# International Regime Formation:
# The Politics of Ozone Layer Depletion and Global Warming

Ian Harshaw Rowlands
London School of Economics and Political Science

A thesis submitted in partial fulfilment of the requirements for the
Ph.D. degree in the Faculty of Economics of the University of London

## Abstract

This thesis examines the politics of international regime formation, with particular reference to the global atmospheric problems of ozone layer depletion and global warming. A review of the international relations literature reveals that there are three approaches to the study of international regime formation: global, state-centred and individualistic. Building upon these, three preconditions and four catalysts for international regime formation are proposed. Each of the hypothesised preconditions -- scientific consensus, tolerable domestic economics costs and global equity -- is necessary, though not by itself sufficient, for international regime formation. Meanwhile, although no one of the hypothesised catalysts -- political entrepreneurs, the solidity of the broader international political system, environmental pressure groups and the mobilisation of public opinion -- is a necessary element for the formation of an international regime, the presence of any one can nevertheless accelerate the rate at which regimes are formed. The theoretical framework that is proposed is applied to the histories of the ozone layer depletion and global warming issues. In this investigation, data up to the end of 1991 were considered. The thesis also considers some issues that extend beyond the end of 1991, for the nature of parts of the analysis precludes an unwavering commitment to this cut-off date. The findings of this investigation have both theoretical and empirical dimensions. First, because the application of the theoretical framework does not invalidate it, thinking about the formation of regimes in international society in general is advanced. And second, by applying the framework to these two particular issues, explanations are offered as to why an international regime had been formed by the end of 1991 to preserve the earth's ozone layer, while one to deal with global warming had not.

To my mother and father

## Table of Contents

Materials not bound into the thesis:

'The Security Challenges of Global Environmental Change', *The Washington Quarterly* (Vol. 14, No. 1, Winter 1991), pp. 99-114 (reprinted in Brad Roberts (ed.), *U.S. Foreign Policy After the Cold War* (London: MIT Press, 1992), pp. 207-22).

'Ozone Layer Depletion and Global Warming: New Sources for Environmental Disputes', *Peace and Change* (Vol. 16, No. 3, July 1991), pp. 260-84.

Editor (with Malory Greene) of *Global Environmental Change and International Relations* (Basingstoke: Macmillan, 1992).

'The International Politics of Global Environmental Change', in Ian H. Rowlands and Malory Greene (eds.), *Global Environmental Change and International Relations* (Basingstoke: Macmillan, 1992), pp. 19-37.

'Environmental Issues in World Politics', in N.J. Rengger and John Baylis (eds.), *Dilemmas of World Politics: International Issues in a Changing World* (Oxford: Oxford University Press, 1992), pp. 287-309.

## List of Tables and Figures

### Tables



### Figures

## Acknowledgements

This thesis was completed under the supervision of Michael Banks of the Department of International Relations at the London School of Economics and Political Science. Michael initially sparked my interest in the discipline, and he remained a source of much inspiration during the three and one-half years that I spent working on this thesis. I would therefore like to thank him for all of the guidance, encouragement and friendship with which he provided me.

I was fortunate to be based in the Department of International Relations at the LSE for most of the time that I spent working on this project. Both the staff and the students in the Department provided me with a great deal of intellectual stimulation and personal support. Among the faculty, I would particularly like to thank Mark Hoffman, Margot Light and the late John Vincent. Further, the involvement that I had with *Millennium: Journal of International Studies* was one of my most rewarding experiences. I have learned much from the many wonderful people who have been associated with the journal through the years. I would especially like to thank Hugh Dyer, Spyros Economides, Rebecca Grant, Malory Greene, David Long, Kathleen Newland and Peter Wilson. Of these, Malory and Kathleen were particularly encouraging.

Moreover, during the final six months that I spent working on this thesis, I was lucky in that I was able to adopt a second 'home' at the LSE -- namely, the Development Studies Institute. I am grateful to my friends and colleagues there -- in particular, John Harriss -- for their support during the last stages of this project.

Malory Greene, Mark Hoffman, Richard Jerram, Jeremy Larkins, Kathleen Newland, Annie Taylor and Tim Woolf each read and commented upon parts of this thesis. I would like to thank them for their time and effort, for their ideas helped me to increase my understanding of the subject.

I am also grateful to all of the people who took time off from their busy schedules to agree to be interviewed by me (see the list of interviews in Appendix A.5.1 of this thesis). In particular, I would like to express my appreciation for the efforts of Peter Usher of the United Nations Environment Programme in Nairobi. Peter ensured that the five weeks which I spent in Kenya on research during July and August of 1991 were both successful from an academic perspective and enjoyable from a personal outlook.

A number of organisations provided me with financial assistance during the time that I spent working on this thesis. The Commonwealth Scholarship Commission in the United Kingdom and the Canadian Institute for International Peace and Security gave me significant funding during this period. To them, I am particularly thankful. I am also grateful for the assistance that I received from the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom (an Overseas Research Students Award), the Edward Boyle Memorial Trust and the London School of Economics and Political Science (a Montague Burton Studentship).

I would also like to thank all of my friends in the United Kingdom and Canada for supporting me through the highs and lows that are inevitably associated with any course of research -- their understanding was something upon which I could

always depend. Additionally, I would like to thank my family for all that they have given me. My sister, Martha, and my brother, Bill, and his family, were always supportive. Finally, I would like to thank my parents for the love, friendship, encouragement and everything else that they have continuously provided me with throughout my life. There is no way that I could ever hope to express adequately this appreciation. Nevertheless, as a small token of this gratefulness, I dedicate this thesis to them.

Notwithstanding all of the assistance that I received, I remain solely responsible for any remaining errors in this work.

## Abbreviations

| | |
|---|---|
| AAOE | Airborne Antarctic Ozone Experiment |
| °C | degrees Celsius |
| CBA | cost-benefit analysis |
| CCOL | Co-ordinating Committee on the Ozone Layer |
| CEQ | Council on Environmental Quality |
| CFC | chlorofluorocarbon |
| CFM | chlorofluoromethane |
| CIAP | Climate Impact Assessment Program |
| CMA | Chemical Manufacturers' Association |
| $CO_2$ | carbon dioxide |
| DDT | dichloro-diphenyl-trichloroethane |
| EC | European Communities |
| EEC | European Economic Community |
| EPA | Environmental Protection Agency |
| EPG | environmental pressure group |
| FC | fluorocarbon |
| FCST | Federal Council on Science and Technology |
| GATT | General Agreement on Tariffs and Trade |
| GDP | gross domestic product |
| GEF | Global Environmental Facility |
| GNP | gross national product |
| G7 | Group of 7 |
| HCFC | hydrochlorofluorocarbon |
| HFC | hydrofluorocarbon |
| HST | Hegemonic Stability Theory |
| ICI | Imperial Chemical Industries |
| ICSU | International Council of Scientific Unions |
| IEA | International Energy Agency |
| IGY | International Geophysical Year |
| IMF | International Monetary Fund |
| IMOS | Inadvertent Modification of the Atmosphere |
| INC | Intergovernmental Negotiating Committee on a Framework Convention on Climate Change |
| IPCC | Intergovernmental Panel on Climate Change |
| IUCN | World Conservation Union |
| LTG | Limits to Growth |
| MIT | Massachusetts Institute of Technology |
| MTOE | million tonnes oil equivalent |
| NAS | National Academy of Sciences |
| NASA | National Aeronautics and Space Administration |
| NGO | nongovernmental organisation |
| NOAA | National Oceanic and Atmospheric Administration |
| NOZE | National Ozone Expedition |
| NRC | National Research Council |
| NSF | National Science Foundation |
| OECD | Organisation for Economic Co-operation and Development |
| SAGE | Stratospheric Aerosol and Gas Experiment |

| | |
|---|---|
| SST | supersonic transport |
| STAP | Scientific and Technical Advisory Panel |
| TOMS | Total Ozone Mapping Spectrometer |
| UNCED | United Nations Conference on Environment and Development |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| UNGA | United Nations General Assembly |
| WCED | World Commission on Environment and Development |
| WCP | World Climate Programme |
| WG | working group |
| WIPO | World Intellectual Property Organisation |
| WMO | World Meteorological Organisation |

## Introduction

At the end of 1991, the global environmental issues of ozone layer depletion and global warming were firmly entrenched upon the international political agenda. The significance of these issues had been demonstrated by two findings which had revealed the consequences of human intervention in the earth's natural systems. First, scientific investigations after the 1985 discovery of an ozone 'crater' above Antarctica showed that chlorofluorocarbons and other widely-used substances were destroying the earth's protective ozone layer.[1] And second, in 1990, an international group of scientific experts (the Intergovernmental Panel on Climate Change) concluded with certainty that

> emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases ... These increases will enhance the greenhouse effect, resulting on average in an additional warming of the Earth's surface.[2]

It was recognised that such changes in the earth's natural equilibria could have profound impacts upon the world's population.[3] Indeed, a number of reports published during the late 1980s and the early 1990s illuminated the possible social consequences of human intervention in the earth's natural systems.[4] The research teams commissioned to produce these reports suggested that if the members of international society did not change their normal practices and address each of the two issues in an effective manner, then substantial disruptions to international relations would undoubtedly take place. The scale of the transformations

---

[1] J.C. Farman *et al*, 'Large Losses of Total Ozone in Antarctica Reveal Seasonal $CLO_x/NO_x$ Interaction', *Nature* (Vol. 315, 16 May 1985), pp. 207-10.

[2] WMO and UNEP, *The Policymakers' Summary of the Report of Working Group I to the Intergovernmental Panel on Climate Change* (Geneva: WMO and UNEP, 1990), p. 2.

[3] These first two paragraphs are adapted from Ian H. Rowlands and Malory Greene, 'Introduction', in Ian H. Rowlands and Malory Greene (eds.), *Global Environmental Change and International Relations* (Basingstoke: Macmillan, 1992), p. 1.

[4] See, for example, the Report of the Environmental Panel, one of the Open-Ended Working Groups of the Parties to the Montreal Protocol (UNEP, *Synthesis Report*, UNEP/OzL.Pro.WG.II(1)/4, 13 November 1989); and W.J.McG. Tegart, G.W. Sheldon and D.C. Griffiths (eds.), *Climate Change: The IPCC Impacts Assessment* (Canberra: Australian Government Publishing Service for WMO and UNEP, 1990).

suggested by some of these estimates underlined the need for change.[5]

The condition of the earth's atmosphere is of concern to every person on the planet, because no individual would be able to escape the consequences of a deteriorated atmosphere. There was no guarantee, however, that the members of international society would be able to abandon their usual practices, which were degrading the global atmosphere, in order to implement a new order. Indeed, there are significant forces within any society that hinder any departure from the status quo. Over 400 years ago, Niccolo Machiavelli noted the considerable challenges facing any attempt to introduce new arrangements:

> It must be considered that there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order, this lukewarmness arising partly from fear of their adversaries, who have the laws in their favour; and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it.[6]

Present-day scholars in international relations echo this. Oran Young, for example, notes that:

> Social practices and convergent expectations frequently prove resistant to change, even when they produce outcomes that are widely understood to be undesirable or suboptimal. Existing institutional arrangements, such as the international agreements pertaining to coffee or Antarctica, are familiar constructs while new arrangements require actors to assimilate alternative procedures or patterns of behavior and to accept (initially) unknown outcomes. Additionally, planned changes in regimes require not only the destruction of existing institutions but also the coordination of expectations

---

[5] Much of the work on 'environmental security' suggests that environmental degradation could cause international conflicts. See, for example, Thomas F. Homer-Dixon, 'On the Threshold: Environmental Changes as Causes of Acute Conflict', *International Security* (Vol. 16, No. 2, Fall 1991), pp. 76-116; Jessica Tuchman Mathews, 'Redefining Security', *Foreign Affairs* (Vol. 68, No. 2, Spring 1989), pp. 162-77; Norman Myers, 'Environmental Security', *Foreign Policy* (No. 74, Spring 1989), pp. 23-41; and Michael Renner, *National Security: The Economic and Environmental Dimensions* (Washington, DC: Worldwatch Paper No. 89, May 1989). I adopt a similar theme, applying it directly to the ozone layer depletion and global warming issues, in Ian Rowlands, 'The Security Challenges of Global Environmental Change', *The Washington Quarterly* (Vol. 14, No. 1, Winter 1991), pp. 99-114.

[6] Niccolo Machiavelli, *The Prince and The Discourses* (New York: The Modern Library, 1950), p. 21.

around new focal points.[7]

These views are generally regarded as representative of broader classical and contemporary opinions, respectively, and together they suggest that the implementation of new policies to stabilise the global atmosphere was not probable, let alone inevitable.

The particular nature of global atmospheric change,[8] furthermore, increased the difficulties of achieving a new arrangement. Although every person in the world may have desired a particular end -- that is, an atmosphere with an ozone layer that is intact and a climate that is stable[9] -- individual states' leaders may have perceived it to be rational to implement policies that worked against the achievement of this end. In the fourth century BC, Aristotle identified the root of this seemingly counterintuitive assertion:

> What is common to the greatest number gets the least amount of care. Men pay most attention to what is their own: they care less for what is common. ... When everyone has his own sphere of interest ... the amount of interest will increase, because each man will feel that he is applying himself to what is his own.[10]

Because the global atmosphere is a 'common' good -- that is, no parts of it are 'owned' by any entity, state or non-state -- the leaders of states may not have attempted to change their country's policies in order to work to preserve it. Indeed, if they did change direction and other states' leaders did not adopt similar policies, then this unilateral action may have brought about substantial net costs. Such a prospect may have therefore persuaded every national decision-maker to maintain

---

[7] Oran R. Young, 'Regime Dynamics: The Rise and Fall of International Regimes', *International Organization* (Vol. 36, No. 2, Spring 1982), p. 280. Others have, additionally, noted that because international arrangements often involve substantial 'sunk costs', they are 'not likely to be readily changed or destroyed' (Arthur A. Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (London: Cornell University Press, 1990), p. 52).

[8] In this thesis, I use the term 'global atmospheric change' to refer to the two issues of ozone layer depletion and global warming together.

[9] A rate of warming of 0.1°C per decade has been advanced as 'an "ecologically manageable" rate of increase in warming -- *i.e.*, it is the rate at which non-disruptive ecological change will take place' (David Pearce, 'Economics and the Global Environmental Challenge', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 371). Pearce, in turn, cites a study by the International Project for Sustainable Energy Paths (*Energy Policy in the Greenhouse* (El Cerrito, CA: International Project for Sustainable Energy Paths, 1989)).

[10] Aristotle, *Politics*, Book II, Chapters 3 and 4, quoted in: 'Preface: The Evolution of Cultural Norms', in Garrett Hardin and John Baden (eds.), *Managing the Commons* (San Francisco: W.H. Freeman and Company, 1977), p. xi.

a course of policy that served to deteriorate the global atmosphere. Consequently, as many scholars in the international relations literature recognise, states' actions may, in such instances, 'produce collective outcomes that are socially undesirable or, in other words, [their actions may] generate collective-action problems'.[11] Like a traditional 'tragedy of the commons' scenario,[12] therefore, the preservation of a habitable global atmosphere required worldwide commitment.[13]

In spite of these powerful forces that mitigate against a co-ordinated response, a number of international collective goods have been provided in the past. Since the beginning of our present international political system in 1648, states' leaders have sometimes entered into mechanisms for international co-operation (*e.g.*, conventions, understandings and treaties) in order to escape sub-optimal outcomes in the anarchical international system.[14] Such issues include: human health standards,[15] security,[16] trading practices[17] and transportation regulations.[18] Furthermore, a number of environmental collective action dilemmas have been successfully overcome by the members of international society.

---

[11] Oran R. Young, *International Cooperation: Building Regimes for Natural Resources and the Environment* (Ithaca. NY: Cornell University Press, 1989), p. 2.

[12] Garrett Hardin, 'The Tragedy of the Commons', *Science* (Vol. 162, 13 December 1968), pp. 1243-48. See, also, William Forster Lloyd, 'On the Checks to Population' [1833], reprinted in Hardin and Baden (eds.), *op. cit.*, in note 10, pp. 8-15.

[13] In this way, we can model each of these issues as 'collective goods'. See, for example, Russell Hardin, *Collective Action* (Baltimore, MD: Johns Hopkins University Press, 1982); Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965); and Duncan Snidal, 'Public Goods, Property Rights, and Political Organizations', *International Studies Quarterly* (Vol. 23, No. 4, December 1979), pp. 532-66.

[14] Hedley Bull, *The Anarchical Society: A Study of Order in World Politics* (Basingstoke: Macmillan, 1977).

[15] See, for example, Richard N. Cooper, 'International Cooperation in Public Health as a Prologue to Macroeconomic Cooperation', in Richard N. Cooper *et al*, *Can Nations Agree? Issues in International Economic Cooperation* (Washington, DC: The Brookings Institution, 1989), pp. 178-254.

[16] See, for example, Mancur Olson Jr. and Richard Zeckhauser, 'An Economic Theory of Alliances', *Review of Economics and Statistics* (Vol. 48, No. 3, August 1966), pp. 266-79; and Wallace J. Thies, 'Alliances and Collective Goods: A Reappraisal', *Journal of Conflict Resolution* (Vol. 31, No. 2, January 1987), pp. 298-332.

[17] See, for example, Joseph M. Grieco, *Cooperation Among Nations: Europe, America, and Non-tariff Barriers to Trade* (London: Cornell University Press, 1990).

[18] See, for example, Christer Jonsson, *International Aviation and the Politics of Regime Change* (London: Frances Pinter, 1987).

Regional pollution problems[19] and above-ground nuclear testing[20] are but two cases. Both the number and the significance of these examples suggest that the members of international society have in some cases been able to overcome the obstacles to co-ordinated action. In other instances, however, the barriers have proved to be insurmountable, and thus these same members of international society have not been able to escape sub-optimal outcomes. The most obvious examples of this are policies of military armament and economic protectionism. Additionally, in each of the examples mentioned above, for the period *before* each of the appropriate agreements were concluded, the members of international society were in a sub-optimal position. Thus, arrangements to escape collective action dilemmas have only sometimes been created in international society. Indeed, a closer inspection of the ozone layer depletion and global warming dilemmas reveals that this contrast between relative success and relative failure is also apparent in these two issues.

Traditionally, individuals and therefore states could do what they wanted with regard to the discharge of trace chemicals and particles into the atmosphere. The predominant norm was that neither individuals nor states possessed obligations in these issue-areas. There was no regime in place, because the behaviour of states' leaders was not facilitating the resolution of these particular collective action problems.[21] Additionally, no co-ordinated decision-making procedures had been developed, and no need for them had been perceived.[22]

By the end of 1991, however, governments had together built an international regime in one of these two issue-areas, for most of the world's states

---

[19] See, for example, Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990); and Sunneva Saetevik, *Environmental Cooperation Between the North Sea States: Success or Failure?* (London: Belhaven Press, 1988).

[20] See, for example, Robert A. Divine, *Blowing on the Wind: The Nuclear Test Ban Debate, 1954-60* (New York: Oxford University Press, 1978).

[21] Throughout this thesis, I use the term 'regime' in the way that it is used by international relations specialists. This usage is distinct from that employed by other scholars and practitioners -- for example, international lawyers or students of political science. The best-known work representative of the international relations approach is Stephen Krasner, *International Regimes* (Ithaca, NY: Cornell University Press, 1983). A further examination of this term is provided in Chapter 1 of this thesis.

[22] Some scholars would argue that the absence of restrictive rules itself constitutes a regime, called a '*laissez-faire*' regime. Given the definition of 'regime' adopted in this work, however (see Chapter 1, note 12, and accompanying text), it is clear that a '*laissez-faire*' policy, worldwide, does not constitute a regime.

had implemented co-ordinated decision-making procedures which were facilitating the preservation of the ozone layer.[23] This was in sharp contrast, however, with the other issue-area under consideration in this thesis. Although some observers might suggest that, by the end of 1991, some common principles had been agreed in international society with regard to global warming,[24] the patterned behaviour of states' leaders was not facilitating the resolution of this particular collective action problem. An international regime to deal with global warming had, therefore, not been created.[25]

The fact that the world's governments had responded to the challenges posed by one source of global atmospheric change, while, at the end of 1991, they had failed to do so to another, invites us to study the two issues in parallel. Thus, the purpose of this thesis is to explain why an international regime had been formed to preserve the earth's ozone layer, while an international regime to deal with global warming had not been formed by the end of 1991. To achieve this end, the investigation focuses upon the conditions that must be in place before international regimes to address each issue can be formed. The primary concern is therefore with the path to international regime formation, not with a description of what lies at the end of that road. Thus, although some consideration of the particular form that a regime may take or the independent influence that a regime may exert is inescapable, those issues are not central to this study.

The demand for investigations into both ozone layer depletion and global warming has been met by a generous supply of work from various branches of the social sciences, including international relations. The majority of the studies concerned with the international politics, however, examine the issues of ozone layer depletion and global warming primarily from journalistic, diplomatic or policy

---

[23] This assertion is supported by the fact that many states had accepted the obligations outlined in three important international agreements: the 1985 Vienna Convention for the Protection of the Ozone Layer (reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1516-40); the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1541-61); and the 1990 London Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer (reprinted in *International Legal Materials* (Vol. 30, No. 2), pp. 539-554).

[24] I examine this more closely in Chapter 2.2 of this thesis.

[25] Formal, international negotiations on a global warming convention began in Washington, DC in February 1991 (under the auspices of the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change). By the end of 1991, however, no significant co-ordinated policy action had been agreed.

perspectives.[26] Although international relations scholars are beginning to explore the issues in a theoretical manner,[27] there remains a need for an investigation of the sort carried out in this thesis. By using a different theoretical prism to analyse data that others have previously examined, new light may be cast upon available information. Moreover, by explicitly comparing and contrasting the issues of ozone layer depletion and global warming, fresh insights may be gained. And by constructing a theoretical framework for international regime formation, this work may contribute to the broader study and practice of international relations.

The study draws primarily upon two bodies of literature. The first -- on international regimes -- is tapped in order to construct the theoretical framework. This literature is used, because it presents a wealth of ideas about why collective arrangements sometimes succeed and sometimes fail in international society. Although the arguments employed in the thesis also draw upon work that is not related to the regime literature -- for example, writings on international institutions and international co-operation more generally -- the discussion is placed within the broader academic debate about international regimes.

A second body of literature -- on global atmospheric change -- is drawn upon in order to gather the empirical evidence for the two issues. These works include books, articles (in both social science and natural science journals), conference records and reports, documents from governments and international organisations, and publications from non-governmental organisations. This

---

[26] Examples of these works on the ozone layer issue include: Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991); Lydia Dotto and Harold Schiff, *The Ozone War* (Garden City, NY: Doubleday & Company, 1978); John Gribbin, *The Hole in the Sky: Man's Threat to the Ozone Layer* (London: Corgi Books, 1988); and Sharon L. Roan, *Ozone Crisis: The 15 Year Evolution of a Sudden Global Emergency* (Chichester: John Wiley & Sons, 1989). On the global warming issue, meanwhile, they include: Stewart Boyle and John Ardill, *The Greenhouse Effect: A Practical Guide to the World's Changing Climate* (Sevenoaks: Hodder & Stoughton, 1989); Michael Oppenheimer and Robert H. Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (New York: Basic Books, 1990); Fred Pearce, *Turning up the Heat: Our Perilous Future in the Global Greenhouse* (London: The Bodley Head, 1989); Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco, CA: Sierra Club Books, 1989); and Crispin Tickell, *Climatic Change and World Affairs* (New York: Pergamon Press, 1977).

[27] See, for example, Peter M. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', *International Organization* (Vol. 46, No. 1, Winter 1992), pp. 187-224; Fen Osler Hampson, 'Climate Change: Building International Coalitions of the Like-Minded', *International Journal* (Vol. 45, No. 1, Winter 1989-90), pp. 36-74; and James K. Sebenius, 'Designing Negotiations Toward a New Regime: The Case of Global Warming', *International Security* (Vol. 15, No. 4, Spring 1991), pp. 110-48.

literature began, of course, when the problems of ozone layer depletion and global warming were initially recognised (which was, for the former, in the 1960s, and, for the latter, in the nineteenth century[28]), and data up to the end of 1991 were considered. The thesis also considers issues that extend beyond the end of 1991, for the nature of parts of the analysis precludes an unwavering commitment to any cut-off date. Additionally, these written sources are supplemented by interviews with individuals who had been involved in the relevant political negotiations. Although no formal survey technique was used,[29] the field work provides evidence that complements the information gathered from published materials.[30] In this way, a variety of sources are used in the presentation of the empirical data.

This thesis is presented in six chapters. In Chapter 1, a review of the writings on international regime formation reveals that there are three broad approaches in the literature: global, state-centred and individualistic. Building upon this classification, it is proposed that there are three preconditions and four catalysts for international regime formation. In Chapters 2 through 5, this theoretical framework is applied to the empirical issues of ozone layer depletion and global warming in order to further our understanding about the international politics of these issues.

In Chapter 2, the first of the three proposed preconditions -- each of which is necessary, though not by itself sufficient, for international regime formation -- is considered; it is the need for scientific consensus. Before an environmental problem appears upon any political agenda, it must be brought to the attention of policy-makers by a scientist or a group of scientists. Once the problem has been placed upon the political agenda, however, there may still be scientific disagreement about the nature of the particular issue. Therefore, the proposition put forward in this chapter is that the formation of an international regime will remain elusive as long as there is disagreement about the science of the issue among the world's most eminent scientists. Building upon the work of the individualistic theorists in the regime literature, it is proposed that this consensus will need to include an agreement about the nature and identification of the

---

[28] See Chapter 2 of this thesis for a fuller discussion.

[29] All interviews were open-ended.

[30] Significant attempts were made to confirm data gained from interviews by other sources. This, however, was not always possible. A list of interviews is given in Appendix A.5.1 of this thesis.

problem under consideration, together with an agreement about both the data collection process and the method of data interpretation.

Additionally, it is argued that the leaders of the world's industrialised states will not encourage the process of international regime formation until the cost-benefit analysis that they undertake yields a 'tolerable' outcome. This second precondition is explored in Chapter 3. Taking some of the contributions of state-centred theorists in the regime literature, it is proposed that states' leaders are able to identify objectively the benefits and liabilities associated with particular courses of action. With the help of a given set of criteria, each leader costs these various options, and then chooses the route that will yield the highest gain or, failing that, result in the smallest loss. It is maintained that there exists a negative correlation between a leader's willingness to help to build a new international regime and the domestic economic costs of doing so.

The perception of global equity is important in these issues, and it is considered in Chapter 4. Because the world is made up of states that exist within a broader international system, the decisions adopted by national leaders will not be reached irrespective of the realities that exist beyond national borders. Some scholars argue that a government is expected not only to further the interests of its own people (hence the recognition, in Chapter 3 of this thesis, of the role that economic costs play in the quest for regime formation), but it is also not expected to afford other states a disproportionate share of any mutual benefit achieved in an international arrangement. If states are to take part in international regime formation, then their leaders will expect not only to achieve an absolute gain, but also to avoid a relative loss. It is shown that of all of the calls for equity, the dominant issue in the international negotiations on the atmosphere is that which is most closely linked to North-South concerns. Employing some of the ideas of the global theorists in the regime literature, then, it is suggested that an adequate resolution of the concerns voiced by the representatives of the states of the developing world is the third precondition for the formation of an international regime.

Along with these three preconditions, four catalysts for international regime formation are proposed; they are examined in Chapter 5. Although no one of the catalysts is a necessary element for the formation of an international regime, it is argued that the presence of any one can nevertheless accelerate the rate at which

an international regime is formed. The first catalyst is the role of 'political entrepreneurs': persons who find it in their private interest to work to provide collective goods for the international community. Second, it is hypothesised that the solidity of the broader international political system is also a significant determinant of the rate of regime formation. Changes in the political landscape may alter perceived payoffs and thereby affect the process of international regime formation. Additionally, there are forces other than the state that can help to facilitate international co-operation and thus act as catalysts. The primary such actor that is not considered in other parts of this thesis -- namely, environmental pressure groups -- is considered as a third catalyst. Finally, it is argued that the extent to which public opinion is mobilised will also affect the rate of regime formation. Thus, it is maintained that these four factors act as catalysts in the process of international regime formation.

In each of the second, third and fourth chapters (along with the particular sub-sections within the fifth chapter), the arguments are developed in a parallel manner. In the first section, the component of the overall framework under examination is presented, and its inclusion as a factor is further justified. In the second and third sections, the relevant parts of the historical records of the international politics of the ozone layer depletion and global warming issues are, respectively, examined. By presenting the argument in this manner, the two histories can be easily compared in order to determine what similarities and differences might be discerned. In this way, it is anticipated that our knowledge about the processes of international regime formation can be advanced.

A summary of the findings emerging from this investigation is presented in Chapter 6, and some final conclusions are offered at the end of this thesis. Taken together, the six chapters (along with the Introduction and the Conclusion) attempt to increase our knowledge about international regime formation in general, and to explain why an international regime had been formed by the end of 1991 to preserve the earth's ozone layer, while one to deal with global warming had not.

Both ozone layer depletion and global warming could cause broader changes in the earth's environment that would have the potential to create significant turmoil in the world's social systems. If international society is to avoid substantial upheavals, then its members will have to construct some sort of international regime (or set of international regimes). Overcoming the obstacles to

regime formation for international collective goods, however, is a daunting task. Thus, the fact that the members of international society had been able to form an international regime that was designed both to halt and to reverse the depletion of the ozone layer is noteworthy. The barriers to the formation of any international regime to deal with the global warming issue had, however, by the end of 1991, yet to be surmounted. By focusing upon the theoretical dilemmas and the historical evidence, this thesis seeks to contribute to the general discussion as the members of international society attempted to build a regime to address the challenges of global warming.

## Chapter 1 -- The Problem of International Regime Formation

Many of the investigations into the collective action dilemmas that confront the members of international society have been made within the literature on 'international regimes'. Based upon the ideas that scholars working in this tradition have developed, an examination of various theories of international regime formation is undertaken in this chapter. In the subsequent section, the origins of the term 'international regime' are identified, and some of the ways in which it has been defined are presented. Representative works of the study of international regime formation are then reviewed. Many different proposals have been put forward in response to the question: 'Why are regimes formed in some issue-areas, while not in others?' It is shown, however, that these diverse ideas can be usefully grouped into three categories: global, state-centred and individualistic approaches. By reviewing, analysing and assessing the contribution of various scholars' works, the strengths of each view can be distilled and subsequently used in the creation of a theoretical framework. This framework, which is used in this thesis to study the politics of ozone layer depletion and global warming, is presented in the final part of this chapter.

### 1.1 -- International Regimes

Regime is a term that is the subject of not only much inquiry but also much debate in the literature on international relations, for its use is by no means universally accepted.[1] Before we study how this term has been utilised by different scholars, it is useful to explore its origins.

Vinod Aggarwal notes that the 'concept of regime derives from the Latin word *regimen*, a form of the word *regere*, which means "to rule" in English'.[2] Susan Strange, in addition, notes its use in another language -- namely French:

---

[1] Susan Strange has delivered one of the most oft-cited criticisms of the concept (Susan Strange, '*Cave! hic dragones*: A Critique of Regime Analysis', in Stephen D. Krasner (ed.), *International Regimes* (Ithaca NY: Cornell University Press, 1983), pp. 337-54). For further critiques, see: Friedrich Kratochwil, 'The Force of Prescriptions', *International Organization* (Vol. 38, No. 4, Autumn 1984), pp. 685-708; and Friedrich Kratochwil and John Gerard Ruggie, 'International Organization: A State of the Art on an Art of the State', *International Organization* (Vol. 40, No. 4, Autumn 1986), pp. 753-75.

[2] Vinod K. Aggarwal, *Liberal Protectionism: The International Politics of Organized Textile Trade* (London: University of California Press, 1985), p. 17.

> In everyday language it means a diet, an ordered, purposive plan of eating, exercising, and living. ... [a] second meaning is political: the government of a society by an individual, a dynasty, party or group that wields effective power over the rest of society.[3]

In English, meanwhile, regime is defined as: 'Method of system of government, prevailing system of things [or] Condition(s) under which scientific, industrial, etc., process occurs.'[4]

'Regime' acquires new meanings, however, when it is modified by the word 'international'. The best place to begin a discussion of the use of this concept in the international relations discipline is with Stephen Krasner's definition. He states that international regimes are 'defined as principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue-area'.[5] He expands by explaining that:

> Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice.[6]

Although Krasner's is the definition that is most often cited, it is not the only one that has been put forward. Writing eight years earlier, Ernst Haas defines regimes as 'collective arrangements among nations designed to create or more effectively use scientific and technological capabilities'.[7] In addition, John Gerard Ruggie sees regimes as 'sets of mutual expectations, generally agreed-to rules, regulations and plans, in accordance with which organizational energies and financial commitments are allocated',[8] while Robert Keohane and Joseph Nye define regimes as 'procedures, rules, or institutions for certain kinds of activity'.[9] More recently, Keohane has restricted his interpretation, for he writes that '[e]xtensive

---

[3] Strange, *op. cit.*, in note 1, p. 344.

[4] *The Concise Oxford Dictionary.*

[5] Stephen D. Krasner, 'Structural Causes and Regime Consequences: Regimes as Intervening Variables', in Krasner (ed.), *op. cit.*, in note 1, p. 1.

[6] *Ibid.*, p. 2.

[7] Ernst B. Haas, 'On Systems and International Regimes', *World Politics* (Vol. 27, No. 2, January 1975), p. 147.

[8] John Gerard Ruggie, 'International Responses to Technology: Concepts and Trends', *International Organization* (Vol. 29, No. 3, Summer 1975), p. 569.

[9] Robert O. Keohane and Joseph S. Nye, *Power and Interdependence: World Politics in Transition* (Boston, MA: Little, Brown and Company, 1977), p. 5.

terminological discussion of regimes has convinced me that it is clearest to limit the term "regimes" to institutions with explicit rules, negotiated by states'.[10] Finally, Oran Young defines regimes as

> social institutions governing the actions of those involved in specifiable activities or sets of activities. Like all social institutions, they are practices consisting of recognized roles linked together by clusters of rules or conventions governing relations among the occupants of these roles.[11]

These varied interpretations lend support to the assertion made above that the debate about international regimes is highly controversial. It is not my primary purpose in this thesis, however, to assess the relative merits of the various definitions. Nevertheless, because 'international regimes' are objects of study in this investigation, the term must be defined. Therefore, for the purposes of this thesis, an international regime exists when the patterned behaviour of states' leaders facilitates the resolution of collective action problems in a given issue-area of international relations.[12] One strength of this definition is that it does not place particular emphasis upon the independent influence of regimes,[13] an aspect of the debate which does not enter the discussion of international regime formation directly. In addition, this definition seems to occupy a conceptually-useful middle-ground between those who seem to equate international regimes with formal international institutions[14] and those who seem to believe that all international interactions can be rightfully called international regimes.[15] Therefore, for the purposes of our discussion, an international regime will be considered to be 'formed' on either of the issues of ozone layer depletion or global warming when

---

[10] Robert O. Keohane, 'Neoliberal Institutionalism: A Perspective on World Politics', in Robert O. Keohane, *International Institutions and State Power: Essays in International Relations Theory* (London: Westview Press, 1989), p. 17, note 5.

[11] Oran R. Young, *International Cooperation: Building Regimes for Natural Resources and the Environment* (London: Cornell University Press, 1989), pp. 12-13.

[12] The definition employed here is not incompatible with the ones offered by most other scholars.

[13] Compare with Young, *op. cit.*, in note 11.

[14] Compare with Keohane, *op. cit.*, in note 10.

[15] Arthur A. Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (London: Cornell University Press, 1990), p. 26, note 2, summarising Donald J. Puchala and Raymond F. Hopkins, 'International Regimes: Lessons from Inductive Analysis', in Krasner (ed.), *op. cit.*, in note 1, pp. 61-91. In addition, Strange argues that: '"Regime" is yet one more woolly concept that is a fertile source of discussion simply because people mean different things when they use it.' (Strange, *op. cit.*, in note 1, pp. 342-43.)

the above condition has been met.

### 1.2 -- A Review of the Regime Literature in International Relations Scholarship

In a review of the regime literature in international relations scholarship, it is impractical to present and to analyse the contribution of every scholar who has ever considered the concept. Instead, I divide the ideas contained in the literature into three separate categories and consider the contributions of some of the scholars who are best-known or most representative of each grouping.

Because it is assumed that there is a constant *unit* of analysis in this investigation[16] (for the foreign policies of states are together treated as the key dependent variable throughout this study[17]), the classification of the literature is made upon the basis of the *level* of analysis.[18] Thus, the ideas of scholars writing about international regime formation are divided and grouped under three umbrellas, with the members of each category using the same level of analysis -- either the system, the state or the individual -- in order to explain international regime formation.

The 'global' theories that I examine focus upon the international system as a whole in order to explain international regime formation. The 'state-centred' theories that I explore direct attention to the state as a unitary entity, arguing that the actions of this actor are the key determinants of international regime formation. The 'individualistic' theories that I consider accentuate the importance of individuals

---

[16] This thesis is not primarily concerned with the 'agent-structure problem', which is 'whether the system, the state, agencies within the state and human agents are irreducible units in international relations' (Martin Hollis and Steve Smith, 'Beware of Gurus: Structure and Action in International Relations', *Review of International Studies* (Vol. 17, No. 4, October 1991), p. 395). Instead, it merely adopts the three most obvious 'levels of analysis' as a means of classifying the literature (*infra*, in note 18).

[17] By both making this statement and defining international regimes as I do, I am assuming that states' representatives must take conscious decisions to implement a new order before an international regime will be formed. This statement was substantiated by numerous interviews with officials who were involved in the negotiations. They all agreed that states' governments were the key implementors in the process. Thus, we can consider the 'foreign policies of states' and 'international regimes' to be directly correlated in this analysis.

[18] Wendt notes that the 'level of analysis problem ... is a problem of explanation: of assessing the relative importance of causal factors at different levels of aggregation in explaining the behaviour of a given unit of analysis' (Alexander Wendt, 'Bridging the Theory/Meta-theory Gap in International Relations', *Review of International Studies* (Vol. 17, No. 4, October 1991), p. 387). The inspiration for this type of approach includes: Kenneth N. Waltz, *Man, the State, and War: A Theoretical Analysis* (New York: Columbia University Press, 1954); and J. David Singer, 'The Level-of-Analysis Problem in International Relations', *World Politics* (Vol. 14, No. 1, October 1961), pp. 77-92.

in the formation of international regimes. Although each is presented separately, some overlap among the three necessarily exists. Nevertheless, this tripartite division helps us both to order our thoughts about international regime formation and to construct a theoretical framework for the subsequent examination of the politics of global atmospheric change.

### 1.2.1 -- Global Theories

First, there are various global approaches to the study of international regime formation. In this category, I include all of those propositions that focus upon the international system in order to explain international regime formation. Although writers from a number of diverse perspectives find themselves grouped together within this category, they all nevertheless share the idea that the distribution of power (however defined) in the international system (among whatever units) is a key indicator of the prospects for international regime formation.[19] The two most significant approaches under this umbrella are, first, associated with traditional realist ideas and, second, inspired by Marxist scholarship.

Traditional realists argue that states are 'preoccupied with their security and power; by consequence, states are predisposed toward conflict and competition, and they often fail to cooperate even when they have common interests'.[20] These scholars maintain that the distribution of power -- primarily defined as military strength -- among the states of the world is the key characteristic of the international political system.[21] Further, because 'the structure of a system so constituted shapes the behaviour of its elements',[22] they are pessimistic about the chances for international regime formation. The only way in which regimes could arise, some realists contend, is if a hegemon is present in the international system. The theory that they put forward, which is labelled 'Hegemonic Stability Theory' (HST), 'predicts that the more one such power dominates the world political

---

[19] Although groups of theorists in this category disagree whether the distribution of power determines the structure of the system or whether the structure of the system determines the distribution of power, they do agree that a global view is essential.

