substantially to the corpus of general international law. However, neither the Commission nor its work on state responsibility have escaped well directed and savage criticism. *See generally* M. EL BARADEI ET AL., THE INTERNATIONAL LAW COMMISSION: THE NEED FOR A NEW DIRECTION (UNITAR 1981); Philip Allott, *State Responsibility and the Unmaking of International Law* 29 HARV. INT'L. L.J. 1 (1988) *passim* (hypothesizing that the International Law Commission's work on state responsibility is doing serious damage to international law).

356. *See supra* note 64 and accompanying text.

357. Both the Intergovernmental Panel on Climate Change (IPCC) and the United Nations General Assembly (see Resolutions 44/207 and 44/228 of December 22, 1989) have agreed in principle on the need for a framework convention to address global warming. According to an IPCC Report released in June 1990, "[s]uch a Convention should generally follow the format of the Vienna Convention for the Protection of the Ozone Layer, in laying down, as a minimum, general principles and obligations." INTERGOVERNMENTAL PANEL ON CLIMATE

practical example of how an initial agreement may, by (i) developing consensus on the nature and seriousness of the scientific and political issues involved,[358] and (ii) encouraging wide ranging cooperation, bridge the gap between States with widely differing capacities or views on how a particular threat ought to be addressed.[359] While the ability of framework agreements to create expectations of behavior, and to thereby facilitate the development of legal norms, is unproven, the *possibilities* offered by this innovative approach to rule-making ought to be further explored.

There is, however, an important caveat. A framework treaty should not be used as an excuse for avoiding or postponing the creation and imposition of hard legal rights and obligations. Despite *secondary* achievements,[360] the Vienna Convention was *of itself* totally incapable of addressing the ozone problem and therefore of negligible value when measured against a strict criterion of environmental effectiveness. Decision-makers must avoid utilization of the treaty form in the absence of even basic consensus.[361] They must recognize that the usefulness of any framework treaty lies solely in its status as the first step of an ongoing process towards creation of enforceable legal norms.

The Protocol's flexible approach to implementation is also a worthy precedent. In addition to the obvious practical benefits, a result-oriented control schedule is politically astute in terms of minimizing perceptible losses of sovereignty. By permitting signatories to choose their own method of internal regulation, the Protocol also reflects shrewd acknowledgement of cultural diversity—an understanding of the disparity in regulatory approaches and decision-making customs that exist between Protocol parties. It is this kind of versatility—capable

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CHANGE: FORMULATION OF RESPONSE STRATEGIES 249 (June 1990) (Report Prepared for IPCC by working Group III).

358. *Cf.* M. GRUBB, THE GREENHOUSE EFFECT: NEGOTIATING TARGETS vii, 10-11 (1989).

359. *See* Springer, *supra* note 353, at 60; Birnie, *The Role of International Law in Solving Certain Environmental Conflicts, in* Carroll, *supra* note 353, at 101-02.

360. *See supra* notes 52-64 and accompanying text.

361. On the dangers of the treaty form losing its normative status, " . . . when continually used to define a consensus which is still too imprecise, fluid or weak to be able to live up to the rigid demands of *pacta sunt servanda* . . . ," see Simma, *Consent: Strains in the Treaty System, in* MACDONALD & JOHNSTON , *supra* note 53, at 485-90.

of being embodied in a treaty *without* loss of substance—that will be a crucial aspect of future environmental agreements, particularly those between States sharing few social or legal traditions.[362]

3. Changing Visions of Consent: Decision-making in the Absence of Unanimity

Adjustments to the Protocol's control schedule may be adopted as binding on all parties by a two-thirds majority vote.[363] As no reservations are permitted,[364] a state will be bound even if it fails to vote or actually votes against the adjustment.

This provision departs from what is commonly asserted to be a rule of customary international law: that a treaty may not be revised without the consent of all parties. In practice, a great number of modern multilateral agreements contain provisions for qualified majority amendment.[365] However, apart from the constituent instruments of intergovernmental organizations,[366] treaties exist that, when modified, will operate to bind nonconsenting states. Perhaps the most celebrated case of a state taking exception to such a provision is in relation to the

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362. On the need to address such cultural realities by going beyond regulatory models based on supposed "universalistic criteria," see Gerlach & Rayner, *Culture and the Common Management of Global Risks*, PRACTICING ANTHROPOLOGY, 15, 15-16 (1987). *See generally* A.B. BOZEMAN, THE FUTURE OF INTERNATIONAL LAW IN A MULTICULTURAL WORLD (1971).

363. 1987 Montreal Protocol, *supra* note 70, art. 2(9). In accordance with the 1990 amendment to this section, the requisite two-thirds majority is to represent a majority of both Article 5 parties and non-Article 5 parties present and voting. Revised Protocol, *supra* note 125, art. 2(9)(c).

364. 1987 Montreal Protocol, *supra* note 70, art. 18.

365. For such agreements in the environmental context, see Convention on Long-Range Transboundary Air Pollution, 1979, *reprinted in* 18 I.L.M. 1442 [hereinafter Transboundary Air Pollution Convention]; South Pacific Convention, *supra* note 351, at 51-52; Basel Convention, *supra* note 351, at 673.

366. Shabtai Rosenne points to article 108 of the United Nations Charter as the basis of modern organizational practice in which a duly adopted amendment, once entering into force, will become binding upon every member of the organization "regardless of how it voted or whether it has expressed its consent to be bound by the amendment." SHABTAI ROSENNE, DEVELOPMENTS IN THE LAW OF TREATIES 1945-1986, 223 (1989). A State refusing to accept the amended treaty must presumably withdraw from it and in doing so, withdraw also from the organization. *See* WOLFGANG FRIEDMANN, THE CHANGING STRUCTURE OF INTERNATIONAL LAW 129-30 (1964).

United States and Article 155(4) of the United Nations Law of the Sea Convention.[367] According to a statement made by President Reagan in 1982, "provisions that would allow Amendments without approval of all participating states, including in our case the advice and consent of the Senate, [are] clearly incompatible with the United States process on treaties."[368]

It is a truism worth repeating that effective legal protection of the global environment is incompatible with unfettered sovereignty. Despite a cumulative erosion of the traditionally absolute nature of this concept, the United States objection, in this context, is not difficult to fathom. A fundamental challenge to state sovereignty as a principle of international law is inherent in the notion of a state being bound by an international legal rule without its consent. Nevertheless, there are perceptible movements in just this direction. For example, in 1989, representatives of twenty-four states signed the Declaration of the Hague[369] in an attempt to formulate a new approach to environmental protection "through the development of new Principles of International Law."[370] One such principle espoused by

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367. Article 155 deals with procedural aspects of the conference to review the system of exploration and exploitation of deep seabed resources, which is to be convened fifteen years after commencement of commercial production. Law of the Sea, *supra* note 351, *reprinted in* 21 I.L.M. at 1297-98. In the event that after a period of five years the Review Conference fails to reach agreement, it may, in accordance with paragraph 4, "decide . . . by a three-fourths majority of the state parties, to adopt and to submit to the state parties for ratification or accession such amendments changing or modifying the system as it determines necessary and appropriate. Such amendments shall enter into force *for all state parties* 12 months after the deposit of instruments of ratification or accession by three-fourths of the States Parties . . . ." *Id.* at 1298 (emphasis added). In accordance with the Conventions denunciation clause, article 317, countries objecting to or rejecting amendments made in this way can avoid being bound only by withdrawing from the Convention in its entirety. *Id.* at 1328.

368. Statement on United States Actions Concerning the Conference on the Law of the Sea, II PUB. PAPERS 911 (July 9, 1982), *reprinted in* AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS BACKGROUNDER, July 14, 1982. Whether, and to what extent, the United States has modified its views on this matter remains unclear as the amendment provision of the Montreal Protocol did not appear to attract attention among negotiators.

369. *Declaration of the Hague* (1989), *reprinted in* Philippe Sands, *The Environment, Community and International Law*, 30 HARV. INT'L L.J. 393, 417-20 (1989).

370. *Id.* at 418.

the Declaration is that of effective decision-making even in the absence of unanimous agreement.[371]

This may not be an unrealistic notion. The Protocol's adjustment procedure represents a clear recognition of the difficulties involved in effectively responding to environmental threats within the confines of consensus-based decision-making.[372] If not merely an aberration, or a variation on the "international ecostandard" approach,[373] the provision is to be welcomed as a promising innovation—a first (albeit modest) step towards transcending the boundaries of a decision-making procedure which has stifled imaginative legal development and produced disappointing, least-common denominator results.

B. Closing the Implementation Gap

Environmental protection agreements concluded at the international level characteristically fail to incorporate precise, or rigorous, provisions for the monitoring or enforcement of obligations assumed thereunder. What are the consequences of this tendency in terms of a particular agreement's effectiveness? Is such an omission, of itself, fatal?

As the Montreal Protocol demonstrates, careful drafting can almost make for self-enforcement by constructing a situation in which nonconformity would be unreasonable. The inclusion of positive incentives, such as, a provision of technical and financial assistance, and negative disincentives, such as, for example,

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371. *Id.* at 419.