[20] Joseph M. Grieco, *Cooperation Among Nations: Europe, American, and Non-tariff Barriers to Trade* (London: Cornell University Press, 1990), p. 4.

[21] Perhaps best known of these is Kenneth N. Waltz, *Theory of International Politics* (London: Addison-Wesley Publishing Company, 1979).

[22] Wendt summarising Waltz's argument in Wendt, *op. cit.*, in note 18, p. 389.

economy, the more cooperative will interstate relations be'.[23] Although originating in the field of international political economy, the idea has also been applied to other issue-areas.

Scholars who subscribe to the HST generally define a hegemon (usually in the form of a state, or, increasingly, a group of states working in concert, which may be labelled a 'hegemonic bloc or condominium') as an actor that has sufficient resources with which to impose a co-operative order upon the international system. They claim that there is, therefore, a congruity between the concentration of power and the chances for the formation of an international regime.

Within this general categorisation, Duncan Snidal makes a useful differentiation between two sorts of HST.[24] On the one hand, he identifies a 'benign version', as presented by Charles Kindleberger and, in his earlier writings, Robert Keohane.[25] In this instance, the hegemonic power is willing to provide the international public good, because 'it will capture a share of the benefit of the public good larger than the entire cost of providing it'.[26] In Olsonian language, the group (that is, the international society of states) is 'privileged', because a single state desires the good sufficiently to accept the full costs of its establishment.[27] The benefits accruing to the hegemon, meanwhile, may be tangible or intangible.

> [The hegemon] is willing to bear an undue part of the short-run costs of these goods, either because it regards itself as gaining in the long run, because it is paid in a different coin such as prestige, glory, immortality, or some combination of the two.[28]

---

[23] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, NJ: Princeton University Press, 1984), p. 34. Snidal credits Keohane with coining the term (Duncan Snidal, 'The Limits of Hegemonic Stability Theory', *International Organization* (Vol. 39, No. 4, Autumn 1985), p. 581, note 4).

[24] *Ibid.*

[25] *Ibid.*, pp. 580-81. Kindleberger's first writings on the subject include: *The World in Depression* (Los Angeles, CA: University of California Press, 1973); and 'Systems of International Economic Order', in David Calleo (ed.), *Money and the Coming World Order* (New York: New York University Press, 1976); while Keohane's earlier works include 'The Theory of Hegemonic Stability and Changes in International Economic Regimes, 1967-1977', in Ole R. Holsti, Randolph M. Siverson and Alexander L. George (eds.), *Changes in the International System* (Boulder, CO: Westview Press, 1980).

[26] Snidal, *op. cit.*, in note 23, p. 581.

[27] Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965).

[28] Charles P. Kindleberger, 'International Public Goods Without International Government', *The American Economic Review* (Vol. 76, No. 1, March 1986), p. 8.

Regardless, all members of international society are better off, because of the deliberate actions of the benign hegemon.

An alternative interpretation of HST, however, suggests that states are motivated by different incentives. Following Snidal's distinction, Peter Haas labels this the 'dark side of hegemony' -- that is, the 'malevolent view' of HST.[29] Robert Gilpin and Stephen Krasner are often identified as its best-known adherents.[30] World politics, these theorists argue, is best modelled as a zero-sum game, and

> because outcomes depend entirely on the leadership of a dominant party and that party's willingness to compel other parties to comply, coordinated arrangements will occur in terms favorable to that party. Coordinated policies will reflect the short-term interests of the hegemon, rather than the more generous, longer-term ones proposed by Keohane and Kindleberger. Gilpin and Krasner think that cooperation will only be transitory; that, in fact, the possibility that resources and power will be redistributed as a result of faithful adherence to cooperative goals will in part deter full hegemonic support out of each country's fear of losing its control over other countries.[31]

This view of international regime formation places an emphasis upon the importance of the perceived relative standing of states in the international system. In other words, given the anarchical nature of international society,[32] a policy outcome should not be judged by the absolute gains that accrue from it, but, rather, the merit of the action can only be assessed by measuring the relative gains amassed *vis-a-vis* other states. Thus, these theorists agree with their 'benevolent-view' colleagues that when a single actor has sufficient power resources available to transform the arrangements in international society, then a regime may be formed. They disagree, however, in their view that not all members of international society will be better off in light of the new regime. Instead, the new arrangements will yield the highest net benefits for the hegemon, most probably at the expense of others. Nevertheless, all HST theorists contend that an examination of the entire

---

[29] Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990), pp. 42ff.

[30] Gilpin's works include: *U.S. Power and the Multinational Corporation: The Political Economy of Foreign Direct Investment* (New York: Basic Books, 1975); and *War and Change in World Politics* (Cambridge: Cambridge University Press, 1981); while Krasner's writings include 'State Power and the Structure of International Trade', *World Politics* (Vol. 28, No. 3, April 1976), pp. 317-47.

[31] Haas, *op. cit.*, in note 29, p. 42.

[32] Hedley Bull, *The Anarchical Society: A Study of Order in World Politics* (Basingstoke: Macmillan, 1977).

international system is necessary if the manner in which the composition of that same international system has been transformed by the hegemon is to be discovered. This tinkering, they continue, accounts for the formation of some international regimes.

While reviewing the various strands of thought about international regime formation, other writers have also identified HST as a prevalent tool of analysis. Oran Young, in a general tripartite classification of regime formation, identifies one sort as 'imposed regimes'. Such regimes, he argues,

> are fostered deliberately by dominant powers or consortia of dominant powers. ... In short, imposed regimes are established deliberately by dominant actors who succeed in getting others to conform to the requirements of these arrangements through some combination of coercion, cooperation, and the manipulation of incentives.[33]

The emphasis laid here upon the action by 'dominant actors' fits very closely with our description of HST.

Although its fashionableness may be fading, HST remains an important proposition in the general literature on regime formation.[34] Indeed, the theory proved to be irresistible to American policy-makers after the Second World War, because it suggested that strong 'policing' interventions by the United States in world affairs would be necessary if any sort of co-operation and order were to be achieved.[35] As a tool of analysis, furthermore, HST has a clear parsimonious appeal, for it encourages the analyst to look at the relative power capability of the dominant state in world politics and to speculate upon the chances for regime formation or preservation from there. As Young notes: 'For all its shortcomings, the hegemonic-stability hypothesis offered the attractions of a simple theory

---

[33] Young, *op. cit.*, in note 11, p. 88.

[34] The first part of the title of Keohane's 1984 book (Keohane, *op. cit.*, in note 23) might lead some to think that scholars should be considering other analytical tools. Regardless, the reference to hegemony effectively demonstrates that HST had, at least in 1984, an important position in academic study. The debate about the so-called end of American hegemony is, furthermore, far from being resolved. See, for example, Susan Strange, 'The Persistent Myth of Lost Hegemony', *International Organization* (Vol. 41, No. 4, Autumn 1987), pp. 551-74, for an alternative view.

[35] Grunberg exposes the ethnocentric appeal of the theory, showing how some scholars (particularly Kindleberger) have stressed the moralistic mission of the hegemon both to engage in self-sacrifice and to work for the benefit of the entire international community (Isabelle Grunberg, 'Exploring the "Myth" of Hegemonic Stability', *International Organization* (Vol. 44, No. 4, Autumn 1990), pp. 431-77).

emphasizing a single, master variable.'[36]

This attraction may have encouraged a few to support its tenets, for Young notes that some scholars 'have even suggested that the presence of a hegemon constitutes a necessary (though not sufficient) condition for success in regime formation'.[37] Even Keohane, who himself has undergone an intellectual transformation on this issue, recognises that the 'dominance of a single great power may contribute to order in world politics, in particular circumstances...'.[38] Puchala and Hopkins, furthermore, identify 'revolutionary change' as one of two sources of regime change.[39] In this instance, they argue that the dominant power(s) imposes a regime that has to accepted by the minor actors. They also maintain that power transition 'ushers in regime transformation; previously disadvantaged but newly powerful participants ascend to dominance and impose new norms favouring their own interests'.[40] They claim that this is the 'most frequent pattern of regime change'.[41] Arthur Stein also identifies the domination of the weak by the strong as a key determinant of regime formation.[42] Meanwhile, even Young, who is certainly no friend of the theory, notes that any criticisms laid upon HST do not

> exhaust the potential linkages between power and regime formation; it is not difficult to see opportunities to formulate a number of other propositions relating structural power or the distribution of such power to regime formation and to apply them to the realm of environmental concerns.[43]

There are also, however, a number of problems with the theory.

Keohane is one who subjects the theory to fairly rigorous testing to illuminate its empirical weaknesses.[44] The problems with HST, he argues, include

---

[36] Young, *op. cit.*, in note 11, p. 206.

[37] *Ibid.*, p. 200.

[38] Keohane, *op. cit.*, in note 23, p. 46.

[39] The other that they identify is 'evolutionary change', which I consider *infra.*, in note 116, and accompanying text (Puchala and Hopkins, *op. cit.*, in note 15, pp. 61-91).

[40] *Ibid.*, p. 66.

[41] *Ibid.*, p. 90.

[42] Arthur A. Stein, 'Coordination and Collaboration: Regimes in an Anarchic World', in Krasner (ed.), *op. cit.*, in note 1, p. 136.

[43] Oran R. Young, 'Global Environmental Change and International Governance', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 341.

[44] Keohane, *op. cit.*, in note 23, Chapters 8-10.

the fact that it cannot explain 'lags between changes in power structures and changes in international regimes'.[45] He also discovers that the theory does 'not account well for the differential durability of different institutions within a given issue-area',[46] and that it 'avoids addressing the question of why international regimes seem so much more extensive now in world politics than during earlier periods (such as the late 19th century) of supposed hegemonic leadership'.[47] Keohane further concludes that the 'empirical evidence for the general validity of hegemonic stability theory is weak'.[48] Young echoes this assertion after judging the theory's particular relevance for the sort of issue that this thesis examines: 'With respect to international environmental regimes, at least, this proposition [HST] has not held up well in the face of empirical testing.'[49] Indeed, many scholars question the real-world validity of the hypothesis. Ernst Haas, for one, wonders if 'states really calculate their participation in a regime on the basis of a concern for their overall rank in some international pecking order...'.[50]

Aside from its failures in the face of application, the theory is also attacked on theoretical grounds. Young questions the conclusions of HST:

> No doubt, the presence of a dominant player may give rise to an Olsonian privileged group. Also, the exertion of coercive pressure on the part of a particularly powerful actor or an effective ruling coalition will be critical to any effort to form imposed regimes or institutional arrangements. But there is nothing in the theoretical literature on bargaining to suggest that social contracts will come unglued in the absence of a dominant partner.[51]

In an oft-cited article, Duncan Snidal lays out one of the most comprehensive theoretical attacks upon HST. Using formal models, he comes to a conclusion that contradicts HST -- namely, that international regimes cannot only persist in the face of declining hegemony, but that they can even be strengthened. This, he argues,

---

[45] Robert O. Keohane, 'The Demand for International Regimes', in Krasner (ed.), *op. cit.*, in note 1, p. 142.

[46] *Ibid.*, p. 142.

[47] *Ibid.*, p. 142.

[48] Keohane, *op. cit.*, in note 23, p. 38.

[49] Young, *op. cit.*, in note 43, p. 341.

[50] Ernst B. Haas, 'Words Can Hurt You; or, Who Said What to Whom About Regimes', in Krasner (ed.), *op. cit.*, in note 1, p. 58.

[51] Although Young is referring to regime persistence explicitly, his comments are, nevertheless, pertinent (Young, *op. cit.*, in note 11, p. 203).

shows that hegemonic stability is only a special case of international co-operation.[52] In addition, Stein challenges the HST theorists' assertion that changes in the distribution of power will lead to regime change. He argues, instead, that more subtle factors are at work in international society.

> If interests intervene between structure and regimes, then only those structural changes that affect patterns of interest will affect regimes. Further, since other factors also affect interests, it may be that the impact of changing power distributions on actor preferences can be negated by other structural changes, such as those in technology.[53]

And although Keohane does not complement his rigorous empirical testing with an equally comprehensive theoretical analysis, he nevertheless maintains that the 'argument that hegemony is necessary for cooperation is both theoretically and empirically weak'.[54] The conclusion in light of such observations is, Young contends, that 'the hegemonic-stability hypothesis is dead'.[55] Although this declaration might be premature, it is clear that there are problems with at least parts of the theory.

Within global theories generally, there exists a second strand of thought, which, inspired by Marxist scholarship, has been often labelled 'dependency theory'.[56] Many of the writers working under this broad classification are united by the belief that

> there is a social whole that may be called a capitalist world-economy. [They] believe this capitalist world-economy came into existence a long time ago, probably in the sixteenth century, and that it had expanded historically from its European origins to cover the globe by the late nineteenth century. [They] believe it can be described as capitalist in that endless accumulation is its motor force. [They] believe that the appropriation by the world bourgeoisie of the surplus value created by the world's direct producers has involved not merely direct appropriation at the market place, but also

---

[52] Snidal, *op. cit.*, in note 23, pp. 597-612.

[53] Stein, *op. cit.*, in note 42, p. 138. We should recognise, nevertheless, that Stein also recognises the importance of the distribution of power in the international system (*ibid.*, p. 135).

[54] Keohane, *op. cit.*, in note 23, p. 38.

[55] Young, *op. cit.*, in note 11, p. 204.

[56] Brown uses this term to categorise a number of diverse writers, some of whom are noted *infra*, in notes 57-59 (Chris Brown, 'Development and Dependency', in Margot Light and A.J.R. Groom (eds.), *International Relations: A Handbook of Current Theory* (London: Frances Pinter, 1985), pp. 60-73).

unequal exchange, transferring surplus from peripheral to core zones.[57]

Although there are substantial differences among these scholars' work -- Andre Gunder Frank stresses the exploitation of the periphery by the core,[58] while Immanuel Wallerstein focuses upon the system (the 'capitalist world-economy') more generally[59] -- there is little doubt that they all place an emphasis upon power structures in international society. However, in contrast to the HST theorists, who focus upon the distribution of military power among states, these scholars argue that the distribution of economic power among classes should be the primary focus of any analysis. International regime formation, they maintain, can be explained by looking at the way in which the subjugators structure the capitalist world-economy so that they can advance their economic interests at the expense of the subjugated.[60]

In spite of the attention accorded the ideas of these scholars by other academic disciplines, their global theories do not receive as much attention as HST in the literature on international regime formation. Indeed, many scholars in their research typologies omit such concerns altogether.[61] Others, nevertheless, do take note. Peter Haas, for one, identifies the contributions of these scholars to the discussion. Identifying dependency theorists as members of the 'historical materialist' school, he summarises their major proposition:

> When effective interstate collaboration does occur, it is on the terms of the North, or serves to reproduce the systemic principles of world capitalism, which permits persistent outcomes to be determined according to the logic

---

[57] Samir Amin, Giovanni Arrighi, Andre Gunder Frank and Immanuel Wallerstein, *Dynamics of Global Crisis* (Basingstoke: Macmillan, 1982), p. 9.

[58] See, for example, Andre Gunder Frank, *Capitalism and Underdevelopment in Latin America: Historical Studies of Chile and Brazil*, Revised Edition (London: Monthly Review Press, 1969). See, also, Johan Galtung, 'A Structural Theory of Imperialism', *Journal of Peace Research* (Vol. 8, No. 2, 1971), pp. 81-117.

[59] See, for example, Immanuel Wallerstein, *The Capitalist World-Economy* (Cambridge: Cambridge University Press, 1979); and Immanuel Wallerstein, *The Politics of the World-Economy: The States, the Movements, and the Civilizations* (Cambridge: Cambridge University Press, 1984).

[60] In this manner, I am focusing upon those approaches that look at domination in the economic-sense. This approach has close links with ideas in the literature about domination in other senses. See Chapter 1.2.3 of this thesis (on 'individualistic' theories) for a further discussion.

[61] In one of the most-cited syntheses of the regime literature, this sort of analysis does not appear, explicitly, in the description of four types of regime scholarship (Stephan Haggard and Beth A. Simmons, 'Theories of International Regimes', *International Organization* (Vol. 41, No. 3, Summer 1987), pp. 491-517).

of the international division of labor.[62]

He continues:

> ... historical materialists argue that authoritative policy prescriptions will inherently embody northern preferences. Southern preferences will either be eliminated or disingenuously associated with northern preferences.[63]

International regime formation can therefore be explained 'in terms of the systemic control of powerful industrialized capitalist states over weaker ones'.[64] Young, in addition, identifies a similar group of scholars:

> Marxists and others who think in dialectic terms, for example, can be expected to approach the problem of regime transformation primarily in terms of the impact of internal contradictions. They will search for dialectic laws governing regime dynamics and emphasize the growth of antithetical forces leading to the collapse or breakdown of existing institutional arrangements.[65]

Thus, although this work is neglected in most mainstream considerations of international regimes, some scholars have noted its contributions.

Despite the fact that most of the discussion surrounding the validity the ideas of dependency theorists takes place outside of the confines of the debate on international regimes, their contributions may help to further our understanding of international regime formation. It is for this reason that their hypotheses are outlined here.

In this brief review, the ideas of various global theorists are presented. The scholars within this general classification, who are predominantly concerned with the Hegemonic Stability Theory, argue that the prospects for international regime formation are determined by the actions of the most powerful actor in international society. Although there are problems with this approach (some have been identified and more will be discussed in the subsequent analyses), the ideas of the global theorists do have something to contribute to our understanding of international regime formation. This is elaborated further in Chapter 1.3 of this thesis.

---

[62] Haas, *op. cit.*, in note 29, p. 48.

[63] *Ibid.*, p. 51.

[64] *Ibid.*, p. 64.

[65] Young, *op. cit.*, in note 11, p. 101.

### 1.2.2 -- State-Centred Theories

Second, there are a number of theories that focus upon the nation-state in order to explain international regime formation. Taken to the extreme, the theorists in this group would not deem it necessary to look at the way in which states interact in the international political system. Instead, they would simply identify the costs and benefits that would accrue to the state, contingent upon the course of policy that its leaders chose to follow. If a sufficient number of states found it in their interests to follow similar courses of action, then a regime may 'spontaneously' arise.[66] And, although most state-centred theorists make a point of acknowledging the presence of systemic constraints, it is clear that all of the theorists grouped together under this umbrella term have a rational, unitary state as the primary focus of their analysis.

In most discussions of state-centred approaches, the concept of game theory is eventually raised as an issue. Many theorists have used 'games', such as the Prisoner's Dilemma, in order to model collective action problems that face the members (most commonly, states) of international society.[67] Although some scholars separate the two concepts explicitly (Haggard and Simmons, for example, have distinguished between the 'game theoretic' and the 'functional' approaches[68]), they should be considered together. Any separation might be incorrectly predicated upon a perceived distinction between method and theory. Just as it was eventually recognised that behaviourial studies did not, in themselves, constitute a new theory in the field of international relations, but simply did present a new method for realism,[69] we should recognise that game theory is simply a formalisation of the state-centred theorists' theme. Because of their

---

[66] The terminology used is Oran Young's in *ibid.*, pp. 50-52. Keohane, meanwhile, would describe this situation as one of international 'harmony' (Keohane, *op. cit.*, in note 23, pp. 51ff).

[67] See, for example, Russell Hardin, *Collective Action* (Baltimore, MD: Johns Hopkins University Press, 1982). For a clear discussion of the use of games in international relations scholarship, see Michael Nicholson, *Formal Theories in International Relations* (Cambridge: Cambridge University Press, 1989).

[68] Haggard and Simmons, *op. cit.*, in note 61, pp. 504-09. 'Functionalism' is the term they use to refer to state-centred approaches. To be fair to Haggard and Simmons, however, they do acknowledge the close links between the two.

[69] See Michael Banks, 'The Inter-Paradigm Debate', in Light and Groom (eds.), *op. cit.*, in note 56, p. 11; and John Vasquez, *The Power of Power Politics: A Critique* (London: Frances Pinter, 1983), *passim*, especially Chapter 2.

common assumptions about international politics, the two approaches are considered together in this typology.

Joshua Goldstein and John Freeman note the major characteristics of the state-centred approach:

> Accepting most realist assumptions, this school attempts to show that it is possible to achieve cooperation even under conditions of anarchy. This school synthesizes two traditions in international relations theory, bringing together 'neorealism' and studies of 'international interdependence.' This synthesis has come to occupy a central place in American international relations research.[70]

Robert Axelrod, Robert Keohane and Kenneth Oye are often identified as three of the leading proponents of this approach in international relations.[71] Their work is rooted firmly in both rational choice analysis and game theoretic models.

Although inspired, and to some extent informed, by realist thinking, this approach's advocates do not assume that the world is doomed to the realists' zero-sum games. On the contrary, Keohane notes that 'rationalistic theory can be used to explore the conditions under which cooperation takes place, and it seeks to explain why international institutions are constructed by states'.[72] The analysis borrows many concepts from microeconomics and suggests that participants may form regimes in order to 'overcome the barriers to more efficient coordination identified by theories of market failure'.[73] In other words, states will form international regimes in order to reduce both information and transaction costs.[74] Oran Young summarises some of these ideas:

> Self-interested utility maximizers choose continuously among available alternatives in such a way as to maximize their own welfare without comparing their performance with that of others or even considering the implications of their own actions for others. It is easy enough to see why actors of this type will often accept the constraints associated with regimes

---

[70] Joshua S. Goldstein and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics* (London: University of Chicago Press, 1990), p. 11.

[71] See, for example, the contributions in Kenneth A. Oye (ed.), *Cooperation Under Anarchy* (Princeton, NJ: Princeton University Press, 1986).

[72] Robert O. Keohane, 'International Institutions: Two Approaches', *International Studies Quarterly* (Vol. 32, No. 4, December 1988), p. 381.

[73] Keohane, *op. cit.*, in note 45, p. 151.

[74] Haggard and Simmons, *op. cit.*, in note 61, p. 506. Furthermore, Grieco notes that state-centred scholars maintain that international regimes can 'reduce the attractiveness of cheating and thus are able to promote cooperation' (Grieco, *op. cit.*, in note 20, p. 9).

> or other social institutions on the basis of straightforward calculations of a utilitarian nature. ... They participate in regimes fundamentally as a means of maximizing net benefits for themselves. It follows that those whose behavior emanates from such calculations will feel no compunctions about violating institutional requirements, if and when they conclude that it is possible to increase their net benefits by doing so.[75]

Many writers have identified this approach as a distinctive contribution to thought on international regime formation. They have, however, done so under a variety of classifications: Young, for example, labels it as 'structural analysis';[76] while Grieco (using Keohane's term) calls it 'neoliberal institutionalism';[77] and Jonsson identifies its tools as 'situational models'.[78] Lang identifies a 'functional strain of regime theories';[79] whereas Peter Haas, in his discussion, adopts the 'cooperation under anarchy' terminology.[80] Additionally, as is the case with global theories, it should be acknowledged that the pedigree of this approach dates further back than the early 1980s. Writing in the late 1970s, Paul Taylor's description of 'adjustment theories' seems to parallel, at least somewhat, this general classification.

> Adjustment theories are concerned with the response of national governments to demands made upon them as a result of changes in their environment. Governments are continuously faced with the need to carry out new tasks, which may arise from political circumstances in the international system, or from technological change or other features of modernisation, or economic development, or from new demands made upon them by their own citizens. ... The essential point is that adjustment theories are about the ways in which existing governments cope with demands made upon them by working through international institutions and carrying through appropriate adjustments in their position. They do not see governments, or other levels of the state, as being fundamentally changed, and, accordingly they stress the range of inter-governmental arrangements

---

[75] Young, *op. cit.*, in note 11, pp. 210-11.

[76] Young, *op. cit.*, in note 43, p. 340.

[77] Grieco, *op. cit.*, in note 20. See, also, Keohane, *op. cit.*, in note 10.

[78] Jonsson notes that: 'According to this perspective, decisions by governments to create, maintain or change regimes are not determined solely by existing power structures but constitute conscious choices in dilemma-like situations.' (Christer Jonsson, *International Aviation and the Politics of Regime Change* (London: Frances Pinter, 1987), p. 158.)

[79] Laszlo Lang, *International Regimes and the Political Economy of East-West Regimes* (New York: Institute for East-West Security Studies, 1989), p. 10. As noted above, Haggard and Simmons use a similar term (Haggard and Simmons, *op. cit.*, in note 61).

[80] While placing it firmly within the realist and neorealist camp, he labels them as the 'cooperation under anarchy' school (Haas, *op. cit.*, in note 29, pp. 44ff).

> in international organisation. *Governments are seen as the dominant actors, using international organisation to the extent that it serves their interests in the context of a changing environment.*[81]

The ancestry of this approach is, thus, significant.

In light of the perceived decline of American hegemony during the 1970s and 1980s,[82] the attraction of state-centred theories increased significantly. Indeed, this approach was thought to be the most appropriate, for many scholars saw the international system developing into a multipolar world, which could be modelled as a game with a greater number of players of increasingly equal strength. Goldstein and Freeman, however, identify an even more pressing impetus:

> The anarchic nature of international relations is very troubling to these theorists because the prospect of a continuing free for all in the nuclear age is so undesirable. Thus these international relations theorists are quite interested in formal models that propose possible resolutions of such a dilemma.[83]

Not surprisingly, the ideas have come under much scrutiny, and thus, various strengths and weaknesses associated with state-centred approaches have been identified.

Focusing specifically upon game theory, Robert Jervis notes the inherent strengths of this tool of analysis:

> [I]t builds upon central characteristics of international politics -- anarchy, the security dilemma, and the combination of common and conflicting interests. ... the approach is parsimonious and lends itself to deductive thinking. ... it seeks to bring together the study of conflict and the study of cooperation, and tries to explain a wide range of phenomena encompassing both security and political economy.[84]

Furthermore, Keohane maintains that these

> models, especially Prisoner's Dilemma, draw our attention to ways in which barriers to information and communication in world politics can impede

---

[81] Paul Taylor, 'A Conceptual Typology of International Organisation', in Paul Taylor and A.J.R. Groom (eds.), *International Organisation: A Conceptual Approach* (London: Frances Pinter, 1978), pp. 119-20. Emphasis added.

[82] *Op. cit.*, in note 34.

[83] Goldstein and Freeman, *op. cit.*, in note 70, p. 11.

[84] Robert Jervis, 'Realism, Game Theory, and Cooperation', *World Politics* (Vol. 40, No. 3, April 1988), p. 319.

cooperation and create discord even when common interests exist.[85]

By illuminating counter-intuitive findings, the theory of games may be able to provide a framework for both discussion and analysis of various international collective action problems. The main insight developed by such approaches is that equilibrium outcomes in nonco-operative games may be sub-optimal; or, in less technical language, rational actions may not necessarily produce the most favourable outcome for society as a whole. In this way, state-centred theorists in general, and game theorists in particular, attempt to formalise the traditional dilemma of collective action.

Despite their concentration upon dilemmas of collective action, however, these theorists, as mentioned above, do not claim that international society is condemned to sub-optimal outcomes. Indeed, another perceived strength of the state-centred approach is that the models can identify factors that encourage co-operation.[86] First, the 'mutuality of interest'[87] can be a key determinant. States will engage in co-operative actions if it is in their rational self-interest to do so. By examining how the payoff matrices are calculated, analysts and policy-makers may be able to discern how these values might be changed, so that regime formation can be fostered.[88]

A second valuable insight is that the 'shadow of the future' is a very important determinant of co-operation. As Oran Young notes: 'Parties expecting to engage in a long running relationship are apt to find that the shadow of the future exerts considerable pressure on them to behave co-operatively at the outset.'[89] Robert Axelrod, in his book *The Evolution of Cooperation*, makes this point, while supporting his argument with both empirical case-studies and an analysis of an innovative computer tournament.[90] Again, quoting Young:

---

[85] Keohane, *op. cit.*, in note 23, p. 69.

[86] Kenneth A. Oye, 'Explaining Cooperation Under Anarchy: Hypotheses and Strategies', in Oye (ed.), *op. cit.*, in note 71, pp. 1-24.

[87] Robert Axelrod and Robert O. Keohane, 'Achieving Cooperation Under Anarchy: Strategies and Institutions', in Oye (ed.), *op. cit.*, in note 71, p. 227.

[88] Robert Axelrod, for one, has attempted this. See his 'Conflict of Interest: An Axiomatic Approach', *Journal of Conflict Resolution* (Vol. 11, No. 1, March 1967), pp. 87-99, where he explicitly examines the calculation of the payoff matrices.

[89] Young, *op. cit.*, in note 43, pp. 340-41.

[90] Robert M. Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984).

> [Axelrod's work] demonstrates that purely self-interested actors may develop effective rules or social conventions through an interactive learning process involving trial and error coupled with a kind of behavioral natural selection, so long as they expect to interact with each other repeatedly and employ relatively low discount rates in computing the present value of future benefits.[91]

Axelrod and Keohane, furthermore, emphasise the importance of anticipated future interactions. They argue that a norm of reciprocity, which can help lay the foundation for the formation of an international regime, is more likely to develop if three conditions are satisfied: '(1) players can identify defectors; (2) they are able to focus retaliation on defectors; and (3) they have sufficient long-run incentives to punish defectors'.[92] Although these ideas, concentrating upon interaction among states, suggest a global focus, the primary concentration remains upon the 'free' choice of the state in view of the perceived costs and benefits of action.

Third, state-centred analyses highlight the significance of the number of players -- that is, the number of states -- involved in the particular issue. Reporting upon findings made famous by Mancur Olson,[93] Peter Haas notes that a 'smaller number of actors facilitates surveillance, and hence improves the likelihood of further cooperation'.[94] Similarly, Young states that the 'number of participants is important, it is argued, because the transaction costs of reaching agreement on the content of specific provisions rise steeply as the size of the group increases'.[95] Oye supports Olson's conclusions that the larger the number of participants, the harder it will be to build a regime.[96] Taken together, therefore, it is not surprising to find that a number of international relations scholars have recognised the importance of state-centred approaches. In addition to the insights that these theories can provide in the study of regime formation, however, there are also a number of problems with both game theory in particular and the entire approach more generally.

First, the required-by-definition focus upon the state gives rise to a number

---

[91] Young, *op. cit.*, in note 11, p. 202.

[92] Axelrod and Keohane, *op. cit.*, in note 87, p. 235.

[93] Olson, *op. cit.*, in note 27.

[94] Haas, *op. cit.*, in note 29, p. 45.

[95] Young, *op. cit.*, in note 11, p. 340.

[96] Oye, *op. cit.*, in note 86.

of difficulties, because the assumption that the nation-state is the most important actor in the international system is increasingly coming under attack by, among others, those who take a more pluralistic view of international society. These critics claim that state-centred theorists do not, consciously, acknowledge the important role that other transnational actors and coalitions (for example, transnational corporations) play in international society.[97] Another attack from a different direction, furthermore, is launched by some global theorists. By treating all states similarly, they argue that state-centred theorists 'assume too easily that actors' decisions are in some meaningful sense voluntary, thus running the risk of ignoring inequalities of power among actors'.[98] In short, a state-centred analysis may not be appropriate in some international predicaments.[99]

Regardless, however, of which actor is chosen to 'play the game', difficulties will be encountered when attempts are made to operationalise the theory by constructing the model. The first problem regards deciding what the game is -- not only deciding upon the form of the game, but also placing a value upon the payoffs. One must wonder whether a state's leaders, in a real-world situation, are ever faced with a clear pair of alternatives ('co-operate' or 'defect') or even some sort of continuum of choices. Thus, identifying the dominant policy options may be a demanding task. Additionally, given the difficulty of assigning ordinal numbers to the boxes (that is, ranking preferences), it is that much more difficult if one has to establish cardinal values (that is, ranking preferences and intensities) for the outcomes. Further, when game theorists build their payoff matrices, sceptics claim that they often overlook many elements that should be included in the payoffs -- for example, ideologies, beliefs and other intangible factors -- simply because they are difficult to quantify. Therefore, the absence of these factors, which such critics argue are integral to the decision-making process, seriously weakens the method. Keohane, for one, accepts this criticism by recognising that the conclusions of

---

[97] This weakness will be further explored in the examination of the 'individualist' theories in Chapter 1.2.3 of this thesis.

[98] Keohane, *op. cit.*, in note 23, p. 70. Some state-centred theorists who can also be labelled 'modified structuralists' (this is Krasner's terminology (Krasner, *op. cit.*, in note 5)) do acknowledge this point, for they argue that 'regimes cannot be relevant for zero-sum situations in which states act to maximize the difference between their utilities and those of others' (*ibid.*, p. 8).

[99] Jervis makes a similar argument (Jervis, *op. cit.*, in note 84, p. 334). Keohane also recognises that actors' choices 'will be constrained in such a way that the preferences of the most powerful actors will be accorded the greatest weight' (Keohane, *op. cit.*, in note 23, p. 71).

rationalistic analyses depend upon the model chosen. He also admits that the choice of model necessarily depends upon contextual factors -- such as history -- which do not enter the state-centred theorists' considerations.[100]

Perceptions and misperceptions are also very important in the decision-making process, because the way in which information is received and processed will affect how the dilemma is interpreted and understood.[101] In this way, different states' leaders may represent the same situation by different payoffs, or even different games. Therefore, the fact that state-centred theorists use a single matrix means that they may not be able to represent the predicament fully.

Such differences may not only be found between states, but they may also be found within states. As advocates of bureaucratic politics argue, different factions within society may view an issue differently -- depending upon where they sit.[102] Thus, it is wrong to assume that the 'national interest' is somehow 'given', for an examination of the various competing interests on the domestic scene will be a key part of the calculation of 'national interest'. Additionally, the roles of routines, habits and traditions should not be overlooked, because they are often influential in dictating the decision-paths that states choose to follow.[103] The 'rationality' of the entire process is thus placed in doubt.

Further, the entire state-centred approach tends to be static, while, in reality, the international system is quite dynamic. Not only will preferences change as consensual knowledge grows and as actors learn, but the individuals who occupy the important decision-making positions may be replaced over time and these transformations may affect the state's priorities. Peter Haas notes that because 'many neorealist authors use game-theoretic techniques in their analysis, they are unlikely to consider the possibility of learning that recognizes and transcends the limitations of the game being played'.[104] Indeed, the payoffs may shift to such an extent that the nature of the game may fundamentally change -- for example,

---

[100] Keohane, *op. cit.*, in note 72, p. 388.

[101] Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976).

[102] Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston, MA: Little, Brown, and Company, 1971).

[103] See, for example, James Rosenau, 'Before Cooperation: Hegemons, Regimes, and Habit-Driven Actors in World Politics', *International Organization* (Vol. 40, No. 4, Autumn 1986), pp. 849-94.

[104] Haas, *op. cit.*, in note 29, p. 61.

a Prisoner's Dilemma game may become a Chicken game.

Another problem with the state-centred theorists' approach is that it assumes that states choose independently, ignorant of their opponent's choices. This can be questioned, because technological improvements in remote sensing and the greater importance attached to verification means that actors now have a greater understanding of the actions of others.[105]

In addition, these theories, particularly those that use games, assume that all actors are egoistic -- that is, that 'the desire [is] to maximize one's own utility function where that function does not include the utility of another party'.[106] This can be challenged, because it may be 'rational' for a state to have its utility function dependent upon the utility of other states.[107] Indeed, the state's leaders may behave out of some feeling of altruism or indeed feel some sort of moral obligation or shared ethical standards -- such conditions are not accommodated by some forms of game theory.

Finally, each game must be placed within the context of a larger game -- namely, all of the activities in the international system. Many issues are linked to others, and therefore cannot be examined in complete isolation. In this way, a variety of games -- that may be compatible or incompatible -- must be considered.[108] The fact that many game theorists fail to do so substantially weakens their analysis.

Moving from the theoretical to the empirical, a number of authors question the explanatory ability of state-centred approaches. More specifically, and more importantly for the purposes of this study, scholars note that these analytical tools may have more to say about regime maintenance than about regime formation. Even Keohane, who is one of the approach's major articulators and proponents, recognises that the theory has not been used much to explain the creation of

---

[105] See the work by Nigel Howard on 'metagames' for an attempt to address this weakness -- for example, *Paradoxes of Rationality: Theory of Metagames and Political Behavior* (London: MIT Press, 1971).

[106] Krasner, *op. cit.*, in note 5, p. 11.

[107] Keohane makes the important distinction between 'rationality' and 'egoism' (Keohane, *op. cit.*, in note 23, p. 70).

[108] I pursue this idea in Chapter 5.2 of this thesis.

institutions.[109] Young reiterates this observation by noting that: 'While the logic behind each of these propositions is straightforward, an initial assessment of the evidence regarding the formation of environmental regimes raises significant questions about their explanatory power.'[110] He further contends that: 'When we turn to the actual processes through which institutions emerge ... confusion abounds.'[111] The approach is thus not only questioned on theoretical grounds, but it also encounters problems in the face of empirical testing.

In this section, the central propositions of the scholars who make up the 'state-centred' approach to the study of international regime formation are presented. A focus upon the state as a rational, unitary actor is required, they maintain, in order to understand why international regimes are created. An analysis of the perceived costs and benefits will indicate, they continue, why and when particular states might be able to form regimes at the international level. The liberal use of formal methods -- in particular, game theory -- is a characteristic that is unique to this approach. Notwithstanding the fact that there are problems with both the theoretical assumptions and the methodological tools of these theorists, their emphasis upon state action brings to light a number of important insights that relate to our investigation. For this reason, an analysis of state-centred approaches should be undertaken to discern what contribution they can make to further our understanding of international regime formation. This issue is pursued at greater length in Chapter 1.3 of this thesis.

### 1.2.3 -- Individualistic Theories

Some theorists direct attention to the most disaggregated unit of analysis in international relations -- namely, the human being -- in order to explain international regime formation. Although these writers do not focus upon the individual to the exclusion of other 'levels', it is clear that their primary concerns are to do with the processes that go on within the minds of certain human beings. An examination of individuals' cognitive factors, they argue, is the most important consideration in

---

[109] Keohane, *op. cit.*, in note 72, p. 387. Keohane's use of the term 'institution' is sufficiently similar to our term 'regime' so as to make the comparison valid.

[110] Young, *op. cit.*, in note 43, p. 341.

[111] Young, *op. cit.*, in note 11, p. 200.

the study of international regime formation. Using the phrase 'individualistic theorists' as an umbrella term to include all of those scholars who emphasise the roles of learning, perception and other such factors in the formation of international regimes, their work constitutes a third distinct strand of thought in the literature on international regimes.

Peter Haas, one of the foremost individualistic theorists, argues that:

> Writers from this tradition look at policymaking in terms of such nonsystemic variables and actors as ideas, knowledge, beliefs, experts, and scientists. Arguing that structural analysis alone overpredicts interstate conflict and underpredicts cooperation, such writers rely on insights from organization theory, policy sciences, social psychology, the philosophy and history of science, the sociology of knowledge, and international relations to explain the choice of state ends to which resources will be deployed and the preconditions for and forms of international cooperation.[112]

Indeed, many scholars, while constructing their respective typologies of the regime literature, identify this as a unique grouping. It is not surprising, however, to find that they employ a variety of different labels to do so.

Haggard and Simmons, for example, identify 'cognitive approaches' as one of four branches in the literature. They argue that by focusing on 'the intersubjective meaning structures that bind actors together, [cognitivist theorists] necessarily see a looser fit between structural constraints, interests, and choices'.[113] Jonsson uses the same label to identify this group of scholars. Mixing individualistic and global ideas, he summarises their arguments as follows: 'Changes in the power structure and the emergence of bargaining situations, *as perceived by the principal actors*, explain the evolution of international regimes.'[114] Similarly, Goldstein and Freeman offer 'psychological models' as one of their three general classifications. They note that some scholars attempt to fill in the game-theorists' black-box by looking at the motivations, cognitive abilities and perceptions of the players in the game.[115] Additionally, while identifying two types of regime change, Puchala and Hopkins note that there may be an evolutionary change -- that is, regimes

---

[112] Haas, *op. cit.*, in note 29, p. 52.

[113] Haggard and Simmons, *op. cit.*, in note 61, p. 499.

[114] Jonsson, *op. cit.*, in note 78, p. 24. Emphasis in original.

[115] Goldstein and Freeman, *op. cit.*, in note 70, p. 14-22.

> may change qualitatively because those who participate in them change their minds about interests and aims, usually because of changes in information available to elites or new knowledge otherwise attained. ... Such change, undisturbing to the power structure and within the regime's 'rules of the game,' is rather exceptional and characteristic mainly of functionally specific regimes.[116]

Young, furthermore, identifies a group of scholars who harbour the view that regimes can 'only come into existence in the presence of widely shared visions of the problems at stake and the appropriate solutions'.[117] He goes on to argue that this 'way of thinking suggests the importance of hegemony in the Gramscian, in contrast to the material, sense in accounting for successes and failures in efforts to form international regimes'.[118] Additionally, in a bipartite division of the study of international institutions, one of Keohane's categories can be considered to be a grouping of individualistic theories. Referring to it as a sociological approach and formally labelling the adherents as 'reflective writers', he notes that this type of analysis 'stresses the role of impersonal social forces as well as the impact of cultural practices, norms, and values that are not derived from calculations of interests'.[119] Within this camp, he directly identifies Hayward Alker, Richard Ashley, Friedrich Kratochwil and John Ruggie,[120] and indirectly identifies Karl Deutsch and Ernst Haas.[121]

And although, once again, one might think that the individualistic theorists' ideas originated when American scholars demonstrated a rush of academic interest in regimes during the 1980s, such thinking can be traced back much earlier in the

---

[116] Puchala and Hopkins, *op. cit.*, in note 15, pp. 65-66. Their other type of regime change -- revolutionary -- is noted *op. cit.*, in note 39, and accompanying text.

[117] Young, *op. cit.*, in note 43, p. 341.

[118] *Ibid.*, p. 341. This is, obviously, related to our previous consideration of Marxist thought on the subject (which is classified in this work as a 'global' theory). When hegemony is discussed in terms of ideas (instead of economics), however, the arguments can be classified as 'individualistic'. (Robert Cox, for example, notes that 'the language of consensus is a language of common interest expressed in universalist terms, though the structure of power underlying it is skewed in favor of dominant groups' (Robert W. Cox, 'Labor and Hegemony, *International Organization* (Vol. 31, No. 3, Summer 1977). See, also, Robert W. Cox, 'Gramsci, Hegemony and International Relations: An Essay in Method', *Millennium: Journal of International Studies* (Vol. 12, No. 2, Summer 1983), pp. 162-75, where he notes the importance of the ways in which international organisations universalise the norms supported by the leaders of the dominant state.)

[119] Keohane, *op. cit.*, in note 72, p. 381.

[120] *Ibid.*, p. 381.

[121] *Ibid.*, p. 391.

international relations literature. Taylor, for example, labels one strand of the literature on international co-operation as 'integration theories'. These approaches 'describe and explain a qualitative change in the context of decision-making: integration theories are about a fundamental change which is expected to be persistent at one or more of four levels of the state'.[122] Among them are ideas about security communities,[123] functionalism and neo-functionalism,[124] and transnationalism.[125] Although these do not include learning in their analyses as explicitly as more recent work, they do direct scholars to look at the role of individuals' actions in regime formation.[126]

Indeed, this is perhaps one of the major contributions of individualistic theorists. By claiming that the analysis of international regimes should not be obsessed with the state (either on its own [state-centred theories] or in combination, thereby defining structure [HST-global theories]), these scholars have

---

[122] Taylor, *op. cit.*, in note 81, p. 126.

[123] This concept is attributed to Karl W. Deutsch. We should recognise that Deutsch also had his own explicit theories about organisational learning. See, for example, his *The Nerves of Government: Models of Political Communication and Control* (New York: The Free Press, 1966).

[124] David Mitrany is considered to be the 'founder' of the functionalist school of thought, while Ernst Haas and Leon Lindberg elaborated the idea of 'neo-functionalism'. For an excellent review of these ideas, along with further references, see Jeppe Tranholm-Mikkelsen, 'Neo-functionalism: Obstinate or Obsolete? A Reappraisal in the Light of the New Dynamism of the EC', *Millennium: Journal of International Studies* (Vol. 20, No. 1, Spring 1991), pp. 1-22.

[125] See, for example, Robert O. Keohane and Joseph S. Nye (eds.), *Transnational Relations and World Politics* (Cambridge, MA: Harvard University Press, 1972).

[126] It should be noted for the sake of completeness that Taylor, in his typology, includes a third category, which he calls 'constitutional theories'. However, because these theories are primarily prescriptive, they are not included in my survey (Taylor, *op. cit.*, in note 81, pp. 131-33). Additionally, at this point, let us consider a classification of Oran Young's ideas. Although some writers' ideas lend themselves very nicely to pigeon-holing (for example, Waltz, Keohane and E. Haas are clearly global, state-centred and individualistic theorists, respectively), Young, in much of his work, summarises various views and, in his own way, argues for a multilevel approach to the study of international regime formation. Nevertheless, it would seem that Young is an 'interest-based' scholar (this is his own categorisation from Young, *op. cit.*, in note 43, p. 341), for he says that from this perspective:

> the essential concern is to overcome the collective-action problems associated with all processes of interactive decision-making. Specific factors highlighted by this stream of analysis include: the extent to which negotiations lend themselves to integrative bargaining, the thickness of the veil of uncertainty, the impact of exogenous shocks or crises and the role of leadership in overcoming the collective-action problems plaguing efforts to form international institutions.

Because of the importance that he places upon these elements in his own work, it seems proper to consider him as an individualistic theorist, while, nevertheless, bearing in mind his multi-dimensional approach to the general question.

highlighted the importance of non-state actors -- be they epistemic communities, political elites or pressure groups -- that are made up of individuals acting across national boundaries. With greater global interdependence, a broadening of the analysis to include such players is surely welcome.

Individualistic theorists also encourage the analyst to consider domestic politics as one of the determinants of international politics. Citing this as one of the most important reasons for their explicit endorsement of cognitive approaches, Haggard and Simmons maintain that it is vital to direct attention to domestic political processes, which, they argue, have been ignored in the past. Owing to greater global interdependence, they continue, 'groups at the domestic level increasingly have "regime interests"'.[127] Although the individualistic theorists have much more work to do as they examine the impact of domestic processes, Keohane's claim that they have overlooked domestic politics seems rather unfair.[128] Indeed, it appears that they have done more to permeate the realists' billiard-ball -- the dominant image in the international relations literature for much of the post-Second World War period -- than the members of any other approach.

A third strength of this approach is that its theories are dynamic. Recognising one of the weaknesses of his own preferred methodology, Keohane notes how the reflective writers have properly included an endogenous dynamic, which Alker calls 'historicity' and E. Haas calls 'learning'.[129] This addresses one of the major problems with the rationalistic, or state-centred, approach -- namely, that preferences are assumed to be fixed. With the accelerating rates of development in science and technology, an approach that is better able to handle changes in social institutions is most welcome.

The potential contribution of such approaches is recognised by scholars who are not necessarily identified with this particular strand of thinking. Arthur Stein, for example, notes that changes 'in the nature of human understanding

---

[127] Haggard and Simmons, *op. cit.*, in note 61, p. 517.

[128] Although Keohane's assertion that an analysis of domestic politics 'could lead to a fruitful reexamination of shifts in preferences that emerge from complex interactions between the operation of international institutions and the processes of domestic politics' (Keohane, *op. cit.*, in note 72, pp. 392-93) is welcome, his suggestion that both rationalistic and reflectivist writers are equally guilty of neglecting domestic politics overlooks the contribution that some reflective scholars have already made in this respect.

[129] *Ibid.*, p. 390.

about how the world works, knowledge, can also transform state interests and therefore the prospects for international cooperation and regime formation'.[130] Even Stephen Krasner (although still defending the validity of his preferred global theories) accepts that the individualist theorists may have a contribution to make:

> Knowledge alone is never enough to explain either the creation or the functioning of a regime. Interests and power cannot be banished. But knowledge and understanding can affect regimes. If regimes matter, then cognitive understanding can matter as well.[131]

In general, it seems that this is, at present, the most 'fashionable' of the three approaches identified in this chapter.

This popularity has, inevitably, led these scholars' ideas to be placed under greater scrutiny. Such an examination prompts one commentator to suggest that the approach has, at this stage, more to say about the weaknesses of other methods than the strengths of its own particular ideas:

> Reflective approaches are less well specified as theories: their advocates have been more adept at pointing out what is omitted in rationalistic theory than in developing theories of their own with a prior content. Supporters of this research program need to develop testable theories, and to be explicit about their scope.[132]

More recently, Young suggests that the argument about epistemic communities 'requires further elaboration and may not stand up in its strongest form...'.[133] Greater critical analysis will presumably take place as the concepts of this group's adherents are further developed and elaborated.

The main ideas put forth by scholars of the individualistic approach are outlined in this section. Because of the vagueness of their theoretical propositions at this point, it is difficult to identify exactly what their requirements for international regime formation are. Nevertheless, these scholars' emphasis upon learning directs the analysis towards the manner in which individuals receive, process, interpret and adapt to new information. Their arguments further suggest that similarities in cognitive processes among key decision-makers will encourage the formation of

---

[130] Stein, *op. cit.*, in note 42, p. 136.

[131] Stephen D. Krasner, 'Regimes and the Limits of Realism: Regimes as Autonomous Variables', in Krasner (ed.), *op. cit.*, in note 1, p. 368.

[132] Keohane, *op. cit.*, in note 72, p. 393.

[133] Young, *op. cit.*, in note 43, p. 341.

international regimes. Despite the present vagueness of some of the ideas of the individualistic scholars, their central hypothesis can contribute to an overall understanding of international regime formation. For this reason, the ideas of these theorists are explored further in Chapter 1.3 of this thesis.

### 1.3 -- The Framework for Analysis

For each of the approaches to the study of international regime formation, the reviews are mixed. The question remains: Which of them should be used to investigate the historical records of the politics of both ozone layer depletion and global warming? The preceding analysis suggests that an unwavering commitment to any one of the three approaches could constrain our analysis and interpretations, thereby impeding our ability to gain the fullest picture possible. At the same time, however, the assessment also reveals that each of the approaches seems to capture at least one important aspect of the process of international regime formation. The merits and faults of each approach, therefore, encourage us to attempt to draw upon the strengths of each, while rejecting (or, ideally, redressing) its weaknesses. To this end, a model of international regime formation is presented in this section. It will then be used to study the politics of ozone layer depletion and global warming in the subsequent chapters of this thesis.

There have been previous attempts by international relations writers to make use of more than one theory of international regime formation. Christer Jonsson, for one, explicitly uses a number of established theoretical ideas in his study of the creation, change and maintenance of the international aviation regime. 'Rather than relying on any one model, [Jonsson probes] the ability of several models to account for the observed regime dynamics.'[134] Although his different models have varying degrees of explanatory power, and although no single one is a panacea, each contributes to a better understanding of at least part of the whole story.[135] As Jonsson admits, the inspiration for this approach includes the comments of Keohane and Nye, who suggested 10 years earlier that:

> It would not be wise to develop a single amalgamated model; but under different conditions, different combinations of the models will provide the

---

[134] Jonsson, *op. cit.*, in note 78, p. 152.

[135] *Ibid.*, p. 158.

> best explanations of international regime change and political outcomes.[136]

Young puts forth similar ideas. When discussing the various models of regimes (specifically, Krasner's groupings of conventional structuralists, modified structuralists and Grotians[137]), he argues that each approach has something to offer.

> Like competing models in other fields of inquiry (for example, the wave and particle theories of light), each captures some important features of reality but none offers a satisfactory account of the full range of observable phenomena.[138]

Therefore, the precedence of using more than one approach is, in this way, well established.

Although inspired by such past efforts, the approach that I take in this work is significantly different from these other inquiries. The way in which most scholars have attempted to make use of more than one approach is outlined by Jonsson:

> [P]olitical scientists, like dentists, need both a variety of tools and the discrimination to know which to use at the right time. While the contribution of this study has primarily been in adding to the multitude of tools, we are still a long way from understanding fully the conditions under which the different tools are most helpful.[139]

Remaining with Jonsson's dental analogy for the moment, it is evident that he imagines a variety of tools lying upon a table (building upon the ideas of Keohane and Nye,[140] he identifies four in his book),[141] from which it is little more than inspired guesswork to tell which will be the most appropriate for the patient under examination (that is, the question of regime creation, change and maintenance). In this study, alternatively, I propose that each of the various tools should always be used to help explain why international regimes form in some issue-areas, but not in other issue-areas. While I accept the assertion that the different tools will be used to varying degrees, I reject the proposition that only certain tools can be used

---

[136] Keohane and Nye, *op. cit.*, in note 9, p. 59.

[137] Krasner, *op. cit.*, in note 5.

[138] Young, *op. cit.*, in note 11, p. 213.

[139] Jonsson, *op. cit.*, in note 78, p. 165.

[140] Keohane and Nye, *op. cit.*, in note 9.

[141] Jonsson, *op. cit.*, in note 78.

in particular instances. Thus, instead of attempting to spell out the conditions under which one or the other tool should be used, I attempt to incorporate them into one theoretical framework.[142] Accordingly, in order to describe fully the framework for analysis that is employed in this thesis, I will examine, in turn, both the form and the substance of the proposition.

To outline the methodological form, let us move, metaphorically, from Jonsson's dentist office to the scientist's research laboratory, so that I may offer a simple chemistry analogy. The theoretical proposition about international regime formation, from which this thesis proceeds, is notationally presented as follows:

$$A + B + C \xrightarrow{k} D \qquad (1)$$

$$k \propto [E]\,[F]\,[G]\,[H] \qquad (2)$$

Although this schema may appear to have more to tell a student of chemistry than a student of international relations, it does, nevertheless, present a theoretical framework for the study of international regime formation. An explanation of the symbolic notation goes some way towards clarifying the assertion.

The first statement (1) simply asserts that if A and B and C are present in combination, then they will fuse to form D. In this way, A, B and C can be considered to be preconditions for the formation of D. The rate at which D will be formed will be determined by the rate constant k, which, in turn, is described in the second statement (2). This relationship tells us that the value of k is directly proportional to the product of the concentrations of E, F, G and H. In this way, E, F, G and H can be considered to be catalysts for formation of D. The explanation, of course, remains incomplete as long as the representational letters continue to be undefined.

As this suggests, the next task is to identify the individual components that make up the hypothesis -- in other words, to specify the substance of this

---

[142] Other scholars have used ideas from more than one approach. Aggarwal, for example, supplements his global explanations for regime change in the international politics of the textile trade with 'a consideration of domestic politics, transnational coalitions, and bureaucratic struggles' (Aggarwal, *op. cit.*, in note 2, p. 14). See, also, in this respect, M.J. Peterson, *Managing the Frozen South: The Creation and Evolution of the Antarctic Treaty System* (London: University of California Press, 1988), p. 9. For the most part, however, it remains that 'little thought has been given so far to integrating ... different approaches' (Volker Rittberger and Michael Zurn, 'Regime Theory: Findings from the Study of "East-West Regimes"', *Cooperation and Conflict* (Vol. 26, No. 4, 1991), p. 167).

proposition. The proposed preconditions and catalysts for this reaction are inspired by the analysis of the three strands of thought on international regime formation that are described and scrutinised in Chapter 1.2 of this thesis. Working upon the assumption that the strengths of each approach should be culled and collected, each of the three has inspired, at least indirectly and often directly, at least one factor (either a precondition or a catalyst) for international regime formation. At this point, the various factors are simply presented, and no effort is made either to describe them more fully or to locate them within the broader theoretical heritage from which they originate. Each of these tasks is performed in the subsequent chapters of this thesis, where the individual factors are examined more closely. Thus, for now, it is sufficient to note the seven factors, which are outlined in Table 1.1, and the composite model, which is presented notationally in Figure 1.1.[143] These seven factors thus form the foundation for this investigation into the politics of ozone layer depletion and global warming.

TABLE 1.1 -- *Components of a Theoretical Framework for the Analysis of International Regime Formation.*

| Approach | Precondition | Catalyst | Product |
|---|---|---|---|
| Global | Global Equity | S of the BIPS<br>EPGs | |
| State-centred | Tolerable Domestic Economic Costs | | INTER-<br>NATIONAL |
| Individ-ualistic | Scientific Consensus | Pol. Entrepre.<br>EPGs<br>Mob. of Publ. Opin. | REGIME |

Note: S of the BIPS = Solidity of the Broader International Political System
EPGs = Environmental Pressure Groups
Pol. Entrepre. = Political Entrepreneurs
Mob. of Publ. Opin. = Mobilisation of Public Opinion

[143] There is at least one fault with the analogy that is made. In the reaction that I am proposing, substances A, B and C will remain after the reaction has taken place -- that is, after D has formed. Therefore, for completeness, these substances should also be presented on the right-hand side of the equation. Leaving them off, however, although technically incorrect, improves the descriptive power of the analytical tool while not misrepresenting the substance of the argument.

FIGURE 1.1 -- *Statement of a Theoretical Framework for the Analysis of International Regime Formation.*

Scientific Consensus + Tolerable Domestic Economic Costs +
Global Equity —k—> International Regime

k o< [Political Entrepreneurs] [Solidity of the International Political System]
[Environmental Pressure Groups] [Mobilisation of Public Opinion]

Thus, a tight framework is being advanced here: if the three preconditions are satisfied, then an international regime will form; further, if any of the four catalysts are present, then the rate at which an international regime is formed will be accelerated. There are, nevertheless, a number of problems with this approach. First, a sample size of two issues (ozone layer depletion and global warming) is rather small, and in no way statistically significant. Second, the exclusive focus upon seven variables means that we cannot be certain of the causal link between the claimed cause and effect. Finally, the sheer parsimony of this approach may well repulse some scholars. Young, for example, maintains that:

> there are no necessary conditions for change in international regimes ... any of a variety of factors may be sufficient to precipitate major changes in prevailing social institutions in real-world situations. This may seem frustrating to those seeking to construct a parsimonious theory of stability and change in international regimes.[144]

Additionally, Keohane argues that:

> This suggests that no general theory of international politics may be feasible. It makes sense to seek to develop cumulative verifiable knowledge, but we must understand that we can aspire only to formulate conditional, context-specific generalizations rather than to discover universal laws, and that our understanding of world politics will always be incomplete.[145]

I would like to refute each of these three criticisms individually.

First, although only two cases are examined in this thesis, other scholars could use the theoretical framework that is developed in order to increase the sample size. Indeed, as I argue in the Introduction of this thesis, although the issues of global atmospheric change are unprecedented, other conceptually-similar dilemmas exist in international relations. Thus, this model could be applied to

---

[144] Young, *op. cit.*, in note 11, p. 206.

[145] Keohane, *op. cit.*, in note 72, pp. 379-80.

empirical issues in other fields. (I return to this point in the Conclusion of this thesis.) In this way, a larger sample size might strengthen the significance of the theory.

Second, although two 'successful' applications would not necessarily 'prove' the model, it remains that it could be falsified. Either D could form in the absence of A, B or C; or A, B and C could be present, but D could fail to form. True to Popperian tradition, therefore, it can be argued that any successful application of this theoretical framework constitutes a contribution to our knowledge about the process of international regime formation.[146]

Finally, in spite of the discreteness of the proposition presented, the model has much less well-defined boundaries and much greater overlap than might first be imagined. It should consequently simply be regarded as a framework for analysis, which we can use as a starting base for our investigation. Indeed, the identification of certain elements should not cause us to disregard other possible factors. In his own work, Aggarwal employs a comparable theoretical technique. Anticipating similar criticism, he comments:

> ... rather than pursuing an inductive analysis and using questions to discover a potential causal pattern, I use the expectations generated from the theoretical ideas discussed earlier to investigate regime transformation. This method provides the first step in utilizing cases systematically.[147]

Instead of viewing the framework as an immalleable structure, therefore, it should simply be considered to be an initial outline for the analysis of the international politics of ozone layer depletion and global warming.

Although these various concerns do highlight possible problems with the approach that is employed in this work, it is likely that any scholarly technique would attract some objections from some corners. Nevertheless, I hope that the framework that is presented in this chapter is either suitably defended to allow the examination of the empirical evidence for each of the two issues under consideration to proceed, or suitably documented to allow others to challenge it and propose their own ideas. Continuing upon the assumption that the former is tenable, the theoretical framework is used to examine the politics of the ozone layer

---

[146] Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge & Kegan Paul, 1963).

[147] Aggarwal, *op. cit.*, in note 2, p. 39.

depletion and global warming issues in the subsequent chapters of this thesis.

## Chapter 2 -- Scientific Consensus

In this chapter, the first hypothesised precondition for international regime formation is examined.[1] It is proposed that there must be a scientific consensus with regard to the issue under consideration before an international regime can possibly be formed. In order to support the inclusion of this factor as part of the overall framework, let us first ponder how any matter becomes 'political'.

Generally, a particular activity will not be a concern for society's politicians unless someone has identified a consequence of that activity that may potentially lower the relative level of welfare of some individual in the society. Although one could imagine any number of activities that could create such deleterious outcomes, let us narrow the focus to consider problems of particular concern to our investigation -- namely, environmental ones.[2] Because of the nature of the environmental issue-area, the 'someone' who identifies the activity that decreases welfare will most likely be a member of the scientific community; while the damaging outcome arising from that activity will most likely be the harm caused by a changed natural environment. Subsequently, those that are worse off because of changes in parts of the Earth's physical environment will probably insist that they be compensated for the harm that they have incurred. This, therefore, gives rise to a number of questions -- for example: 'Should their claim be honoured?'; 'Who should pay?'; 'How much should be given?'; and 'What transfer mechanisms should be constructed?' The ways in which any society responds to these sorts of questions are, of course, what politics is all about. On many environmental issues, moreover, international arrangements -- or regimes -- would need to be formed in order to institutionalise the answers at which the members of international society arrive. For these reasons, then, it is suggested that the implications of scientific discoveries can have significant political dimensions. Some of these ideas are pursued in the subsequent chapters of this thesis. For the purposes of the discussion in this chapter, however, the most important aspect is the suggestion that decision-makers will have no reason to consider political action

---

[1] See Chapter 1.3 of this thesis.

[2] Compare the analysis developed here with Anthony Downs, 'Up and Down with Ecology: The "Issue-Attention" Cycle', *The Public Interest* (No. 28, Summer 1972), pp. 38-50.

of any sort until scientists have directed attention to a cause-effect link on environmental issues.[3]

We should not, however, assume that scientists will be in agreement about the particulars of the cause-effect relationship under consideration. Indeed, we should recognise that there exists a myth about science, which leads many outside of the fellowship to believe that 'science' is a singular body of knowledge. Helga Nowotny describes the 'Ideal of Science':

> [Science offers] advice held to be clean from political considerations, free from values and mere opinions, from interests and control over its later applications. Science was disinterested and neutral, committed solely to its own impartial and context-independent conception of Truth.[4]

Similarly, Ernst Haas, Mary Pat Williams and Don Babai identify a commonly-held view: 'Politicians and lay publics disagree and argue over values. Scientists discover facts.'[5] The perceived objectivity and universality of the scientific method suggest that science should be outside the realm of intradisciplinary dissent and that scientific consensus should therefore be easily achievable. These views are, however, mistaken. Instead, it is increasingly being recognised that scientific consensus 'is the exception rather than the rule',[6] because agreement about a particular problem is not assured among members of a given scientific community.[7]

Therefore, just because the actions of individual scientists have caused an

---

[3] In this way, science plays an important role in 'agenda setting by identifying and highlighting previously unknown and often cumulative problems arising from the human use of natural resources and environmental services whose solution requires the creation of suitable institutional arrangements' (Oran R. Young, 'Science and Social Institutions: Lessons for International Resource Regimes', in Steinar Andresen and Willy Ostreng (eds.), *International Resource Management: The Role of Science and Politics* (London: Belhaven, 1989), p. 10). In addition, it is accepted that environmental issues -- especially, local ones -- may also emerge upon political agendas because of the concern expressed by the particular individuals who are affected. This idea is pursued in Chapter 5.4 of this thesis.

[4] Helga Nowotny, 'A New Branch of Science, Inc.', in Harvey Brooks and Chester L. Cooper (eds.), *Science for Public Policy* (Oxford: Pergamon Press, 1987), p. 62.

[5] Ernst B. Haas, Mary Pat Williams and Don Babai, *Scientists and World Order: The Uses of Technical Knowledge in International Organizations* (London: University of California Press, 1977), p. 27.

[6] Steinar Andresen, 'Increased Public Attention: Communication and Polarization', in Andresen and Ostreng (eds.), *op. cit.*, in note 3, p. 34.

[7] A number of factors can cause a diversity of views to persist among members of a scientific community. A few are proposed *infra*, in notes 28 and 82.

environmental issue to become 'political', there will not necessarily be consensus about its nature or significance among most scientists, still less among most politicians. Rather, if scientific nonconsensus endures, then politicians will find a variety of views emanating from different parts of the scientific community. Because different decision-makers will tend both to select different information and also to process that information in different ways, then it is probable that they will support many diverse policy positions.[8] This speculation suggests that scientific nonconsensus can give rise to political nonconsensus. To arrive at the first precondition for international regime formation, therefore, a corollary is proposed -- namely, that scientific consensus is a necessary (though not sufficient) condition for international regime formation.[9]

This proposition is not without precedent in the literature of international relations, for many scholars have noted the role of knowledge (even if not specifically referring to 'scientific knowledge') in world affairs.[10] With regard to the perception of the problem under investigation, Stephan Haggard and Beth Simmons argue that the '*degree* of ideological consensus and agreement over causal relationships, regardless of the nature of the issue, is an important variable in explaining cooperation'.[11] Seyom Brown and others, in addition, contend that it must be agreed that the raw data being collected is accurate and that the analysis (that is, the method of interpretation) is acceptable to all parties in order

---

[8] See, for example, John D. Steinbruner, *The Cybernetic Theory of Decision: New Dimensions of Political Analysis* (Princeton, NJ: Princeton University Press, 1974).

[9] Some of the inspiration for this precondition derives from the contributions of the individualistic theorists in the literature on international regime formation. For a discussion of their work, see Chapter 1.2.3 of this thesis.

[10] Arthur Stein, for example, maintains that the 'nature of knowledge ... determine[s] actor preferences and thus the prospects for regimes' (Arthur A. Stein, 'Coordination and Collaboration: Regimes in an Anarchic World', in Stephen D. Krasner (ed.), *International Regimes* (Ithaca, NY: Cornell University Press, 1983), p. 136). More generally, others identify a number of ways in which science has affected society, and vice versa. See, for example, Edward T. Chase, 'Politics and Technology', in William R. Nelson (ed.), *The Politics of Science: Readings in Science, Technology, and Government* (London: Oxford University Press, 1968), pp. 435-49; and Margaret Gowing, 'An Old and Intimate Relationship', in Vernon Bogdanor (ed.), *Science and Politics: The Herbert Spencer Lectures 1982* (Oxford: Clarendon Press, 1984), pp. 52-69.

[11] Stephan Haggard and Beth A. Simmons, 'Theories of International Regimes', *International Organization* (Vol. 41, No. 3, Summer 1987), p. 511. Emphasis in original.

to achieve a co-operative agreement.[12] Scholars specifically examining global atmospheric issues, meanwhile, have also put forth similar ideas. Per Bakken, for example, maintains that as

> a basis for any international environmental treaty there has to be a scientific cause-effect relationship. ... without agreement at least in influential parts of the scientific community, the chances of reaching international agreement are small.[13]

Furthermore, Peter Haas's proposition about the need for 'epistemic communities' has close links with the stated hypothesis.[14] These references suggest, therefore, that the foundation of this precondition is well-established.

Thus, the primary purpose of this chapter is to explore the proposition that a scientific consensus is a precondition for the formation of international regimes on issues of global atmospheric change.[15] To achieve this aim, the chapter is divided into two main sections. In the first section, the emergence of a scientific consensus on the ozone layer depletion issue and the way in which it affected the political process are examined. The second section of this chapter presents a similar study of the history of the global warming issue in order to discover how the degree of consensus among scientists on that issue not only evolved but also influenced the political debate. By considering these matters, it is anticipated that our knowledge about the process of international regime formation on issues of global atmospheric change can be advanced.

---

[12] Seyom Brown *et al*, *Regimes for the Ocean, Outer Space, and Weather* (Washington, DC: The Brookings Institution, 1977), pp. 234-35.

[13] Per M. Bakken, 'Science and Politics in the Protection of the Ozone Layer', in Andresen and Ostreng (eds.), *op. cit.*, in note 3, p. 198.

[14] See, for example, Peter M. Haas, 'Introduction: Epistemic Communities and International Policy Coordination', *International Organization* (Vol. 46, No. 1, Winter 1992), pp. 1-35.

[15] 'Science' can be defined quite broadly as 'knowledge' (*The Concise Oxford Dictionary*). If one adopts this general definition, then it is clear that science plays an all-pervasive role, for actors' policy positions on issues of global atmospheric change are affected by a wide variety of scientific considerations. However, in order to focus upon some particular dilemmas posed by these environmental problems, 'science' will be somewhat more restrictively defined. More specifically, in this chapter, 'scientific knowledge' refers to the theories and data governing and describing the natural processes known as ozone layer depletion and global warming. Although the laws governing social activity (for example, economics) are also relevant to the issues of global atmospheric change, the unique importance of natural processes governed by relationships independent of human intervention means that the natural science deserves special investigation.

## 2.1 -- Scientific Consensus and Ozone Layer Depletion

### 2.1.1 -- Discovery of the Ozone Layer

Although ozone was first detected in 1840,[16] the first suggestions that the bulk of the ozone must be in the upper atmosphere rather than near ground level were not put forward until the latter part of the nineteenth century.[17] Speculation about the formation and destruction of ozone prompted Sydney Chapman, a British chemist, to investigate the substance. In 1930, he proposed that the amount of ozone present in the stratosphere was dictated only by the concentrations of atomic oxygen, molecular oxygen and ozone.[18] His work became the accepted foundation of this branch of atmospheric chemistry for many years.[19]

Following an investigation of new data collected after the International Geophysical Year (1957-58),[20] however, scientists discovered that other atmospheric trace gases also affect the ozone balance in the stratosphere.[21] By establishing that both hydrogen and nitrogen compounds could influence ozone levels, these scientists demonstrated that ordinary human activities could have deleterious impacts upon the natural environment. Thus, such suppositions launched the political debate about the ozone layer.

---

[16] 'The word "ozone" itself (from the Greek ozein, to smell) was introduced by Schoenbein in 1840 to characterize a chemical species with a pronounced odor.' (Guy Brasseur, 'The Endangered Ozone Layer (A Century of Ozone Research)', *Environment* (Vol. 29, No. 1, January/February 1989), p. 8.)

[17] Between 1879 and 1881, 'W.N. Hartley and A. Cornu measured the ultraviolet radiation reaching the surface of the earth and found a sharp cutoff, which they correctly attributed to ozone' ('The Ozone Layer and Homo Sapiens', *EarthQuest* (Fall 1991), p. 3).

[18] Sydney Chapman, 'The Theory of Upper Atmosphere Ozone', *Memoirs of the Royal Meteorological Society* (Vol. 3, No. 26, 1930), pp. 103-25. A list of all of Chapman's publications can be found in Syun-Ichi Akasofu, Benson Fogler and Bernhard Haurwitz (eds.), *Sydney Chapman, Eighty, from his friends* (Sponsored by the University of Alaska, the University of Colorado and the University Corporation for Atmospheric Research, 1968).

[19] For a good summary of the early investigations into the ozone layer, see John Gribbin, 'The Ozone Layer', *New Scientist* (Vol. 68, 2 October 1975), pp. 12-14.

[20] At this time, a 'network of ground-based instruments for continuous monitoring of ozone using the technique pioneered by [G.M.B.] Dobson [during the 1920s] was established worldwide (the Dobson network)' ('The Ozone Layer and Homo Sapiens', *op. cit.*, in note 17, p. 3).

[21] In 1966, Hampson suggested that significant stratospheric ozone reductions might be caused by water vapours. Crutzen (in 1970) and Johnston (in 1971) postulated that nitrogen oxides might deplete stratospheric ozone. For these references, see R. P. Turco *et al*, 'SSTs, Nitrogen Fertiliser and Stratospheric Ozone', *Nature* (Vol. 276, 21/28 December 1978), pp. 805-07.

### 2.1.2 -- The Supersonic Transport as a Threat to the Ozone Layer, 1970-1974

This new scientific information was used by environmentalists (and others) in order to challenge the supersonic transport (SST) project that was being developed during the late 1960s. Among other environmental concerns (including sonic booms and noise pollution),[22] some claimed that the hydrogen and nitrogen compounds released by the airplanes while in flight could deplete the ozone layer. One estimate suggested that there could eventually be over one thousand SSTs in operation,[23] leading environmentalists to argue that the damage could be significant. Although at the time, most of the development of the SST was being undertaken by the Boeing Corporation in the US, the Soviets were also building a prototype (the Tupolev 144) and the French and the British were collaborating on the Concorde project.

With the potential impact upon the ozone layer being highlighted by a number of individuals, pressure mounted upon formal, political institutions to initiate studies. Responding to a request by the US Department of Transport, the Department of Commerce Technical Advisory Board was set up in September 1970 in order to investigate the scientific evidence for the likely environmental impact of the proposed SST fleet. Citing a need to come 'to grips with the scientific issues',[24] a workshop of experts in the field of stratospheric chemistry was convened in Boulder, Colorado on 18 and 19 March 1971.[25]

At this meeting, debate regarding the science of possible ozone layer depletion raged. James McDonald of the University of Arizona continued to be the most vocal proponent of the hypothesis that water vapour caused depletion of stratospheric ozone. He warned of the potential increase in cancer rates among the human population that such destruction could cause.[26] McDonald's views,

---

[22] For further information about the SST-environment debate, see Joel Primack and Frank Von Hippel, 'Scientists, Politics and SST: A Critical Review', *Bulletin of the Atomic Scientists* (Vol. 28, No. 4, April 1972), pp. 24-30; and Douglas Ross, 'The Concorde Compromise: The Politics of Decision-Making', *Bulletin of the Atomic Scientists* (Vol. 34, No. 3, March 1978), pp. 46-53.

[23] John Costello and Terry Hughes, *Concorde: The International Race for a Supersonic Passenger Transport* (London: Angus & Robertson, 1976), p. 144.

[24] Lydia Dotto and Harold Schiff, *The Ozone War* (Garden City, NY: Doubleday & Company, Inc., 1978), p. 45.

[25] John Gribbin, *The Hole in the Sky: Man's Threat to the Ozone Layer* (London: Corgi Books, 1988), p. 31.

[26] Dotto and Schiff, *op. cit.*, in note 24, pp. 47-48.

however, did not go unchallenged. Arnold Goldburg, chief scientist of Boeing's SST Division, vigorously questioned the theory.

> Goldburg became obsessed with recent measurements that indicated that ozone had been increasing in the atmosphere and that water-vapour levels had also been going up at the same time. This was not what the water-vapour theory predicted would happen, and Goldburg clearly believed these data to constitute a virtual death blow to McDonald's ozone-depletion calculations.[27]

Although certain institutional pressures may have motivated Goldburg to argue his case with such zeal,[28] his attacks upon McDonald's arguments were, nonetheless, substantial.

The hypothesis that nitrogen compounds caused depletion of the ozone layer also came under scrutiny at the Boulder meeting. Harold Johnston, a chemist at the University of California at Berkeley, had been one of the first to put forward the proposition,[29] and he unyieldingly pushed the case at this time. Johnston believed that the scientific community was too concerned with the, as he saw it, relatively less important question of the influence of water vapour. The real threat, Johnston argued, was from nitrous oxides. In 1971, he had calculated that if SSTs were allowed to operate, then there would be 'quite large ozone reductions -- average global reductions ranging from 3 to 23 per cent, with 50 per cent local reductions near zones of high SST traffic'.[30] Johnston also used the highly emotive issue of increased cancer rates and other health ailments to help illuminate

---

[27] *Ibid.*, p. 48.

[28] The presence of non-scientific pressures may cause different scientists working in different organisations to hold dissimilar views. Ernst Haas argues that scientists are 'subject to personal and social constraints derived from the institutional pressures on their careers, which may result in deviations from stipulated norms of behavior in the production of knowledge' (Ernst B. Haas, *When Knowledge Is Power: Three Models of Change in International Organizations* (Oxford: University of California Press, 1990), p. 41). On the ozone layer depletion issue, scientific research was undertaken by governments, universities, environmental pressure groups, industrial and business interests and associations, along with a host of other organisations. If we accept the proposition that 'in the day-to-day practice[, scientists] are also preoccupied with the bureaucratic imperatives of assuring the continuity of their work with mandates, projects, personnel, and budgets' (Haas, Williams and Babai, *op. cit.*, in note 5, p. 41.), then we should acknowledge that different groups may arrive at different scientific conclusions simply because they work in different institutions. In this way, scientific nonconsensus may arise out of the need for organisations to defend their particular interests.

[29] *Op. cit.*, in note 21.

[30] Dotto and Schiff, *op. cit.*, in note 24, p. 64.

the consequences of a depleted ozone layer.[31] Just as the water-vapour thesis had come under attack, however, some participants had reservations about the nitrous oxide hypothesis, and no consensus about the causes and consequences of ozone layer depletion could be reached at this workshop.

Details of the meeting and enduring scientific disagreement had a revealing impact upon the political process. Lydia Dotto and Harold Schiff note that:

> news of the heated debate in Boulder had rapidly reached the ears of John Ehrlichman -- then the top domestic adviser to [US President] Nixon -- who was reported to have said that if these scientists couldn't agree with one another, the White House wouldn't pay any attention to any of them. This was later confirmed publicly by Hubert Heffner, former deputy director of the White House's Office of Science and Technology. In a speech, Heffner suggested that when scientists reach opposite conclusions based on the same evidence, the public and government officials tend to disregard their views on political issues. He is quoted as saying that such lack of public confidence enabled Ehrlichman to dismiss Johnston's calculations by saying, 'No one believes scientists anyway.'[32]

These comments suggest that, in this case, nonconsensus within the scientific community lessened the political influence of its members.

Nevertheless, in light of projected environmental impacts of such significance, the US Government decided to investigate further the possible dangers of SST flights, and Congress ordered a report in 1971.[33] This report, initiated by the US Department of Transport and undertaken by the Climate Impact Assessment Program (CIAP), involved 1000 individuals from 10 countries[34] and cost US$40 million.[35] The final report, which was the most thorough study of the SST-ozone layer relationship ever undertaken, was completed in 1974.[36]

---

[31] *Ibid.*, p. 65.

[32] *Ibid.*, p. 61.

[33] Johnston believes that without the attention drawn to the issue by himself and other scientists, politicians would not have pursued the issue. He stated that: 'The [Department of Transport] said they had planned even back in 1970 to make a study but Congress turned them down in 1970 and probably would have turned them down again in 1971.' (Quoted in: *ibid.*, p. 67.)

[34] *Ibid.*, p. 67.