372. Wirth & Lashof, *Beyond Vienna and Montreal—Multilateral Agreements on Greenhouse Gases*, 19 AMBIO 305, 309 (1990).

373. It is not uncommon for technical standards to be separated from basic treaty provisions and thereby subject to less stringent amendment procedures. However, such agreements will rarely be without a saving clause for dissenters, often some kind of notification procedure similar to that laid down in the Montreal Protocol in relation to the imposition of trade restrictions on products manufactured with or containing controlled substances. *See supra* notes 80-81 and accompanying text. For examples of the uncommon treaty in which adoption or amendment of standards by a stipulated majority operates to automatically bind non-consenting states, see 1944 Convention on International Civil Aviation, (art. 12(3) dealing with air navigation over the High Seas); Treaty Establishing the European Atomic Energy Community, (art. 38 dealing with radioactive contamination standards). *See generally* Paolo Contini & Peter H. Sands, *Methods to Expedite Environmental Protection: International Ecostandards*, 66 AM. J. INT'L L. 37 (1972) (discussing the emerging concept of setting international standards of environmental protection).

the imposition of trade restrictions, will go a long way toward promoting and perhaps even dictating participation in and compliance with, treaty-based obligations. However, the utility of any such incentive network will be lessened if its utilization appears based on the dubious assumption that a state will not sign an agreement unless it intends to comply with it.[374] Future negotiators must, in relation to future environmental protection agreements, go beyond the example set at Montreal[375] and ensure that application of economic inducements is extended to encompass instances of noncompliance.

This is not to say that violation of a treaty norm should trigger an automatic sanctioning response. As drafters of the amended Protocol recognized, the matter of blameworthiness may well be unclear.[376] If so, effective correction or control will depend heavily upon the existence of a discretionary ability, wheresoever residing, to examine circumstances surrounding the breach. Persuasion and support is particularly important given the need for a continuing relationship between the enforcer and rule-breaker.[377] Indeed, coercive enforcement should be granted small space in a strategy which must, by necessity, focus on encouraging conformity with a rule rather than punishing its

374. Environmental protection agreements are especially prone to being utilized as tools of domestic political rhetoric, allowing states to "reap the public image benefits of signature without bearing the cost of implementation." Hahn & Richards, *supra* note 342, at 437. Even if an intention to comply is present at the time of signature, this is not of itself sufficient to guarantee effective implementation. First, officials or agencies that negotiate agreements are not always those authorized to ratify or otherwise implement them. Second, the accepting government may fall from power with its successor being unwilling or unable to honor its commitments. Third, a government's administrative capacity may be insufficient to permit discharge of its obligations. *See supra* note 326 and accompanying text. *See also* Caldwell, *Beyond Environmental Diplomacy: The Changing Institutional Structure of International Cooperation, in* Carroll, *supra* note 353, at 13, 14.

375. One example is situations where trade restrictions are directed only at non-parties.

376. For example, a Developing (Article 5) State Party may notify the Secretariat that it is unable to comply with the Protocol's control schedule as a result of the inadequate implementation by other parties of financial cooperation and technology transfer provisions. While the matter is being considered by the parties in plenary session, non-compliance procedures contained in the Protocol are not applied to the notifying party. Revised Protocol, *supra* note 125, arts. 5(6), (7).

377. *See* KEITH HAWKINS, ENVIRONMENT AND ENFORCEMENT: REGULATION AND THE SOCIAL DEFINITION OF POLLUTION 6 (1984).

breach. A clearly articulated, credible threat of collective retaliation, to be employed "in the face of uncooperation and intransigence"[378] is essential to an agreement's legitimacy. However, its rigid and unreflective application could well be ruinous.

One procedural aspect of enforcement which deserves brief consideration at this point, being discussed from the institutional angle below,[379] is the monitoring of compliance or, more broadly, the supervision of legal obligations.[380] In one sense, this aspect of enforcement is inseparable from the incentive structure outlined above. The ability to authoritatively identify an instance of wrongdoing[381] can itself operate to effectively deter potential violators.[382] On a more elementary level, any effort to cause compliance by influencing its behavior[383] assumes a capacity to actually judge or assess that conduct for

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378. *Id.* at 8.

379. *See infra* notes 519-29, 550-53 and accompanying text.

380. Alexandre-Charles Kiss defines supervision as, "a control on the way in which legal obligations—and in particular those resulting from treaties, are performed by states who have accepted those obligations." Alexandre-Charles Kiss, *Mechanisms of Supervision of International Environmental Rules, in* ESSAYS ON THE DEVELOPMENT OF THE INTERNATIONAL LEGAL ORDER 99 (Frits Kalshoven et al. eds., 1980) [hereinafter Kiss, *Supervision of Rules*]. A much earlier study on this phenomenon concluded:

> The Supervisory Function is an essential part of the Legal Technique. It performs a function which is absolutely necessary to the existence and progress of any society, of any social organization. The main object of this function is to ensure respect for the law and the realization of rules of law as well as the regular functioning of public service within the limits laid down in these rules of law. Supervision is an organic function which makes it possible for errors (either in the assessment of a situation or in taking action) which might jeopardize the stability and security of social existence to be rectified. It therefore serves to ensure public order.

SUPERVISORY MECHANISMS IN INTERNATIONAL ECONOMIC ORGANIZATIONS 7 (P. Van Dijk ed., 1984) (quoting M. KAASIK, LE CONTROLE EN DROIT INTERNAIONAL (1933)) [hereinafter SUPERVISORY MECHANISMS].

381. According to Van Dijk, it is possible to discern two hard-core functions of international supervision, namely review and correction. The first is said to be exercised "whenever the behavior of states is judged against a rule of international law by a supervisory body with international status." SUPERVISORY MECHANISMS, *supra* note 380, at 11. The correction function involves the external exertion of persuasion or pressure to ensure compliance with international legal obligations. *Id.*

382. *See* Richard A. Falk, *On Identifying and Solving the Problem of Compliance with International Law*, 58 PROC. AM. SOC. INT'L L. 1 (1964); ROGER FISHER, IMPROVING COMPLIANCE WITH INTERNATIONAL LAW 163 (1981).

383. SUPERVISORY MECHANISMS, *supra* note 381, at 11.

conformity to a rule of law. Despite being traditionally considered a diplomatic task and an accessory element in bilateral or multilateral agreements,[384] the organized supervision of international obligations is becoming increasingly complex and widespread. All intergovernmental institutions are, to varying degrees, engaged in the realization of rules of law through the supervision of member obligations.[385] Organizations that are employing increasingly sophisticated supervisory techniques are widely employed by organizations in the areas of arms control, and atomic energy[386] economic regulation,[387] and human rights.[388]

In the environmental context, where monitoring of a state's treaty obligations is the main and often the only way in which an agreement is enforced,[389] supervision is still relatively primitive. A system of self-monitoring is usual with information being periodically submitted to a central administrative agency.[390] Less common is a petition and complaint procedure

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384. H.A.H. AUDRETCH, SUPERVISION IN EUROPEAN COMMUNITY LAW 1 (1986).

385. *See generally* SUPERVISORY MECHANISMS, *supra* note 380 (on the various economic organizations); AUDRETCH, *supra* note 384 (on the European Communities); W. MICHAEL REISMAN, NULLITY AND REVISION: THE REVIEW AND ENFORCEMENT OF INTERNATIONAL JUDGEMENTS AND AWARDS (1966) (on the International Labour Organization); E. LANDY, THE EFFECTIVENESS OF INTERNATIONAL SUPERVISION: THIRTY YEARS OF I.L.O. EXPERIENCE (1966) (on the International Labour Organization).

386. The International Atomic Energy Agency (IAEA) for example, has developed extensive inspection, reporting and evaluation procedures to ensure the implementation of nuclear safety standards and also that nuclear materials intended for peaceful purposes are not diverted to military purposes. For an overview of these procedures, see THE UNITED NATIONS, THE UNITED NATIONS AND DISARMAMENT: A SHORT HISTORY 64-65 (1988); Jennekens, *IAEA Safeguards: A Look at 1970-1990 and Future Prospects,* 32 IAEA BULL. 5-10 (1990) and in the same volume, News Feature, *International Safeguards in the Context of Non-Proliferation* (insert).

387. *See generally* SUPERVISORY MECHANISMS, *supra* note 380 *passim.*

388. The supervision of human rights obligations is both complex and diverse. For a general overview, see PAUL SEIGHARDT, THE INTERNATIONAL LAW OF HUMAN RIGHTS 45-48 (1984). *See also* INTERNATIONAL ENFORCEMENT OF HUMAN RIGHTS (Rudolf Bernhardt & John Anthony Jolowicz eds., 1985); Christian Dominice, *The Implementation of Humanitarian Law, in* 2 THE INTERNATIONAL DIMENSIONS OF HUMAN RIGHTS (Karel Vasek ed., 1982); INTERNATIONAL LAW AND FACT-FINDING IN THE FIELD OF HUMAN RIGHTS (B.G. Ramcharan ed., 1982).

389. *See* Kiss, *Supervision of Rules, supra* note 380, at 109.