[35] Nicholas Valery, 'SSTs are Clean -- In Small Numbers', *New Scientist* (Vol. 68, 2 October 1975) pp. 19-21.

[36] Climate Impact Assessment Program, *Report of Findings. The Effects of Stratospheric Pollution by Aircraft* (Washington, DC: US Department of Transport, DOT-TST-75-50, 1974). See, also, Climate Impact Committee, 'Environmental Impact of Stratospheric Flight: Biological and Climate Effects of Aircraft Emissions in the Stratosphere', (Washington, DC: National Academy of Sciences, 1975). This committee was formed in 1972 to 'advise the [Department of Transportation]

In response to the concerns that had prompted the investigation in 1971, the final report concluded that a 500-plane fleet of Boeing SSTs would have caused a 16 per cent depletion of stratospheric ozone in the northern hemisphere and an 8 per cent depletion in the southern hemisphere.[37] It validated the hypothesis that Johnston had put forward about nitrous oxide, although the Berkeley chemist had projected greater depletion. Since the 1971 report had been commissioned, however, circumstances had changed. Most significantly, Boeing's SST programme had been discontinued.[38] Therefore, in order to try to retain some relevancy for their investigations, the CIAP's members also put forth their estimates for a smaller fleet of SSTs. The researchers concluded that 125 SSTs would have to be in operation before any ozone depletion would be detectable.[39]

The use of two scenarios -- large-fleets and small-fleets -- generated some confusion. Because the report seemed to be noting that a small fleet was environmentally acceptable, while only a larger fleet would be damaging, it offered some support for a variety of scientific views. To add to the confusion, the manner in which the CIAP report was packaged ensured that the ozone layer-environment nail was not driven deeply into the coffin of the SST project. More specifically, although the 7,200 pages of the report presented a comprehensive overview of the issue, the 27 page executive summary did not, many scientists believed, accurately represent the committee's findings, for it only made oblique references to the harmful consequences of projected ozone layer depletion.[40] Many journalists, therefore, concluded that the SSTs were 'cleared'.[41] It was noted at the time that:

> The result has been, temporarily at least, to publicly discredit those scientists who initially raised a quite justified concern about SSTs and to raise a credibility gap in regard to the still more serious threat of ozone

---

on CIAP' (*ibid.*, p. iv).

[37] Cited in F.S. Rowland, 'Possible Influences of Human Activities on Stratospheric Ozone', *WMO Bulletin* (Vol. 25, No. 2, April 1976), p. 82.

[38] The US Senate, in May 1971, had cancelled the plan. Not only was the environmental impact of its operation being questioned, but the SST's economic non-viability also played a major role in the final decision (Andrew Wilson, *The Concorde Fiasco* (Harmondsworth: Penguin, 1973), p. 85).

[39] Cited in: Colin Norman, 'SSTs: It's an Ill Wind...', *Nature* (Vol. 253, 31 January 1975), pp. 298-99.

[40] Allen J. Grobecker, 'The SST and Ozone Depletion (Letters)', *Science* (Vol. 187, 28 March 1975), pp. 1144-45.

[41] The headline in *The Washington Post* on 22 January 1975 was 'SST Is Cleared on Ozone'.

depletion by halocarbons and other chemicals.[42]

Comments like these suggest that, in 1974, an assortment of scientific views about the causes and consequences of ozone layer depletion by SSTs was still credible among members of both the scientific and the political communities. Consequently, the first hypothesised precondition for international regime formation was not satisfied at this time.

The SST question, however, fell down the political agenda. Not only was the American undertaking cancelled, but so too was the Soviet one. Additionally, the Concorde project was significantly scaled back, primarily because of its commercial nonviability. (There have never been more than 14 Concordes in operation.)[43] Thus, the scientific debate about SST-induced ozone layer depletion became largely theoretical and, as such, a matter primarily for scientists once again.

### 2.1.3 -- Other Recognised Anthropogenic Threats to the Ozone Layer Before 1974

During the early 1970s, individuals identified other threats to the ozone layer that could be potentially significant. One was the effects of nuclear explosions.[44] This issue would have received greater attention if international agreements to restrict above-ground nuclear tests had not been concluded during the 1960s. In 1976, it was noted that the 'effects of nuclear bomb tests around 1960 on ozone are only marginally detectable'.[45] With Test-Ban treaties being respected by the United States and the Soviet Union, the level of the harmful activity had decreased, and, thus, there was less reason for the issue to develop politically.

At this time, fertilisers were also identified as a possible threat to stratospheric ozone. Because their use in agriculture causes nitrogen compounds to be released, some individuals were suggesting that they could be a potentially

---

[42] Allen L. Hammond, 'Public Credibility on Ozone', *Science* (Vol. 187, 28 March 1975), p. 1182.

[43] See, for example, Keith Hayward, *The British Aircraft Industry* (Manchester: Manchester University Press, 1989), p. 106; and British Airways official, London, personal communication, 1 April 1992.

[44] See, for example, National Academy of Sciences, *Long-Term World-Wide Effects of Multiple Nuclear-Weapons Detonations* (Washington, DC: National Academy of Sciences, 1975), cited in Rowland, *op. cit.*, in note 37, p. 82.

[45] Noted in CIAP, *op. cit.*, in note 36.

significant cause of ozone layer depletion.[46] Their likely impact was still, however, a matter of much debate, and the fertiliser-ozone layer link did not substantially impact the political agenda.

During the early 1970s, the proposition that chlorine could be a cause of ozone layer depletion was also forwarded. A potentially large source of chlorine was the hydrogen chloride that would be discharged from the engines of the space shuttles that were being developed by the United States National Aeronautics and Space Administration (NASA) at this time. The first significant elaboration of this hypothesis was offered at a scientific gathering in Kyoto, Japan on 10-12 September 1973, when Richard Stolarski and Ralph Cicerone, two scientists from the University of Michigan, presented the findings from their research. Responding both to pressure from outside the academic community (in particular, NASA[47]) and to their own uncertainties (neither were 'true' atmospheric chemists -- the former had trained in physics, the latter in electrical engineering[48]), however, they did not mention the space shuttle, but instead framed their ideas within a broader discussion about the impact of volcanic eruptions (which are the most significant natural sources of chlorine). Because no one was expecting a meaningful increase in the incidence of volcanic eruptions, many considered their suggestions to be curious, at best. Nevertheless, others did recognise the significance of their remarks, and in the report of the proceedings of the conference, two papers examined the potential role of chlorine in the destruction of stratospheric ozone.[49]

Although the hypothesis had potentially explosive political implications, NASA's adept ability in public relations,[50] coupled with the fact that shuttles were

---

[46] See Deborah Shapley, 'Will Fertilisers Harm Ozone As Much As SSTs?', *Science* (Vol. 195, 18 February 1977), p. 658; Harold Johnston, 'The Fertiliser-Ozone Connection', *Science* (Vol. 195, 18 March 1977), p. 1280; and 'WMO Statement on Modification of the Ozone Layer Due to Man's Activities and Some Possible Geophysical Consequences', *WMO Bulletin* (Vol. 25, No. 1, January 1976), p. 61.

[47] NASA became involved in much of the research into this hypothesis during 1972 and 1973, because the Agency wanted to avoid the same sort of politics that had helped to kill the SST project (Gribbin, *op. cit.*, in note 25, pp. 34-38).

[48] Dotto and Schiff, *op. cit.*, in note 24, p. 125.

[49] H.I. Schiff (ed.), Special Issue of *Canadian Journal of Chemistry* on 'Aeronomy of the Stratosphere and Mesosphere' (Vol. 52, No. 8, Part 2, 15 April 1974), pp. 1381-1634. The papers are by Steve C. Wofsy and Michael B. McElroy of Harvard University ('$HO_x$, $NO_x$, and $ClO_x$: Their Role in Atmospheric Chemistry', pp. 1582-91); and R.S. Stolarski and R.J. Cicerone ('Stratospheric Chlorine: A Possible Sink for Ozone', pp. 1610-15).

[50] Gribbin, *op. cit.*, in note 25, p. 38.

not expected to be used extensively (like had been initially envisioned for the SSTs), effectively thwarted the issue's emergence upon the political agenda.[51] Thus, the

> chlorine issue was dropped. Other than volcanic emissions and exhaust produced by the space shuttle, which wasn't even built yet, there was no other known source of free chlorine in the stratosphere.[52]

Once again, without any scientific estimates of the harmful consequences of any everyday human activities, the ozone layer question did not take on significant political dimensions. Nevertheless, the space shuttle issue is notable, because it marked the first time that the issue of chlorine was raised during the ozone layer depletion discussions. In this way, it helped to set the stage for the ensuing debate.

### 2.1.4 -- Initial Propositions Identifying Chlorofluorocarbons as a Threat to the Ozone Layer, 1974-1979

The scientific debate about the ozone layer entered new territory after the 1974 publication of a paper in the scientific journal *Nature*.[53] In this paper, Mario Molina and Sherry Rowland, two scientists at the University of California at Irvine, hypothesised that the chlorine found in chlorofluorocarbons (CFCs) had the potential to destroy substantial amounts of stratospheric ozone. With this supposition, the international political debate about the ozone layer was also launched into a new dimension.

Because of the potentially significant consequences for international society of Molina and Rowland's initial calculations,[54] there was a demand for high-quality

---

[51] By 1977, NASA had gathered sufficient evidence to conclude that the effect upon the ozone layer of 60 shuttle launches a year would be negligible (NASA, *Chlorofluoromethanes and the Stratosphere* (Greenbelt, MD: NASA Reference Publication 1010, 1977)). This conclusion was independently supported by the US National Academy of Science (Gribbin, *op. cit.*, in note 25, p. 37).

[52] Sharon L. Roan, *Ozone Crisis: The 15 Year Evolution of a Sudden Global Emergency* (Chichester: John Wiley & Sons, Inc., 1989), p. 18.

[53] Mario J. Molina and F. S. Rowland, 'Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom-catalysed Destruction of Ozone', *Nature* (Vol. 249, 28 June 1974), pp. 810-12.

[54] 'It seems quite clear that the atmosphere has only a finite capacity for absorbing [chlorine] atoms produced in the stratosphere, and that important consequences may result. This capacity is probably not sufficient in steady state even for the present role of introduction of chlorofluoromethanes.' (*Ibid.*, p. 812.) At this time, substantial quantities of CFCs were being discharged into the atmosphere by many everyday activities -- including aerosol spray cans, solvents, refrigeration and foam manufacturing. See Chapter 3.1 of this thesis for a fuller discussion.

scientific information. Despite the substantial research that had been undertaken on the SST issue, however, Dotto and Schiff note that the stratosphere was still 'dubbed the "ignorosphere" because aeronomers had paid so little attention to it in the past'.[55] There was a lack of data describing this part of the Earth's atmosphere, and thus the Molina/Rowland hypothesis was based only upon theoretical assumptions and limited laboratory observations. This prompted many scientists to adopt divergent positions about the validity of the two chemists' work.[56]

The first major investigation into the CFC[57] theory was ordered by the US government in January 1975, and a report was released in June 1975.[58] The report noted that: 'Thus far, the validity of the theory and the predicted amounts of ozone reduction have not been seriously challenged. More research is required ... but there seems to be legitimate cause for serious concern.'[59] This report also placed particular emphasis upon another study that was being carried out by the US National Academy of Sciences (NAS) at this time. (The NAS was a private, nonprofit society, which was mandated to advise the US federal government on scientific and technical matters.) That study, convened under the Academy's 'Climatic Impact Committee' (later renamed the 'Committee on Impacts of Stratospheric Change') had been initiated in April 1975 and was due to be completed in 1976. Anticipation of its publication was high, and 'it is certainly true that [the NAS] essentially became the scientific Supreme Court in the case of the fluorocarbon debate'.[60]

The much-awaited NAS report was finally released in September 1976. Its conclusions were somewhat unclear, for it confirmed the hypothesis (it predicted

---

[55] Dotto and Schiff, *op. cit.*, in note 24, p. 206. Also, interview with Peter Usher, Co-ordinator, Global Environmental Monitoring Service (Atmosphere), United Nations Environment Programme, Nairobi, Kenya.

[56] For a sceptical view at the time, see R.S. Scorer, 'Freon in the Stratosphere (Letters)', *New Scientist* (Vol. 64, 10 October 1974), p. 140.

[57] At this time, the terms 'fluorocarbons' (FCs) or 'chlorofluoromethanes' (CFMs) were also being used for CFCs.

[58] Report of Federal Task Force on Inadvertent Modification of the Atmosphere (IMOS), *Fluorocarbons and the Environment* (Washington, DC: Council on Environmental Quality (CEQ) and the Federal Council on Science and Technology (FCST), June 1975), p. iii.

[59] Quoted in Constance Holden, 'Federal Task Force Supplies Fuel for Fluorocarbon Debate', *Science* (Vol. 188, 27 June 1975), p. 1286.

[60] Dotto and Schiff, *op. cit.*, in note 24, p. 198.

an eventual 2 to 20 per cent depletion of stratospheric ozone, with a most likely depletion level between 6 and 7.5 per cent), but it did not recommend any immediate ban upon the use of CFCs.[61] Rather, its members simply asserted that 'selective regulation of CFM uses and release is almost certain to be necessary *at some time* and to some degree of completeness'.[62] Effectively reflecting this ambiguity, two major American newspapers reported the National Academy's study differently. The headline in the *New York Times* was 'Scientists Back New Aerosol Curbs to Protect Ozone in Atmosphere', while the *Washington Post*'s headline was 'Aerosol Ban Opposed by Science Unit'.[63] One fact that was clear, however, was that the Report had found nothing to disprove the original hypothesis. Thus, its findings ensured that ozone layer depletion remained a political issue of some importance in the United States.[64]

In November 1979, a second report was published by the NAS in the United States. It highlighted the potential significance of the CFC-ozone link, estimating eventual ozone layer depletion at 16.5 per cent.[65] This report from the Academy further argued that a 'wait-and-see' approach was not advised, and it encouraged the United States both to foster and to lead international efforts to protect the ozone layer. In this way, its findings suggested that the issue should be addressed by politicians with some degree of urgency.

Although the NAS reports were essentially endorsing the CFC theory and suggesting that the issue should be considered seriously, scientific consensus within the US was still absent at this time. Scientists employed by the major CFC producers were the most vocal individuals in opposition. Although their interest in challenging the Molina/Rowland hypothesis is self-evident, the strength of some

---

[61] Committee on Impacts of Stratospheric Change, *Halocarbons: Environmental Effects of Chlorofluoromethane Release* (Washington, DC: National Academy of Sciences, 1976).

[62] Noted in Peter Gwynne, 'Aerosols Lost in the Ozone', *New Scientist* (Vol. 71, 23 September 1976), p. 627. Emphasis added.

[63] Both newspapers were from 14 September 1976 (noted in Dotto and Schiff, *op. cit.*, in note 24, p. 262).

[64] Indeed, the findings did contribute to the 1978 US decision to implement a ban upon the use of CFCs in non-essential aerosols. See Chapter 3.1.1 of this thesis for a further discussion.

[65] Panel on Stratospheric Chemistry and Transport, *Stratospheric Ozone Depletion by Halocarbons: Chemistry and Transport* (Washington, DC: National Academy of Sciences, 1979). See, also, 'US Scientists Double Estimates of Ozone Depletion Rate', *Nature* (Vol. 282, 15 November 1979), p. 220.

of their assertions was not in doubt.[66] For example, in

> a 1979 statement, Du Pont officials stated: 'No ozone depletion has ever been detected despite the most sophisticated analysis ... All ozone-depletion figures to date are computer projects based on a series of uncertain assumptions.'[67]

These weaknesses in the scientific case that were highlighted by industry's representatives were unassailable at this time.

Further, the significance of substantial eventual ozone depletion was not being stressed as strongly throughout the rest of the world during the late 1970s. Although most of the scientific investigations into the problem were being conducted in the United States,[68] some research was being carried out in other locations, with the most substantial being in Europe in general[69] and in the United Kingdom in particular.[70] A review of the British studies on ozone layer depletion from this time suggests that the degree of nonconsensus, worldwide, was even greater than the degree of nonconsensus within the United States.

Although scientific reports emanating from various British groups were drawing attention to potential stratospheric ozone depletion, such possible developments were considered to be highly uncertain and, even if true, not of great consequence. A report released by the UK government in late April 1976, for example, foresaw a potential 8 per cent depletion of stratospheric ozone in 100 years; yet it did not view this potentiality as significant.[71] Another British report was even more dismissive of the entire CFC-ozone issue. The Environment Secretary's Clean Air Council (an advisory body) found the evidence linking CFCs and ozone depletion to be tenuous and inconclusive and therefore recommended

---

[66] For a fuller discussion of the role of industry in this debate, see Chapter 3.1 of this thesis.

[67] Roan, *op. cit.*, in note 52, p. 96.

[68] Peter Haas notes that 80 to 90 per cent of all atmospheric science is conducted in the United States (Peter M. Haas, 'Obtaining International Environmental Protection through Epistemic Consensus', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 356). Also, interview with Usher, *op. cit.*, in note 55.

[69] See, for example, Commission of the European Communities, *Evaluation of the Effects of Chlorofluorocarbons on Atmospheric Ozone: Present Status of Research* (Brussels: European Economic Community, 1981).

[70] Interview with Usher, *op. cit.*, in note 55.

[71] Department of the Environment, Central Unit on Environmental Pollution, *Chlorofluorocarbons and their Effect on Stratospheric Ozone* (London: HMSO, Pollution Paper No. 5, 1976). See, also, 'The Official View on CFCs and the Ozone Layer', *New Scientist* (Vol. 70, 29 April 1976), p. 213.

the continuation of the British Government's 'wait and see' approach.[72] In a remark that is oft-cited, the UK Royal Commission on Environmental Pollution's Chairman, Prof. Hans Kornberg, said that although the CFC-ozone link

> ... may give rise to concern, there is certainly no need for panic. ... We feel that, even if production were to continue at the present rate, the evidence suggests that, at worst, over the next ten years the decrease in the ozone layer would result in an increase in ultraviolet radiation of biologically harmful wavelengths *which would roughly correspond to moving from the North of Scotland to the South of England.*[73]

In 1979, additionally, the British government published a follow-up report, which suggested that basic scientific understanding, 'although progressing rapidly, is still inadequate in many respects'.[74] As this suggests, reports from the UK government were, at this time, highlighting the need for more research, rather than action.

This view was echoed by representatives of industry. 'Fluorostrat '78', a conference organised by the Society of Chemical Industry, was held in Brighton in October 1978. Speakers at this meeting argued that improvements in almost every aspect of the scientific investigations, which encompassed both theoretical and empirical considerations, were needed in order to reduce the numerous uncertainties about the science of the ozone layer that remained.[75]

Similarly, there was no sense of urgency prevalent among members of the British independent scientific community at this time, for they too felt that much more research needed to be done in order to resolve the many uncertainties. In 1978, James Lovelock, arguably Britain's foremost scientist in this field,[76] maintained that 'no one can be sure which if any of the reported analyses of

---

[72] 'Aerosols Can Continue', *New Scientist* (Vol. 75, 15 September 1977), p. 655.

[73] Quoted in 'Mixed Response to Aerosol Propellants', *New Scientist* (Vol. 76, 15 December 1977), p. 685. Emphasis added.

[74] Department of the Environment, Central Directorate on Environmental Protection, *Chlorofluorocarbons and their Effect on Stratospheric Ozone (Second Report)* (London: HMSO, Pollution Paper No. 15, 1979), p. 209.

[75] 'A Threat from Fluorocarbons?', *Nature* (Vol. 276, 16 November 1978), pp. 215-16.

[76] Lovelock had, in 1971, been the first person to detect CFCs in the atmosphere, 'using a new measurement technique he had developed' (Environment Directorate, *Fluorocarbons: An Assessment of Worldwide Production, Use and Environmental Issues (First Interim Report)* (Paris: OECD, 1976), p. 6, note 1).

atmospheric concentrations in the published literature are correct'.[77] These observations thus suggest that British government, industry and independent science were in agreement that, although the ozone layer depletion issue was worthy of more research, many significant uncertainties precluded any accurate predictions.[78] We can speculate that they would have agreed with a writer from the British journal *New Scientist* who, in 1979, argued that: 'On balance, the evidence that is now available suggests that nothing mankind is now doing will have a disastrous effect on the ozone layer ...'[79]

Thus, by the end of the 1970s, no worldwide scientific consensus on ozone layer depletion was in existence. Instead, the situation was such that:

> Regulatory agencies in [countries other than the United States] continue to accept the industry position that there remains major uncertainties in a number of key assumptions in the theory, [and] that there have been some discrepancies between measured concentrations of reactants in the stratosphere and calculated values ...[80]

In turn, this scientific nonconsensus affected the international political negotiations. In December 1978 in Munich, for example, representatives from 14 countries met to discuss the possibilities of internationally regulating CFCs. One account of that meeting reports that:

> In particular, the British and French representatives referred to 'new developments' not yet reported in the scientific literature and given little credence at [a meeting of technical experts the previous week in Bonn] ... If European scientists had been more closely involved in assessment of fluorocarbon risks since 1974 Britain and France might not have felt so free to disregard the scientific consensus.[81]

---

[77] Quoted in John Gribbin, 'Ozone Passion Cooled by the Breath of Sweet Reason', *New Scientist* (Vol. 80, 12 October 1978), p. 94. See, also, Michael Allaby and J.E. Lovelock, 'Controversy Buried (Letters)', *Nature* (Vol. 285, 26 June 1980), p. 610.

[78] Warr argues that there was 'an attitude prevalent among British scientists that the US was overreacting in the urgency of its response' (Kiki Warr, 'Ozone: The Burden of Proof', *New Scientist* (Vol. 128, 27 October 1990), p. 37).

[79] John Gribbin, 'Disappearing Threat to Ozone', *New Scientist* (Vol. 81, 15 February 1979), p. 474. Maugh notes that governmental attitudes around the world at this time generally suggested that 'present understanding of ozone depletion is limited and based on model assumptions which have not been adequately identified' (Thomas H. Maugh II, 'Ozone Depletion Would Have Dire Effects', *Science* (Vol. 207, 25 January 1980), pp. 395).

[80] Thomas H. Maugh II, 'The Threat to Ozone Is Real, Increasing', *Science* (Vol. 206, 7 December 1979), p. 1167.

[81] Thomas Stoel, 'Fluorocarbons as a Global Environmental Case Study', *New Scientist* (Vol. 81, 18 January 1979), pp. 166-67.

These observations appear to strengthen our original hypothesis -- namely, that different scientific views may give rise to divergent political positions among states' representatives.[82]

Therefore, at the turn of the decade, there were many different views about the science of the CFC-ozone link evident in international society.[83] Although it

---

[82] Just as nonconsensus can arise from the fact that different scientists come from different institutions (*op. cit.*, in note 28), nonconsensus can also stem from the fact that different scientists come from different countries. Indeed, Ernst Haas recognises that scientific terms may be contested, because they are embodied in specific (mainly Western) cultures and because each particular society 'decodes' them in a different way (Haas, *op. cit.*, in note 28, p. 47). A different idea, yet on a similar plane, comes from Brian Wynne, who notes that different political cultures place science and scientists in different institutional roles (Brian Wynne, 'Uncertainty -- Technical and Social', in Brooks and Cooper (eds.), *op. cit.*, in note 4, p. 106). Indeed, in different states, scientists may pose different questions, employ different 'methods' and undertake different data search patterns, which may well lead to divergent scientific conclusions. This may hinder the chances for political co-operation, particularly if decision-makers base their decisions upon the advice of their 'own' scientists. This may often be the case, for Helge Ole Bergesen notes that: 'All too often we have seen in the area of resource management that scientific results produced by institutions in one particular country involved in the political process are not recognised as valid by other countries.' (Helge Ole Bergesen, 'The Credibility of Science in International Resource Management', in Andresen and Ostreng (eds.), *op. cit.*, in note 3, p. 126.) Peter Haas arrives at a similar conclusion -- looking explicitly at the differences between the North and the South in this regard (Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990), p. 209). Thus, nationalism may have some role to play in the persistence of nonconsensus within the scientific community.

In light of this concentration upon the drive for a 'scientific consensus', we should not overlook the fact that 'knowledge is power' in international society and thus information should be regarded as a 'significant systemic variable in world politics' (Haas, *op. cit.*, in note 28; and Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, NJ: Princeton University Press, 1984), p. 245). In other words, we should not fall into the trap of assuming that a scientific consensus, once achieved, is either 'correct' or 'good'; we should keep in mind the fact that the evolution of any scientific consensus may be manipulated by a hegemonic power in order to further its own goals (in either a Gramscian interpretation of 'hegemony', whereby the language, ideas and other cultural elements are the key variables; or the more-popular (at least in international relations) sense of hegemony as military power, as discussed in Chapter 1.2.1 of this thesis). Although this issue is not pursued to a significant degree in this work, it could, nevertheless, have importance. (See, also, the Conclusions of this thesis.)

[83] Scientific research was not, however, just being undertaken under 'national' auspices at this time. The World Meteorological Organisation (WMO) and the International Council of Scientific Unions (ICSU) had been concerned with ozone for a number of years. (See, for example, WMO, 'Atmospheric Ozone -- A Survey of the Current State of Knowledge of the Ozone Layer', in Asit K. Biswas (ed.), *The Ozone Layer*, (Oxford: Pergamon Press, 1979), pp. 75-76.) The possibility of stratospheric ozone depletion was not, however, upon their agendas before 1975. At the WMO's Seventh Congress, in May 1975, it was agreed that 'there was an urgent need for more studies (and for a definite review of these studies) to determine the extent to which man-made pollutants might be responsible for reducing the quantity of ozone in the stratosphere' (*ibid.* p. 76). In addition, the WMO issued its first statement on the issue (which called for more data collection and research) in September 1975 ('WMO Statement on Modification of the Ozone Layer ...', *op. cit.*, in note 46, pp. 59-63). The primary component of the WMO's efforts on the issue was the Global Ozone Research and Monitoring Project, which was established in 1976 to investigate further the science of the issue, with an emphasis upon monitoring and data collection ('Research and Development', *WMO Bulletin* (Vol. 25, No. 4, October 1975), p. 247). The other important international body operating at the end of the 1970s was the 'Co-ordinating Committee on the Ozone Layer' (CCOL). Created after an

was an issue on the agendas of a number of states (because their leaders recognised that the depletion of stratospheric ozone had the potential to decrease levels of human welfare) and although discussions were taking place at the international level, the emphasis was placed primarily upon the need for more scientific investigations.[84] In this way, the hypothesised precondition for international regime formation remained unsatisfied at the end of the 1970s.

### 2.1.5 -- Diminishing Concern Regarding Chlorofluorocarbons as a Threat to the Ozone Layer, 1980-1985

As improvements in both the theoretical modelling and the data collection process occurred during the late 1970s and early 1980s,[85] scientists were able to improve their estimates of future ozone levels.[86] As a consequence, the predictions for eventual ozone depletion were constantly being revised during the early 1980s. The estimates, however, were being revised *downwards*. Table 2.1 presents a longitudinal comparison of the predictions of the two most important scientific bodies -- the CCOL and the US NAS[87] -- in which the downward trend is clearly evident.

---

international conference in Washington, DC in 1977, it met for the first time in Geneva in November 1977 (*UNEP Report to Governments* (No. 10, September/October 1977)). While it was recognised that the WMO would conduct most of the 'science', the CCOL was expected to co-ordinate that effort at the international level.

[84] See, for example, the opening paragraphs of the World Plan of Action agreed at the 1977 Washington conference, where delegates emphasised the need for an 'intensive and well coordinated monitoring and research programme' (reprinted in Biswas (ed.), *op. cit.*, in note 83, p. 377). For information about both the theoretical and the empirical uncertainties at this time, see, for example: Michael A.A. Clyne, 'Destruction of Stratospheric Ozone?', *Nature* (Vol. 263, 28 October 1976), pp. 723-26; Allen L. Hammond and Thomas H. Maugh II, 'Stratospheric Pollution: Multiple Threats to Earth's Ozone', *Science* (Vol. 186, 25 October 1974), pp. 335-38; and Thomas H. Maugh II, 'The Ozone Layer: The Threat from Aerosol Cans is Real', *Science* (Vol. 194, 8 October 1976), pp. 170-72.

[85] For information about advances in the theoretical modelling at this time, see: J.A. Pyle, 'A Simple Calculation of Ozone Depletion by Chlorofluoromethanes Using a Two-Dimensional Model', *Nature* (Vol. 271, 5 January 1978), pp. 42-43; and H.I. Schiff, 'Ups and Downs in Ozone Prediction', *Nature* (Vol. 305, 6 October 1983), pp. 471-72. For information about the improvement in both the breadth and quality of the data collection, meanwhile, see: John Gribbin, 'Monitoring Halocarbons in the Atmosphere', *New Scientist* (Vol. 81, 18 January 1979), pp. 164-67; John Maddox, 'The Great Ozone Controversy', *Nature* (Vol. 329, 10 September 1987), p. 101; 'Ozone Wisdom from SAGE', *New Scientist* (Vol. 81, 1 March 1979), p. 652; and 'Sniffing the Air for Aerosol Propellants', *New Scientist* (Vol. 78, 11 May 1978), p. 348.

[86] Thomas H. Maugh II, 'What Is the Risk from Chlorofluorocarbons?', *Science* (Vol. 223, 9 March 1984), pp. 1051-52.

[87] Interview with Usher, *op. cit.*, in note 55.

TABLE 2.1 -- *Estimates of Projected Ozone Depletion by the CCOL and the US NAS, 1979-1984*[88]

| | CCOL | NAS |
|---|---|---|
| 1979 | 15 % | 16.5 % |
| 1980 | 10 % | - |
| 1981 | 5 - 10 % | - |
| 1982 | - | 5 - 9 % |
| 1983 | 3 - 5 % | - |
| 1984 | - | 2 - 4 % |

Bakken notes the impact that this scientific trend had upon the political process:

> This new information ... reduced national concern about the whole issue. ... The more or less annual reports from the CCOL became more diffuse and uncertainty became the dominant impression. Policy-makers were waiting for scientists to come up with a clear answer before further action was taken.[89]

Even within the US, the nation which had displayed by far the greatest concern (both scientific and political) about the issue, this trend served to diminish interest. Anne Gorsuch, the first head of the US Environmental Protection Agency under President Ronald Reagan, said that the ozone theory was 'highly controversial', and that 'apparently there is a need for additional scientific data before the international scientific community would be willing to accept the ozone layer depletion theory as the basis for additional government action'.[90] There were those who fought this view (Sherry Rowland was one of the strongest proponents of the CFC-ozone theory throughout the history of the issue), however, and thus the debate persisted. Nevertheless, James Lovelock caught the dominant

---

[88] Sources: Robin Clarke and Lloyd Timberlake, *Stockholm Plus Ten: Promises, Promises?* (London: Earthscan for the IIED, 1982), p. 44; Roan, *op. cit.*, in note 52; UNEP, *Annual Review* (Nairobi: UNEP, 1979), p. 30; UNEP, *Annual Review* (Nairobi: UNEP, 1981), p. 41; and UNEP, *Annual Report of the Executive Directory* (Nairobi: UNEP, 1983), p. 43.

[89] Bakken, *op. cit.*, in note 13, p. 200.

[90] Quoted in David Dickson, 'Congress Faces Decision on CFC', *Nature* (Vol. 293, 3 September 1981), p. 4.

perception during the first half of the 1980s by noting: 'Had we known in 1975 as much as we know now about atmospheric chemistry, it is doubtful if politicians could have been persuaded to legislate against the emission of CFCs'.[91]

Indicative of the findings emerging from much research at the time, two Belgian scientists claimed, in 1985, that the threat to the ozone layer from CFCs was 'distant' and 'that time can be allowed without risk for further scientific evaluation of theory.'[92] Their research reinforced EC opposition to a proposed global ban on aerosols propelled by CFCs that was being put forward by the Americans at this time.[93] Although the EC position was informed by a number of considerations,[94] the presence of conflicting scientific evidence contributed to the EC's reluctance to impose any significant regulatory controls.[95] In similar manners, the Japanese and the Soviets were also arguing that international regulation should be postponed until scientific proof of a cause-effect link became available.[96] Thus, the hypothesised precondition for international regime formation remained unsatisfied at this time.

### 2.1.6 -- Increasingly Consensual Opinion Regarding Chlorofluorocarbons as a Threat to the Ozone Layer, 1985-1988

The entire debate, however, changed dramatically with the detection of a significant 'crater' in the ozone layer above the Antarctic continent by the British Antarctic

---

[91] James E. Lovelock, 'Report on Reports: *Causes and Effects of Changes in Stratospheric Ozone: Update 1983*', *Environment* (Vol. 26, No. 10, December 1984), p. 26.

[92] The two scientists were Guy Brasseur and A. de Rudder (Anna Lubinska, 'Europe Takes a Cheerful View', *Nature* (Vol. 313, 28 February 1985), p. 727).

[93] For more information, see Chapter 3.1.3 of this thesis.

[94] The economic factors were particularly important in their policy formulation. See Chapter 3.1 of this thesis.

[95] Lubinska, *op. cit.*, in note 92, p. 727.

[96] Peter H. Sand, 'Protecting the Ozone Layer: The Vienna Convention is Adopted', *Environment* (Vol. 27, No. 5, June 1985), p. 40. Indeed, the lack of a scientific consensus was one factor which hindered efforts to have an international protocol opened for signature in 1985. In March of that year, some members of international society could agree only a framework convention on the issue of ozone layer depletion, in which they recognised 'the need for further research and systematic observations to further develop scientific knowledge of the ozone layer and possible adverse effects resulting from its modification' (*Vienna Convention for the Protection of the Ozone Layer* (Nairobi: UNEP, 1985), p. 11). Only in a resolution that encouraged the protocol-building process was the scientific link between CFC emission and modification of the ozone layer acknowledged. Even there, however, delegates could only agree that there was a 'possibility' of such a link -- definitely not a scientific certainty ('Resolution on a Protocol Concerning Chlorofluorocarbons', *Vienna Convention for the Protection of the Ozone Layer* (Nairobi: UNEP, 1985), p. 7).

Survey.[97] Publishing their results in May 1985, the group had discovered that ozone levels had dropped significantly -- up to over 30 per cent -- during the Antarctic spring. There had been discoveries of ozone depletion just a couple of years before. (In August 1980, NASA had, using satellite data, discovered a slight drop in global ozone levels.[98]) The figure cited at that time of 0.5 per cent, however, paled in comparison with the significant depletion that the British team had detected. Indeed, what made it even more unexpected was that the American satellites that had been gathering data over the Antarctic since 1979 had not detected any significant change in the ozone levels. The reason being, it was discerned later, was that the satellite's computers had been programmed to discard any data that were outside of an anticipated range. When the computers were reprogrammed, with this condition removed, they revealed the same pattern of springtime depletion that had been discovered by the British ground-based stations.[99] As John Gribbin notes:

> The point is that in the late 1970s and early 1980s atmospheric scientists were increasingly confident that they understood, more or less, what was going on in the atmosphere. Both the chemistry and the dynamics of air movements were being analysed in more detail than ever before, and a coherent picture was emerging. But nowhere in that coherent picture was there even a hint that a dramatic change like the development of a huge hole in the ozone layer could occur.[100]

The importance of having some tangible scientific evidence of actual ozone layer depletion had a powerful impact upon not only the scientific community, but also the political process. This should not surprise us, because, as Oran Young notes, anyone 'who has studied the politics of regime formation cannot help being struck by the role of crises (real or imagined) in breaking logjams and persuading reluctant parties to accept new institutional arrangements'.[101] In this case, the multi-colour time-series computer plots of satellite data, which showed the ozone

---

[97] J.C. Farman *et al*, 'Large Losses of Total Ozone in Antarctica Reveal Seasonal $CLO_x/NO_x$ Interaction', *Nature* (Vol. 315, 16 May 1985), pp. 207-10.

[98] Dickson, *op. cit.*, in note 90, pp. 3-4.

[99] R.S. Stolarski *et al*, 'Nimbus 7 Satellite Measurements of the Springtime Antarctic Ozone Decrease', *Nature* (Vol. 322, 28 August 1986), pp. 808-11.

[100] Gribbin, *op. cit.*, in note 25, p. 95.

[101] Oran R. Young, '"Arctic Waters": The Politics of Regime Formation', *Ocean Development and International Law* (Vol. 18, No. 1, 1987), p. 105. See, also, Ernst Haas's comments on the importance of 'urgency' (Haas, *op. cit.*, in note 28, p. 28).

crater opening during the Antarctic spring, effectively demonstrated the severity of the issue.[102]

Although crises can do much to catalyse political action by illuminating the importance of the issue, they do not necessarily resolve nonconsensus among scientists, for we must recognise that one dramatic occurrence will not necessarily prove one scientific view nor disprove another one. Such was the case in this instance, because there was still disagreement about the explanation for the observed depletion. At the time, three contending theories -- the CFC or chemical theory, the natural or dynamic theory and the solar cycle or 'odd-nitrogen' theory[103] -- were popular with significant sections of the scientific community. Indeed, it was noted that

> Theorists are offering explanations, almost as many as there are workers in the field. ... [These other explanations] involve normal chemical and meteorological processes interacting in unforeseen but innocuous ways.[104]

Although the validity of this dramatic empirical evidence was agreed, consensus about the cause of the ozone depletion over Antarctica remained elusive at this time. In light of these conflicting views, scientists intensified their efforts.

As investigations continued after mid 1985, new data were collected which suggested not only that 'global ozone depletion has been far more severe than originally predicted',[105] but also that an ozone crater could be forming over the Arctic as well.[106] Indeed, the contents of a WMO report published in 1986 suggest that there was substantial consensus at this time that damage to the Earth's ozone layer had in fact occurred.[107] Moreover, the findings from a gathering of atmospheric modellers in Wurzburg, West Germany showed that there

---

[102] I am grateful to T.M.L. Wigley, Climatic Research Unit, University of East Anglia, for a technical clarification on this point (personal communication, 17 December 1990).

[103] For a clear, primarily non-technical, discussion of the three theories, see Roan, *op. cit.*, in note 52.

[104] Richard A. Kerr, 'Antarctic Ozone Hole is Still Deepening', *Science* (Vol. 232, 27 June 1986), p. 1602.

[105] NASA scientist Donald Heath, reported in Kathy Johnston, 'Agreement Nears on Protection of the Earth's Ozone Layer', *Nature* (Vol. 328, 2 July 1987), p. 7.

[106] Kathy Johnston, 'Europe Agrees to Act for Protection of the Ozone Layer', *Nature* (Vol. 326, 26 March 1987), p. 321.

[107] World Meteorological Organisation, *Atmospheric Ozone 1985* (Geneva: WMO, Global Ozone Research and Monitoring Project -- Report No. 16, 1986).

was a further consensus growing that ongoing human activities could cause significant levels of ozone layer depletion.[108]

These developments -- mounting empirical evidence, coupled with increasingly-accepted ozone depletion projections -- were starting to influence the political process. As a case in point, it has been speculated that the shift in the EC position -- their negotiators were becoming more receptive to the idea of regulations -- was due, in no small part, to the emerging scientific consensus.[109] Nevertheless, there was at least one significant point of contention that still remained -- namely, the question of causality. Although a trip to the Antarctic continent by 13 American scientists in August 1986[110] had effectively killed the odd-nitrogen theory,[111] different interpretations of this group's findings sustained a variety of chemical and dynamical theories, and the proponents of each were 'as yet not giving an inch'.[112] Therefore, in order to try to arrive at a scientific agreement over causality, there were calls for the creation of an international panel of atmospheric scientists.

The Ozone Trends Panel was therefore set up in October 1986 'in response to claims made before [the US] Congress by Donald Heath, of the NASA/Goddard Space Flight Center, that ozone levels were decreasing globally at an inexplicably high rate'.[113] The NASA-sponsored group had over 100 scientists from 10 countries. Keeping in mind the hypothesis about national science,[114] it is instructive to note that Robert Watson, a NASA scientist and one of the leaders of

---

[108] UNEP, '*Ad Hoc* Scientific Meeting to Compare Model-Generated Assessments of Ozone Layer Change for Various Strategies for CFC Control, Wurzburg, 9-10 April 1987' (UNEP/WG.167/INF.1). See, also, Peter M. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', *International Organization* (Vol. 46, No. 1, Winter 1992), pp. 211-12; and Gribbin, *op. cit.*, in note 25, p. 137. Furthermore, one report argues that the organisation of informal workshops during the summer of 1986 helped to develop consensus about the underlying seriousness of the problem (Daniel A. Lashof and Dennis A. Tirpak, *Policy Options for Stabilizing Global Climate: Report to Congress, Main Report* (Washington, DC: US EPA, Office of Policy, Planning and Evaluation, December 1990), p. VIII-23).

[109] Interview with Fiona McConnell, Department of the Environment, London, England, 27 March 1990. See, also, Johnston, *op. cit.*, in note 106, p. 321; and Haas, *op. cit.*, in note 68, p. 356.

[110] This mission was called the National Ozone Expedition (NOZE) (Richard A. Kerr, 'Taking Shots at Ozone Hole Theories', *Science* (Vol. 234, 14 November 1986), pp. 817-18).

[111] Roan, *op. cit.*, in note 52, p. 178.

[112] Kerr, *op. cit.*, in note 110, p. 817.

[113] David Lindley, 'CFCs Cause Part of Global Ozone Decline', *Nature* (Vol. 332, 24 March 1988) p. 293.

[114] *Op. cit.*, in note 82.

the investigation,

> invited scientists from around the world to participate on the Trends Panel report. He felt that the involvement of several countries might mean that the results of the report -- whatever they turned out to be -- would be accepted by all countries. This, in turn, could assist in the international negotiations on protecting the ozone layer.[115]

The centrepiece of the Panel's efforts was a second trip to the Antarctic, which was called the Airborne Antarctic Ozone Experiment (AAOE). Preparations for this journey began soon after the completion of the NOZE expedition in November 1986; and in the Autumn of 1987, 150 travelled to the south of Chile, from where they launched their experiments in the Antarctic. Their efforts were, in the end, rewarded, for they found the elusive 'smoking gun' that implicated CFCs in stratospheric ozone depletion -- namely, they discovered an anti-correlation between chlorine monoxide and ozone levels. Thus, the journey's results demonstrated 'an undoubted chemical cause in the destruction of ozone by atmospheric chlorine ...'.[116]

These results were formalised on 15 March 1988, when the Ozone Trends Panel called a press conference to publicise their findings.[117] The group's members found both evidence of ozone layer depletion *and* substantial proof of its cause. Richard Benedick notes the impact that the weight of this evidence had:

> The panel's conclusions made headlines around the world. Ozone layer depletion was no longer a theory; at last it had been substantiated by hard evidence. And CFCs and halons were now implicated beyond reasonable doubt.[118]

With this pronouncement, the cause of stratospheric ozone depletion was no longer a major point of contention. Although there remained some dissension from

---

[115] Roan, *op. cit.*, in note 52, pp. 180-81. Not only was the Panel cross-national, it was also cross-sectoral, for the manufacturer's association played a key role. For similar reasons, therefore, their participation might contribute to the emergence of a broad-based scientific consensus (David Lindley, 'Ozone Hole Deeper than Ever', *Nature* (Vol. 329, 8 October 1987), p. 473).

[116] Their discoveries were announced less than a month after the terms of the original Montreal Protocol had been agreed (*ibid.*, p. 473).

[117] See, for example, Kevin E. Trenberth, 'Report on Reports: Executive Summary of the Ozone Trends Panel Report', *Environment* (Vol. 30, No. 6, July/August 1988), pp. 25-26.

[118] Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991), p. 110.

this view,[119] the evidence suggests that significant worldwide scientific consensus about both the causes and consequences of the problem were in place.[120] Thus, in March 1988, the first hypothesised precondition for international regime formation on ozone layer depletion was satisfied.

### 2.1.7 -- Steady Solidification of the Scientific Consensus, 1988-1991

After March 1988, evidence about the severity of the problem continued to mount, thereby strengthening the international consensus.

> At a series of UNEP meetings held in the Hague, Netherlands in October 1988, the world's leading scientists were of the consensus viewpoint that the antarctic hole is here to stay unless we reduced the emission levels of controlled CFCs by at least 85% from 1986 levels and addressed the adverse effects of other contributing ozone depleting substances such as methyl chloroform.[121]

During the winter of 1988-89, furthermore, a number of reports were published which speculated that significant destruction of stratospheric ozone over the Arctic was possible as well.[122] Although a multi-national investigation did not discover any ozone depletion, its members did detect conditions which suggested that Arctic ozone was 'primed for destruction'.[123] NASA's Robert Watson emphasised

---

[119] After this time, Rogelio Maduro, for one, argues that natural sources of chlorine are a major source that is overlooked and notes that: 'Fortunately for mankind, Rowland's theory has more holes than the ozone layer.' (Rogelio Maduro, 'CFCs are not Depleting the Ozone Layer', *EIR*, 9 June 1989, p. 19.) See, also, Rogelio A. Maduro, 'Ozone Depletion is Proven to be a Scientific Fraud', *EIR*, 28 April 1989, pp. 20-27; and S. Fred Singer, 'My Adventures in the Ozone Layer', *National Review*, 30 June 1989, pp. 34-38.

[120] There was, nevertheless, one significant deviation from the consensual view -- namely, that of the Soviet Union's representatives during late 1988 and 1989. At a conference in London in March 1989, for example, the Soviets suggested that Arctic ozone depletion 'was primarily caused by weather and climate, and not by man's emission of gases'. At this time, the leader of the Soviet delegation, stressed that any moves to strengthen the Montreal Protocol must be based upon scientific knowledge (John Ardill and Tim Radford, 'EEC Official Pledges to Speed up Ozone Fight', *The Guardian* (London), 6 March 1989, p. 1; and Richard North, 'Appeal for Fund to Help Third World Cut CFCs', *The Independent* (London), 7 March 1989). The Soviet delegation, nevertheless, had re-endorsed the scientific consensus by the Helsinki meeting in May 1989.

[121] G. Victor Buxton, 'International and Canadian Progress on Implementing the Montreal Protocol', presented at the Air and Waste Management Association Meeting, Annaheim, CA, 26-30 June 1989, p. 3.

[122] Joseph Palca and Philippa Lloyd, 'Ozone Hole Looms Large', *Nature* (Vol. 337, 9 February 1989), p. 492.

[123] Tim Radford, 'Ozone Talks Need Action, Not Words', *The Guardian* (London), 4 March 1989, p. 2. See, also, Fred Pearce, 'Plugging the Hole in Our Sun-Roof', *The Sunday Times* (London), 5 March 1989, p. F1; and Nicholas Schoon, 'Arctic Ozone Layer "Set for Destruction"', *The*

that there was:

> strong evidence that the atmospheric chemistry in the Arctic, although not as important as in the Antarctic, plays an important and hitherto unacknowledged role in the destruction of global stratospheric ozone. He pointed out that the models used to determine restrictions on chlorofluorocarbons adopted in the Montreal Protocol did not take into account heterogeneous chemistry now shown to be occurring at both poles.[124]

Regardless of the scientific detail, the sheer possibility of ozone depletion over the Arctic, which would have direct implications for the highly populated, northern latitudes, affected the policy positions of many industrialised states. Geoffrey Lean notes how the direct consequences for national interests were not lost on some policy-makers at this time: 'Governments have been shaken by evidence disclosed last month that a new ozone hole may be opening up in the Arctic, over many northern countries.'[125]

At conferences in London in March 1989 and Helsinki in May 1989, concern about the increasingly astonishing scientific evidence led many policy-makers to push for controls that went beyond those embodied in the Montreal Protocol. Indeed, Michael Oppenheimer and Robert Boyle argue that 'the telltale signs of an ozone hole in the Arctic ... prompted a change in the European Community's position [and] led to the May [1989] agreement in Helsinki to eliminate CFCs altogether'.[126] Regardless of the motivation -- although the link with the science is very suggestive -- it is clear that the consensus about the findings arising from the scientific investigations generated a sense of urgency at these meetings.[127]

---

*Independent* (London), 13 July 1989.

[124] Reported in Joseph Palca and Philippa Lloyd, 'Arctic Chemistry May Cause Significant Ozone Loss', *Nature* (Vol. 337, 23 February 1989), p. 677.

[125] Geoffrey Lean, 'Ozone: UN Acts to Tighten Controls', *The Observer* (London), 5 March 1989, p. 2.

[126] Michael Oppenheimer and Robert Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (London: I.B. Tauris and Co. Ltd., 1990), p. 160.

[127] Although some questions remained (see, for example, Robert Watson's remarks at this time, quoted in Tim Radford, 'If Only They'd Known What We Know Now', *The Guardian* (London), 5 May 1989), it was nevertheless clear that the scientific evidence was compelling. Indeed, at the Helsinki conference,

> [a representative from the] EPA made a special presentation to the conference of its latest estimates of future chlorine loading of the atmosphere under various assumptions of emissions of CFCs, halons, carbon tetrachloride, methyl chloroform, and HCFCs. Governments that two and a half years earlier had resisted going beyond a freeze of only

The scientific assessment continued to dominate the discussions as they moved away from the limelight of the international, ministerial-level conference to the uncelebrated surroundings of the closed-door, working group -- four of which were formed in May 1989 in order to recommend amendments to the Montreal Protocol. Benedick notes:

> The discussions of the Open-Ended Working Group would prove to be dominated by the findings of the science panel. The scientists had become increasingly concerned about the inability of their models to predict accurately the actually measured depletion of the ozone layer. Their misgivings were heightened by the new elements in the science since Montreal: the unexpectedly large ozone losses measured over northern latitudes, the effects of the annual Antarctic ozone hole on southern populated latitudes, the potential for precipitous ozone depletion over the Arctic, and the ominous new factor of possible consequences from volcanic eruptions.[128]

Once the negotiations returned to the international stage (namely, at the Second Meeting of the Parties to the Montreal Protocol, which was held in London in Junè 1990), the urgent and consensual scientific view again informed the high-level political process. Indeed, it appears that the mounting scientific concern about ozone layer depletion[129] was a significant force which pushed the Parties' representatives to agree to an accelerated timetable at this time.[130]

Finally, because apprehension also continued to escalate during the second

---

CFCs 11 and 12 now joined in calling for early phaseout of a broad range of chemicals.

(Benedick, *op. cit.*, in note 118, p. 125.) Also, interview with Usher, *op. cit.*, in note 55. The declaration agreed at that conference noted:

> Aware of the wide agreement among scientists that depletion of the ozone layer will threaten present and future generations unless more stringent control measures are adopted ... [and] ... Mindful that some ozone depleting substances are powerful greenhouse gases leading to global warming.

(Reprinted in: *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), p. 137.) The certainty reflected in the wording is significant.

[128] Benedick, *op. cit.*, in note 118, p. 129.

[129] A report of the British Stratospheric Ozone Review Group, released in June 1990, for example, found ozone depletion levels to be between 5 and 10 per cent in the northern hemisphere (quoted in Andrew Morgan, 'Ozone Alarm for Europe', *The Sunday Correspondent* (London), 27 May 1990, p. 1).

[130] Author's conclusion after attendance at this conference.

half of 1990 and all of 1991,[131] it is evident that the consensus steadily solidified during this period as well. Thus, in summary, the findings from this investigation into the emergence of a scientific consensus suggest that the first hypothesised precondition for international regime formation on the ozone layer depletion issue was satisfied in March 1988. They also reveal that this consensus was subsequently strengthened during the ensuing four years.

## 2.2 -- Scientific Consensus and Global Warming

### 2.2.1 -- Initial Concerns About Climate and Fossil Fuel Combustion

The weather has always been a concern for human beings, because the amount of sunshine, precipitation and so on that a land-area receives determines, to a significant extent, the type of activities in which people can engage. Indeed, there are references through much of recorded history which reflect this concern -- even as far back as the ancient Egyptians[132] and Greeks.[133]

Additionally, humans have also been concerned about the damage that may be caused by the production of energy. This concern has been in evidence for at least 2,000 years, for James Lodge notes that the 'Romans complained of the foul air of Rome, possibly recording the first documentation of the problem'.[134] Moreover, during the first 800 years of the second millennium, laws were

---

[131] On 22 October 1991, for example, 'WMO and UNEP released the Executive Summary of the latest *Scientific Assessment of Stratospheric Ozone*, ... The report caused a wave of shock through governments and industry worldwide, by revealing that the destruction of the ozone layer has advanced far more rapidly than predicted.' (Cited in *Brundtland Bulletin* (Issue 14, December 1991), p. 26.) See, also, Guy P. Brasseur, 'A Deepening, Broadening Trend', *Nature* (Vol. 352, 22 August 1991), pp. 668-69.

[132] The first climate model, according to one report, was 'that of the Egyptian scribe who said, around 3000 BC, "the Sun warms the Earth"' (T.M.L. Wigley and P. Brimblecombe, 'What is Climatology?', *Nature* (Vol. 276, 16 November 1978), p. 214).

[133] Theophrastus and others in classical Greece wrote about the possibility of widespread artificially-induced climate change (J.D. Hughes, 'Theophrastus as Ecologist', *Environmental Review* (Vol. 4, 1985), pp. 296-307, cited in Richard Grove, 'Threatened Islands, Threatened Earth; Early Professional Science and the Historical Origins of Global Environmental Concerns', in David J.R. Angell, Justyn D. Comer and Matthew L.N. Wilkinson (eds.), *Sustaining Earth: Response to the Environmental Threat* (Basingstoke: Macmillan, 1990), p. 15).

[134] James P. Lodge, *The Smoake of London: Two Prophecies* (Elmsford, NY: Maxwell Reprint Co., 1969), pp. ix-x.

passed[135] and books were written,[136] which were concerned with the deterioration of the quality of the local atmosphere by the use of, in particular, fossil fuels.

The relationship between these two concerns -- that is, changes in the weather and fossil fuel combustion -- was not, however, identified until the nineteenth century. In 1827, French mathematician Baron Jean-Baptiste-Joseph Fourier set out the analogy between the behaviour of heat in the atmosphere and its behaviour in a greenhouse.[137] Thirty-eight years later, John Tyndall built upon these ideas by further developing the concept of the 'atmospheric envelope' and the notion of 'greenhouse' retention of radiation heat by particular gases in the atmosphere.[138] The theory that rising concentrations of atmospheric carbon dioxide would increase this effect and lead to global warming was first advanced by Svante Arrhenius, a Swedish scientist, in 1896. He postulated that an effective doubling of the amount of carbon dioxide in the atmosphere would cause the average global temperature to rise by 5°C.[139] Despite the facts that Arrhenius was a well-respected scientist (he won a Nobel Prize in chemistry in 1903) and that subsequent work in the area effectively bore out his conclusions, his work was largely ignored for over 50 years.[140] Instead, throughout the first half of the

---

[135] In 1273, 'the first air pollution law was passed to counter the nuisance of smoke from domestic fires in [London]' (Matthew Wilkinson and Sarah Woodin, 'Acid Precipitation', in Angell *et al*, *op. cit.*, in note 133, p. 43).

[136] In 1661, John Evelyn wrote that human health and well-being, as well as plants, buildings, monuments and waters, were being ruined by coal smoke (John Evelyn, *Fumifugium: The Incovenience of the Aer, and the Smoake of London Dissipated*, reprinted in Lodge, *op. cit.*, in note 134).

[137] Jean-Baptiste Fourier, 'Les Temperatures du Globe Terrestre et des Espaces Planetaires', *Memoires de L'Academe Royal des Sciences de L'Institut de France* (Vol. 7, 1824), pp. 569-604.

[138] J. Tyndall, 'On Radiation Through the Earth's Atmosphere', *Philosophical Magazine* (Vol. 4, 1863), pp. 200-07.

[139] Svante Arrhenius, 'On the Influence of Carbonic Acid in the Air Upon the Temperature on the Ground', *Philosophical Magazine* (Vol. 41, April 1896) pp. 237-76.

[140] We should recognise, however, that at least two individuals did pursue the question. First, during the beginning of the twentieth century, Thomas C. Chamberlin, an American geologist, studied climatic variations throughout later geological time (cited in Roger Revelle, 'Introduction: The Scientific History of Carbon Dioxide', in E.T. Sundquist and W.S. Broecker (eds.), *The Carbon Cycle and Atmospheric $CO_2$: Natural Variations, Archean to Present* (Washington, DC: American Geophysical Union, 1985), p. 3). Second, G.D. Callendar, a British meteorologist, gathered temperature records from over 200 weather stations around the world and discovered that a global warming had occurred between the 1880s and the 1930s. In 1938, he tried to persuade the members of the Royal Society in London that this was the result of increasing carbon dioxide levels in the atmosphere. His argument, however, was greeted with scepticism. Nevertheless, for at least one

twentieth century, the conventional wisdom remained that 'climate is essentially constant, apart from short-term fluctuations, some of which might involve shadowy cyclic changes'.[141] Indeed, with little scientific interest being shown in the question,[142] the issue did not take on political dimensions of any kind during this period.

However, two important advances in the study of atmospheric science -- one theoretical and one empirical -- were made during the 1950s. The theoretical one was achieved by Roger Revelle and Hans E. Suess of the Scripps Institute of Oceanography in 1957. Up until that time, most scientists had believed that the oceans, which have a large capacity to store carbon, would harmlessly absorb almost all of the carbon dioxide that was being emitted by human activities. Challenging this view, these two scientists wrote a paper in which they reported that the oceans had not absorbed as much carbon dioxide as previously assumed. They argued that:

> human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future. Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in the sedimentary rocks over hundreds of millions of years. This experiment, if adequately documented, may yield a far-reaching insight into the processes determining weather and climate.[143]

The empirical advance, meanwhile, was the establishment, also in 1957 and as part

---

commentator, Callendar's paper had significant political implications: Kenneth Hare marks 'Callendar's 1938 paper as the point at which climate began to move centre-stage in world affairs' (F. Kenneth Hare, 'The Global Greenhouse Effect', in *The Changing Atmosphere: Implications for Global Security, Conference Proceedings* (Geneva: WMO, No. 710), p. 59). See, also G.D. Callendar, 'The Artificial Production of Carbon Dioxide and Its Influence on Temperature', *Quarterly Journal of the Royal Meteorological Society* (Vol. 64, 1938), pp. 223-40; and William R. Moomaw, 'Scientific and International Policy Responses to Global Climate Change', *The Fletcher Forum of World Affairs* (Vol. 14, No. 2, Summer 1990), pp. 252-53.

[141] H. H. Lamb, 'Fluctuations in Climate', *Nature* (Vol. 251, 18 October 1974), p. 568.

[142] It is important to recognise that the climate question was not a concern of most scientists at this time. At an international symposium on 'Man's Role in Changing the Face of the Earth' (in Princeton, NJ in June 1955), for example, the only mention of hydrocarbon combustion was with regard to the quality of the air. See, for example, Paul B. Sears, 'The Process of Environmental Change by Man', in William L. Thomas Jr., *Man's Role in Changing the Face of the Earth* (Chicago, IL: The University of Chicago Press for the Wenner-Gren Foundation for Anthropological Research and the National Science Foundation, 1956), pp. 471-84.

[143] R. Revelle and H. E. Suess, 'Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric $CO_2$ During the Past Decades', *Tellus* (Vol. 9, 1957), pp. 18-27.

of International Geophysical Year, of an atmospheric carbon dioxide measuring station at the Mauna Loa Observatory in Hawaii. Situated at an elevation of 11,000 feet, far from any human-made sources of pollution, this represented the first major attempt to construct a longitudinal record of measurements of background carbon dioxide concentrations.[144]

Once speculation about climatic change was accompanied by an observed increase in carbon dioxide concentrations, as was being recorded in Hawaii,[145] the apparent urgency of the issue rose and a governmental response, at least in the United States, was encouraged.[146] In 1964-65, Roger Revelle led a US White House study into the relationship between the burning of fossil fuels and climatic change. The members of Revelle's task force concluded that the expected 25 per cent increase in carbon dioxide concentration by the year 2000 might be 'sufficient to produce measurable and perhaps marked changes in climate, in the temperature and other properties of the stratosphere'.[147] Such natural changes, they concluded, could be 'deleterious from the point of view of human beings',[148] and they therefore called for exploring the *possibilities of bringing about countervailing climatic changes.*[149] The significance of this report, William Kellogg argues, is that it was the 'first public recognition in a United States government document that climate change could be caused by human activities

---

[144] See, for example, C.D. Keeling, 'The Influence of Mauna Loa Observatory on the Development of Atmospheric $CO_2$ Research', in J. Miller (ed.), *Mauna Loa Observatory 20th Anniversary Report* (Washington, DC: NOAA Special Report, 1978), pp. 36-54.

[145] Hare, *op. cit.*, in note 140.

[146] Kellogg reports that one of the first reports on possible global warming was by an American NGO:

> In 1963, the Conservation Foundation sponsored a meeting, and its report stated the situation more succinctly than anyone had before: 'It is estimated that a doubling of the carbon dioxide content of the atmosphere would produce a temperature rise of 3.8 degrees [Celsius]' -- the timescale involved is left unspecified, however.

(The Report is 'Implications of Rising Carbon Dioxide Content of the Atmosphere' (New York: The Conservation Foundation, 1963); while the quotation is from William W. Kellogg, 'Theory of Climate: Transition from Academic Challenge to Global Imperative', in Terrell J. Minger (ed.), *Greenhouse Glasnost: The Crisis of Global Warming* (New York: The Ecco Press, 1990), p. 99.)

[147] President's Science Advisory Committee, *Restoring the Quality of Our Environment: Report of the Environmental Pollution Panel* (Washington, DC: The White House, 1965), pp. 126-27. See, also, R. Revelle, *Report of the Task Force on Carbon Dioxide Production* (Washington, DC: The White House, 1965).

[148] President's Science Advisory Committee, *op. cit.*, in note 147, p. 127.

[149] *Ibid.*, p. 127. Emphasis added.

and that this would have important consequences for the world'.[150]

This report appears, however, to have been the only response by a governmental organisation before 1970. No other political interest was evident at this time, because much of the science remained unexplored. During the late 1960s, only a 'handful of scientists on both sides of the Atlantic were beginning to develop a physical theory to explain the behavior of the complex system that determines climate'.[151] Without sufficient understanding of carbon dioxide-atmosphere interactions, scientists were in no position to draw attention to any harmful consequences that might have arisen from the continued activities of human beings. Accordingly, the issue of global climatic change remained primarily apolitical during this period.

### 2.2.2 -- Climate Change as a Political Issue, 1970-1985

Climate change first appeared on political agendas as a significant issue during the early 1970s. Discussions about both weather and climate became the concerns of policy-makers at this time, because, at least in part, there was a general feeling that something was 'going wrong with the weather'.[152] Variations in the 'Indian monsoons and temperatures and rainfalls in middle latitudes of both hemispheres'[153] had led to world-wide droughts during the early 1970s.[154] Because 'the growth of population and the rationalisation of agriculture towards specialisation in one-crop economies in various regions [had] increased vulnerabilities to weather',[155] global food supplies had fallen to dangerously low amounts.[156] With welfare levels thus being threatened by changes in both weather and climate, the issue became a concern for politicians, and there were

---

[150] William W. Kellogg, 'Mankind's Impact on Climate: The Evolution of Awareness', *Climatic Change* (Vol. 10, 1987), p. 117.

[151] *Ibid.*, p. 119.

[152] John Gribbin, 'Weather Warning: You are now Experiencing a Climatic Change', *Nature* (Vol. 252, 15 November 1974), p. 182.

[153] P.M. Kelly and H.H. Lamb, 'Prediction of Volcanic Activity and Climate', *Nature* (Vol. 262, 1 July 1976), p. 5.

[154] Robert M. White, 'Our Climatic Future: Science, Technology, and World Climate Negotiations', *Environment* (Vol. 33, No. 2, March 1991), p. 19.

[155] Kelly and Lamb, *op. cit.*, in note 153, p. 5.

[156] White, *op. cit.*, in note 154, p. 19.

calls for scientific studies.[157]

One of the first influential inquiries into the possibility of global warming was undertaken by a group at the Massachusetts Institute of Technology (MIT) in July 1970. Researchers attending a conference on 'The Study of Critical Environmental Problems' concluded that the likelihood of climatic change during the twentieth century was small. However, they also stressed that 'the long-term potential consequences of $CO_2$ effects on the climate or of societal reaction to such threats are so serious that much more must be learned about future trends of climate change',[158] and they therefore called for more data collection. Reflective of the predominantly dismissive attitude at the time, however, an observer, commenting upon the MIT report, argued that the greenhouse effect had been a greatly exaggerated topic for anxiety: 'In short, half a degree by the end of the century (by which time nuclear power should have taken the load off the fossil fuels) is much more than sober men should worry about.'[159]

We should recognise, furthermore, that those involved in the climate change debate were not only considering the possibility of a $CO_2$-induced global warming. Indeed, most of the members of the international community -- if interested in climatic change at all -- were more concerned with global cooling. Average global temperatures had decreased from 1945 to 1970,[160] and this had initiated a spell of investigations into the prospects of a coming ice-age. In 1971, for example, Ichtiaque Rasool and Stephen Schneider, two prominent climatologists, were arguing that, in spite of the

> ... obvious uncertainties in estimating and predicting the effects of carbon dioxide and aerosols in the atmosphere, it seems that, on balance, *man's continued pollution is likely to lead to a reduction rather than an increase in global temperature*. Thus, far from there being a melting of the ice caps, it is [their] view that the triggering of an ice age is more likely.[161]

---

[157] See, for example, Henry Kissinger's call, at the UNGA in April 1974, for an investigation by the ICSU and the WMO (cited in H. H. Lamb, 'Fluctuations in Climate', *Nature* (Vol. 251, 18 October 1974), p. 568).

[158] *Man's Impact on the Global Environment: Report of the Study of Critical Environmental Problems* (London: MIT Press, 1970), p. 12. See, also, Luther J. Carter, 'The Global Environment: M.I.T. Study Looks for Danger Signs', *Science* (Vol. 169, 14 August 1970) pp. 660-62.

[159] 'The Great Greenhouse Scare', *Nature* (Vol. 229, 19 February 1971), p. 514.

[160] Lamb, *op. cit.*, in note 157, p. 568.

[161] '$CO_2$ Versus Aerosols', *Nature* (Vol. 232, 23 July 1971), p. 225. Emphasis added.

Thus, there was by no means any consensus about the direction that any climatic change would take, let alone if it would even occur.[162]

Nevertheless, in 1975, the US National Academy of Sciences (NAS) launched an investigation into the causes and consequences of carbon dioxide accumulation.[163] Under the chairmenship of W. Lawrence Gates and Yale Mintz, a Panel on Climatic Variation produced a report which highlighted the need for more research -- in both data collection and theoretical modelling.[164] Although the Panel's members placed their primary emphasis upon the need to improve the science, they also argued that climatic change could have potentially major economic and social impacts.[165]

Another NAS report, prepared by a committee headed by Roger Revelle, was published in July 1977.[166] According to Colin Norman, this report constituted 'the first major attempt to assess the validity and potential consequences of the so-called "greenhouse effect".'[167] Like their predecessors, the members of this committee called for more research to try to 'address some of the major unknowns in the climatic models and measurements on which the projections are based'.[168] Nevertheless, despite the uncertainties and the qualifications, the committee's

---

[162] The question of purposeful, human-caused changes in the weather -- for both military and civilian purposes -- was also becoming more political at this time. At the Seventh World Meteorological Congress in 1975, for example, the first item of attention under the general heading of 'Weather and Climate Modification' was the question of 'participation enhancement' ('Seventh World Meteorological Congress: Review of the Main Decisions', *WMO Bulletin* (Vol. 24, No. 4, October 1975), p. 219).

[163] The 1975 study was not the first investigation during the 1970s, for the National Research Council (NRC), under the chairmanship of Thomas F. Malone, had issued a report in 1973. Its primary concern, however, was with deliberate weather modification. In the very brief section about carbon dioxide accumulation, the authors observe the then-recent global cooling and conclude that 'changes in global temperatures cannot be solely attributed to changes in the composition of the air' (National Research Council, Committee on Atmospheric Sciences, *Weather and Climate Modification: Problems and Progress* (Washington, DC: National Academy of Science, 1973), p. 155).

[164] What it called 'data' and 'understanding' (United States Committee for the Global Atmospheric Research Program, National Research Council, *Understanding Climate Change: A Program for Action* (Washington, DC: National Academy of Science, 1975), pp. 2-4).

[165] *Ibid.*, p. 5. See, also, John Gribbin, No Title, *Nature* (Vol. 254, 10 April 1975), p. 476.

[166] National Research Council, Panel on Energy and Climate, Geophysics Study Committee, Assembly of Mathematical and Physical Sciences, *Energy and Climate* (Washington, DC: National Academy of Sciences, 1977), See, also, National Academy of Sciences, *Climate, Climatic Change, and Water Supply* (Washington, DC: National Academy Press, 1977).

[167] Colin Norman, 'Assessing the "Greenhouse Effect"', *Nature* (Vol. 268, 28 July 1977), p. 289.

[168] Cited in *ibid.*, p. 290.

members made it clear that 'if use of fossil fuels continues to increase at present rates, average global temperature could rise by about 6°C over the next 200 years, with potentially dire consequences for agriculture and fisheries'.[169] They also argued that 'the implications warrant prompt action'.[170]

Subsequent reports published in the United States in 1979, 1982 and 1983[171] confirmed the hypotheses that global warming could occur, over some period, and that it could have significant impacts for human societies. Scientists, however, continued to disagree about the level of urgency that was warranted by these suppositions. Authors of reports published by the NAS and the EPA in 1983, for example, reached different conclusions from similar findings -- the former noting that the '$CO_2$ issue [was] reason for concern, but not panic...'; while the latter adopting a much more anxious tone, arguing that the projected 'temperature increases are likely to ... [disrupt] environmental and economic systems, and [stress] political institutions'.[172] In light of these two reports, George Keyworth, US President Reagan's science advisor, denounced the EPA study as 'unnecessarily alarmist', and 'what appears to have irritated [him] is not EPA's projections themselves but its warning that early planning is necessary to deal with the disruptive effects of a global rise in temperature'.[173] These comments suggest that during the first half of the 1980s, there were significant differences among the scientific studies being undertaken in the United States.

As in our previous investigation of the ozone layer depletion issue, the focus of this section has been, thus far, upon scientific research that was being conducted in the United States. The reason for this emphasis is, once again, that

---

[169] Cited in *ibid.*, p. 289.

[170] Cited in *ibid.*, p. 289.

[171] National Academy of Sciences, *Carbon Dioxide and Climate: A Scientific Assessment* (Washington, DC: National Academy of Sciences, Climate Research Board, 1979); National Academy of Sciences, *Carbon Dioxide and Climate: A Second Assessment* (Washington, DC: National Academy Press, 1982); National Academy of Sciences, *Changing Climate: Report of the Carbon Dioxide Assessment Committee* (Washington, DC: National Academy Press, 1983); and Stephen Seidel and Dale Keyes, *Can We Delay a Greenhouse Warming?: The Effectiveness and Feasibility of Options to Slow a Build-Up of Carbon Dioxide in the Atmosphere* (Washington, DC: Office of Policy and Resources Management, US EPA, September 1983).

[172] *Ibid.*, p. i.

[173] Peter David, 'Two Views on Whether More Means Doom', *Nature* (Vol. 305, 27 October 1983), p. 751.

the vast majority of atmospheric science was being undertaken in the US.[174] There were, nevertheless, other organisations -- both national and international -- that were also studying the climate change issue during this period.

Along with the NAS, the most important body undertaking, co-ordinating and summarising research into climatic change was the World Meteorological Organization (WMO).[175] The WMO had been concerned, at least nominally, with the issue since the creation of its predecessor, the International Meteorological Organization (IMO), in 1873.[176] Significant consideration of the climate issue, however, did not take place until the 1960s, when the WMO, along with UNESCO, sponsored a meeting on climate issues in Rome.[177] During the 1960s and 1970s, climate change continued to occupy a position upon the WMO's broader agenda, with conferences being convened[178] and statements being issued.[179]

The most significant international gathering on climate change, to that date, was the First World Climate Conference, which the WMO convened in Geneva in February 1979.[180] Much of the discussion at this conference centred around the

---

[174] *Op. cit.*, in note 68.

[175] In its work on climatic change, the WMO was often joined by ICSU and/or UNEP (US Environmental Protection Agency, *Assessing the Risks of Trace Gases That Can Modify the Stratosphere*, Volume 1: Executive Summary (Washington, DC: EPA, December 1987), p. 62).

[176] The acquisition of information on climate was identified as one of the IMO's original 'major concerns' ('World Climate Programme', *WMO Bulletin* (Vol. 28, No. 1, January 1979), p. 42).

[177] UNESCO and WMO, *Changes of Climate: Proceedings of the Rome Symposium Organized by UNESCO and WMO* (Paris: UNESCO -- Arid Zone Research Series XX, 1963).

[178] In 1975, for example, the WMO (along with the International Association of Meteorology and Atmospheric Physics) sponsored an 'International Symposium on Long-Term Climate Fluctuations' in Norwich, England. This meeting is significant, because its findings effectively challenged the viability of the global cooling hypothesis and, according to one observer, 'left the greenhouse warming to dominate the stage' (Kellogg, *op. cit.*, in note 150, p. 122). See, also, H.H. Lamb, 'Long-Term Climate Fluctuations: Symposium at Norwich, 18-23 August 1975', *WMO Bulletin* (Vol. 25, No. 1, January 1976), pp. 3-9; and the proceedings of the conference, which were published as World Meteorological Organisation, *Proceedings of the WMO/IAMAP Symposium on Long-term Climatic Fluctuations: Norwich 18-23 August 1975* (Geneva: WMO -- No. 42, 1975).

[179] In 1976, for example, the WMO released a statement on climate change. The wording of this document suggests that the prospect of a possible global warming was starting to become the dominant concern in the climate change debate ('WMO Statement on Climatic Change', *WMO Bulletin* (Vol. 25, No. 3, July 1976), pp. 211-12).

[180] We should recognise, however, that one of the first international meetings of scientists to look at the problem was held in Wijk, Sweden in July 1971. At this meeting, the participants' aim was to produce an authoritative assessment of the then-present state of scientific understanding of the possible impacts of humankind's activities upon regional and global climates. They could not, however, reach agreement about many of the projected effects of climatic change. At this time, there were 'just too many honest differences of opinion and not enough facts at hand to resolve them' (Kellogg, *op. cit.*, in note 150, p. 122). The report is *Inadvertent Climate Modification: Report of the*

debate between the ice-age prophets and those who saw global warming as being more important in the medium-term. It seemed that a consensus was slowly building in favour of the latter view. The final declaration agreed that:

> We can say with some confidence that the burning of fossil fuels, deforestation, and changes of land use have increased the amount of carbon dioxide in the atmosphere ... and it appears plausible that [this] can contribute to a gradual warming of the lower atmosphere, especially at high latitudes ... It is possible that some effects on a regional and global scale may ... become significant before the middle of the next century.[181]

In such international fora, however, the issue was being discussed primarily by scientists. Kenneth Hare notes that at the time of the First World Climate Conference, the response was 'little or none from politicians.'[182]

Nevertheless, scientific activity continued, and in the wake of this conference, the Eighth World Meterological Conference created the World Climate Programme (WCP).[183] The first major initiative to result from its establishment was an international conference to address climate change in Villach, Austria, from 17 to 22 November 1980.[184] Under the chairmanship of Prof. B. Bolin of the University of Stockholm, the delegates issued a warning that the accumulation of greenhouse gases posed a great risk to the earth's natural equilibria; they declared that the issue therefore had to be addressed with some urgency.[185] Although their pronouncement drew some attention, its political impact was by no means dramatic.[186]

In addition to the US Government and the WMO, investigations were also

---

*Study of Man's Impact on Climate* (London: The MIT Press, 1971).

[181] Cited in W.W. Kellogg, 'Prediction of a Global Cooling', *Nature* (Vol. 280, 16 August 1979), p. 615.

[182] Hare, *op. cit.*, in note 140, p. 60.

[183] 'Eighth World Meteorological Congress: Review of the Main Decisions', *WMO Bulletin* (Vol. 28, No. 4, October 1979), p. 277. For more information about the WCP and its various offshoots, see Thomas D. Potter and Lars E. Olsson, 'An Overview of International Developments, Trends and Actions', in H-J Karpe, D. Otten and S.C. Trinidade (eds.), *Climate and Development: Climatic Change and Variability and the Resulting Social, Economic and Technological Implications* (London: Springer-Verlag, 1990), pp. 448-70.

[184] 'World Climate Programme', *WMO Bulletin* (Vol. 30, No. 2, April 1981), p. 126.

[185] *Ibid.*; and 'UNEP's Role in Combatting Climate Change', *Our Planet* (Vol. 3, No. 4, 1991), p. vii of supplement.

[186] Interview with Usher, *op. cit.*, in note 55.

being carried out by organisations in Europe during this period.[187] Although the reports of these groups were highlighting the fact that global warming could become significant during the twentieth-first century, they did not inspire any significant parallel inquiries by European governments.[188] Thus, the climate change issue did not occupy a prominent position upon political agendas in Europe at this time.

During the first half of the 1980s, a number of scientific uncertainties about global climate change -- particularly with respect to theoretical modelling and data coverage -- remained unresolved.[189] Although the potential socio-economic impacts of global warming were being discussed by scientists in national and international fora, they were not able to demonstrate conclusively any harmful outcomes arising from everyday human activities. Nevertheless, it was believed that the time-horizons associated with global warming safely provided ample time for further scientific investigations.[190] The issue was therefore not highly political at this time, because it was thought that decision-makers' consideration of climate questions could wait until the science had advanced sufficiently. The evidence cited in this section thus suggests that, since consensus about global warming was not evident among members of the scientific community, the hypothesised precondition for international regime formation remained unsatisfied during the first half of the 1980s.

---

[187] See, for example: the report of the summer meeting of the Royal Meteorological Society, which took place in Norwich on 15-16 July 1982 and was entitled 'Climatic Effects of Increasing Atmospheric $CO_2$' (John G. Lovelock, 'Increasing Atmospheric Carbon Dioxide and Its Consequences', *Nature* (Vol. 299, 16 September 1982), p. 203); Wilfrid Bach, Jurgen Pankrath and William Kellogg (eds.), *Man's Impact on Climate: Proceedings of an International Conference held in Berlin, June 14-16, 1978* (Oxford: Elsevier Scientific Publishing Company, 1979); and W. Bach *et al*, *Carbon Dioxide: Current Views and Developments in Energy/Climate Research, 2nd Course of the International School of Climatology, Eftore Majorana Centre for Scientific Culture, Erice, Italy, July 16-26, 1982* (Lancaster: D. Reidel Publishing Company, 1983).

[188] Although in 1984, for example, a United Kingdom Royal Commission did consider the global warming question, its only recommendation was 'that all necessary steps should be taken to ensure that there is the best chance of an early resolution of the uncertainties surrounding the effects of increasing concentrations of carbon dioxide in the atmosphere' (Royal Commission on Environmental Pollution (Chairman: Sir Richard Southwood), Tenth Report, *Tackling Pollution -- Experience and Prospects* (London: HMSO, February 1984), Chapter 5.130, p. 160).