390. *See* Protocol to the 1979 Convention on Long-range Transboundary Air Pollution Concerning the Control of Emission of Nitrogen or their Transboundary Fluxes, Oct. 31, 1988, art. 13, *reprinted in* 28 I.L.M. 212; Convention on the

which could allow this general overseeing to be more specifically focused.[391] Direct surveillance or independent fact finding is virtually unknown,[392] such activity being widely considered an infringement of sovereignty.[393] The consequences of a finding of noncompliance typically remain vague or unspecified. Efforts to secure the compliance of a defaulting state are thereby confined to discussion of the problem within the relevant plenary body. Parties to environmental protection agreements invariably retain the right to reject binding dispute settlement,[394]

Conservation of Antarctic Marine Living Resources, May 20, 1980, arts. XX, XXI, *reprinted in* 19 I.L.M. 837; Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, Feb. 15, 1972, art. 11, *reprinted in* 11 I.L.M. 262; Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 12, 1972, art. VI(4), 26 U.S.T. 2403, T.I.A.S. 8165; Convention on International Trade in Endangered Species of Wild Flora and Fauna, Mar. 3, 1973, art. VIII, *reprinted in* 12 I.L.M. 1088; Convention on the Prevention of Marine Pollution from Land-based Sources, Feb. 21, 1974, arts. 12(2), 17, *reprinted in* 13 I.L.M. 352; Convention on the Conservation of European Wildlife and Natural Habitats, Sept. 19, 1979, art. 9(2), *reprinted in* LYSTER, *infra* note 392, at 428; International Convention for the Regulation of Whaling, Dec. 2, 1946, arts. VIII(3), IX(4), 62 Stat.(2) 1716, T.I.A.S. 1849.

391. E.g., Basel Convention, *supra* note 353, at 674 (under which any party may inform the Secretariat of its belief that another party is in breach of the Convention). *See also* Flora and Fauna Convention, *supra* note 390, at 1093 (authorizing the Secretariat established under that agreement to contact a party suspected of non-compliance on the basis of "information received").

392. For two (not altogether successful) exceptions, see Whaling Convention, *supra* note 390; Antarctic Convention, *supra* note 390. Both attempt to introduce an element of impartiality into the monitoring process. The Schedule to the Whaling Convention has, since 1949, stipulated that inspectors employed by party-states are to be maintained on the factory ships and land stations over which that party exercises jurisdiction. Whaling Convention, *supra* note 390, at 91. In 1971, the International Whaling Commission set up a scheme whereby observers were to be appointed by and made responsible to that body although paid for by the nominating government. (Schedule, para. 21(c)). The observer scheme is implemented through bilateral or trilateral agreements with the countries concerned. *See also* S. LYSTER, INTERNATIONAL WILDLIFE LAW 31-32 (1985). Article XXIV of the Antarctic Convention outlines a monitoring system for the verification of compliance. Antarctic Convention, *supra* note 390, art. XXIV. Inspectors and observers participating in the scheme are under the jurisdiction of and required to report to the contracting parties of which they are nationals. While such reports are to be communicated to the Commission set up under the agreement, there is no provision for any follow-up action to be taken against a party found to be in default of its obligations.

393. Kiss, *Supervision of Rules*, *supra* note 380, at 109.

394. *See, e.g.*, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Mar. 22, 1989, art. 20, *reprinted in* 28 I.L.M. 657 (1989); Convention on Long-Range Transboundary Air Pollution,

and while judicial exercise of the "corrective" function of supervision may be contemplated, it is never compulsory.

The absence of explicit enforcement provisions in the Montreal Protocol is hardly surprising. Invariably, decision-makers strongly resist the level of institutional reform necessary for development of a truly effective monitoring system.[395] Any future attempts are also likely to encounter significant political opposition. However, a move, such as that made in the Protocol, towards de-emphasizing the strictly legal or punitive consequences of noncompliance could well persuade states to sacrifice a small measure of sovereignty in exchange for an enforcement system based on the provision of practical assistance in the implementation of treaty obligations.

Nevertheless, facilitating compliance and dealing effectively with instances or patterns of default are only part of the enforcement solution. A viable strategy for ensuring conformity with prescribed rules of conduct is premised upon the existence of adequate means of detecting unlawful behavior. It is here that constructive reform could and should commence. At a minimum, the relevant administrative body ought to be vested with the legal capacity to authenticate reports—the submission of which should be made and enforced as a positive obligation. The body ought to exercise its verifying capacity at its discretion or in response to a complaint or petition received from another party. The enormous potential for wider public participation in the review and correction functions of supervision has not as yet been realized. In relation to the former, this inefficiency could be mitigated by ensuring that the right to draw the relevant organ's attention to noncompliance by a contracting state is extended to appropriate nongovernmental organizations[396] and that publication and dissemination of statistical

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Nov. 13, 1979, art. XIII, T.I.A.S. 10541, *reprinted in* 18 I.L.M. 1442 (1979); Convention on the Conservation of Migratory Species of Wild Animals, art. XIII, 1979, *reprinted in* 19 I.L.M. 15; International Convention for the Prevention of Pollution from Ships, Nov. 2, 1973, I.M.C.O. Doc. MP/CONF/WP.21/Add.4 (1973), *reprinted in* 12 I.L.M. 1319, *as modified by* Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships (1978), I.M.C.O. Doc. TSPP/CONF/11 (1973), *reprinted in* 17 I.L.M. 546; Convention for the Protection of the Mediterranean Sea Against Pollution, Feb. 16, 1976, art. 22, Annex A, *reprinted in* 15 I.L.M. 29.

395. See *infra* notes 421-23 and accompanying text.

396. There is no precedent in the environmental context for extending the

data and other relevant information, including instances and circumstances of noncompliance, is made a nondiscretionary duty of the receiving institution.[397]

A single mechanism or particular strategy will not be sufficient to ensure adequate implementation of standard setting treaties for environmental protection. Traditional reliance on monitoring of obligations, while undeveloped, is not misplaced. While the provision of practical assistance and the inclusion of economic inducements will be critical factors in ensuring the long term success of future agreements, the worth of these innovative compliance techniques will remain heavily dependent upon the simultaneous creation of effective administrative machinery for evaluating compliance.

C. Institutional Issues

The past two decades have witnessed a rapid, albeit fragmented, institutionalization of environmental protection efforts. Almost every environmental agreement has set up new administrative bodies.[398] Many of these treaties, including the Vien-

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right of complaint or petition to an NGO although the practice is not uncommon in the area of human rights. In accordance with ECOSOC Resolution 1503 (XLVIII) of May 27, 1970, communications from certain NGOs to the Human Rights Commission are admissible if the Organization acts in good faith and is in possession of direct and reliable knowledge of violations. Human rights NGOs are also entitled to testify before, or submit written communications to, a number of other United Nations bodies including the Special Committee on Human Rights in the Occupied Territories, the Working Group on Enforced and Involuntary Disappearances, the Commission on the Status of Women and the not yet operational Committee against Torture. *See generally* David Weissbrodt, *The Role of International Non-Governmental Organizations in the Implementation of Human Rights*, 12 TEX. INT'L L.J. 293 (1977); TON J.M. ZULJDWICJK, PETITIONING THE UNITED NATIONS—A STUDY IN HUMAN RIGHTS (1982).

397. The 1980 Convention on the Conservation of Antarctic Marine Living Resources appears to be the only example of an environmental protection agreement referring to publicity or the dissemination of compliance information. According to article X(2), the Commission established under that agreement is required to draw the attention of all contracting parties to any activity which, *in its opinion*, "affects the implementation by a contracting party of the objective of this convention or the compliance by that contracting party with its obligations under this Convention." *Id.*

398. *See, e.g.*, International Tropic Timber Agreement, Nov. 18, 1983, *reprinted in* 23 I.L.M. 1195; Treaty for Amazonian Cooperation, July 3, 1978, *reprinted in* 17 I.L.M. 1045; Convention on the Protection of Marine Pollution from Land-based Sources, Feb. 21, 1974, *reprinted in* 13 I.L.M. 352; Convention on the Protection of the Marine Environment of the Baltic Sea Area, Mar. 22, 1974,

na Convention and Montreal Protocol, were initiated by, and negotiated under the auspices of, an organization.[399] In this area particularly, Nongovernmental entities are increasing in number, membership, and influence.[400] The agenda and planning processes of every major intergovernmental organization reflect the new priority levels now accorded environmental concerns.[401] While noting that this development is one with profound implications for the future of international environmental law, considerations of space preclude anything more than a selective analysis of this topic. The following section will examine, with necessary brevity, both UNEP and the group of major international nongovernmental organizations (INGOs) exclusively or primarily concerned with environmental issues.

As previously displayed, UNEP and a handful of these INGOs have played a significant role in the formulation of an international legal response to depletion of stratospheric ozone. Still to be considered are wider ramifications of what appears to be a readily discernible trend in such agreements—the extension of significant participation privileges to governmental organizations and nonstate entities. What impact does or should this have on the international decision-making process? Is the

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reprinted in 13 I.L.M. 546; International Convention for the Conservation of the Living Resources of the Southeast Atlantic, Oct. 23, 1969, 801 U.N.T.S. 101; Convention on the Conservation of Antarctic Marine Living Resources, June 23, 1961, *reprinted in* 19 I.L.M. 841; Interim Convention on the Conservation of North Pacific Fur Seals, Feb. 9, 1957, 314 U.N.T.S. 105; International Convention for the Regulation of Whaling, Dec. 2, 1946, 62 Stat.(2) 1716, T.I.A.S. 1849.

399. European Agreement on the Restriction of the Use of Certain Detergents in Washing and Cleaning Products, Sept. 16, 1968, 788 U.N.T.S. 181; International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, *reprinted in* 9 I.L.M. 45; Benelux Convention on the Hunting and Protection of Birds, June 10, 1970, 847 U.N.T.S. 255; Agreement on an International Energy Program, Nov. 18, 1974, *reprinted in* 14 I.L.M. 1; Convention on the Protection of the Archaeological, Historical and Artistic Heritage of the American Nations, June 16, 1976, 15 I.L.M. 1350; Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, *reprinted in* 18 I.L.M. 1442; Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Oct. 29, 1986, *reprinted in* 25 I.L.M. 1370. On Conventions negotiated under the auspices of the United Nations Environment Program, see *infra* note 409.

400. *See infra* notes 443-55 and accompanying text.

401. *See generally* P.L. DE REEDER, ENVIRONMENTAL PROGRAMS IN INTERGOVERNMENTAL ORGANIZATIONS (1977); STANLEY P. JOHNSON & GUY CORCELLE, THE ENVIRONMENTAL POLICY OF THE EUROPEAN COMMUNITIES (1989) (on the European Communities).

increasing institutionalization of environmental affairs inevitable? Is it desirable? If international governmental and nongovernmental organizations *are* capable of "shaping the debate"[402] or otherwise enhancing the effectiveness of environmental protection efforts, how can we ensure the wise utilization of this valuable resource?

1. The United Nations Environment Program

The United Nations Environment Programme was established in 1972[403] "to promote international cooperation in the field of the environment and to recommend, as appropriate, policies to this end [and] to provide general policy guidance for the direction and coordination of environmental programs within the United Nations System."[404]

The mandate is broad, and the agency's response has been equally substantial. By developing an internal network of monitoring and assessment systems, it has rightfully assumed a central role in the collection, analysis, and dissemination of technical data on the state of the global environment.[405] As the main United Nations source for such information, UNEP is

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402. Hahn & Richards, *supra* note 342, at 423.

403. For a general overview of the political and institutional background against which UNEP was established, see Brian Johnson, *The United Nations Institutional Response to Stockholm: A Case Study in the International Politics of Institutional Change*, 26 INT'L ORG. 255 (1972); Richard N. Gardner, *The Role of the UN in Environmental Problems*, 26 INT'L ORG. 237 (1972).

404. G.A. Res. 2997, U.N. GAOR, 27th Sess., Supp. No. 30, at 43, U.N. Doc. A/8730 (1972).

405. The Global Environment Monitoring System (GEMS) works in cooperation with other UN organizations on surveillance activities in fields of "vital environmental concern" (climate and atmosphere, terrestrial renewable resources, oceans, transboundary pollution, and health consequences of pollution). By standardizing the collection, analysis, and dissemination of environmental data, GEMS aims at providing the necessary information upon which ecologically sound environmental management decisions may be made. The International Referral System for Sources of Environmental Information (INFOTERRA) is a network of data sources assisting both organizations and individuals in locating technical, scientific and decision-oriented information. The International Register of Potentially Toxic Chemicals (IRPTC) provides readily accessible information on chemicals (toxicity, national legislation, etc.) to those dealing with control of chemical hazards, including experts and authorities responsible for regulatory decisions. *See also* UNEP PROFILE (UNEP, Nairobi 1987), at 24-26; UNEP IN BRIEF (UNEP, Nairobi 1989); PACIFIC PARTNERS—A GUIDE TO UNITED NATIONS AGENCIES IN THE PACIFIC (United Nations 1985).

in a position to provide the technical basis for ecologically sound decision-making at both the domestic and international levels. By improving coordination between international organizations, it has managed to minimize, if not eliminate, the duplication and resulting dilution of technical and diplomatic effort.[406]

Although lacking formal legislative authority,[407] UNEP has, through its various initiatives, exercised considerable influence over the development of international environmental law. Pursuant to a carefully formulated strategy,[408] the organization has initiated, negotiated, and assumed some level of administrative responsibility for twenty-six international agreements during the period from 1973 to 1991.[409] In addition,

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406. *See* UNEP PROFILE, *supra* note 405, at 32-33; K. Ramakrishna, *UNEP: An Assessment of its Impact*, 24 INDIAN J. INT'L L. 347, 363-68 (1984).

407. While it is clear that decisions of UNEP or its Governing Council are not per se binding on Member States, a number of commentators have ascribed to the agency a "quasi-legislative" role in the area of international environmental law. This position seems based upon the view that, in delegating to UNEP the authority to promote international environmental cooperation, the General Assembly was relying on its own authority, under articles 13 and 55 of the U.N. Charter, to encourage the codification and progressive development of international law—an authority that it could and did confer upon UNEP's Governing Council in respect to environmental matters. Carol A. Petsonk, *The Role of the United Nations Environmental Program (UNEP) in the Development of International Environmental Law*, 5 AM. U.J. INT'L L. & POL'Y. 351, 355 (1990). *See also* Mark A. Gray, *The United Nations Environmental Program: An Assessment*, 20 ENVT'L L. 291, 295 (1990) ("UNEP was designed as a catalyst, promoting, encouraging and guiding government action . . . "). For an earlier view, see T.C. Bacon, *The Role of UNEP in the Development of International Environmental Law*, 12 CAN. Y.B. INT'L L. 255 (1974).

408. This strategy is set out in two program documents. *See* AN IN-DEPTH REVIEW OF ENVIRONMENTAL LAW (UNEP, Nairobi 1982); *Report of the Ad Hoc Meeting of Senior Government Officials Expert in Environmental Law* (MONTEVIDEO PROGRAM FOR THE DEVELOPMENT AND PERIODIC REVIEW OF INTERNATIONAL LAW (1982)).

409. For treaties enacted under the Regional Seas Program, see *supra* note 64. *See also* Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources, May 17, 1980, *reprinted in* 19 I.L.M. 869 (entered into force June 17, 1983); Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment, Apr. 24, 1978, *reprinted in* 17 I.L.M. 511; Convention for the Protection of Mediterranean Sea Against Pollution, Feb. 16, 1976, *reprinted in* 15 I.L.M. 290, supplemented by Protocol for Prevention of Pollution of Mediterranean Sea by Dumping from Ships and Aircraft, *reprinted in* 15 I.L.M. 300; Protocol Concerning Cooperation in Combatting Pollution of Mediterranean Sea by Oil and Other Harmful Substances in Case of Emergencies, *reprinted in* 15 I.L.M. 306.

UNEP has assisted in the drafting and/or implementing stage of a number of major environmental conventions concluded under the auspices of other organizations.[410] The Agency has also engaged in extensive "normative activit[y] below the treaty level,"[411] producing a number of soft law instruments,[412] several of which have been specifically formulated as a prologue to the development of binding rules.[413] Legal initiatives at both

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In addition to the Vienna Convention and Montreal Protocol, the following agreements have also been concluded under UNEP Auspices: Conference of Plenipotentiaries on the Global Convention on the Control of Transboundary Movements of Hazardous Wastes, UNEP Doc. IG.80/3 (1989); Conference to Conclude a Convention on the Conservation of Migratory Species of Wild Animals, June 11, 1979, *reprinted in* 19 I.L.M. 11; Convention on International Trade in Endangered Species of Wild Fauna and Flora, Apr. 13, 1973, S. EXEC. DOC. H, 93rd Cong., 1st Sess. (1973).

410. *See generally* ENVIRONMENTAL LAW IN THE UNITED NATIONS ENVIRONMENT PROGRAM (UNEP, Nairobi, 1985) [hereinafter UNEP-ENVIRONMENTAL LAW]. *See, e.g.*, International Tropical Timber Agreement, Nov. 18, 1983, *reprinted in* 23 I.L.M. 1195; Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, *reprinted in* 18 I.L.M. 442; Convention on the Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques, Dec. 22, 1976, *reprinted in* 16 I.L.M. 88; Convention Concerning the Protection of the World Cultural and Natural Heritage, Nov. 16, 1972, *reprinted in* 11 I.L.M. 1358; Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 12, 1972, *reprinted in* 11 I.L.M. 1291.

411. *Id.* at 7.

412. UNEP-ENVIRONMENTAL LAW, *supra* note 410. *See, e.g., Final Report of the Working Group of Experts on the Protection of the Marine Environment Against Pollution from Land-based Sources*, U.N. Doc. UNEP/WG.12 0/3, Annex III, at 3 (1985); *Draft Principles of Conduct in the Field of the Environment for the Guidance of States in the Conservation and Harmonious Utilization of Natural Resources Shared by Two or More States*, UNEP Doc. GC.6/CRP.2 (1978), *reprinted in* 17 I.L.M. 1091, 1097, 1099 (1978).

413. For example, in 1981 UNEP and the World Health Organization jointly produced a set of Policy Guidelines and Code of Practice for the Management of Hazardous Waste. *See* Petsonk, *supra* note 407, at 374. UNEP subsequently established the Ad Hoc Working Group of Experts on the Environmentally Sound Management of Hazardous Wastes. *Id.* This Working Group negotiated the 1985 Cairo Guidelines and Principles for the Environmentally Sound Management and Disposal of Hazardous Wastes. *Id.* Following adoption of these guidelines by the UNEP Governing Council in 1987, a working group was convened to prepare a global convention. *Id.* The guidelines provided the group "with scientific and legal bases for its waste convention negotiating strategy." *Id.* Eighteen months later the Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal was adopted. *See Developments in Regard to a Global Convention on the Control of Transboundary Movements of Hazardous Wastes: Report of the Secretary General*, U.N. Doc. A/44/479, September 19, 1989; Barbara D. Huntoon, *Emerging Controls on Transfers of Hazardous Waste to*

levels are supplemented by a technical assistance program designed to facilitate the implementation and administration of environmental law in LDCs.[414]

Despite its obvious achievements, including the much lauded Regional Seas Program,[415] UNEP has, until now, retained a relatively low international profile, attracting occasional criticism[416] but little public attention. Its latest success on the issue of ozone depletion has changed this considerably; now UNEP is hailed as a model of "how a UN Agency should operate in a complex international negotiation."[417]

Without doubt, the organization's eighteen year battle for effective and equitable regulation of ozone-depleting substances will prove a useful precedent when it is called upon to perform similar miracles with other environmental problems. Its practical as well as ideological identification with the Third World[418] has contributed to the development of a legally endorsed approach to burden sharing which may irreversibly alter the terms upon which environmental diplomacy is conducted.[419] Its willingness to deal directly with ex-state, "horizontally-affiliated"[420] interest groups, such as industrialists, scientists, environmentalists, has introduced an element of realism into the consensus-building process that will be difficult to subsequently ignore or abolish.