[189] See, for example, John Maddox, 'Great Greenhouse in the Sky?', *Nature* (Vol. 306, 17 November 1983), p. 221. See, also, *infra*, in note 204.

[190] A commentator in *Nature* at this time noted the long-term time horizons associated with the issue: 'The uncertainties beyond that are, however, so great that a greenhouse effect expected, on present trends, to become apparent only halfway through the next century might in fact not become apparent for a century after that.' (Maddox, *op. cit.*, in note 189, p. 221.)

### 2.2.3 -- Global Warming as an International Political Issue, 1985-1988

Scientific investigations into the global warming issue continued during the second half of the 1980s. In October 1985 and as part of the ongoing WCP, the WMO hosted another meeting in Villach, Austria.[191] Scientists from 29 countries reviewed the then-current state of understanding about the greenhouse effect. One subsequent report notes the significance of this meeting:

> [The participants] agreed for the first time that global mean surface temperatures will rise. There was also agreement that this temperature rise was caused by man-made increases in atmospheric concentrations of radiatively active greenhouse gases...[192]

In light of this consensus about the severity of the scientific aspects of global warming, the participants at this meeting also recommended a 'start on policy analysis to identify the widest possible range of social responses for limiting or adapting to climatic changes'.[193]

The gravity attributed to the issue by some scientists is not only revealed by their declaration at this particular gathering, but also by the fact that they felt it necessary to increase the frequency of their meetings. Thus, instead of next gathering in 1990 (as the original WCP plans had dictated), two further workshops were held in Villach and Bellagio, Italy in 1987.[194] Stewart Boyle and John Ardill note that:

> The Villach-Bellagio workshops were significant for two main reasons. Not only were global warming trends confirmed, but, for the first time, policies to respond to climatic change were discussed in detail and agreed.[195]

From these meetings, a cross-national agreement about climate change emerged. Although many aspects of the debate were still enwrapped by uncertainties, these

---

[191] The International Conference on the Assessment of the Role of Carbon Dioxide and Other Greenhouse Gases in Climate Variations and Associated Impacts, Villach, Austria, 9-15 October 1985 (Geneva: WMO-No. 661). The scientific papers prepared for the conference, along with the conference statement, appear in *The Greenhouse Effect, Climatic Change, and Ecosystems (SCOPE 29)* (Chichester: Wiley, 1986).

[192] German Bundestag (ed.), *Protecting the Earth's Atmosphere: An International Challenge* (Bonn: German Bundestag, 1989), p. 340.

[193] World Climate Programme, *Developing Policies for Responding to Climatic Change* (Geneva: WMO and UNEP, WCIP-1, WMO/TD-No. 225, April 1988), p. 2.

[194] Interview with Usher, *op. cit.*, in note 55; and World Climate Programme, *op. cit.*, in note 193.

[195] Stewart Boyle and John Ardill, *The Greenhouse Effect: A Practical Guide to the World's Changing Climate* (Sevenoaks: New English Library, 1989), p. 41.

scientists noted that ongoing human activities would cause substantial changes in the natural environment and, therefore, in the social environment as well. With the potential severity of these societal consequences being illuminated, national leaders began to consider the issue.

Global warming first appeared on the international political agenda as a significant issue in 1988. In June of that year, over 300 individuals from 46 countries attended a conference on 'The Changing Atmosphere: Implications for Global Security' in Toronto. With a mandate to 'consider the threats posed by the changing global atmosphere and how they might be addressed', this conference was the first major international political gathering to have global warming as one of its principle foci.[196] It is instructive to recognise that the state of the scientific debate was summarised by the Norwegian Prime Minister, Gro Harlem Brundtland, when she said: 'Scientists still have no unanimous view on the magnitude of the climate change problem, but it is established beyond any doubt that we will experience a global change in climate.'[197] Although individuals had flagged the potential dangers of a 'business-as-usual' policy, no 'unanimous' or consensual view about global warming had emerged.

On both sides of the Atlantic Ocean, tangibility played a key role in the science-politics relationship at this time. First, in North America, the summer of 1988 will be remembered as one of the hottest on record. The drought conditions, although not necessarily manifestations of global warming, galvanised interest in the issue for both policy-makers and the general public.[198] At this time, a writer for the scientific journal *Nature* noted that:

> [US] congressional attitudes about chlorofluorocarbons (CFCs) and carbon dioxide emissions are influenced far more by the fact that the corn in most of Iowa is nowhere near as high as an elephant's eye, and that outside the House and Senate chambers it has been stiflingly hot, than any number of scientific treatises on the subject.[199]

---

[196] World Meteorological Organisation, *The Changing Atmosphere: Implications for Global Security, Conference Proceedings* (Geneva: WMO, No. 710, 1988).

[197] Quoted in Craig McInnes, 'Climate Change Called One of Mankind's Biggest Challenges', *The Globe and Mail* (Toronto), 28 June 1988, p. A5.

[198] Compare with the impact of the discovery of the ozone crater (*op. cit.*, in note 97 and accompanying text).

[199] 'Summer Heat Fires Policy Hares', *Nature* (Vol. 334, 11 August 1988), p. 457.

Second, erratic weather in the United Kingdom did much to increase speculation in that country that the climate was somehow changing.[200] More generally, the 1980s was also proving to be one of the hottest decades of the century.[201] In these ways, some empirical evidence was being gathered which, at least superficially, appeared to support the scientific case that the global warming problem was genuine.

Additionally, in response to policy-makers' demands for scientific investigations, the findings of the climatologists were being more widely heard within the political process at this time. One of the most significant statements in this regard was delivered on 23 June 1988. On this day, James Hansen of NASA's Goddard Institute for Space Studies in New York appeared before the US Senate Energy and Natural Resources Committee and declared that he was 99 per cent certain that the warming of the 1980s was not a chance event.[202] He went on to argue that it was time to stop stalling on the basis of scientific uncertainty and time to start taking action to address global warming. This statement attracted widespread attention, illuminated the importance of the issue and proclaimed a causal link.

Even given both empirical evidence and expert testimony, however, scientific consensus about global warming remained elusive at this time for a number of reasons. First, there was no agreement that the observed changes in the weather had been caused by some larger global climatic shift. Second, many other highly-respected atmospheric scientists in the US challenged Hansen's remarks and explicitly challenged the link between the warming trend and global warming.[203] Indeed, during the late 1980s, a number of uncertainties about the science of

---

[200] See, for example, the British press reports following the hurricanes of 1987 and 1988.

[201] By the end of the decade, it had been calculated that 6 of the 10 warmest years during the twentieth century had occurred in the 1980s (Nicholas Schoon, 'Scientists find Evidence of Global Warming', *The Independent* (London), 13 January 1990, p. 2).

[202] He said: 'The probability of a chance warming of that magnitude is about 1 percent. So, with 99 percent confidence, we can state that the warming during this time period [the past 30 years] is a real warming trend.' (Statement of Dr. James Hansen, Director, NASA Goddard Institute for Space Studies, *Greenhouse Effect and Global Climate Change (Hearing Before the Committee on Energy and Natural Resources, United States Senate, One Hundredth Congress, First Session on the Greenhouse Effect and Global Climate Change, Part 2)* (S.Hrg 100-461 Pt. 2, 23 June 1988).)

[203] Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco, CA: Sierra Club Books, 1989) pp. 194-98.

global warming remained[204] and there was no agreement among members of the scientific community about what the ramifications of 'business-as-usual' would hold for the Earth's natural systems. Accordingly, the hypothesised precondition for international regime formation remained unsatisfied in the middle of 1988.

### 2.2.4 -- Increasingly Consensual Opinion Regarding Global Warming, 1988-1990

Nevertheless, with such devastating predictions of both natural changes and their impacts upon socio-economic systems being voiced, the issue could not be ignored by politicians. Given the divergent scientific predictions, however, decision-makers were finding it difficult to formulate policy. Martin Parry of Birmingham University noted that the politicians were saying to the scientists: 'You have to come clean. Is the greenhouse effect happening or not?'[205] Thus, demands for a clearer scientific picture were being made in an increasingly urgent manner.

In response, the Intergovernmental Panel on Climate Change (IPCC) was formed by UNEP and WMO in 1987. This group, which brought together most of the world's preeminent climatologists, met for the first time in Geneva in November 1988. It was 'subsequently charged by [the UN General Assembly] with the task of preparing a comprehensive review of options and recommendations in response to global warming'.[206] For our purposes, the most important of the IPCC's three Working Groups was the one which investigated the science (IPCC I). Its Terms of Reference were that it should consider:

> factors affecting climate change, including greenhouse gases, responses to these factors of the atmosphere-ocean-land-ice system, assessment of current capabilities of modeling global and regional climate change and their predictability, past climate record and presently observed climate anomalies,

---

[204] Not only was the global climate system not fully understood, but there were a number of other phenomena that might have been responsible for the observed changes in the weather. For more information, see, for example: 'Holes in Data May Stall "Greenhouse" Remedies', *The Globe and Mail* (Toronto), 6 January 1989, p. D4; William Stevens, 'High-Minded Study of Mother Earth', *The Globe and Mail* (Toronto), 29 July 1989, p. D4; and Nigel Williams, 'Heat and Dust-ups', *The Guardian* (London), 25 May 1990, p. 25. For two sceptical views of the science of global warming that received much attention at the time of their respective publication and transmission, see Warren T. Brookes, 'The Global Warming Panic', *Forbes* (Vol. 144, No. 14, 25 December 1989), pp. 96-102; and *The Greenhouse Conspiracy: An Edited Transcript* (London: Channel 4 Television, 1990).

[205] Amit Roy, 'Hot News from the Pacific', *The Sunday Times* (London), 12 February 1989.

[206] Glen Plant, 'Institutional and Legal Responses to Global Climate Change', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 415.

> projections of future climate and sea level and the timing of changes. The reports should identify the range of projections and their regional variations, gaps and uncertainties. The Working Group should reduce the uncertainties. A peer review should be incorporated in the preparation of the reports.[207]

In this way, the aim was to discover whether a consensual scientific view on global warming existed.

Heeding the lesson of, among other past episodes, the ozone layer experience, there was a conscious effort to include scientists from as many different states as possible. Particular effort was expended in order to ensure the active participation of representatives from the developing world.[208] Prof. G.O.P. Obasi, head of the WMO, was one of the most vocal advocates of such a transnational approach. He notes that Southern states:

> wish to take part in the systematic observations, research and analysis. That means some need help, scientifically and financially. They require support for training and research. In addition, WMO & UNEP must provide 'information packages' to create informed awareness in developing countries. The global observing networks on climate and greenhouse gases are inadequate in tropical regions and the southern hemisphere. WMO is seeking wide support for a special fund to assist countries in these regions to establish and operate observations stations.[209]

To further this objective, 'a Special Committee on the Participation of Developing Countries was created, chaired by France', in 1989 in order to try to ensure that participation would be as universal as possible.[210] By this means, the international group, under the chairmanship of John Houghton of the United Kingdom, began its deliberations on the science of global warming.

While the scientific jury was out -- the IPCC did not present its first report until May 1990 -- scientific consensus remained lacking in international society. This, in turn, provided justification for policy inaction in the international system, for

---

[207] Quoted in Kilaparti Ramakrishna, 'North-South Issues, Common Heritage of Mankind and Global Climate Change', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 445, note 52. See, also, Jack Fitzgerald, 'The Intergovernmental Panel on Climate Change: Taking the First Steps Towards a Global Response', *Southern Illinois Law Journal* (Vol. 14, Winter 1990), pp. 231-55.

[208] For a further discussion of the role of the developing world in these issues, see Chapter 4 of this thesis.

[209] 'Global Warming: Progress on Strategies', *Environmental Policy and Law* (Vol. 19, No. 5, September 1989), p. 149.

[210] Ramakrishna, *op. cit.*, in note 207, p. 442.

many actors publicly proclaimed that more needed to be learnt about global warming before any decisions could be taken. Some explicitly cited the IPCC deliberations, arguing that they would postpone political actions until their report was published. Others, meanwhile, simply cited the 'lack of science' rationale without explicitly anticipating the IPCC report.

The state of the scientific deliberations played a particularly important role in policy-making in the United States at this time. US President George Bush often pointed to the gaps in the scientific knowledge as a rationale for advocating an intensive scientific response (*i.e.*, more research), coupled with a cautious political response (*i.e.*, do little or nothing). Indeed, in at least one instance, the Bush Administration even went so far as to 'rewrite the science', so that their policy-rationale would appear to remain defensible. More specifically, a much-publicised episode, which did much to illustrate the intimate links between science and politics, occurred on 8 May 1989. On that day,

> a spokesman confirmed that the Office of Management and Budget had altered congressional testimony by Mr. James Hansen, director of the [NASA] Goddard Institute of Space Studies, on the so-called greenhouse effect, weakening his conclusion that enough is known about the phenomenon to justify immediate action. The White House defended the editing as an effort to avoid the appearance of policy disagreements within the Administration, but the effect has been the reverse, within highly publicized congressional criticisms of the decision. The scientist himself said that the changes 'had amounted to altering the science', and added that he had been forced by the budget office to make changes that raised questions about the reliability of scientific advice on expected climate changes. Hansen believes the greenhouse warming may have already started.[211]

The political fallout from this episode was considerable, not only within the United States, but internationally as well.[212]

The US Administration brought its scientific scepticism to the international negotiations later that same year. At a ministerial conference in the Netherlands in November of 1989, the Americans claimed that there was insufficient scientific evidence to know by how much the emissions of greenhouse gases needed to be

---

[211] 'Opposition to Global Warming Convention', *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), p. 116. See, also, 'Senators Press Bush on Global Warming Threat', *International Herald Tribune*, 11 May 1989; and 'Fudge in the Greenhouse', *International Herald Tribune*, 11 May 1989.

[212] *Ibid.*

cut.[213] They therefore successfully blocked the inclusion of any timetables for the stabilisation of trace gas emissions, preferring a statement which maintained that 'such stabilisation should be achieved "as soon as possible"'.[214]

The Americans continued to use the enduring scientific nonconsensus to justify policy inaction at a conference in April 1990. Following President Bush's election promise to implement the 'White House Effect', the President gathered international decision-makers for 'The White House Conference on Science and Economics Research Related to Global Change'. Bush opened the 17-nation conference by saying: 'What we need are facts.'[215] He continued:

> to emphasize scientific differences, citing a recent television interview in which scientists disagreed on the extent of temperature change. 'Two scientists, two diametrically opposed points of view,' Bush said. 'Now where does that leave us?'[216]

Instead, Bush proposed a 60 per cent increase in spending for climate change research and called for further study to 'advance the scientific understanding we need if we are to make decisions' on remedial action.[217] In addition, an Administration paper on 'Talking Points' that was leaked was quite revealing of White House policy:

> Under the heading 'Debates to Avoid,' the paper advised delegates that it is 'not beneficial to discuss whether there is or is not warming, or how much or how little warming. In the eyes of the public we will lose this debate. A better approach is to raise the many uncertainties that need to be better understood on this issue.'[218]

Indeed, the US delegates even avoided the use of the term 'global warming', 'in

---

[213] 'Global Warming Conference Falters', *International Herald Tribune*, 7 November 1989, p. 2; and Glenn Frankel, 'U.S. Leads Way to Weaker Global Warming Plan', *International Herald Tribune*, 8 November 1989.

[214] Robert E. Morrison, *Global Climate Change*, CRS Issue Brief (Washington, DC: Cogressional Research Service, Library of Congress, 5 January 1990), p. 13.

[215] Quoted in Michael Weisskopf, 'Bush Says More Data On Warming Needed', *The Washington Post*, 18 April 1990, p. A1. Another report had the quotation in more vintage Bushesque: 'President Bush demanded "facts, the stuff that science is made of".' (Myles Allan, 'No Time for Dead Certs', *The Guardian* (London), 9 November 1990, p. 29.)

[216] Weisskopf, *op. cit.*, in note 215, p. A1.

[217] *Ibid.*, p. A1.

[218] Michael Weisskopf, 'Climate Meeting Ends in Controversy', *The Washington Post*, 19 April 1990, p. A19.

favor of the more innocuous "climate change"'.[219]

During the period of the IPCC's deliberations, other actors in international society also highlighted the scientific uncertainty in the global warming debate. With regard to other states' representatives, the United Kingdom and the Soviet Union's officials were the ones who were most often citing gaps in the scientific knowledge, using this to explain their inaction.[220] Additionally, and perhaps most stridently, a number of representatives from the fossil fuels industry were articulating the need for a better scientific understanding before the conclusion of any international agreements.[221]

On the other side of the debate, however, a number of actors had endorsed the view that global warming was, indeed, happening and that its future impact, if unabated, would be significant. Officials from the Netherlands and West Germany were putting this view forward most emphatically. Indeed, the Dutch were the first to take policy action on global warming, setting a target in 1989 to stabilise carbon dioxide emissions at the 1989/1990 level by the year 2000 at the latest.[222] Their view about the authenticity of global warming first confronted the aforementioned, more tentative position at the Noordwijk conference in November 1989.[223] This meeting did not generate as much friction or controversy as did the subsequent White House Conference in April 1990. At this time, European representatives were frustrated by the US dependence on scientific nonconsensus. German environmental minister Klaus Topfer articulated the view of a number of states' decision-makers by noting that 'gaps in information should not be used as an

---

[219] Weisskopf, *op. cit.*, in note 215, p. A1.

[220] They echoed the Americans' position with regard to the state of the scientific knowledge during the Noordwijk conference in November 1989 (*op. cit.*, in notes 213 and 214). Moreover, the major recommendation from the UK government at this time was that 'additional funding be provided for research on the greenhouse effect' (House of Commons Environment Committee, First Report, *Air Pollution*, Volume 1 (Report and Appendices together with the Proceedings of the Committee Relating to the Report) (London: HMSO, 25 May 1988), p. xlvii).

[221] See, for example, a 'Discussion Paper on Potential Global Warming' published by Imperial Oil Ltd. (Canada) in early 1990. Although it was more forward-looking than many similar reports produced by other businesses, it nevertheless maintained that 'the first critical step is to improve scientific knowledge' (noted in Frank Dabbs, 'Imperial Adds Fuel to Global Warming Debate', *The Financial Post* (Toronto), 22 May 1990, p. 20). See, also, the discussion in Chapter 3.2 of this thesis on industry's position.

[222] Karen Schmidt, 'How Industrial Countries are Responding to Global Climate Change', *International Environmental Affairs* (Vol. 3, No. 4, Fall 1991), pp. 292-317.

[223] *Op. cit.*, in note 213, and accompanying text.

excuse for worldwide inaction'.[224] They felt that there was sufficient scientific evidence to warrant serious policy consideration.[225]

Meanwhile, the presence of a variety of views regarding the persuasiveness of the collected evidence seemed to hamper what could be agreed in international declarations on global warming, for only cautious and tentative declarations about the state of the science were passed at this time.[226] Until the middle of 1990, national leaders were able to advance the argument of scientific nonconsensus in a palatable manner by referring to the then-imminent report of the IPCC science working group. In other words, some members of international society viewed it as 'acceptable' to delay further decisions until this scientific report had been tabled.

The IPCC's first Working Group released its interim report in May 1990, finalised its report at a meeting in Sundsvall, Sweden in August 1990 and presented its findings to the Second World Climate Conference in Geneva in November 1990.[227] The group's members were particularly eager to stress the fact that their findings represented the prevailing international scientific consensus on global warming:

> In the preparation of the main Assessment most of the active scientists working in the field have been involved. One hundred and seventy scientists from 25 countries have contributed to it, either through participation in the twelve international workshops organised specially for the purpose or through written contributions. A further 200 scientists have been involved in the peer review of the draft report. Although, as in any developing scientific topic, there is a minority of opinions which we have not been able to accommodate, the peer review has helped to ensure a high degree of consensus amongst authors and reviewers regarding the results presented. Thus the Assessment is an authoritative statement of the views of the international scientific community at this time.[228]

The Group was able to report that it was certain that

---

[224] Quoted in Weisskopf, *op. cit.*, in note 215, p. A1.

[225] Other actors in international society were also arguing that the science warranted policy action. Representatives of some nongovernmental organisations were some of the most vocal in this regard. See Chapter 5.3 of this thesis for a further discussion of their role.

[226] See, for example, the resolution of the 15th UNEP Governing Council from the summer of 1989, which notes that 'further scientific studies are needed' (reprinted in *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), p. 118).

[227] J.T. Houghton, G.J. Jenkins and J.J. Ephraums (eds.), *Climate Change: The IPCC Scientific Assessment* (Cambridge: Cambridge University Press for WMO and UNEP, 1990).

[228] *Ibid.*, p. iii.

> emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases: carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide. These increases will enhance the greenhouse effect, resulting on average in an additional warming of the Earth's surface. The main greenhouse gas, water vapour, will increase in response to global warming and further enhance it.[229]

Additionally, the group's members were able to predict, based upon then-current models, the consequences of ongoing human activities:

> ... a rate of increase of global mean temperature during the next century of about 0.3°C per decade (with an uncertainty range of 0.2°C to 0.5°C per decade); this is greater than that seen over the past 10,000 years. This will result in a likely increase in global mean temperature of about 1°C above the present value by 2025 and 3°C before the end of the next century. The rise will not be steady because of the influence of other factors.[230]

With this report, a substantial level of scientific consensus had been achieved among members of the worldwide community of atmospheric scientists. In this way, the first proposed precondition for international regime formation was, during the second half of 1990, satisfied on the global warming issue.

The report was greeted with trepidation by some members of international society, for the scientists predicted, to the best of their abilities, global climatic change of unprecedented rates. The United Kingdom government was quick to respond to the interim report's publication, and in May 1990, its officials changed their position on the science -- most notably for the first time at a conference in Bergen, Norway. At this time, it was reported that: 'Britain has until recently been allied to the United States on this issue but over the last few weeks has been distancing itself from the United States.'[231] More generally, between May and December 1990, 14 of the OECD's 24 member-states initiated policies to stabilise or reduce emission levels of greenhouse gases. Additionally, three other states had already done so, and five other states, though not proclaiming unilateral goals, nevertheless endorsed the European Communities' target of the stabilisation of carbon dioxide emissions at the 1990 level by the year 2000.[232] Although

---

[229] *Ibid.*, p. xi.

[230] *Ibid.*, p. xi.

[231] Paul Brown, 'Global Warming Report Throws Down the Gauntlet', *The Guardian* (London), 25 May 1990, p. 24. See, also, Nicholas Schoon, 'Experts Say the World Must Be Led by Example', *The Independent* (London), 26 May 1990, p. 3.

[232] Author's calculations from Schmidt, *op. cit.*, in note 222.

numerous factors undoubtedly influenced these decisions, the timing suggests that the IPCC's findings had at least some bearing upon the course of policy adopted.

### 2.2.5 -- Challenges to the Scientific Consensus, 1990-1991

Members of the IPCC also, however, acknowledged that a number of uncertainties remained. This fact, coupled with the absence of any unqualified proof that greenhouse-induced global warming was happening, left the door open for politicians and others to continue to cite conflicting scientific advice as a reason for a cautious political programme. American officials were one such group that adopted this tactic. At the conference in Sundsvall, Sweden in August 1990, the US delegation proposed a number of amendments that claimed that the scientists' forecasts of global warming were still highly uncertain.[233] Although most of these were successfully opposed, some American changes were adopted, including one

> saying there were formidable difficulties for policy-makers in drawing up a response to climate change and that information available for sound policy analysis was inadequate. It emphasised what it termed the remaining scientific uncertainties and also uncertainty about the costs. ... However, the amendment was countered with an Australian amendment underlining the wide scientific consensus on climate change.[234]

United States' officials were not the only ones to highlight the scientific discrepancies. In Sundsvall, the Soviet Union's delegates also questioned the findings and 'complained that some of the figures were "fictional".'[235]

United States' representatives continued to question the consensual view during the lead-up to the Second World Climate Conference in Geneva in November 1990. Just one week before the meeting began, US President George Bush was asked about the validity of the IPCC's report. He was reported to have replied: 'My scientists are telling me something very different.'[236] He was referring

---

[233] John Hunt, 'US Stand on Global Warming Attacked', *The Financial Times* (London), 30 August 1990. 'The US, which was attending the conference for the first time, had until then [yesterday morning] opposed the use of the term "global warming" and proposed 46 pages of amendments to an executive summary only 31 pages long.' (Paul Brown, 'World Treaty on Climate Mapped Out', *The Guardian* (London), 31 August 1990, p. 20.)

[234] Hunt, *op. cit.*, in note 233.

[235] *Ibid.*

[236] Quoted in David Nicholson-Lord, 'Bush Defies Alert on Global Warming', *The Independent on Sunday* (London), 4 November 1990, p. 6.

to a report from the George C. Marshall Institute in Washington, DC, which argued that other natural factors would offset global warming by cooling the Earth's atmosphere.[237] Although most climatologists dismissed the report's validity,[238] its mere existence is evidence that some continued to question the scientific consensus on the issue. Furthermore, its covert-endorsement by President Bush also helps to explain the subsequent position advanced by the Americans at the Second World Climate Conference: 'The draft US ministerial resolution [for this conference said] that human action "may" be altering the atmosphere but "the state of our knowledge is imperfect -- many important uncertainties remain".'[239] Responding to this position, one NGO campaigner complained: 'Instead of the politicians working according to the answers they have been given by the scientists, they are moving the goalposts.'[240]

Despite mounting evidence that appeared to confirm the consensual scientific position during 1991[241] -- an NAS report in the US went so far as to argue that 'even given the considerable uncertainties in our knowledge of the relevant phenomena, greenhouse warming poses a potential threat sufficient *to merit prompt responses*'[242] -- some actors continued to highlight the remaining uncertainties in the international negotiations. The Americans, in particular, still questioned the scientific consensus,[243] and they used this as a justification for

---

[237] *Scientific Perspectives on the Greenhouse Problem* (Washington, DC: George C. Marshall Institute, 1989).

[238] See the critique in John Gribbin, 'An Assault on the Climate Consensus', *New Scientist* (Vol. 128, 15 December 1990), pp. 26-31.

[239] Nicholson-Lord, *op. cit.*, in note 236, p. 6. Further, at a 'private briefing last month, Robert Reinstein, a senior official at the US Department of State, complained that Continental European countries tended "to make the political commitment first, then gather the information". Anglo-Saxons, he said, did things the other way round.' (*Ibid.*)

[240] Steve Elsworth, Greenpeace's atmosphere campaigner, quoted in *ibid.*, p. 6.

[241] After publishing its report, the members of the IPCC continued to meet to discuss the state of scientific knowledge of global warming (interview with Usher, *op. cit.*, in note 55).

[242] United States Committee on Science, Engineering, and Public Policy, *Policy Implications of Greenhouse Warming -- Synthesis Panel* (Washington, DC: National Academy Press for the National Academy of Sciences, National Academy of Engineering and the National Institute of Medicine, 1991), quoted in Robert Pool, 'NAS on Global Warming: "Insurance Needed"', *Nature* (Vol. 350, 11 April 1991), p. 449. Emphasis added.

[243] See, for example, the report of the second session of the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change (Geneva, June 1991), in Sebastian Oberthur, 'Climate Negotiations: Progress Slow', *Environmental Policy and Law* (Vol. 21, Nos. 5/6, December 1991), pp. 193-95.

refusing to introduce any specific targets for stabilising or reducing greenhouse gas emissions.[244] Such observations suggest that although a substantial consensus about the science of the global warming phenomena was in place at the end of 1991, the nature of this consensus -- particularly, its emphasis upon uncertainty, together with the general lack of tangible evidence -- meant that it was susceptible to challenge in an (arguably) politically-acceptable fashion. In this way, the manner in which scientific information informed the political discussions was still an important part of the broader debate.

### 2.3 -- Summary

The primary purpose of this chapter is to explore the hypothesis that there must be a scientific consensus with regard to the issue under consideration before an international regime can possibly be formed. To achieve this aim, the emergence of a scientific consensus on issues of global atmospheric change, along with the way in which it influenced political processes, are examined.

On the ozone layer issue, laboratory hypotheses during the late 1960s and early 1970s placed the problem upon the scientific agenda. The recognition that then-present and planned human activities could exacerbate the effect subsequently prompted its appearance upon the political agenda as well. While scientific activity intensified, however, different groups of scientists proposed different explanations of ozone layer depletion. Although the discovery of the ozone crater over Antarctica in 1985 highlighted the urgency of the issue, an agreed causal explanation also had to be in place before a broad scientific consensus could be formed. The 1987 AAOE trip to the Antarctic implicated CFCs in ozone destruction, and, with the publication of a report by the Ozone Trends Panel, the scientific consensus finally emerged in March 1988. In this way, the first hypothesised precondition was satisfied at this time.

Although speculation about anthropogenic-induced climate change had been evident for centuries, significant scientific activity on the issue did not begin until the

---

[244] In its policy announced in February 1991, the US Government declared that as a result of currently planned actions, US greenhouse gas emissions in the year 2000 would be equal to or below 1987 levels; it did not, however, make a commitment to any kind of target (*America's Climate Change Strategy: An Action Agenda* (Washington, DC: U.S. Government Printing Office, February 1991)).

1970s, when erratic variations in the weather encouraged such research. Throughout the late 1970s and early 1980s, feelings grew not only that a global warming was more likely than a global cooling, but that a 'business-as-usual' policy could bring about significant natural changes. In response to this speculation, the members of international society formed a multinational panel of experts to investigate further the phenomenon. Their report, published in 1990, confirmed that ongoing human activities would bring about enhanced global warming. In this way, it represented a significant worldwide scientific consensus on the issue, leading us to conclude that the first hypothesised precondition for international regime formation -- scientific consensus -- was satisfied by the middle of 1990. Nevertheless, the particular nature of the consensus -- which was based to a significant extent upon uncertainty and qualified evidence -- meant that science remained a viable negotiating tool in the political deliberations.

## Chapter 3 -- Tolerable Domestic Economic Costs

In this chapter, the second hypothesised precondition for international regime formation is examined.[1] It is proposed that before an international regime can be formed, the leaders of the world's major industrialised states must conclude that any policy action prescribed by emerging principles in international society has a tolerable domestic economic cost. This proposition is inspired by the work of state-centred scholars in international relations.[2] Building upon their ideas, let us consider the evolution of any sort of problem within international society.

Initially, we can assume that an individual or a group of individuals has identified a difficulty in international society by drawing attention to the consequences of ongoing human activities.[3] Upon promulgation of their findings, other individuals or groups will be motivated to suggest and to table a number of new proposals for change that attempt to avoid the costs of policy inertia. These new recommendations for policy action, however, will not automatically be taken up by states' leaders. Rather, it is hypothesised that the state's policy-makers (operating as a single entity, usually in the form of the national government) will estimate the costs and benefits associated with a recommended course of policy action. They, it is further suggested, will not be moved from their present course of policy until the net costs of a new proposal are perceived to be tolerable. If all of the leaders of the world's industrialised states find the costs of such policy action to be tolerable, then the formation of an international regime will be possible. In this way, it is proposed that tolerable domestic economic costs are a necessary (though not sufficient) condition for international regime formation.

The use of the word 'tolerable' in this proposition, rather than, in particular, 'rational', is deliberate. Use of the phrase 'rational policy action' would suggest that in order for an international regime to be formed, the payoffs in the international issue under consideration would have to change to such an extent that the issue could no longer be modelled as a dilemma of collective action. I am not suggesting that such a transformation is necessary for international regime formation. Instead,

---

[1] See Chapter 1.3 of this thesis.

[2] See Chapter 1.2.2 of this thesis.

[3] This idea is elaborated in Chapter 2 of this thesis.

by using the phrase 'tolerable', the hypothesis can be understood to suggest that there is a negative correlation between the willingness of states' leaders to contribute to the formation of an international regime and the domestic economic costs of such action. Instead of trying to quantify either the independent or the dependent variables, we should attempt to discern the direction of movement of the underlying trends, because this is the most significant indicator. The uncovering of this information may serve to further our understanding about international regime formation on the issues of ozone layer depletion and global warming.

There are a number of difficulties with this approach, and they can be divided into two significant groups. First, there are many problems with the conceptualisation of the state as a unitary, rational actor. These are examined elsewhere in this thesis.[4] Even if one accepts this abstraction, however, there is another set of problems that emerge from suggesting that states' leaders use some sort of cost-benefit analysis (CBA) while formulating policy on issues of global atmospheric change. Two in particular stand out.[5]

The first difficulty arises when the analyst attempts to calculate the costs and benefits arising from any policy that aims to reduce environmental damage. Computing the cost of action is straightforward enough, for it will be the total expense of adapting the industrial processes that are discharging the blameworthy gases. We can speculate that a price can be assigned to this industrial reorganisation, because prices are normally used in this sector of society. Greater difficulties are, however, encountered when we try to estimate the monetary value of the benefits, because the benefits themselves -- resulting from the preservation of a stable, habitable, global atmosphere -- have no prices attached to them *per se*. Indeed, many critics are offended by 'the attempt to apply the market-place philosophy to [such] non-market situations'.[6] Nevertheless, upon deeper consideration, some sort of price structure can be determined. More specifically, by taking action to stabilise the atmosphere, society will avoid costs that it

---

[4] See the discussion in Chapter 1.2.2 of this thesis.

[5] Pearce notes another potential problem with CBA: '... the changes that may occur may be "non-marginal", i.e. of significant size and with the potential for disrupting some economies at a large scale. Cost-benefit analysis is essentially about marginal changes in variables.' (David Pearce, 'Evaluating the Socio-Economic Impacts of Climate Change: An Introduction', in OECD, *Climate Change: Evaluating the Socio-Economic Impacts* (Paris: OECD, 1991), p. 19.)

[6] D.W. Pearce, *Cost-Benefit Analysis*, Second Edition (Basingstoke: Macmillan, 1983), p. 4.

otherwise would have to face. Despite the fact that the link between present policy action and the perceived benefit is more obtuse in environmental issues than in non-environmental issues, a link remains. (Whether or not policy-makers are aware of the link, however, is a separate issue and one that must be discerned from the data.[7]) The benefits -- that is the value of the avoided costs -- can nevertheless be identified, summed and presented.[8]

Once the problems associated with pricing environmental benefits are recognised, however, the analyst realises that the costs and benefits have different time horizons attached to them. Generally, the costs of stabilising the atmosphere have to be paid in the present, while the major benefits are not immediately available. Because the benefits will be obtained in the future, there is necessarily some sort of discount rate attached to them.[9] 'Such problems are referred to as "paternalistic bias", or "intergenerational equity" problems.'[10] Although *any* policy analysis will involve costs and benefits spread over different time horizons, there are problems with time horizon that are peculiar to the issues of environmental change. As a 1977 report on the ozone layer notes:

---

[7] Bear in mind that we are primarily concerned with the costs and benefits as *perceived by* states' leaders. It is important to distinguish between decision-makers' psychological environment and their operational environment. (See the work of Harold and Margaret Sprout -- for example, Harold and Margaret Sprout, 'Environmental Factors in the Study of International Politics', in James N. Rosenau (ed.), *International Politics and Foreign Policy*, Revised Edition (London: Collier-Macmillan Limited, 1969), pp. 41-56.)

[8] This encourages us to open, however, a potentially more explosive Pandora's Box. More specifically, whenever one undertakes an effort to examine the 'value' of environmental or natural resource considerations, the inadequacies of the present way that states calculate their national accounts become apparent. Demonstrating how environmental factors do not enter the calculation, one commentator noted that, for example, 'a country that cut down all its trees, sold them as wood chips and gambled the money away playing tiddly-winks would appear from its national accounts to have got richer in terms of GNP per person' ('Growth Can Be Green', *The Economist*, 26 August 1989, pp. 14-15). Of the less radical challenges to economic orthodoxy (*i.e.*, the attempt to place prices upon things that do not have prices determined by 'real' markets), the work of David Pearce has caught the attention of many decision-makers. See, for example, David Pearce, Anil Markandya and Edward B. Barbier, *Blueprint for a Green Economy* (London: Earthscan, 1989). More recently, the World Resources Institute has attempted to recalculate Costa Rica's national accounts, while incorporating changes in the country's natural wealth. See Robert Repetto *et al*, *Natural Resource Depletion in Costa Rica* (Washington, DC: World Resources Institute), cited in 'Wealth of Nature', *The Economist*, 18 January 1992, p. 77. To pursue this debate to the extent that it deserves, however, is beyond the scope of this study. It is sufficient to recognise that such difficulties do exist.

[9] Pearce, *op. cit.*, in note 6, Chapter 4.

[10] The Department of Economic and Social Affairs, 'Protection of the Ozone Layer -- Some Economic and Social Implications of a Possible Ban on the Use of Fluorocarbons', in Asit K. Biswas (ed.), *The Ozone Layer* (Oxford: Pergamon Press, 1983), p. 146.

> [A] problem arises because depletion of natural resources, or the use of an environment as a waste disposal sump, may bring about changes which within a given time-scale (sometimes in terms of several centuries, sometimes in terms of millenia) *are irreversible*. It is argued by some that a simple cost/benefit analysis does not take into account the costs of foreclosing of options to future generations that such a policy represents.[11]

Both the uniqueness and the irreversibility of much environmental capital[12] suggest that a traditional CBA might not be able to take proper account of the benefits of actions to preserve the environment. In addition, a 1988 report on global warming highlights the concept of risk:

> A major problem is the current practice of 'discounting' the future, since it is inappropriate to discount into present monetary values the risk of major transformations to the world of future generations. ... Methods are needed that build on the best of risk-business analysis and intergenerational equity studies, in order to take into account the complex character of long-term, large-scale effects of climatic change.[13]

Some environmental benefits are not inevitable, but are only probable (or sometimes simply possible), because it is not certain that ongoing human activities will bring about particular, large-scale, deleterious changes.[14] Once again, therefore, a standard CBA may not be able to take into account these aspects of the issues.[15]

Alas, with such significant strikes against the use of CBAs, should the hypothesis associated with this precondition really be pursued? The answer must be a tentative 'yes', because despite its problems, some sort of CBA is the method with which many decision-makers try to make sense of the world around them. As David Pearce maintains:

> Arguably, the explanation [of the success of CBA] is very simple. Those

---

[11] *Ibid.*, p. 146. Emphasis added.

[12] David Pearce, 'Economics and the Global Environmental Challenge', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 366.

[13] World Climate Programme (Impact Studies), *Developing Policies for Responding to Climatic Change*, (Geneva: WMO/TD, No. 225, April 1988), pp. 27-28.

[14] Nuclear reactor accidents offer an interesting analogy in this respect.

[15] There is, at present, no sufficient rejoinder to these criticisms of CBAs. However, even though environmental developments are not subject to perfect prediction, nor are other forms of social or economic behaviour. Indeed, we can only speculate that these characteristics of global atmospheric issues enhance the uncertainties associated with various anticipated futures. Regardless, it is clear that these methodological challenges do not preclude the *use* of CBAs by policy-makers. See, also, *infra*, in notes 16 and 17, and accompanying text.

> who practised CBA had a real-world task to attend to. Someone had to decide on the priorities within any sub-budget of government expenditure. The niceties of academic interchange in the learned journals did little to aid those who had these tasks. Instead, it seemed that not only did CBA offer a technique for aiding the evaluative process, albeit subject to many caveats, it actually offered the *only* reasoned technique. Founded, as it is, in a very simple concept of rationality ... CBA also had a fundamental attraction of reducing a complex problem to something less complex and more manageable.[16]

Moving from a theorist to a practitioner, the observations of a Canadian Member of Parliament also suggest that this approach has validity: 'When an environmental initiative reaches the political level, the first hurdle to be cleared is the financial one. Most significant initiatives require a substantial commitment of funds, often at a time when revenues are shrinking.'[17] These comments suggest that the use of this sort of analysis is somewhat justified by the fact that such a perspective is often employed, partly out of a desire for tangibility, by decision-makers in international society.[18]

Thus, the purpose of this chapter is to explore the proposition that leaders of the world's major industrialised states will not consider policies to facilitate the resolution of collective action problems unless the perceived cost-benefit analysis that they undertake yields a 'tolerable' outcome.[19] To achieve this aim, the chapter is divided into two sections. In the first section, the evolution of the domestic economic costs to preserve the ozone layer, as perceived by the industrialised states' leaders, is studied. The second section of this chapter presents an examination of the progression of perceived domestic economic costs

---

[16] Pearce, *op. cit.*, in note 6, p. 21.