However, UNEP's very real triumph should not be used as an excuse to disregard or trivialize the organic and structural weaknesses that have hindered its past work and will, if uncorrected, continue to do so. In terms of authority and control, the organization's ability to deal effectively with global environmen-

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Developing Countries, 21 LAW & POL'Y INT'L BUS. 247 (1990) (discussing the management of hazardous waste transfers in developing countries).

414. *See* UNEP PROFILE, *supra* note 405, at 27; UNEP-ENVIRONMENTAL LAW, *supra* note 410, at 11-12.

415. *See* UNEP PROFILE, *supra* note 405, at 6-7.

416. *See, e.g.*, George P. Smith, *The United Nations and the Environment: Sometimes a Great Notion?* 19 TEX. INT'L L.J. 335 (1984) (arguing UNEP should stop its work and return to the member states the responsibility of determining and meeting the various environmental concerns afflicting the countries).

417. Benedick, *supra* note 341, at 47.

418. *See* G.A. Res. 2997, *supra note* 404.

419. *See infra* notes 459-75 and accompanying text.

420. For an interesting discussion on communication between these "horizontally affiliated populations" and their influence on the international decision-making process, see Gerlach & Rayner, *supra* note 362, at 15-16.

tal issues is severely restricted.[421] It is vested with very limited powers of investigation[422] and is routinely refused access to confidential information.[423] UNEP has no implementation or enforcement capacity per se, except where such is specifically granted to the agency in its role as Secretariat to a particular convention.

Another category of defects relates to the problem of resources. In terms of both personnel and finances, UNEP is in serious danger of being starved into irrelevancy. Despite an increasingly onerous workload, the Environment Fund (upon which UNEP relies for all but administrative expenses) remains totally inadequate.[424] The lack of alternative financing arrangements means that the Program's very existence is dependent upon the continuing support of a handful of capricious Western nations.[425]

Numerous suggestions have been made as to how these weaknesses could best be addressed. The obvious attraction of

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421. *See* Gray, *supra* note 407, at 312-13.

422. TIMOTHY RIORDAN, ENVIRONMENTALISM 295 (1976).

423. Gray, *supra* note 407, at 313 (citing Baruch Boxer, *Mediterranean Pollution: Problems and Response*, 10 OCEAN DEV. & INT'L L.J. 315, 342 (1982)).

424. Contributions to the Environmental Fund are voluntary and average approximately US$30 million per annum. UNEP PROFILE, *supra* note 405, at 31. However, in recent years the amount of money available to UNEP has declined in real terms while the Program's responsibilities and expenses have increased considerably. *See* Gray, *supra* note 407, at 313-14, 316; David Struthers, *The United Nations Environment Program After a Decade: The Nairobi Session of a Special Character*, 12 DENVER J. INT'L L. & POL'Y 271, 284 (1983) (noting how the United States reduced its contributions from $10 million to $7.85 million in 1982 and would possibly pledge only $3 million in 1983). Fund contributions increased nominally (about three percent in real terms) following publication in 1987 of a report by the World Commission on Environment and Development recommending a strengthening of UNEP to make it ". . . the principal source on environmental data, assessment, reporting and related support for environmental management as well as [to] be the principal advocate and agent for change and cooperation on critical environmental natural resource protection issues." WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, OUR COMMON FUTURE 320 (1987) [hereinafter OUR COMMON FUTURE]. The Commission conceded, however, that substantial enlargement of the Fund was unlikely and premised its "ambitious agenda" for UNEP on staff redeployment and program reorientation. *Id.* at 323. *See also* MISTRY & THYNESS, FINANCING THE MULTILATERAL SYSTEM IN THE 1990S 14-15 (The Nordic UN Project, October 1990).

425. Major fund donors include the United States, Japan, the Soviet Union, Sweden, the Federal Republic of Germany, the United Kingdom, Norway, France, Canada, and Finland. UNEP PROFILE, *supra* note 405, at 31.

that elusive creature, an institution with teeth, has led to repeated calls for a strengthening of the organization's legal powers.[426] While this may appear an eminently sensible proposal, the sad fact remains that environmental reality and international political reality are rarely congruent. Any attempt to introduce an element of supranationality into the agency's legal structure could not succeed without widespread endorsement, particularly on the part of Western states, which account for the bulk of UNEP funding. Fundamental change does not seem possible while these dominant forces continue to insist that UNEP remain a catalytic rather than operational force.[427]

Certainly these limitations will not be surmounted by engaging in the "diversionary and conscience-salving"[428] exercise of creating a new institution.[429] Ultimately, the necessary enhancement of UNEP authority and effectiveness must rely upon a consolidation and extension of its current activities. Fortifying the agency's supervisory functions, for example, may be the inevitable result of states continuing to designate it as the responsible body for overseeing implementation of specific agreements. Increased funding will only come from contributors able to discern that their own interests are being served by its continuing existence. UNEP is currently the principal environmental information base and the only global forum in which legal and technical solutions to environmental problems may be negotiated. A careful nurturing of this dual role will ensure that its future existence is perceived as a matter of vital interest to *all* states.

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426. *See* Gray, *supra* note 407, at 317-18.

427. *See* Springer, *supra* note 353, at 53-54 (Reagan administration discouraged UNEP from embarking on new ventures and encouraged consolidation of the United Nation's existing environmental activities).

428. Ian Brownlie, *The Human Environment: Problems of Standard Setting and Enforcement*, 12 NAT. RESOURCES J. 187, 188 (1972).

429. Calls for the establishment of a new International Environmental Agency are being heard more frequently. *See generally Final Recommendation of the International Congress on a More Efficient International Law on the Environment and Establishing an International Court for the Environment Within the United Nations* (held in Rome, Apr. 21-24, 1989), *in* Amedeo Postiglione, *A More Efficient International Law on the Environment and Setting Up an International Court for the Environment Within the United Nations*, 20 ENVT'L L. 326, 326-28 (1990). This recommendation, *inter alia*, requested "the creation of an international body within the United Nations System to guarantee the supervision, planning and management of the world environment." *Id.* at 327.

In relation to ozone depletion, UNEP has already proved itself indispensable to the conduct of global diplomacy. Institution-building is, in many senses, a noble endeavor.[430] If there is a chance that a stronger UNEP can contribute towards the successful resolution of other environmental issues, the battle seems justified. It would be as well to remember, however, the words of the Program's Executive Director when he cautions that "no institution—no matter how lofty the intent, how forceful the mandate, how careful the design—can itself save our planet."[431] UNEP is a tool at the service of the international community. The wisdom and foresight of those wielding this tool will ultimately determine its ability to contribute towards fashioning an ecologically viable world order.

2. International Nongovernmental Organizations (INGOs)

International law has traditionally been conceived of as functioning to regulate relations between sovereign states.[432] From this perspective it required no great leap to assert that "the subjects of the rights and duties arising from the Law of Nations are States solely and exclusively."[433] Today this classical view commands little practical support. While doctrinal controversy as to the origin of their capacity to act remains unsettled,[434] most assume that organizations created by multilateral agreements possess some measure of international legal personality. Even individuals—so long considered the representative "object"—have become potential subjects of international law, capable of possessing, in certain limited circumstances, both rights and responsibilities.[435]

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430. Tolba, *Building an Environmental Institutional Framework for the Future*, 17 ENVT'L CONSERVATION 105 (1990).

431. *Id.*

432. MICHAEL AKEHURST, A MODERN INTRODUCTION TO INTERNATIONAL LAW 1 (6th ed. 1984).

433. L. OPPENHEIM, 1 INTERNATIONAL LAW: A TREATISE 19 (H. Lauterpacht ed., 8th ed. 1955).

434. D.W. BOWETT, THE LAW OF INTERNATIONAL INSTITUTIONS 335-41 (1982). "Doctrinal controversies" primarily relate to whether international personality is an inherent (objective) attribute of international organizations, or whether it depends on the organization's constituent instrument and the powers expressly or implicitly granted therein. *See* L. HENKIN ET AL., INTERNATIONAL LAW CASES AND MATERIALS 331-33 (1987).