[17] Charles Caccia, 'OECD Nations and Sustainable Development', in David J.R. Angell, Justyn D. Colmer and Matthew L.N. Wilkinson (eds.), *Sustaining Earth: Response to the Environmental Threats* (Basingstoke: Macmillan, 1990), p. 125.

[18] It should be recognised at this point that the focus in this chapter is solely upon *economic* costs and benefits. Thus, while state-centred theorists suggest more subtle contributing factors -- for example, the reduction of transaction and information costs (see Chapter 1.2.2 of this thesis) -- the analysis here is cruder, considering only the economic ramifications of policy action prescribed by emerging international principles.

[19] Other scholars who have considered international environmental issues have put forth similar hypotheses. One group, for example, concludes that 'the greater the perceived benefits of participation and the lower the perceived costs, the more enthusiasm nations will show in joining and adhering to an agreement' (Peter M. Morrisette, Joel Darmstadter, Andrew J. Plantingu and Michael A. Toman, *Lessons From Other International Agreements for a Global $CO_2$ Accord* (Washington, DC: Resources for the Future, October 1990), p. 49).

to address the global warming issue. By studying the two issues in such a way, it is anticipated that our knowledge about the process of international regime formation on issues of global atmospheric change can be advanced.

### 3.1 -- Tolerable Domestic Economic Costs and Ozone Layer Depletion

As is recounted in Chapter 2, the actions of several individuals placed the issue of ozone layer depletion upon the international political agenda during the 1970s and 1980s. A number of scientific assessments published during this period suggested that ongoing human activities could have damaging ramifications for states' citizens. Many of these reports went on to recommend regulation of the chemicals that were suspected of depleting the ozone layer. In light of this demand for government intervention, states' leaders called for information about the net costs of various regulatory actions.

During the 1970s, reduction in emissions of ozone-depleting chemicals was central to all of the proposals for government regulation. If a particular state's leaders decided to limit that state's production and use of such chemicals, however, that state -- and, in particular, its chemical industry -- would have to incur significant costs. First, there would be the tangible expense of replacing the indicted chemicals with ozone-benign substances. Second, there would be the cost of forgoing the use of those products that use (or that are manufactured with) ozone-depleting chemicals and for which there were no substitutes. Third, there could be a price to be paid in terms of the international competitiveness of the state's industry. More specifically, if regulation were to forbid a country's chemical companies from producing certain chemicals, then that state might have to sacrifice important export markets. Additionally, if a state's chemical industry were unable to provide substitute chemicals and/or technology, then that state would be forced to increase its level of imports in order to satisfy domestic demand. Accordingly, the trade balance would deteriorate and thereby cause economic harm to that state. In these ways, therefore, regulation of ozone depleting chemicals could be costly.

The primary benefits of regulatory action would be the value of the costs that would have been caused by a thinner ozone layer -- these include the expenditures associated with human health care (treating cancer, cataracts and

other ailments), lost agricultural production (both animal-rearing and crops), replacing manufacturing materials (which would weaken prematurely) and, because some ozone-depleting chemicals also act as significant greenhouse gases, the consequences of a warmer global climate.[20] Additionally and more tangibly, the state that introduces regulatory action could also accumulate benefits by reaping the rewards of developing alternative chemicals or technologies. It may be able to sell them internationally, improve its trade balance and thereby accrue a number of such secondary benefits.[21] Let us now consider the history of the politics of the ozone layer to discern how the perceived costs and benefits associated with proposed policy action evolved.

### 3.1.1 -- Unilateral Aerosol Bans During the 1970s

Because the threat to the ozone layer did not take on significant international dimensions before 1974,[22] the point of departure for this section is the publication of the landmark Molina/Rowland paper in that year.[23] These two scientists concluded that the continued release of chlorofluorocarbons (CFCs) presented a threat to stratospheric ozone. In this way, their unexpected findings challenged the continued use of CFCs and thereby threatened a large industry.[24]

The significance of the Molina/Rowland theory for US industry in particular

---

[20] See UNEP, *Synthesis Report*, UNEP/OzL.Pro.WG.II(1)/4, 13 November 1989, report of the Environmental Panel.

[21] This is simply a rudimentary outline of potential costs and benefits. The identification of these elements precludes neither the inclusion of other factors nor the use of a more complex structure. For an alternative hypothesis about costs and benefits on this issue, see ICF Incorporated, *An Analysis of the Economic Effects of Regulatory and Non-Regulatory Events Related to the Abandonment of Chlorofluorocarbons as Aerosol Propellants in the United States from 1970 to 1980, with a Discussion of Applicability of the Analysis to Other Nations* (Washington, DC: Aerosol Working Paper Series, Paper 1, October 1984), particularly pp. 1-4.

[22] See Chapters 2.1.1 to 2.1.3 of this thesis.

[23] Mario J. Molina and F. S. Rowland, 'Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom-catalysed Destruction of Ozone', *Nature* (Vol. 249, 28 June 1974), pp. 810-12.

[24] Between 1960 and 1974, the use and manufacture of CFCs had been growing at an average annual rate of 13 per cent (Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991), pp. 25-26), and chemical companies saw no reason for this trend to change. Instead, the profitability of manufacturing this 'wonder chemical' was becoming more widely recognised, and growth in the industry had even forced Du Pont 'to consolidate its Freon manufacturing capacity in one large, backward-integrated unit at Corpus Christi, Texas, to obtain the lowest-cost position *in an increasingly competitive business*' (David A. Hounshell and John Kenly Smith, Jr., *Science and Corporate Strategy: Du Pont R & D, 1902-1980* (Cambridge: Cambridge University Press, 1988), p. 584. Emphasis added).

and society more generally did not go unnoticed within American policy-making circles. In order to help US leaders better assess the appropriateness of regulatory action, a number of studies, designed to evaluate the net costs of various policies, were commissioned during the mid-1970s.[25] Although the number of conclusions reached almost equalled the number of studies undertaken, most of the major reports published during the mid-1970s agreed that regulatory action would have an immediate detrimental effect upon the American economy. A study by the US Department of Commerce's Domestic and International Business Administration, for example, 'calculated that a ban on the use of fluorocarbons from 1978 could cost billions of dollars and adversely affect the jobs of millions of workers'.[26]

Another finding that was common to almost every investigation was more specific. Studies revealed that the order of magnitude of the cost of policy action to the United States' economy would be determined by one key factor: whether or not substitutes existed for the ozone-depleting chemicals that would be regulated. If restrictions were implemented upon uses that did not have available substitutes, then there would be significant costs to pay, because many important goods and processes would have to be eliminated. But if appropriate substitutes did exist, then the costs of switching over to alternatives, although still significant (because new plants would have to be constructed and existing production facilities would have to be redesigned and retooled), would pale in comparison to the first scenario outlined.

At this time within the United States, the challenge of finding adequate substitutes for CFCs was much easier in the case of aerosol propellants than refrigerants.[27] The development of substitute chemicals[28] and alternative technologies for CFCs as aerosol propellants had been accelerated by, specifically,

---

[25] A good review of these studies can be found in The Department of Economic and Social Affairs, *op. cit.*, in note 10, pp. 141-167.

[26] 'Fluorocarbons and National Economics', *New Scientist* (Vol. 68, 2 October 1975), pp. 17-18. See, also, 'Fluorocarbon Ban Could Cost US "Millions of Jobs"', *New Scientist* (Vol. 67, 17 July 1975), p. 160; and Gerald Wick, 'Spray Can Dangers', *New Scientist* (Vol. 67, 7 August 1975), pp. 338-39.

[27] See, for example, Council on Environmental Quality, Federal Council for Science and Technology, *Fluorocarbons and the Environment: Report of Federal Task Force on Inadvertent Modification of the Stratosphere (IMOS)* (Washington, DC, June 1975), p. 4.

[28] By 1977, the percentage of aerosol products propelled by CFCs was only 29 per cent, down from 50 per cent in 1974 ('US Ban Nearer for Aerosol Cans', *New Scientist* (Vol. 74, No. 1050, 5 May 1977), p. 254).

a change in public habits after the initial publicity surrounding the CFC-ozone layer hypothesis and by, more generally, the 1974-75 economic recession.[29] Outside the aerosol industry, meanwhile, neither replacement chemicals nor alternative technologies were available for the other major uses of CFCs.[30] Therefore, if CFC emissions had to be reduced, then a ban on their use in aerosol sprays would be the least costly means of achieving immediate reductions.

In the absence of any benefits, however, a *laissez-faire* policy would obviously be preferable to one that brought about economic costs, no matter how small. The magnitude of the primary benefits, and indeed their sheer existence, was dependent upon the scientific estimations of eventual stratospheric ozone depletion. Because there were a number of uncertainties attached to the state-of-the-art scientific understanding at the time,[31] the value of the benefits was difficult to estimate.

One group, however, that was keen both to highlight the costs and to question the benefits of government intervention was the chemical industry. Wanting to protect its steady inflow of profits from CFC production, the industry was vehemently opposed to any kind of regulation. Igor Sobolev of Kaiser Aluminum & Chemical, for example, said: 'We may be about to extrapolate an unproven speculation, one open to serious question, into conclusions and laws that could disrupt our economy and indeed our way of life.'[32] Meanwhile, Du Pont, the world's largest CFC manufacturer,[33] undertook a massive publicity campaign, arguing that 'there is time to find the answer'.[34] The existence of the

---

[29] ICF Incorporated, *op. cit.*, in note 21, p. 1.

[30] In the early 1970s, about 28 per cent of American CFC production was used 'as refrigerants in residential and commercial air conditioning and refrigeration, food storage and display, and automobile air conditioning', making it the second most important application. In 1975, however, it was 'reported by industry representatives that no suitable alternatives are presently known for the majority of refrigeration uses...' (Council on Environmental Quality, Federal Council for Science and Technology, *op. cit.*, in note 27, p. 4).

[31] See Chapter 2.1 of this thesis.

[32] Quoted in Sharon L. Roan, *Ozone Crisis: The 15 Year Evolution of a Sudden Global Emergency* (Chichester: John Wiley & Sons, Inc., 1989), p. 38.

[33] In 1989, it was reported that Du Pont made about 25 per cent of the world's CFCs and 'dominate[d] the U.S. market' (Pamela S. Zurer, 'Producers, Users Grapple with Realities of CFC Phaseout', *Chemical and Engineering News*, 24 July 1989, p. 8).

[34] From a Du Pont advertisement in *Science* (Vol. 190, 3 October 1975), p. 9. In this advertisement, Du Pont also claim that '[b]efore a valuable industry is hypothesized out of existence, more facts are needed' (p. 8).

calculated benefits were too uncertain, industry representatives argued, to justify burdening the United States with the substantial economic costs of regulation.

In the eyes of American policy-makers, however, the relative weights of the costs and benefits shifted significantly after the publication of the National Academy of Science's 1976 report, in which it was estimated that eventual ozone layer depletion would most likely be 7 per cent.[35] A wish to avoid the future costs of policy inaction, coupled with a desire to be seen to be doing 'something', prompted the US government 'to set in train [in May 1977,] legislation to enact [a ban upon ozone depleting chemicals] by the end of 1978'.[36] The legislation, however, stopped short of the total prohibition of CFCs. More specifically, decision-makers only went so far as to ban all CFCs in 'non-essential' aerosols.[37] Americans policy-makers had, therefore, made a distinction between non-essential aerosols and all other uses of CFCs. The former were subject to regulation because the economic costs were tolerable, while it was perceived that regulation to the latter -- in particular, any regulation that affected refrigeration[38] -- would create a significant economic burden.

Although the ban affected 'nearly [US] $3 billion worth of sales in a wide range of products',[39] the disturbance to the US economy as a whole, and even to the chemical industry in particular, was not severe. A writer in the journal *New Scientist* noted at the time that: 'The [US]$4700 million a year chlorofluorocarbon industry had received due warning of last week's action and has already converted many of its aerosol products to alternative propellants such as carbon dioxide, hydrocarbons and simple mechanical pressure.'[40] Thus, in the end,

---

[35] See Chapter 2.1.4 of this thesis.

[36] Kiki Warr, 'Ozone: The Burden of Proof', *New Scientist* (Vol. 128, 27 October 1990), p. 37.

[37] 'US Finalises Aerosol Ban', *New Scientist* (Vol. 77, 30 March 1978), p. 839.

[38] The US Department of Commerce's Domestic and International Business Administration study noted earlier (*op. cit.*, in note 26, and accompanying text) also argued that if a near total ban on CFC use were to be implemented from 1 January 1978, then 'more than 466 000 employees could be directly affected either by layoffs or curtailed employment' in the refrigeration industry alone (quoted in 'Fluorocarbons and National Economics', *op. cit.*, in note 26, pp. 17-18).

[39] Richard Elliot Benedick, Protecting the Ozone Layer: New Directions in Diplomacy', in Jessica Tuchman Mathews (ed.), *Preserving the Global Environment: The Challenge of Shared Leadership* (London: W.W. Norton & Company, 1991), p. 116.

[40] 'US Finalises Aerosol Ban', *op. cit.*, in note 37, p. 839. See, also, ICF Incorporated, *op. cit.*, in note 21, p. 16.

'[e]conomically, the aerosol industry was to suffer little' from the ban.[41]

The United States was soon joined by Sweden (1979), Norway (1979, taking effect from 1 July 1981) and Canada (1980) in the implementation of 'can bans'.[42] We can speculate that these countries' decision-makers conducted similar cost-benefit analyses to those in the US.[43] The conclusions, however, were not reproduced by many others, and the anticipated domino effect throughout the world did not take place at this time. In this way, we can hypothesise that the leaders of the world's other major industrialised states did not undertake domestic action because they viewed the sums differently, perceiving the costs of regulatory action to be intolerable. An examination of European decision-makers' attitudes and perceptions during the 1970s substantiates this assertion.

The European Community was the second largest producer of CFCs during the mid-1970s, with West Germany, the United Kingdom and France being the most significant contributors.[44] Accordingly, the industries in these countries were also placed under threat by the Molina/Rowland hypothesis. There were, however, significant differences between the Europeans' and the Americans' decision-making environments -- both psychological and operational. Because of these differences, decision-makers in the major CFC-producing states of Europe believed that CFC regulation in their states would result in fewer benefits and greater costs.

Their perception of smaller benefits emanated, at least partially, from their assessment of the scientific reports that were published during the 1970s. As in the United States, industry representatives, particularly in the United Kingdom and

---

[41] Roan, *op. cit.*, in note 32, p. 85. Indeed, instead of bringing economic costs, the ban actually brought economic benefits. 'Hydrocarbons, the replacement propellant, are less expensive than CFCs and saved the U.S. economy [US]$165 million in 1983 alone.' (Cynthia Pollock Shea, *Protecting Life on Earth: Steps to Save the Ozone Layer* (Washington, DC: Worldwatch Paper No. 87, December 1988), p. 24.) See, also, ICF Incorporated, *op. cit.*, in note 21, p. 4.

[42] T. Bunge, 'International Agreements', in *Responsibility Means Doing Without -- How to Rescue the Ozone Layer* (Berlin: The Federal Environment Agency, 1989), p. 172. Also note that Denmark introduced a can ban in 1984, with effect from 1 January 1987 (which also included the regulation of CFCs in solvents), as did New Zealand (solely a can ban) in 1988.

[43] Nothing more will be stated, for these countries were neither major producers nor consumers of CFCs. In 1974, Canada, for example, produced about 2.5 per cent of the worldwide total of CFCs (author's calculations from Environment Directorate, *Fluorocarbons: An Assessment of Worldwide Production, Use and Environmental Issues (First Interim Report)* (Paris: OECD, 1976), pp. 30-31, Table II).

[44] In 1974, the US produced 44 per cent of the reported world total of 1,048,391 tonnes of CFCs. Western Europe, as a whole, accounted for 32 per cent (author's calculations from *ibid.*, pp. 30-31, Table II).

France, were highlighting the scientific uncertainties associated with the CFC-ozone layer hypothesis. In 1978, for example, a report published by the British Aerosol Manufacturers Association noted that there was much scientific confusion, and therefore 'there is no hazard in waiting for more definite scientific conclusions, nor any reason to restrict manufacturers' choice of propellants for aerosol cans'.[45] Additionally, Imperial Chemical Industries (ICI), Europe's largest CFC manufacturer, issued a statement 'stressing the balance of evidence which [in 1978 showed] that there is no need for a panic ban on FCs as propellants in aerosol sprays'.[46] Coupled with this, however, and making the situation in Europe distinct from that in the United States, government-sponsored research was also stressing the uncertainties and challenging the validity of some of the suggested catastrophic ramifications of eventual stratospheric ozone depletion.[47] Accordingly, the magnitude of the benefits as perceived in Europe were not as large as they were in the United States.

In addition, the costs of regulation for Europeans were seen to be higher for at least four different reasons. First, the Europeans used more CFCs in aerosols, both absolutely[48] and proportionately,[49] than the Americans did. Therefore, any ban by European governments upon the use of CFCs in non-essential aerosols would affect a greater proportion of its industry, and could thereby be more economically disruptive in Europe than it had been in the United States. As an acute example of this difference, note the unilateral action taken by a large multinational company in 1975. At that time, Johnson Wax decided to replace the CFCs in its aerosol products with other propellants. This decision, however, applied to its products in the US, not in the UK. This uneven application of policy may have been partially 'connected with national differences, both in product formulation and

---

[45] Cited in 'Verdict Still Open on Fluorocarbons', *New Scientist* (Vol. 79, 21 September 1978), p. 830.

[46] Cited in 'ICI Lashes Ozone Econuts', *New Scientist* (Vol. 80, 7 December 1978), p. 750.

[47] See Chapter 2.1.4 of this thesis.

[48] In 1973, approximately 0.95 billion aerosol units were filled in the United States, while approximately 1.70 billion were filled in Europe (author's estimates from Patricia L. Layman, 'Aerosols Back on Road to Success', *Chemical and Engineering News*, 28 April 1986, p. 42).

[49] In 1976, the EEC's proportion of CFC-11 and CFC-12 sales that were aerosols were 73 per cent, while in the United States, the figure was 48 per cent (Frudolf J. Engelmann, 'A Look at Some Issues Before an Ozone Convention', *Environmental Policy and Law* (Vol. 8, 1982), p. 53).

in public reaction to the ozone scare'.[50] However, because this policy change affected less than 5 per cent of the company's American aerosol business, while 20 per cent of Johnson Wax's British aerosol business was CFC-propelled,[51] it is probable that the motivation was also, at least partially, economic.

Second, the international trade in CFCs was very lucrative for a number of European states during the 1970s. Compared with the US, the Europeans exported a greater proportion of the CFCs than they produced.[52] The British, for example, had exports valued at £70 million in 1975.[53] Thus, if the European states were to implement a production ban, then substantial export markets would have to be forsaken. Explicitly citing this as a rationale for its *laissez-faire* policy on CFCs, the UK Minister of State for the Environment, Denis Howell, said in 1975 that an aerosol ban could cause 'a considerable loss to our balance of payments' and have 'far-reaching repercussions on the aerosol industry'.[54]

Third, the European industry was operating at only approximately two-thirds capacity, while American industry was operating at nearly full capacity.[55] If we assume that, given the substantial fixed costs of chemical production, profitability depends upon capacity, then we can speculate that, *ceteris peribus*, gradually increasing cuts in production levels would have pushed European firms into the 'red' sooner than their American counterparts.[56] Once this consideration entered the calculations, therefore, the cost-benefit analysis further dissuaded the Europeans from introducing regulatory action.

Finally, the British and French had their own particular reasons for being

---

[50] Martin Sherwood, 'Johnson Waxes Eloquent -- in US but not UK', *New Scientist* (Vol. 67, 3 July 1975), p. 34. See, also, the discussion in Chapter 5.4.1 of this thesis.

[51] Sherwood, *op. cit.*, in note 50, p. 34.

[52] Alice Enders and Amelia Porges, 'Successful Conventions and Conventional Success: Saving the Ozone Layer', in Kym Anderson and Richard Blackhurst (eds.), *The Greening of World Trade Issues* (London: Harvester Wheatsheaf, 1992), p. 132.

[53] Department of the Environment, Central Unit on Environmental Pollution. *Chlorofluorocarbons and their Effect on Stratospheric Ozone* (London: HMSO, Pollution Paper No. 5, 1976), p. 6.

[54] Quoted in 'MP Calls for British Fluorocarbon Ban', *New Scientist* (Vol. 67, 7 August 1975), p. 336.

[55] Peter H. Sand, 'Protecting the Ozone Layer: The Vienna Convention is Adopted', *Environment* (Vol. 27, No. 5, June 1985), p. 41. Even in 1986, it was noted that European industry 'is probably at only about 70% of its full capacity' (Lois R. Ember *et al*, 'Tending the Global Commons', *Chemical and Engineering News*, 24 November 1986, p. 52).

[56] I am grateful to Richard Jerram, Economist Intelligence Unit, London, for a clarification on this point.

suspicious of the Americans' enthusiasm for CFC regulation. The US decision on landing rights for the Concorde[57] was still fresh in the memories of French and British decision-makers, and they suspected that US policy on ozone layer protection 'was being motivated by economic concerns (the threat of European dominance in supersonic flight) rather than environmental concerns. ... [The British and French] were angered by what they saw as U.S. "environmental neocolonialism".'[58] With the American Boeing programme shelved and the British and French continuing to develop, albeit on a limited scale, an SST, it was generally believed that the Europeans were overtaking the Americans in this strategic sector.[59] Thus, the Europeans suspected that the re-opening of the ozone layer debate, ostensibly by the CFC-route, was a backdoor method to sabotage the Concorde project, whose demise would damage the British and French economies.

Although these four observations suggest that the commercial concerns strongly influenced policy-making in West European countries,[60] European legislators did, nevertheless, take some action.

> In August, 1977, the Commission of the European Communities drafted a proposal calling upon member states to increase the search for fluorocarbon substitutes, to halt the leakage of fluorocarbons, and to restrict production of fluorocarbons to 1975 levels.[61]

No regulation of any sort, however, was adopted in either 1977, 1978 or 1979.[62] Although some EC members were pushing for strong European regulation, specifically the West Germans[63] (particularly towards the end of the decade),

---

[57] The US had only granted limited landing rights to the European SST (Lydia Dotto and Harold Schiff, *The Ozone War* (Garden City, NY: Doubleday & Company, 1978), Chapter 5).

[58] Peter M. Morrisette, 'The Evolution of Policy Responses to Stratospheric Ozone Depletion', *Natural Resources Journal* (Vol. 29, No. 3, Summer 1989), pp. 800-01.

[59] Within the United States, 'it was widely believed at the highest level of government and industry that the future of the U.S. aircraft industry as well as the prestige and dominance of U.S. technology rest with the successful development of an SST' (*ibid.*, p. 801).

[60] For a forceful argument supporting this view, see Benedick, *op. cit.*, in note 39, pp. 116-18.

[61] Kenneth J. Vandevelde, 'International Regulation of Fluorocarbons', *The Harvard Environmental Law Review* (Vol. 2, 1977), p. 478. Research was also being undertaken, for the 'European Commission [was also] studying the use of CFCs as well as the economic and social impacts of regulating their use in aerosols' ('Verdict Still Open on Fluorocarbons', *op. cit.*, in note 45, p. 830).

[62] A 'loose' production cap was agreed in 1980. See *infra*, in note 94, and accompanying text.

[63] 'ICI Lashes Ozone Econuts', *op. cit.*, in note 46, p. 750.

British and French actions effectively thwarted any significant action.[64] These two states' representatives 'opposed a wider negotiation mandate for the Commission. ... As the Council had to decide unanimously, these countries determined the EC's position.'[65] Therefore, the EC action that was taken was primarily defensive, and mainly symbolic.

The leaders of the major industrialised states perceived the costs and benefits of regulatory action on CFCs differently during the 1970s. In the United States, results of the analysis prompted the implementation of an aerosol ban in 1978. Meanwhile, on the other side of the Atlantic, the British and the French interpreted the results differently and did not believe that any regulation would be economically tolerable. Their resistance in effect stymied any EC efforts. Thus, with some players not perceiving the costs of any form of regulation to be 'tolerable', the hypothesised precondition for international regime formation remained unsatisfied at the end of the 1970s.

### 3.1.2 -- Declining Support for Regulation, 1980-1985

During the latter part of the 1970s and the first part of the 1980s, many in the US wanted the regulations on CFCs to be extended. In particular, the Environmental Protection Agency (EPA), prompted by the National Academy of Science's predictions of higher levels of eventual ozone depletion,[66] was investigating the possibility of broadening the restrictions upon CFCs 'to cover non-aerosol uses such as refrigerants, foaming agents and solvents'.[67]

Industry representatives, however, continued to oppose restrictions, demanding 'clear scientific evidence' that CFCs posed a threat to humans and the

---

[64] The United Kingdom government, for example, while calling for more investigation into the ozone layer question, only informally 'advised industry to intensify the search for substitutes and to reduce fluorocarbon leakage' (Vandevelde, *op. cit.*, in note 61, p. 477).

[65] Markus Jachtenfuchs, 'The European Community and the Protection of the Ozone Layer', *Journal of Common Market Studies* (Vol. 28, No. 3, March 1990), p. 265; and interview with Tim Leah, Environment Canada, National Secretariat for UNCED, Ottawa, 2 January 1991.

[66] The NAS released a report in November 1979, which estimated eventual ozone depletion to be 16.5 per cent. See Chapter 2.1.4 of this thesis.

[67] David Dickson, 'Congress Faces Decision on CFC', *Nature* (Vol. 293, 3 September 1981), p. 3. See, also, Colin Norman, 'Satellite Data Indicate Ozone Depletion', *Science* (Vol. 213, 4 September 1981), pp. 1088-89.

environment.[68] This position was being articulated most directly by a coalition called The Alliance for Responsible CFC Policy ('the Alliance'). Formed in September 1980, it was organised 'to represent the interest of [CFC] user and producer industries in the United States'.[69] During the early 1980s, its most pressing task 'was to convince the [US] government -- Congress, the White House and anyone else -- that EPA's proposal to restrict CFCs is ill-advised'.[70] Although the conflict during the first half of the 1980s seemed to consist of the same two sides presenting, roughly, the same arguments as they had during the 1970s, other factors were shifting the benefits and costs as perceived by US decision-makers at this time and thus changing the complexion of the debate. The movement was such that government officials in the United States believed it not to be in the country's interests to impose further regulation upon ozone-depleting chemicals.

The perceived value of the future benefits was declining, because it was being predicted that eventual ozone layer depletion would be lower than originally envisaged. Two developments led policy-makers to reach this conclusion. First, the international scientific group that was studying the issue was steadily revising its calculation of ozone depletion -- downward.[71] Because a good 'rule of thumb' suggested that there was an inverse linear relationship between the quantity of stratospheric ozone and the incidence of cancer,[72] the estimated cost of future health care was therefore also falling at this time.

Second, primarily because of the US 'can ban', the use of CFCs was declining worldwide.[73] With fewer CFCs being discharged into the atmosphere, the level of eventual ozone depletion was thought to be decreasing, and

---

[68] Robert W. Hahn and Albert M. McGartland, 'The Political Economy of Instrument Choice: An Examination of the U.S. Role in Implementing the Montreal Protocol', *Northwestern University Law Review* (Vol. 83, No, 3, Spring 1989), pp. 598 and 607.

[69] The Alliance for Responsible CFC Policy, *The Montreal Protocol: A Briefing Booklet* (Rosslyn, VA: The Alliance for Responsible CFC Policy, December 1987), p. iii.

[70] Comments of an industry spokesman to *The New Yorker* magazine (quoted in Roan, *op. cit.*, in note 32, p. 103).

[71] See Chapter 2 of this thesis, particularly Table 2.1.

[72] At this time, it was accepted that a 1 per cent decrease in stratospheric ozone levels would cause a 2 per cent increase in ultraviolet radiation (Department of the Environment, Central Unit on Environmental Pollution, *op. cit.*, in note 53, p. 8).

[73] CFC production in the Western world dropped between 1976 and 1981 (Chemical Manufacturers' Association, *Production, Sales, and Calculated Release of CFC-11 and CFC-12 Through 1988* (Washington, DC: CMA, 1989)).

accordingly, the value of the perceived benefits of further regulation was also diminishing. Although the influence of declining production levels is being partially double-counted in the present analysis (because they were also being accounted for by the scientists in their predictions), it nevertheless did help to diminish the magnitude of the perceived benefits. More specifically, because the revised depletion estimates were generally held to be independent of the downward trend in CFC-use, the latter independently strengthened an increasingly-held view that the problem of ozone layer depletion was quickly receding. In this way, policy-makers perceived benefits to be falling more rapidly than the scientific evidence and the statistics perhaps justified.

More generally, the new Reagan Administration's election in 1980 reflected a change in popular opinion within the United States. The 1980s was, in many ways, a period during which the importance of the individual and the free market were emphasised. Self-confidence was considered an admirable value, and it in turn motivated self-promotion and self-advancement. Consequently, the interests of others -- fellow citizens or future generations -- may have been accorded less importance. In this way, we can speculate that the perceived discount rate was increasing at this time -- thereby lowering the present-day value of any future benefits.

Further, those diminished benefits that remained were being accorded less visibility during the early 1980s for two important reasons. First, the case advancing the benefits' values was not being pushed as firmly during this period as it had been during the 1970s. In particular, the US Environmental Protection Agency, whose members had done so much to highlight the value of regulatory action during the 1970s, adopted a different position. Owing to staffing changes in the organisation[74] -- not least of which was the appointment of Anne Gorsuch as its head -- the EPA did not pursue the issue vigorously, with Gorsuch dismissing ozone layer depletion as just another environmental scare.[75]

Second, in light of President Reagan's Executive Order 12291, signed shortly

---

[74] Peter M. Haas, 'Obtaining International Environmental Protection through Epistemic Consensus', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 355.

[75] See Chapter 2, note 90 of this thesis.

after he took office, all major new regulations had to undergo benefit-cost analysis.[76] It was, however, quite difficult to quantify the benefits of regulatory action to restrict CFC usage. In a general sense, as Charles Caccia notes, proponents of regulation must 'search desperately for an assessment of the true cost to the economy of not taking action. Data are often not available and such costs are not easily calculated.'[77] More specific to the ozone layer issue, Anil Markandya notes that at this time, 'there were no studies showing how the damage attributable to these chemicals compared to the costs of limiting their use'.[78] Advocates stressing the benefits of regulatory action to save the ozone layer could thus only substantiate their case with 'soft', qualitative evidence.[79] Their assessments were therefore more susceptible to attack in the public debate. Thus, for a variety of reasons, the perceived benefits of regulatory action were falling during the early 1980s.

Additionally in the United States, the perceived costs of regulation were increasing at this time. Members of the Alliance were highlighting these shifts, stressing the immediate economic costs of legislative action. The theme of the members' arguments was not new; industrial interests had issued similar dire warnings in the campaign against the aerosol ban during the second half of the 1970s. This time, however, the arguments seemed to impress decision-makers to a greater extent. Three reasons are suggested for this change in perception.

First, the Reagan Administration was averse to any sort of regulation at all, instead preferring to take government out of the homes and workplaces of the nation.[80] Second, the small-c conservative nature of the Administration made it keen to protect the interests of business. As Sharon Roan notes, the 'Reagan administration was also sympathetic to the idea that additional CFC regulations

---

[76] V. Kerry Smith, 'Environmental Policy Making Under Executive Order 12291: An Introduction', in V. Kerry Smith (ed.), *Environmental Policy Under Reagan's Executive Order: The Role of Cost-Benefit Analysis* (London: University of North Carolina Press, 1984), p. 4.

[77] Caccia, *op. cit.*, in note 17, p. 125.

[78] Anil Markandya, 'Economics and the Ozone Layer', in David Pearce (ed.), *Blueprint 2: Greening the World Economy* (London: Earthscan, 1991), p. 64.

[79] Titus notes that some EPA studies had to highlight seemingly peripheral matters, such as the price of replacing plastics damaged by increased ultraviolet radiation (James G. Titus (ed.), *Effects of Changes in Stratospheric Ozone and Global Climate, Volume 1* (Washington, DC: US EPA, 1986), p. 7).

[80] Alan S. Miller and Irving M. Mintzer, *The Sky Is the Limit: Strategies for Protecting the Ozone Layer* (Washington, DC: World Resources Institute, Research Report No. 3, November 1986), p. 21.

would cause grave economic hardships'[81] -- in particular, the effect that it would have on small businesses.[82] Finally, the predictions of dire economic straits were being made against the backdrop of a global economic recession. Hence, any policy that would cause layoffs and economic disturbance was held to possess a higher marginal cost (both economically and politically) at this time than had been the case during economically more buoyant periods.

In addition to the prospects of unemployment and foreclosure of small businesses, members of the Alliance were also noting that the price of substitute chemicals was higher than the price of CFCs. Recall that any further regulation in the US at this time would have to be imposed upon applications other than aerosols. This would prove more difficult, for studies undertaken 'for the EPA from 1978 to 1982 could find potential substitutes for only a third of CFC applications'.[83]

It is instructive, at this point, to examine further the interesting relationship between government and industry. In a general sense, alternative strategies or substitutes will become less costly to produce only after substantial research has been undertaken. But private enterprise will not conduct such research into alternatives to destructive environmental activities unless it is in their economic interest to do so. It may be, at times, worth their while to develop environmentally-sound products simply in order to improve their public image. But, in the vast majority of instances, such activities are not undertaken merely for considerations of good-will. Instead, research and development into alternatives and substitutes will only be funded if the price of substances used at present increases. Basic economic theory teaches us that the cost of present products will rise with the threat of scarcity (when either the commodity is being depleted or a regulatory body is threatening its future supply -- for example, an announcement that it will be banned, or its production restricted, by legislation). Thus, one condition that accelerates the development of alternatives is the prospect of government regulation. A study of the ozone layer depletion issue suggests that there is a direct

---

[81] Roan, *op. cit.*, in note 32, p. 105.

[82] 'In the spring of 1981, CFCs were a [US]$500 million industry. The Alliance claimed that 260,000 businesses, most of them small, used CFCs, and that no substitutes were available for most applications.' (*Ibid.*, p. 109.)

[83] Alan S. Miller, 'Policy Responses to Global Warming', *Southern Illinois Law Journal* (Vol. 14, Winter 1990), p. 201.

correlation between the threat of government regulation and the development of substitute chemicals.

The threat and implementation of regulations during the 1970s prompted the major chemical companies in the West to undertake research and development into new, ozone-benign substances that could replace chlorofluorocarbons. In the UK during this period, for example, ICI spent £5 million developing benign alternatives.[84] Work progressed to such an extent that ICI patented some of the technology on HFC-134a (which eventually became one of the most significant replacement chemicals).[85] Similarly, in the US, Du Pont and the other major chemical companies were also undertaking research programmes,[86] and by 1979, 'several substitute chemicals had been identified'.[87] Although none could be produced as cheaply as CFC-11 and CFC-12,[88] advances in research and development were nevertheless reducing the anticipated market price of the new chemicals. In this way, during the mid and late 1970s, the economic costs of further regulation were decreasing.

As the 1970s ended and the 1980s began, toxicological and environmental tests were being carried out on these chemicals in order to prepare them for the marketplace.[89] Although costs were mounting, company officials were anticipating further regulation on ozone-depleting substances and thus substantial future markets for the new chemicals. These expectations justified the short-term expense. The situation, however, changed dramatically during the early 1980s.[90] For the reasons mentioned above, the threat of regulation receded. Consequently,

---

[84] United Kingdom House of Commons Environment Committee, First Report, *Air Pollution, Volume 1* (Report and Appendices together with the Proceedings of the Committee relating to the Report) (London: HMSO, 25 May 1988), p. xl.

[85] Telephone interview with George Barnett, Senior Product Manager, responsible for HFC134a, ICI, Runcorn, UK, 4 April 1991.

[86] Michael Oppenheimer and Robert Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (London: I.B. Tauris and Co. Ltd., 1990), pp. 158-59.

[87] Roan, *op. cit.*, in note 32, p. 100.

[88] *Ibid.*, p. 100.

[89] 'It usually takes the chemicals industry between 7 and 10 years to bring a new product onto the market.' (Hugo Steven and Andy Lindley, 'The Race to Heal the Ozone Layer', *New Scientist* (Vol. 126, 16 June 1990), p. 48.)

[90] Interview with M. J. Flux, Group Environment Adviser, ICI Group Headquarters, Group Personnel Department, London, 1 March 1990. See, also, Meirion Jones, 'In Search of the Safe CFCs', *New Scientist* (Vol. 118, 26 May 1988), p. 57.

the anticipated existence of future markets for the alternative chemicals also diminished. Because industry could no longer be certain that it would recoup its research and development costs, continued expenditure into the substances could no longer be justified.[91] All of the major chemical companies, therefore, abandoned their investigations into CFC-alternatives. ICI's Chief Executive told the UK House of Commons Environment Committee in 1988 that had ICI continued its research programme, it 'would have been doing so in a complete commercial vacuum'.[92] Similarly, Donald Strobach, director of Du Pont's Environmental Division, observed: 'No matter how good a material is, if no one will buy it, what good is it? ... The (research) program came to an end because there wasn't enough interest.'[93] Therefore, with research programmes stagnating, the costs of substitute chemicals ceased falling during the early 1980s. Thus, in the United States at this time, a combination of decreasing benefits and increasing costs contributed to a decision-makers' resistance to impose further regulatory controls.

During the first half of the 1980s, the Europeans maintained the position that they had adopted during the 1970s. Citing the economic balance as a justification for a *laissez-faire* policy, they did not cut back their production of CFCs. Granted, they did adopt a very loose regulatory 'production cap' in 1980.[94] Although, on paper, this move may have appeared to have had a restrictive effect, Richard Benedick argues that its commitment to a 30 per cent cutback in CFC aerosol use from 1976 levels was really only 'a trivial target, since European sales of CFCs for

---

[91] 'As ICI Americas, a subsidiary of a British chemical giant, put it, "Further studies [of the substitutes] would require major investment in new plants to produce sufficient material," investments the companies were not then prepared to make.' (Oppenheimer and Boyle, *op. cit.*, in note 86, p. 158.) If they continued to do so, then resources would have to be diverted from other areas -- this might give competitors an advantage.

[92] Quoted in Neil Kinnock, 'The Holes in the Ozone Policy', *The Guardian* (London), 4 March 1989, p. 23. See, also, *op. cit.*, in note 84.

[93] Quoted in Roan, *op. cit.*, in note 32, p. 100.

[94] EC Decision (80/372) said that:

> 1. Production capacity for CFC types F11 and F12 should not be increased.
> 2. By the end of 1981 the use of these substances in aerosol cans was to be reduced by at least 30% of 1976 levels.
> The concept 'production capacity' was defined in a subsequent Decision passed in 1982 (82/795).

(Quoted in Bunge, *op. cit.*, in note 42, p. 165.) See, also, Nigel Haigh, *EEC Environmental Policy and Britain*, Second Revised Edition (Harlow: Longman, 1989), pp. 265-70.

aerosols had already declined by over 28 percent from their 1976 peak, mainly as a result of West German actions'.[95] The interests of both the West European states' chemical companies and the same states' economic well-being overrode any perceived benefits that might have been obtained. Thus, with all of the major players perceiving regulatory action to be too costly, the satisfaction of the hypothesised precondition for international regime formation did not advance during the early 1980s.