435. Hersch Lauterpacht, *Survey of International Law in Relation to the Work of Codification of the International Law Commission, reprinted in* 1 INTERNATION-

This extension of legal personality to nonstate entities can be viewed optimistically as effective progress towards a time, perhaps, where legal norms accurately reflect the shared values and expectations of a truly global society. More cynically, one may argue that if representative participation in the conduct of international relations is a yardstick against which the democratization process may be measured, then the unrepresentative, statist paradigm, with all its "incestuous intimacy"[436] endures virtually unaffected. The supranational element of intergovernmental organizations remains carefully circumscribed,[437] and, despite their status as potential "subjects," individuals remain largely deprived of those manifestations of international personality which give the concept meaning.[438]

The organized representatives of these people are similarly marginalized. International nongovernmental[439] organizations (INGOs), are almost invisible to the international legal regime. Apart from what is admittedly a slowly expanding category of exceptions,[440] INGOs are prevented from pursuing international claims or otherwise utilizing those mechanisms through which international legal relations are conducted.

AL LAW BEING THE COLLECTED PAPERS OF HERSCH LAUTERPACHT 445, 469-71 (E. Lauterpacht ed., 1970).

436. Allot, *supra* note 355, at 9.

437. *See* HENRY G. SCHERMERS, INTERNATIONAL INSTITUTIONAL LAW §§ 40-47 (1980). A true supranational organization must be able to make decisions binding on member governments without the cooperation of all member governments. Those decisions must bind individual inhabitants of member states. Organizations must have enforcement powers and some financial autonomy; members cannot unilaterally withdraw. *Id.* at § 42. The current "supranational" organizations more closely resemble intergovernmental organizations, which rely on cooperation between nations, rather than true supranational organizations, which assume some sovereign functions. *Id.*

438. AKEHURST, *supra* note 432, at 72-75. While various rights may be conferred upon individuals by special treaties, it is rare that such agreements will provide for judicial protection of these rights, such as the means by which individuals may enforce their rights under the treaty. *See* HERSCH LAUTERPACHT, *General Rules of the Law of Peace, in* 1 INTERNATIONAL LAW BEING THE COLLECTED PAPERS OF HERSCH LAUTERPACHT, *supra* note 435 *passim.*

439. For an interesting discussion of *peoples organizations* in the international political system, see Johan Galtung, *International Organizations and World Decision-making*, 38 TRANSNAT'L ASS'N 220 (1986).

440. On these exceptions and on domestic law indications that NGOs may eventually be granted personality and status in international law, see Phillipe J. Sands, *The Environment, Community and International Law*, 30 HARV. INT'L L.J. 393, 412-17 (1989).

While the ultimate power to make law resides in or is derived from states,[441] a lack of formal legal capacity on the part of nonstate entities does not necessarily translate into a practical inability to affect the global decision-making process. On their own and through entering into legal relationships with multilateral institutions, INGOs have made a perceptible impact on the development and codification of international law. In human rights particularly, these organizations operate as a powerful force for initiating, creating, and overseeing the implementation of binding norms.[442]

Environmental protection is another principal issue where which INGOs have exercised, and will continue to exercise, considerable influence. Initiatives for international cooperation on environmental matters rarely arise within government bureaucracies. As early as 1902, multinational conservation groups were lobbying for and securing the legal protection of certain wildlife.[443] Organizations such as the International Union for the Conservation of Nature and Natural Resources (IUCN) continue this tradition and may rightly claim credit for several key environmental protection initiatives, including the endangered species regime, the World Conservation Strategy, and the World Charter for Nature.[444] Private citizens' groups,

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441. WERNER LEVI, LAW AND POLITICS IN THE INTERNATIONAL SOCIETY 109 (1976).

442. *See supra* note 388 and accompanying text; Peter Archer, *Action by Unofficial Organizations on Human Rights*, *in* THE INTERNATIONAL PROTECTION OF HUMAN RIGHTS 160 (Evan Luard ed., 1967); Art Blaser, *Assessing Human Rights: The NGO Contribution*, *in* GLOBAL HUMAN RIGHTS: PUBLIC POLICIES, COMPARATIVE MEASURES AND NGO STRATEGIES 261 (Ved. P. Nanda et al., eds., 1981).

443. For a brief history of the International Ornithological Committee that was largely responsible for the 1902 European Convention Concerning Conservation of Birds Useful to Agriculture, see Caldwell, *supra* note 374, at 17-18.

444. The IUCN is a hybrid "conservation alliance" with membership drawn from states, state departments, nongovernmental organizations, scientific bodies, and individuals. Bruce Davis, *Sixteenth General Assembly of IUCN*, 2 ENVTL. & PLAN. L.J. 87, 87 (1985). On its work in relation to the endangered species regime, see LYSTER, *supra* note 392, at 239-40. On IUCN and the 1980 World Conservation Strategy, see Kenton R. Miller, *The Earth's Living Terrestrial Resources: Managing Their Conservation*, *in* ENVIRONMENTAL PROTECTION 240, 248-50, 260 (David A. Kay & Harold K. Jacobson eds., 1983). On IUCN and the 1982 World Charter for Nature, see Harold Wood, *The United Nations World Charter for Nature: The Developing Nations' Initiative to Establish Protections for the Environment*, 12 ECOLOGY L.Q. 977, 978-79 (1985).

including World Wide Fund for Nature (WWF) and Conservation International, have attempted to address the fundamental problem of Third World environmental degradation by pioneering innovative financial arrangements such as debt for nature swaps.[445] INGOs were largely responsible for mobilizing public concern over the environmental impact of stratospheric ozone depletion and developing public consensus as to what could and should be done.[446] It is these organizations that, by persuading governments to act on their behalf, deserve credit for elevating ozone depletion from the domestic to the international political agenda.[447] The impact of environmentally focused INGOs has been considerably enhanced by the United Nations Environment Program. In accordance with the precedent set at Stockholm in 1972, where INGO involvement was actively solicited,[448] UNEP encourages widespread and formalized participation of public interest groups in its work.[449] The NGO Environmental Liaison Centre in Nairobi, where UNEP maintains its headquarters, facilitates maintenance of close cooperation with INGOs.[450]

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445. Debt-for-nature swaps involve an environmentally oriented INGO purchasing a portion of a country's commercial debt, usually at a heavily discounted price. The organization then exchanges the debt for local currency to be used to fund a particular conservation project. Alternately, it may cancel the debt in return for specific financial or policy commitments on the part of the host government. Debt-for-nature swaps have been concluded in Bolivia, Ecuador, Costa Rica, the Philippinesm, and Zambia. INGOs are currently exploring the possibility of extending this mechanism to other Latin American and African countries, Eastern Europe and Caribbean island nations including Jamaica, Haiti, and the Dominican Republic. Marilyn Post, Comment, *The Debt-for-Nature Swap: A Long-Term Investment for the Economic Stability of Less Developed Countries,* 24 INT'L LAW. 1071, 1081-85 (1990). *See also* J. Eugene Gibson & Randall Curtis, *A Debt-for-Nature Blueprint,* 28 COLUM. J. TRANSNAT'L L. 331 (1990); Sadler, *Debt-for-Nature Swaps: Assessing the Future,* 6 CONTEMP. HEALTH L. & POL. 319 (1990).

446. *See generally* Cook, *supra* note 284 *passim* (for an overview of different environmental groups' efforts to preserve the ozone layer).

447. *Id. See also* Morisette, *supra* note 68, at 800-07 (for an overview of government measures taken in reaction to increasing public concern about environmental issues).

448. *See* Feraru Thompson, *Transnational Political Interests and the Global Environment,* 27 INT'L ORG. 31 (1973).

449. UNEP PROFILE, *supra* note 405, at 29.

450. The Environmental Liaison Centre is assisted by the African Non Governmental Organizations Environmental Network established as a result of a UNEP sponsored meeting of Environment and Development NGOs in Nairobi

The role of INGOs is not limited to initiating action or cooperating with intergovernmental institutions. Almost every major environmental protection agreement concluded since the Stockholm Conference envisages some role for "relevant" or "technically qualified nongovernmental organizations." Most often, involvement is limited to consultation and nonvoting participation in plenary meetings.[451] Occasionally, designated INGOs are entrusted with substantial responsibilities relating to the monitoring and implementation of treaty-imposed obligations.[452] Even in the absence of a legal mandate, INGOs engage in extensive follow-up activities: identifying positive rules, publicizing breaches, highlighting weaknesses or "insufficiencies in program implementation",[453] and lobbying for effective remedial action.[454] Prominent organizations actively promote domestic-level compliance with treaty rules through utilization of national legal processes.[455]

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in 1975. *Id.*

451. Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, Mar. 22, 1989, art. 15(6), *reprinted in* 28 I.L.M. 657; Convention on the Conservation of Antarctic Marine Living Resources, May 20, 1980, art. XXIII(3), *reprinted in* 19 I.L.M. 837; Convention on the Conservation of European Wildlife and Natural Habitats, Sept. 19, 1979, art. 13, para. 3, *reprinted in* LYSTER, *supra* note 392, at 428, 434; Convention on the Conservation of Migratory Species of Wild Animals, Nov. 19, 1979, art. VII(9); Convention on International Trade in Endangered Species of Wild Fauna and Flora, Mar. 3, 1973, arts. XI(7), XII(1), *reprinted in* 12 I.L.M. 1088, 1092; UNESCO Convention for the Protection of the World Cultural and Natural Heritage, Nov. 16, 1972, arts. 8(3), 10(2), 13(7), 14(2), *reprinted in* 11 I.L.M. 1358, 1360-62 (1972); Convention on Wetlands of International Importance Especially as Waterfowl Habitat, June 5-16, 1971, art. 8(1), *reprinted in* 11 I.L.M. 969, 974 (1971) (The convention was never opened for signature. Instead, the United Nations Conference on the Human Environment, held June 5-16, 1972, recommended the governments should sign whenever appropriate).

452. The Convention for the Conservation of Antarctic Seals, *opened for signature* June 1 to Dec. 31, 1972, art. 5, Annex (6), *reprinted in* 11 I.L.M. 251, 254-55, 260-61. Delegates to the Scientific Committee on Antarctic Resources (SCAR) of the International Council of Scientific Unions (ICSU) have authority to receive reports and monitor compliance with Convention provisions. The Committee is also responsible for assessment and evaluation of the Antarctic seal situation and for the formulation of recommendations to be presented to Convention Parties. *See* LYSTER, *supra* note 392, at 49-51 (summarizing the provision of the Antarctic Seals Convention).

453. Caldwell, *supra* note 374, at 22.

454. Sands, *supra* note 440, at 415-16.

455. On NGO utilization of domestic legal processes with regard to the Convention on International Trade in Endangered Species of Wild Fauna and Flora

Despite this limited penetration into the global decision-making arena, the position occupied by INGOs is extremely tenuous. The recent, albeit rapidly reversed, decision of the Montreal Protocol's Executive Committee to exclude nonstate observers from its deliberations[456] is a harsh reminder that in respect of official fora, states remain the ultimate determinants of INGO participation.

As a matter of political reality, the legally entrenched, peripheral role assigned to INGOs is unlikely to change in their favor. By undermining their most powerful allies, considerations of sovereignty and a myopic attachment to increasingly inappropriate concepts of world society will continue to retard the development of an effective legal system for environmental protection. However, while they may not be in a legal position to compensate for the failure of states to make effective environmental protection rules by exercising *their* international personality, the current and future importance of INGOs should not be underestimated. As the brief survey above demonstrates, the granting or recognition of formal legal capacity, while significant, is not an essential prerequisite for action. Current environmental issues including that of ozone depletion have demonstrated conclusively that INGOs possess "the resources, the energy and the interest" to participate effectively in the international legal process.[457] Moreover, these "people's organizations" have what is ultimately the greatest weapon of all at their disposal: public opinion.[458] By disseminating information

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and the ivory trade ban, see Phillip J. Sands & Albert P. Bedecarre, *Convention on International Trade in Endangered Species: The Role of Public Interest Non-Governmental Organizations in Ensuring the Effective Enforcement of the Ivory Trade Ban*, 17 B.C. ENVTL. AFF. L. REV. 799 (1990). On this aspect of the International Whaling Convention and the commercial whaling moratorium, see Birnie, *supra* note 359, at 107-08. *See also* NATURAL RESOURCES DEFENSE COUNCIL, SAVING THE OZONE LAYER 5-6 (1990) (concerning that organization's pursuit of the Environmental Protection Agency's obligations under the Montreal Protocol through the United States courts).

456. *See supra* notes 279-83 and accompanying text.

457. *See* Sands, *supra* note 440, at 412.

458. On the potential scope of application and effectiveness of this positive force for compliance, see FISHER, *supra* note 382, at 129-35; LOUIS HENKIN, HOW NATIONS BEHAVE 60-63, 74-76 (1979) (discussing the fact that domestic influences play an important role in government compliance with international law). For a much earlier examination of world public opinion as a sanction for non-conformity, see Elihu Root, *The Sanction of International Law*, 2 AM. J. INT'L L. 451 (1908).

and raising consciousness, INGOs can initiate and generate support for reforms going far beyond the incremental improvements that states may, in their future wisdom, make to the international law of environmental protection.

D. From Philanthropy to Necessity: The LDC Factor in International Environmental Diplomacy

Negotiations for a legal solution to ozone depletion revealed a rare equality in bargaining power between industrialized and lesser-developed countries. The Montreal Protocol could not succeed in its goal of halting or repairing damage to the ozone layer without widespread and effective endorsement.[459] Even with a control schedule staggered in their favor, developing countries stood to incur considerable expense by involving themselves in the agreement. Most refused to cooperate until vague references to technical and financial assistance were translated into specific pledges.[460] It is reasonable to predict that securing vital cooperation of the Third World in relation to other global environmental problems will similarly depend upon the willingness of industrialized countries to engage in substantial resource transfers.

It is not difficult to justify such transfers on the basis of equity. Present standards of development enjoyed by the industrialized North were only achieved through massive resource exploitation and environmental degradation. In respect to its own path to material well-being, the underdeveloped South is being asked to refrain from compounding this damage as well as to assist in its repair. Compensation is thereby sought for direct implementation protection costs and indirect costs of forfeited development opportunities.

With references to compensation[461] and the related con-

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459. *See supra* notes 259-69.

460. *See supra* notes 164-65, 268 and accompanying text.

461. From the Stockholm Conference, Stockholm Declaration, *supra* note 53, at 1419, 1464 (specifically Principle 12 and Recommendation 109), until quite recently, compensation generally referred to, " . . . any action taken to redress adverse effects caused to the trading position of the developing countries by measures which industrialized countries have taken in their concern for this environment." SHADIA SCHNEIDER-SAWIRIS, THE CONCEPT OF COMPENSATION IN THE FIELD OF TRADE AND THE ENVIRONMENT 12, IUCN ENVIRONMENTAL POLICY AND LAW PAPER NO. 4 (1973). The concept is no longer understood exclusively in terms of trade and can now be applied to ameliorating measures taken with

cept of additionality[462] becoming increasingly common in international fora, it may not be premature to speak of "entitlement reinterpretation"[463]—a re-evaluation by the North as to why assistance should be given, and by the South as to why it should receive such assistance.

The calls for a New International Economic Order (NIEO),[464] which were first heard several decades ago and persist today, albeit in a much lower key, provide a useful point of reference for such a reinterpretation. NIEO claims for redistribution of global wealth ultimately relied upon the altruism or heuristic guilt of those states benefiting from the status quo. Neither proved a particularly effective basis for entitlement in a system where much of the development aid channelled to the Third World was motivated by factors other than the purely philanthropic.[465] The industrialized North failed to support demands for structural adjustment and financial assistance simply because it was not in the perceived self-interests of

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respect to the full range of direct and indirect costs incurred by a developing country as the result of environmental protection efforts undertaken by it or by other states. For details of agreed compensable costs in relation to implementation of the Montreal Protocol, see U.N. Doc. UNEP/OzL.Pro.2/3, *supra* note 123, at Annex IV, Appendix 1.

462. *Additionality* was first mooted in the early 1970s and at that time referred to "the principle that incremental costs arising from the incorporation of environmental measures in development projects should be met by additional funding." SCOTT MACLEOD, FINANCING ENVIRONMENTAL MEASURES IN DEVELOPING COUNTRIES: THE PRINCIPLE OF ADDITIONALITY, 5 IUCN ENVIRONMENTAL POLICY AND LAW PAPER NO. 6 (1974). The term is now used in a broader sense to refer to "resource flows from the developed countries, additional to current commitments, designed to address the environment development priorities of the developing countries." *Id.* at 5. For details of additionality considerations in the context of the Montreal Protocol, see, *supra* note 168, at 11 and accompanying text.

463. *See* Gunther Handl, *Environmental Protection and Development in Third World Countries: Common Destiny—Common Responsibility*, 20 N.Y.U. J. INT'L L. & POL. 603, 608 (1988).

464. For background information on the legal and political aspects of the New International Economic Order, see generally Colloquium, *Legal Aspects of a Projected New International Economic Order*, 24 NETH. INT'L L. REV. 507 (1977); F.V. GARCIA-AMADOR, THE EMERGING INTERNATIONAL LAW OF DEVELOPMENT 83-120 (1990).

465. For a discussion of political bias or "policy preferences and priorities" in the World Bank, see generally TERESA HAYTER & CATHERINE WATSON, AID: RHETORIC AND REALITY 195-226 (1985). For an examination of the political agenda of major Western aid "donors," see *id.* at 238-47.

these countries to do so, to alter an arrangement that nonbeneficiaries allege was specifically designed to "perpetuate and accentuate economic disparities."[466]

It is not difficult to argue that the rapidly widening gap between rich and poor could indeed pose a serious threat to the security, and hence vital national interests, of affluent countries.[467] Regardless of how real such a threat might be, it must be *perceived* as such by potential donors before operating to affect the motivation behind resource transfers. This has not as yet occurred.

In the current environmental context the situation is markedly different. Global ecological interdependence is a fact rendered incontestable by issues such as ozone depletion and global warming. Participation of LDCs in attempts to resolve these and other issues will continue to be vital. If such participation is only obtainable at a price, then it would appear to be in the national interests of those states capable of affording the price to pay it. Such logic was evident in the *negotiation-amongst-equals* style adopted at Montreal, and even more so in London when the Protocol was revised. Undoubtedly a variety of other factors influenced the development of this new-style environmental diplomacy.[468] For example, one may point to

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466. Inamul Haq, *From Charity to Obligation: A Third World Perspective on Concessional Resource Transfers*, 14 TEX. INT'L L.J. 389, 393 (1979).

467. The widening gap between rich and poor is a principal thesis of Haq's article, *id.*, in which he argues that concessional North-South resource transfers ought to be treated as an obligation and not as a charity. According to Haq, such a transformation may be justified, *inter alia*, by reference to "the sheer self-interest of developed countries." *Id.* at 403. He points out that the developed world has an economic stake in securing the prosperity of developing countries. *Id.* at 405-06. He further asserts that poverty breeds conflict—such conflict posing a serious threat to the security of the rich. *Id.* at 403. It is submitted however, that self-interest with reference to motivation is intrinsically a concept capable only of internal definition or justification. Economic and social prosperity of the Third World will only be in the self-interest of major aid donors when those states perceive it that way. Independent or external assessment of self-interest cannot explain the motivation behind past behavior or predict future conduct unless such assessment corresponds with the subject's own.

468. *See generally* A. Mpazi Sinjela, *Developing Countries' Perception of Environmental Protection and Economic Development*, 24 INDIAN J. INT'L L. 489 (1984) (discussing how mutual concern about environmental pollution in developing countries can foster cooperative environmental protection measures between them and advanced nations); H. Jeffrey Leonard & David Morrel, *Emergence of Environmental Concern in Developing Countries: A Political Perspective*, 17 STAN. J. INT'L L. 281 (1981).

the increasing realization among poorer states that environmental protection and economic betterment are not necessarily conflicting goals. Similarly, the concept of sustainable development, despite being overused to the point of irrelevancy, has at least led to widespread acknowledgment of the inextricable link between poverty and economic degradation.[469]

Without minimizing the influence of these developments, it is nonetheless clear that the principal catalyst for this new-style diplomacy has been the re-evaluation of national interest in light of current environmental realities. By acknowledging the vital importance of effective LDC participation, the developed North has given these countries a powerful negotiating tool. The South wielded this weapon at Montreal, and later in London with great effect, and it would be unwise to ignore its potential to influence the way in which other environmental problems are resolved.

Despite widespread acceptance of the equitable justification for compensation, formal articulation of the so-called support obligation[470] of entitlement reinterpretation has been relegated to the nether regions of soft or nonbinding law.[471] In this sense, the Revised Protocol, with its detailed program of technical and financial assistance, is an anomaly—the first indication, perhaps, of a willingness based on perceptions of necessity and self-interest to transform vague, often repeated aspirations into binding obligations. Other more recent examples strengthen this assertion. Preliminary negotiations aimed at constructing a legal strategy to halt global warming reflect an understanding

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469. *See* Stockholm Declaration, *supra* note 53, at 1416, para. 4; OUR COMMON FUTURE, *supra* note 424 *passim*.

470. *See generally* Michael J. Glennon, *Has International Law Failed the Elephant?*, 84 AM. J. INT'L L. 1, 35 (1990). Glennon extrapolates two tiers of obligation from the general duty of states to preserve global environmental resources together. The first of these is a custodial obligation—a duty of preservation imposed upon states in whose physical territory a resource is located. Support obligations refer to the duty of states to assist other states with custodial obligations. In the context of African elephants and the ivory trade, support obligations would extend to (i) the cost of running conservation programs, and (ii) the opportunity cost of foregoing the sale of ivory from natural elephant deaths and that confiscated from poaching operations. *Id.*

471. For example, see the articulation of these obligations in the Stockholm Declaration, *supra* note 53, at 1418. *See also* REGIONAL DEVELOPMENT BANKS AND ORGANIZATIONS DECLARATION ON ENVIRONMENTAL POLICIES AND PROCEDURES RELATING TO ECONOMIC DEVELOPMENT, *reprinted in* 19 I.L.M. 524 (1980).

that the necessary, effective participation of LDCs is predicated upon the existence of an adequate financial structure for compensation or burden-sharing.[472] The international community's attempts to formulate a convention for preservation of biological diversity evidence a similar commitment to equitable allocation of compliance costs through legal mechanisms.[473]

In a much broader context, these developments, coming so soon after the Revised Protocol, may well be indicative of an inchoate obligation of affirmative action on the part of wealthy countries.[474] LDCs have already been accorded some level of recognition through numerous and varied international instruments exhorting or mandating special treatment.[475] While an intriguing trend, this tendency is not, of itself, legally significant. However, by repeatedly enshrining the principle of special treatment into environmental agreements, basing it on stated or unstated social and historical facts, the international community may well be taking the first tentative steps towards creating a genuine support obligation in customary international law.

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472. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FORMULATION OF RESPONSE POLICIES UNEP/WMO, June 1990, at 241-48 (report prepared for IPCC by Working Group III) (discussing implementation measures, and legal and institutional mechanisms). *See also Progress Achieved in the Implementation of Resolution 44/207 on Protection of Global Climate for Present and Future Generations of Mankind: Report of the Secretary General*, U.N. GAOR, 45th Sess., Agenda Item 81, at 13-14, U.N. Doc. A/45/696 (1990); CLIMATE INSTITUTE: REPORT OF THE INTERNATIONAL WORKSHOP ON A FRAMEWORK CONVENTION AND ASSOCIATED PROTOCOLS: A NON-GOVERNMENTAL PERSPECTIVE (February 1990).

473. Interview with M. Palmer, Environment Section of the Australian Department of Foreign Affairs and Trade (June 18, 1991).

474. The obligation of affirmative action suggested here is distinguishable in terms of both justification and purpose from that of "samaritanism" first propounded by Jenks in the NIEO context. *See* Wilfred Jenks, *Economic and Social Change in the Law of Nations*, 138 RECUEIL DES COURS D'ACADAMIE DE DROIT INTERNATIONAL 455, 480, 491-94 (1973) (*cited in* Haq, *supra* note 466, at 415); Haq, *supra* note 466, at 415-16 (the duty of samaritanism translates into a moral duty on the part of rich countries).

475. In the environmental context, see, e.g., Principles 9-12 and 23 of the Stockholm Declaration, *supra* note 53, at 14, 18-20; Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Nov. 25, 1986, art. 18, *reprinted in* 26 I.L.M. 41, 48-49; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Mar. 28, 1989, pmbl., art. 10, *reprinted in* 28 I.L.M. 657, 667-68. *See also* United Nations Convention on the Law of the Sea, Dec. 10, 1982, Part XI, *reprinted in* 21 I.L.M. 1261, 1293-308.

E. Conclusion

Environmental concerns are now a fundamental aspect of organized international relations and there is every indication that this phenomenon has caused and will continue to cause a significant reordering of priorities on the global agenda. It is in respect to issues such as stratospheric ozone depletion that national interests are converging to the point of allowing certain normative structures to develop into binding prescriptions of behavior: rules enforceable through law itself and through the political power derived from universal consensus.

This trend is not, however, cause for complacency. If ozone depletion is halted and eventually reversed, it will be because the solution required only minimal changes to the political and legal status quo, and was therefore possible under the existing system of world order. It is unlikely that other environmental problems currently facing the global community will prove equally amenable to system-friendly resolution. The innovations discussed above are but one small indication of the scope and depth of necessary reform.

Regardless of the way in which the world chooses to address threats to the global environment, it is apparent that building a political order must necessarily represent only part of the equation. A viable solution to the current environmental crisis demands much of international law, and the greatest question must surely be whether those responsible for its development and implementation are willing to assume so grave and urgent a responsibility.

Figure 1:

Comparison of Original and Amended Production and Consumption Control Schedule

CFCs		HALONS		OTHER CFCs		CARBON TETRACHLORIDE		METHYL-CHLOROFORM	
Action	Date	Action	Date	Action	Date	Action	Date	Action	Date
1987 PROTOCOL									
Freeze at '86 levels	From 7-1-90	Freeze at '86 levels	From 7-1-90	NO ACTION		NO ACTION		NO ACTION	
20% reduction (from '86 levels)	From 7-1-83								
50% reduction	From 7-1-98								

Figure 1 (cont'd):

CFCs		HALONS		OTHER CFCs		CARBON TETRACHLORIDE		METHYL-CHLOROFORM	
Action	Date	Action	Date	Action	Date	Action	Date	Action	Date
1990 PROTOCOL									
Freeze at '86 levels	From 7-1-1991	Freeze at '86 levels	From 1-1-1992	20% reduction (from '89 levels)	From 1-1-1993	85% reduction (from '89 levels)	From 1-1-1995	Freeze at '89 levels	From 1-1-1993
50% reduction (from '86 levels)	From 1-1-1995	50% reduction (from '86 levels)	From 1-1-1995	85% reduction	From 1-1-1997	100% reduction	From 1-1-2000	30% reduction	From 1-1-1995
85% reduction	From 1-1-1997	100% reduction	From 1-1-2000	100% reduction	From 1-1-2000			70% reduction	From 1-1-2000
100% reduction	From 1-1-2000							100% reduction	From 1-1-2005

Figure 2:

ARTICLE 4 TRADE RESTRICTIONS (1990 Revised Protocol)

	IMPORT BAN (Controlled Substances)	EXPORT BAN (Controlled Substances)	IMPORT BAN† (Products Containing)	IMPORT BAN‡ (Products Manufactured with)
Annex A Substances				
	1 Jan 1990	1 Jan 1993	1 Jan 1992	1 Jan 1994
Annex B Substances				
	1 Jan 1993*	1 Jan 1993*	1 Jan 1995*	1 Jan 1997*

† By the dates indicated, parties are to have drafted lists of products containing controlled substances. Those not formally objecting are to implement, within one year, a ban on the import of listed products from non-parties.

‡ By the dates indicated, parties are to determine the feasibility of banning or restricting the import of products manufactured with controlled substances from non-parties. If such a ban is considered feasible, a list of products is to be drafted and to enter into force (in respect of non-objecting parties) within one year.

* Dates conditional upon the amendments and adjustments to the Protocol entering into force on 1 January 1992. *Supra* note 231