The ozone layer issue entered a new dimension with the discovery of an ozone crater above Antarctica in 1985.[96] In the immediate aftermath of this discovery, however, industry's position did not change. Rather, the representatives of the major chemical companies greeted the findings with a fair measure of scepticism. Although the discovery did accelerate the feeling that something needed to be done, there had been so many contradictory findings in the past that no one in industry wanted to react in a 'knee-jerk' manner.[97] Caution was thus the order of the day.[98]

Internationally, cost-benefit analysis continued to inform the policy positions of the major states' representatives during the negotiations towards a Protocol in late 1985 and early 1986. The inability to resolve the debate about the availability of substitutes, a key economic determinant, had prompted a series of workshops to be convened in 1986.[99] At the first of these workshops, held in Rome from 26-30 May 1986, 75 participants examined a wide range of issues.[100] Any sort of consensus upon regulatory strategy, however, could not be reached, because the major players, informed by different perceptions of costs and benefits, adopted divergent policy stances.

The Americans and their supporters (known as the 'Toronto Group'[101])

---

[95] Benedick, *op. cit.*, in note 24, p. 25.

[96] See Chapter 2.1.6 of this thesis.

[97] Interview with Barnett, *op. cit.*, in note 85.

[98] Many believed that the hole was not 'a major factor in industry's [subsequent] reassessment' (Ember *et al*, *op. cit.*, in note 55, p. 48). The industry position, instead, remained that there was both a need to reduce the scientific uncertainties and a need to develop cheap, safe substitutes (Roan, *op. cit.*, in note 32, pp. 156-57).

[99] Telephone interview with G. Victor Buxton, Environment Canada, Hull, 3 January 1991.

[100] For more information, see UNEP, *Annual Report of the Executive Director, 1986* (Nairobi: UNEP, 1986), p. 61.

[101] This group also included Canada, Switzerland and the Scandinavian countries.

advocated global control of CFC usage in aerosols. Having implemented such bans during the late 1970s, this option was the economically most-preferable route for two important reasons. First, because this ban had already been undertaken, no further regulation would be necessary. And second, because their chemical industries had already had to eliminate CFCs from aerosols, they were well-advanced in developing alternative technologies and substitute chemicals. Hence, a global ban could open up lucrative export markets for this group's (admittedly, primarily American) firms.

Meanwhile on the other side of the Atlantic, the Europeans were still only willing to discuss a cap on production, because they argued that any ban on particular end uses would only be a temporary remedy. In addition, however, an economic analysis suggests that they also continued to place a high value upon the interests of their domestic chemical industries, for they recognised that an aerosol ban would allow the Americans, for the reasons outlined above, to capitalise upon an important comparative advantage.[102]

Thus, it should come as no surprise that the Rome meeting was 'a grave disappointment, characterised by bad temper and disagreement'.[103] One commentator notes that the Europeans 'still considered the ozone threat ... a big hoax, a way for the US, which had already developed alternative chemicals, to try and capture the market'.[104] In the middle of 1986, the major players perceived different costs and benefits associated with different courses of action. Because there was no policy that was perceived by all players to have 'tolerable' economic costs, satisfaction of this hypothesised precondition remained elusive at this time.

### 3.1.3 -- Rapidly Shifting Perceptions of Costs and Benefits in the United States, 1986

For individuals in the United States, however, the economic calculation shifted

---

[102] An aerosol ban would not only sacrifice important European export markets for CFCs, but could also force Europe to increase its levels of imports, in order to satisfy domestic demand for alternative chemicals. Obviously, this would be a double-blow to any country's trade balance (Benedick, *op. cit.*, in note 39, p. 117).

[103] Geoffrey Lean, *Action on Ozone* (Nairobi: UNEP, 1989), p. 7. Also, interview with Peter Usher, Co-ordinator, Global Environmental Monitoring Service (Atmosphere), United Nations Environment Programme, Nairobi, Kenya.

[104] Anne McIlroy, 'Can the Poor Pay?', *Our Fragile Future* (Southam Publications, 7 October 1989), p. 11.

dramatically during the second half of 1986. Perceived costs decreased and perceived benefits increased for American industry representatives at this time. This change was so great that a threshold was crossed, and the American chemical industry found it in its interest to support some sort of regulation for the first time. This shift in perception was articulated by a significant change in Alliance policy on 16 September 1986. On that day, Alliance President Richard Barnett 'announced support for a "reasonable global limit" on CFC growth. Large increases in CFC emissions, said the Alliance, would be "unacceptable to future generations."'[105] He cited the mounting scientific evidence of stratospheric ozone depletion -- particularly NASA's recent estimates and the continuing Antarctic mystery -- as the reasons for the change in policy.[106] Although the public declaration was that the policy shift was inspired by scientific evidence, the presence of increasing benefits and decreasing costs also suggest that the result of the economic analysis made a powerful contribution to the decision.

The benefits of regulatory action were seen to be increasing on two fronts. First, in 1986, a draft study by the EPA estimated that the 'incidence of skin cancer could increase significantly if [CFC] emissions continue unchecked'.[107] Although industry members were quick to point out that the study had yet to be formally reviewed by the agency's scientific advisory board,[108] such health reports were nevertheless starting to enter their future planning in a more tangible way.[109] More specifically, chemical companies' representatives wondered if lawsuits might, one day, be brought against their organisations for causing skin cancer among humans.[110] The prospect of future legal action, meanwhile, had a persuasive

---

[105] Miller and Mintzer, *op. cit.*, in note 80, p. 31. See, also, 'Statement of Richard Barnett, Chairman, The Alliance for Responsible CFC Policy, September 16, 1986, National Press Club, Washington, DC', pp. I-1 to I-2.

[106] *Ibid.*

[107] Tim Beardsley, 'US Gets Tough on CFC Emissions', *Nature* (Vol. 324, 13 November 1986), p. 102.

[108] *Ibid.*, p. 102.

[109] The report, released in 1987, was the most detailed assessment of costs and benefits of policy action and inaction to that point undertaken (US Environmental Protection Agency, *Regulatory Impact Analysis: Protection of Stratospheric Ozone*, 3 Volumes (Washington, DC: US EPA, 1987)).

[110] Lawsuits were starting to be brought against cigarette manufacturers, holding them responsible for lung-cancer cases. In 1991, for example, it was reported that nine 'US tobacco companies are facing a [US]$5 billion lawsuit filed by a group of flight attendants who say second-hand smoke has endangered their health...' ('Smoked Out', *The Independent* (London), 2 November 1991, p. 10). See, also, Jones, *op. cit.*, in note 90, p. 59.

influence in the American corporate boardroom. As Richard North observes:

> In the US, companies know a lot about their environmental impact because they know they may be sued for damage caused by their actions. The environmental audit was designed precisely to give boardrooms a handle on how much risk they were exposed to. That mattered at least as much as ensuring they were complying with government regulations. Besides, a US firm cannot get insurance if its activities are likely to entail costly law suits.[111]

This potentiality, therefore, was not considered lightly at this time.[112]

Second, the major chemical companies in the United States were concerned about the damage that CFC production was doing to their corporate images, for they wanted to present themselves as good citizens in a community which was increasingly becoming concerned about the global environment.[113] Although CFCs were but one facet of a large business for most of these organisations, negative press about their CFC-activities could cast a shadow over their entire operation.[114] Therefore, the restriction of CFC production was perceived to be a small price to pay in return for avoiding potentially disastrous consumer boycotts.

On the other side of the analysis, the perceived costs of regulatory action were, once again, starting to fall. Du Pont and the other major chemical producers, in light of both the scientific discoveries and the renewed political activity at the international level, had resurrected their programmes that investigated substitute chemicals. Although, owing to the requirements of intra-industry secrecy, it is difficult to discover the exact direction that the companies' research and development programmes were taking, clues that progress was being made in this area had been revealed earlier in the year. Most notably, during one meeting early in 1986, 'Du Pont admitted that substitute chemicals for CFCs as refrigerants and in other applications could be manufactured if the company were given sufficient incentive to do so'.[115] Thus, as during the 1970s, ongoing work was once again

---

[111] Richard North, 'Markets and Law Push US Towards Voluntary Change', *The Independent* (London), 27 September 1989, p. 26.

[112] Benedick, *op. cit.*, in note 24, p. 63.

[113] See the discussion about the influence of public opinion in Chapter 5.4 of this thesis.

[114] Roan notes that there were rumours that 'the CFC-ozone issue had been taken out of the Freon Division's hands at Du Pont and turned over to senior corporate management after the discovery of the Antarctic hole. At this level of the company, the issue would be looked at in a broader manner.' (Roan, *op. cit.*, in note 32, p. 193.)

[115] Oppenheimer and Boyle, *op. cit.*, in note 86, p. 46.

starting to lower the costs of alternatives and thereby also starting to decrease the net economic costs of regulation.

Representatives of American industry recognised, however, that the *laissez-faire* policy option was now almost completely precluded. Because demands for US domestic legislation were increasing, many observers believed that some sort of regulatory action by the US government was inevitable.

> The Environmental Protection Agency (EPA) was under a court order to promulgate regulations to control CFC emissions [this was launched by the Natural Resources Defense Council], and domestic legislation had been proposed to protect the ozone layer.[116]

Thus, the main alternative policies being examined by US industry officials (and by American policy-makers) were no longer the costs and benefits of certain forms of further regulation versus the costs and benefits of no further regulation. Rather, they were the costs and benefits of certain forms of further regulation in isolation versus the costs and benefits of certain forms of further regulation in concert with the other major states of the world. In this way, the impact that regulation would have upon a state's economy, *vis-a-vis* its major trading competitors, was becoming more significant.

American industry representatives and policy-makers were quick to recognise that the American position would be much better off if regulation were indeed worldwide. Juchtenfuchs identifies the motivation for this type of approach:

> [The US] position was not motivated by purely environmentalist reasons but also by manifest trade interest on the part of the US chemical industry. The latter strongly favoured a world-wide agreement instead of national production cuts, because of its fear of an increase in the EC's already high share of the world market at the expense of American producers.[117]

In this way, worldwide regulation might allow Du Pont, which was 'the world leader in developing the substitutes for CFCs, ... [to] move into the marketplace and clean up with sales of substitute'.[118]

---

[116] 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', *Virginia Journal of International Law* (Vol. 29, 1989), p. 221. See, also, Paul J. Allan, 'Overview', *Environment* (Vol. 32, No. 10, December 1990), p. 3; and Chapter 5.3 of this thesis.

[117] Jachtenfuchs, *op. cit.*, in note 65, p. 265.

[118] John Gribbin, *The Hole in the Sky* (London: Corgi, 1988), pp. 137-38.

In light of this, the European reaction at this time was cautious.

> Some European industrialists had suspected all along that the United States was using the ozone scare to cloak commercial motivations. They now believed that American companies had endorsed CFC controls in order to enter the profitable EC export markets with substitute products that they had secretly developed.[119]

Nevertheless, perceptions of costs and benefits among Europeans decision-makers were also changing at this time. First, they recognised that there might be costs associated with retarding the Toronto Group's efforts to forge an international agreement. More specifically, as the formal international negotiations on the Protocol started up in late 1986 and early 1987, European officials 'feared that if there was no international agreement, the United States might take unilateral action and impose trade sanctions'.[120] Indeed, their fears came true when the Americans threatened such actions in February 1987.[121]

The Europeans also recognised that the Americans were at a competitive disadvantage because of the unilateral action that they had taken during the 1970s. Banning non-essential aerosols, as is argued above, was the economically least-painful way of reducing CFC consumption.[122] Hence, if some sort of uniform percentage reduction in CFC usage were agreed by the international community, then it would be more easily achieved by the Europeans for two reasons. First, the Europeans would be able to cut back in the most cost-painless sector -- namely, aerosol usage -- while the Americans would have to achieve reductions in other applications.[123] And second, the Europeans used a higher percentage of

---

[119] Benedick, *op. cit.*, in note 39, p. 123. Benedick goes on to note that: '... this suspicion was unfounded: to the dismay of environmentalists, du Pont had admitted in 1986 that it had ceased research on chlorofluorocarbon alternatives in 1981' (p. 123). Also, interview with Leah, *op. cit.*, in note 65; interview with Serge Langdau, Environment Canada, Hull, 14 December 1990; and Gribbin, *op. cit.*, in note 118, pp. 137-38.

[120] Morrisette, *op. cit.*, in note 58, p. 811.

[121] Steven Dickman, 'US Call to End CFC Emissions', *Nature* (Vol. 325, 26 February 1987), p. 748; and interview with John Kristian Atchley, Counselor of Embassy and Permanent Representative to UNEP, American Embassy, Nairobi, Kenya, 15 August 1991.

[122] In 1986, not only had substitutes for aerosol propellants been available for a number of years, but the US experience had further reduced their costs (interview with Kathryn Ranscombe, PR Manager, British Aerosol Manufacturers' Association, London, 27 March 1991).

[123] Capretta, *op. cit.*, in note 116, pp. 221-22, note 70.

aerosols than even the pre-ban Americans.[124] Thus, even if the cutback were relatively high, all of the gains could be made in this type of usage. At the second workshop in Leesburg, VA in early September 1986, it was evident that the discussion was moving to focusing on a cap on global emissions, rather than on the restriction of end uses. This delighted the European delegations, and with this barrier removed, the states outside of the Toronto Group seemed to be no longer preoccupied with the American-market-share-conspiracy argument and began to view the economic costs of regulation as becoming increasingly tolerable.[125]

Nevertheless, the Europeans remained reluctant to impose ambitious targets, like those being advanced by the Toronto Group, and the EC position did not shift significantly until the summer of 1987, at which time Britain and France changed their policy stances. Although the reasons for the United Kingdom's *volte-face* are unclear, it is probable that the economic factor played a major part in the policy decision.[126] As Markus Jachtenfuchs notes, '[o]nly after ICI, the UK's biggest producer, had lifted its total opposition to further reductions did the British government soften its position within the Council, thus following the policy of ICI.'[127] Similarly, the French government's position was greatly influenced by the wishes of Atochem,[128] although the government's political desires for an environmentally-friendly policy eventually eclipsed its economic concerns.[129]

The focus, thus far, has been upon the US and the members of the European Community, because they were the major CFC-producing states of the world.[130] By the mid-1980s, however, other industrialised states were starting to

---

[124] *Op. cit.*, in note 49. Even in 1988, aerosol propellants accounted for 45 per cent of the CFCs used by the Europeans, as compared with 4 per cent by the US (R.D.B., 'Saving the Ozone Layer', *WMO Bulletin* (Vol. 38, No. 3, July 1989), p. 216).

[125] Interview with Usher, *op. cit.*, in note 103.

[126] Haas notes the influence of a variety of factors, including the economic one (Peter M. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', *International Organization* (Vol. 46, No. 1, Winter 1992), p. 217).

[127] Jachtenfuchs, *op. cit.*, in note 65, p. 268. Also, interview with Vincent Cable, Commonwealth Secretariat, London, 8 February 1990.

[128] Haas, *op. cit.*, in note 126, p. 217.

[129] Jachtenfuchs, *op. cit.*, in note 65, pp. 268, 271 and 275. Although there was a consultative relationship between the French government and Atochem, one government official maintains that Atochem representatives did not dictate the French position (interview with Philippe Orliange, Representant Permanent Adjoint de la France, Aupres de l'Office des Nations-Unies a Nairobi, Ambassade de France au Kenya, Nairobi, Kenya, 15 July 1991).

[130] *Op. cit.*, in note 44.

take greater interest in the progress of the discussions. The Japanese became particularly concerned with the negotiations in late 1986 and early 1987, because CFC-113, in addition to CFC-11 and CFC-12, became the subject of proposed regulation. The Japanese delegates initially objected vigorously to any regulation of CFC-113, because it was used as a solvent in the electronics industry, which was vital to the Japanese economy.[131] The Soviet Union, another major producer of CFCs, was also starting to take a more active part in the negotiations.[132] As is noted in the next section of this thesis, however, these countries' concerns about tolerable domestic economic costs were eventually addressed.

The key developments were, however, the Europeans' acceptance that some form of regulation was 'tolerable' and the Americans' acceptance that regulation beyond solely banning CFCs as aerosol propellants was also 'tolerable'. Thus, with policy-makers from countries that were home to all nine of the world's largest chemical companies[133] perceiving the cost-benefit balance to be tipping in favour of regulatory action, the scene was set for this hypothesised precondition for international regime formation to be satisfied.

### 3.1.4 -- Tolerable Domestic Economic Costs to all Industrialised States, 1987-1988

The Montreal Protocol on Substances that Deplete the Ozone Layer was opened for signature on 16 September 1987.[134] Although it is difficult to overstate the significance of this path-breaking document, we should recognise that the members of international society could only agree its contents after each's demands for 'tolerable' domestic economic costs of policy action had been adequately addressed. Indeed, Lee Thomas, Administrator of the US Environmental Protection Agency, noted that the Protocol demonstrated an unprecedented degree of co-operation in balancing environmental protection and *economic*

---

[131] Roan, *op. cit.*, in note 32, p. 198.

[132] *Ibid.*, p. 198.

[133] Although the size of a chemical company does not necessarily reflect the size of its CFC production, the secrecy of disaggregated production information means that it is one of the best general indicators available (Hoechst, cited in deZoete and Bevan Chemicals Research, 'ICI -- Withdrawing from Heavy Chemicals?' (October 1986), p. 1).

[134] This document is reprinted in Appendix A.3 of this thesis.

*development*.[135] A closer examination of the terms of the Protocol reveal that a number of special provisions had to be included so that this balance could be achieved.

First, industry insisted upon a number of mechanisms that were designed to encourage compliance. Kevin Fay, Executive-Director of the Alliance, expressed the concerns of industry representatives:

> [I]ndustry [is] concerned that if [compliance is] not widespread enough, there [will] be uneven competition with some companies in some countries restricted and other companies in other countries free to continue producing CFCs.[136]

Such fears were addressed in the Protocol:

> Nations that do not participate are penalized with trade restrictions in the form of import barriers. The trade restrictions are designed to make non-compliance less profitable and to protect the economic interests of those nations that do become Parties to the Protocol. Parties to the Protocol also gain access to CFC-related environmental protection technologies that as non-Parties they would be unable to obtain.[137]

It was generally anticipated that non-participating countries would perceive the costs of non-participation to outweigh any perceived benefits. They would thus be convinced to accede to the agreement. At the time, David Wirth said: 'Faced with the loss of major U.S. markets, it is inconceivable that other countries will decline to [comply], ... a step [which has] trivial economic and political costs in comparison.'[138]

Second, at the insistence of the Europeans, the most restrictive measures were placed upon consumption, which was calculated to be the level of production minus exports plus imports.[139] Because production controls were slightly looser than consumption controls, the Europeans' lucrative export business was not curtailed as rapidly as it could have been.

Third, the Soviet officials insisted upon the inclusion of Article 2.6. This article

---

[135] Noted in Capretta, *op. cit.*, in note 116, p. 213. Emphasis added.

[136] Quoted in *ibid.*, p. 231, note 136.

[137] *Ibid.*, p. 231. See, also, Article 4 ('Control of Trade with Non-Parties') of the Montreal Protocol, *op. cit.*, in note 134.

[138] Quoted in Capretta, *op. cit.*, in note 116, p. 231, note 135.

[139] See Article 2 ('Control Measures') of the Montreal Protocol, *op. cit.*, in note 134.

allowed the Soviet Union to complete two CFC plants then under construction and to increase per capita consumption (to 0.5 kg/capita) so as to account for the implementation of its five-year plan.[140] The economic cost of abandonment would, otherwise, have been intolerable.

Finally, shifting the use of CFCs was, at Japan's insistence, permitted under the terms of the Montreal Protocol.[141] Once again, Japan was conscious of the importance of CFC-113 to the health of its electronics industry.[142] In these ways, the costs and benefits for the significant players had to be transformed so that the net costs were sufficiently decreased.

Although industry representatives supported the Montreal Protocol, as they had the Vienna Convention,[143] they nevertheless continued to argue that the level of use of CFC compounds presented no immediate threat to either health or the environment. Rather, their members viewed the Protocol simply as an anticipatory response to computer model calculations of ozone depletion.[144] Furthermore, they also continued to highlight the economic costs of regulation. The Alliance's members estimated that implementing the Protocol in the US alone would cost between five and 10 billion US dollars.[145] More specifically, it was maintained that '[s]udden increases in prices will likely result in bankruptcy for marginal firms, a loss in U.S. productivity and competitiveness, increased social costs and could dissipate the societal consensus for CFC restriction'.[146]

Although these costs were based upon the prevailing higher prices of alternative chemicals,[147] a number of CFC substitutes were starting to appear on

---

[140] Haas, *op. cit.*, in note 74, p. 357.

[141] *Ibid.*, p. 357.

[142] The Japanese had also called for a transition period, so that the 'initial costs of converting equipment' would not be intolerable (Ember *et al*, *op. cit.*, in note 55, pp. 50-51).

[143] Margaret E. Somerset, 'An Attempt to Stop the Sky from Falling: The Montreal Protocol to Protect Against Atmospheric Ozone Reduction', *Syracuse Journal of International Law and Commerce* (Vol. 15, No. 3, Spring 1989), pp. 409-10.

[144] 'Remarks of Kevin J. Fay, Executive Director, Alliance for Responsible CFC Policy, Forum on the Impact of Ozone Layer depletion, House Chamber of the Massachusetts General Court, State House, Boston, MA, October 30, 1987', pp. I-9 to I-10.

[145] Benedick, *op. cit.*, in note 39, p. 134. See, also, Somerset, *op. cit.*, in note 143, p. 410, note 126.

[146] *Ibid.*, p. 411. See, also, Elliot D. Lee, 'Pending Treaty Worries Chlorofluorocarbon Industry', *The Wall Street Journal*, 15 September 1987, p. 6.

[147] For some examples, see Capretta, *op. cit.*, in note 116, p. 241, note 185.

the market at this time. Many of these chemicals were initially displayed at a large chemical trade fair in Washington, DC in early 1988. One of the most significant was unveiled by A T & T: their representatives announced that they had, with the assistance of Petroferm, Inc., developed an environmentally-safe substitute for CFC-113.[148] 'Eileen B. Claussen, director of the EPA's CFC program, called the development a "major breakthrough" as many Protocol participants were concerned that substitution would be particularly difficult for this compound.'[149]

Equally significant was the announcement in January 1988 that 'thirteen competing companies from seven nations [were] joining together to speed the testing of alternative, less-damaging compounds'.[150] Such a move was unprecedented among the major chemical companies, because 'manufacturers, in trying to position themselves for a competitive advantage, [are not] too forthcoming about their research efforts'.[151] The programme focused upon testing the toxicity of two agents -- HFC-123 and HFC-134a.[152] In ways like these, progress on the development of substitutes was clearly being made.

Many commentators maintain that the Protocol was the necessary impetus to prompt industry to develop substitutes. Peter Morrisette, for example, argues that:

> ... the development of alternatives was dependent on economic and regulatory incentives to do so. An international protocol was seen by industry as a useful mechanism for providing the necessary economic incentive to develop and market suitable alternatives.[153]

Producers had to be confident that there would be a market for the substitute chemicals, and the Protocol ensured that.[154]

---

[148] Pamela S. Zurer, 'Search Intensifies for Alternatives to Ozone-Depleting Halocarbons', *Chemical and Engineering News*, 8 February 1988, p. 19.

[149] Somerset, *op. cit.*, in note 143, p. 414.

[150] Alun Anderson, 'Depletion of Ozone Layer Drives Competitors to Cooperate', *Nature* (Vol. 331, 21 January 1988), p. 201. They planned to spend [US] $8 million on testing the substances ('Supplement 3', *UNEP News* (No. 21, August 1988), p. 3).

[151] Comments of Richard Barnett, paraphrased in Roan, *op. cit.*, in note 32, p. 194.

[152] Anderson, *op. cit.*, in note 150, p. 201.

[153] Morrisette, *op. cit.*, in note 58, p. 816.

[154] James T.B. Tripp, 'The UNEP Montreal Protocol: Industrialized and Developing Countries Sharing the Responsibility for Protecting the Stratospheric Ozone Layer', *New York University Journal of International Law and Politics* (Vol. 20, 1988), pp. 749-750. At the time, Michael Harris, manager of halon projects at ICI Americas, noted: 'The first one there [to develop substitutes] is

Although the original Montreal Protocol did not nail the coffin shut on the industry,[155] any expectations that CFCs would undergo any sort of resurrection soon disappeared. In spite of resistance to further restrictions on CFCs right up until the middle of March 1988 -- owing ostensibly to the scientific uncertainty[156] -- Du Pont officials announced, in late March 1988, that their goal was 'an orderly phaseout of fully halogenated CFC production'.[157] Citing the recently-released report of the Ozone Trends Panel,[158] Du Pont officials noted that 'new scientific evidence suggested more rapid global ozone change than previously reported, as well as the likely involvement of fully halogenated CFCs in that change'.[159]

In addition to this public justification based upon scientific discoveries,[160] a cost-benefit analysis also offers some insight into the motivation for this shift in Du Pont's policy. First, it was becoming clear that the costs of adopting such a position were falling -- most significantly, as noted above, advances in alternatives were progressing rapidly. Additionally, the benefits of eliminating CFCs were also increasing. Not only was the scientific evidence that was implicating the chemicals in future wrongs contributing to the calculation, but the importance of cultivating a 'green corporate image' was also perceived to be not only beneficial, but even vital.[161] For example, Jeffrey Eves, Vice President of Fort Howard Corp., the largest manufacturer of foam food containers in the United States, said: 'More and more consumers have become knowledgeable. Every company that wants to stay in business wants to please its customers.'[162] Tim Leah contends that Du Pont

---

going to win an enormous prize.' (Quoted in Christopher Joyce, 'AT&T Leads the Pack in Search for Safer Propellants', *New Scientist* (Vol. 117, 21 January 1988), p. 24.)

[155] 'If the Protocol imposed no limits and no post-1999 reduction schedule on the LCCs [Southern states], the major producers of CFCs could anticipate an expanding market for their CFC products until 1999 and a stable or expanding market thereafter.' (Tripp, *op. cit.*, in note 154, p. 750.) See, also, the discussion in Chapter 4.2 of this thesis.

[156] See the story in Roan, *op. cit.*, in note 32, particular Chapter 15.

[157] 'Summary of the Chairman's Remarks (27 April 1988)', *Du Pont: First Quarter Report*, 1988, p. 4.

[158] See Chapter 2.1.6 of this thesis.

[159] 'Summary of the Chairman's Remarks (27 April 1988)', *op. cit.*, in note 157, p. 4.

[160] Joseph Steed, Du Pont's environmental manager, said: 'I hope it's clear that it's the science of the last week we're responding to.' (Quoted in Roan, *op. cit.*, in note 32, p. 239.)

[161] See, for example, the findings from a study reported in Simon Pincombe, 'Environmentalist Pressure Changes Business Attitudes', *The Independent* (London), 3 July 1990, p. 17.

[162] Quoted in Roan, *op. cit.*, in note 32, p. 240.

executives were particularly astute in recognising the shift in the prevailing public opinion.[163] They, therefore, found it in their interest to attempt to position themselves near the driver's seat of this bandwagon (or, at least, to appear to do so).[164] Finally, the profits that could be made from the international marketing of CFC-substitutes were not overlooked by the company's officials at this time.[165]

Du Pont's announcement had a 'profound ripple effect',[166] and the race for substitutes was soon proceeding at top speed. Calls for a full 100 per cent phase-out sparked investigations into replacement chemicals and technologies for *all* usages of CFCs. In this way, although substitutes were not yet available for every CFC application, it was anticipated that they would soon appear on the market. Thus, taken together, these observations suggest that the second hypothesised precondition for international regime formation was, by the middle of 1988, fully satisfied.[167]

### 3.1.5 -- Steadily Declining Costs, 1988-1991

Between the middle of 1988 and the end of 1991, both quantitative and qualitative remarks suggest that the costs of substitute chemicals were falling at an appreciable rate. In June 1988 and November 1989, for example, the US Environmental Protection Agency reviewed the projected costs of CFC reduction. They found that during the interim 17 months, significant scientific progress had

---

[163] For a further discussion of the role of public opinion in the process of international regime formation, see Chapter 5.4 of this thesis.

[164] Interview with Leah, *op. cit.*, in note 65.

[165] At this time, one commentator maintained that:

> Three leading scientists, who requested anonymity in interviews with *EIR*, have insisted that DuPont Chemicals is behind the banning of CFCs. These scientists have pointed out that DuPont, the only company with patented chemicals that can replace CFCs, stands to profit billions if the CFCs are banned. It was only because DuPont suddenly decided to drop all opposition to a CFC ban that the environmentalists have gotten as far as they have.

(Rogelio A. Maduro, 'Ozone Depletion is Proven to be a Scientific Fraud', *EIR* (28 April 1989), p. 20.)

[166] Roan, *op. cit.*, in note 32, p. 240. Indeed, its volte-face helped to motivate, among others', ICI's change of heart (interview with Tom Burke, Director, Green Alliance, London, 4 June 1990).

[167] The importance of 'tolerable' domestic economic costs on the ozone layer issue is recognised by many in the literature. Mathews, for one, acknowledges that the ozone agreement 'would not have been reached as quickly, and perhaps not at all, had it not been for the cooperation of the chlorofluorocarbon producers' (Jessica Tuchman Mathews, 'Redefining Security', *Foreign Affairs* (Vol. 68, No. 2, Spring 1989), p. 176).

been made, and this had allowed the Agency to lower its cost estimate.[168] Additionally, in late 1988, UNEP Executive-Director Mostafa Tolba 'estimated that research and development was five years ahead of what had been thought possible [in September 1987] in Montreal'.[169]

Even once the hypothesised precondition had been satisfied, however, policy-makers and industry's representatives remained in close contact. The focal point of their interaction was the Technology Assessment Panel, established under the terms of the Montreal Protocol. This group brought together experts from governments, industry and research institutions, and was chaired by G. Victor Buxton.[170] It was charged with the task of monitoring the development of substitute chemicals and technologies. This information was to be made available to policy-makers for their deliberations on the Protocol. Irrespective of its influence, the mere existence of this panel further highlights the importance that the major states' leaders placed upon the desirability of 'tolerable' domestic economic costs.[171]

The Technology Assessment Panel reported on the state of development of alternative substances and technologies at the First Meeting of the Protocol's Parties in Helsinki in May 1989. They noted that the technology to eliminate all CFCs was not yet available, with the task of adapting industrial refrigeration being particularly difficult because of the large capital costs involved.[172] Nevertheless, the Technology Assessment Panel concluded that it was at least 'technically

---

[168] Miller, *op. cit.*, in note 83, p. 201.

[169] 'Saving the Ozone Layer', *op. cit.*, in note 124, p. 216.

[170] See, for example, G. Victor Buxton, 'International and Canadian Progress on Implementing the Montreal Protocol', presented at the Air and Waste Management Association Meeting, Annaheim, CA, 26-30 June 1989, pp. 6-11.

[171] At this time, those states that made unilateral declarations of CFC reductions beyond their obligations in the Montreal Protocol cautioned that complete elimination could only occur once adequate substitutes became available. In February 1989, for example, 'Canada announced regulations that will reduce the use of CFCs and halons by 85 per cent over the next 10 years. Regulations to eliminate the remaining 15 per cent were promised as soon as the chemicals could safely be replaced.' ('Europeans Vow to Curb Ozone Killers', *The Citizen* (Ottawa), 3 March 1989, p. A6.)

[172] See, for example, Michael McCarthy, 'Doubts Arise on Ozone Timescale', *The Times* (London), 5 May 1989; and John Hunt, 'Ozone Layer Measures Debated', *The Financial Times* (London), 5 May 1989.

feasible' to phase out some of the chemicals by the turn of the century.[173] Policy-makers responded to this information by agreeing a non-binding resolution to 'phase out the production and the consumption of CFC's controlled by the Montreal Protocol as soon as possible but not later than the year 2000'.[174] This commitment was not extended to halons, primarily because, a cost-benefit analysis would suggest, 'of the continued unavailability of prospective substitutes'[175] for these chemicals. Instead, an agreement to phase out 'as soon as feasible' could only be agreed.[176]

The Helsinki Declaration also committed the Parties to 'control and reduce other ozone-depleting substances which contribute significantly to ozone depletion as soon as feasible'.[177] This vaguely-worded declaration referred primarily to hydrochlorofluorocarbons (HCFCs), which some thought should also be subject to controls under the terms of the Montreal Protocol. HCFCs were one of the potential substitute chemicals for the ozone-destroyers identified by the Annexes of the Montreal Protocol,[178] and some estimated that they would replace up to 30 per cent of the controlled CFCs.[179] The problem, however, was that HCFCs, although more ozone-benign than CFCs, nevertheless destroy some stratospheric ozone. In light of this fact, pressure mounted during the first half of 1990 to impose restrictions upon their use at the meeting of the Parties in London in June 1990.

Industry officials resisted this pressure. They argued that without use of these 'bridging chemicals', the world would be unable to achieve a rapid phase-out of CFCs.[180] Because of the substantial capital costs needed to construct HCFC

---

[173] The Standing Committee on Environment, House of Commons, Canada, *Deadly Releases CFCs* (Ottawa: Canadian Government Publishing Center, 1990), p. 21.

[174] 'Helsinki Declaration on the Protection of the Ozone Layer', reprinted in *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), p. 137.

[175] Benedick, *op. cit.*, in note 39, p. 137.

[176] 'Helsinki Declaration on the Protection of the Ozone Layer', *op. cit.*, in note 174, p. 137.

[177] *Ibid.*, p. 137.

[178] See, for example, the comments of the Alliance's Kevin Fay, quoted in AP in Helsinki, 'Nations Seek Chemical Ban by Year 2000', *The Globe and Mail* (Toronto), 4 May 1989, p. A8.

[179] A Du Pont estimate, cited in Jamison Koehler and Scott A. Hajost, 'The Montreal Protocol: A Dynamic Agreement for Protection the Ozone Layer', *Ambio* (Vol. 19, No. 2, April 1990), p. 83.

[180] See, for example, the comments of Mr. Vogelsberg, a Du Pont environmental manager responsible for CFC alternatives, in Mary Fagan, 'Du Pont Plans Cfc-Alternative Plants', *The Independent* (London), 22 June 1990, p. 20. See, also, Debora MacKenzie, 'Cheaper Alternatives for CFCs', *New Scientist* (Vol. 126, 30 June 1990), pp. 39-40.

plants, industry representatives wanted assurances from policy-makers that these chemicals would be able to replace a significant share of the CFC market.[181]

In London in June 1990, decision-makers from low-producing chemical countries, like Norway, Sweden, Australia and New Zealand, pushed for a phase-out date for HCFCs of between 2010 and 2020.[182] However, British officials, supported by representatives from other chemical producing countries, insisted that no firm date be set.[183] The officials from these countries prevailed, and 'signatory nations called for producers to use them responsibly, and work towards eliminating them by 2040'.[184] With, however, proposals in the US Congress to phase out HCFCs by 2015,[185] it appeared that the issue could be at the centre of the discussions at the Protocol Parties' next scheduled review meeting in 1992.

In some ways, it seemed that the international debate about HCFCs (and, perhaps, some other chemicals) was poised to bring about a repeat of the CFC experience. However, although at the end of 1991 it was not known how the costs and benefits as perceived by the major actors would continue to evolve, we could speculate that their views would be in greater harmony than they were during the 1970s and 1980s. This statement can be substantiated by noting that the major states were working together in the same fora examining both the costs (*i.e.*, industry consortia[186] and the Protocol's Technology Assessment Panel) and the benefits (*i.e.*, the scientific analysis). This boded well for the continued satisfaction of this second hypothesised precondition for international regime formation.

---

[181] See, for example, Hamish McRae (ed.), 'The Dilemma of Phasing Out CFCs', *The Independent* (London), 22 June 1990, p. 21; and Andrew Morgan, 'Ozone Pact In Jeopardy', *The Sunday Correspondent* (London), 24 June 1990, p. 6. Also, interview with Usher, *op. cit.*, in note 103.

[182] Nicholas Schoon, 'Deal to Save Ozone Layer Agreed', *The Independent* (London), 30 June 1990, p. 1.

[183] *Ibid.*, p. 1.

[184] *Ibid.*, p. 1.

[185] Fagan, *op. cit.*, in note 180, p. 20.

[186] A new consortium was set up in 1989 to look at seven chemicals. The new group was called Alternative Fluorocarbons Environmental Acceptability Study (AFEAS) and was scheduled to run for 3 years (Mary Fagan, 'Chemical Firms Join Forces to Find Substitute for CFCs', *The Independent* (London), 22 November 1989, p. 8). A parallel programme to examine toxicity was also established. It was called the Program for Alternative Fluorocarbon Toxicity Testing (PAFT).

### 3.2 -- Tolerable Domestic Economic Costs and Global Warming

As outlined in Chapter 2 of this thesis, scientific investigations during the 1970s and, in particular, the 1980s, drew attention to the deleterious impact that continued greenhouse gas emissions could have upon human welfare.[187] A number of reports published during this period recommended that some form of regulation be placed upon the output of carbon dioxide and other trace substances. In light of these demands for controls, some states' leaders called for studies into the net cost of policy action.

Attempts to halt, or at least slow or mitigate, global warming would necessarily entail a reduction in the quantity of greenhouse gases that are released into the earth's atmosphere.[188] If a state's leaders decided to decrease the level of greenhouse gases emitted, then that state -- and, in particular, its energy producers and users -- would have to absorb significant costs. First, there would be costs associated with developing and using cleaner sources of energy. Second, where the use of cleaner sources was not feasible, the costs of forgoing a certain level of consumption of particular goods and services would have to be incurred. Finally, changes in the composition of international trade transactions could introduce economic costs for the state that spread beyond merely domestic considerations.[189]

The primary benefit of regulatory action to reduce greenhouse gas emissions would be the value of the costs that would have been caused by a warmer global climate -- these include the expenditures associated with sea level rises (which would include constructing sea defences, relocating people and infrastructure, and safeguarding against salt water intrusion into fresh water supplies) and the expenses of dealing with climatic zone shifts (which would include adapting agricultural and forestry methods, repairing storm damage and dealing with the effects of the disruption in various ecological equilibria).[190] There

---

[187] See Chapter 2.2 of this thesis.

[188] Another method to reduce greenhouse gas concentrations involves the construction of new 'carbon sinks' -- for example, reforestation. Although this could help to reduce greenhouse gas concentrations, its contribution would be relatively minor.

[189] See the argument developed for the ozone layer example in Chapter 3.1 of this thesis.

[190] See, more generally, W.J.McG. Tegart, G.W. Sheldon and D.C. Griffiths (eds.), *Climate Change: The IPCC Impacts Assessment* (Canberra: Australian Government Publishing Service for WMO and UNEP, 1990).

could, in addition, be a number of secondary benefits that would result from policy action.[191] Let us now consider the history of the politics of global warming to discern how the perceived costs and benefits associated with proposed policy action evolved.

### 3.2.1 -- The Debate Up To 1991

The first serious consideration of substantial policy action to reduce greenhouse gas emissions was undertaken at a scientific conference in 1987.[192] To understand fully the rationale for the reaction of many policy-makers to the various proposals being advanced after this time, a debate that took place 15 years earlier must be recalled.

During the early and mid 1970s, the controversy about the validity of the 'Limits to Growth' (LTG) thesis raged. A report by this name, published in 1972,[193] put forth the argument that there was a positive correlation between growth and pollution. The attention focused upon the debate meant that any subsequent suggestion to reduce pollution -- regardless of its faithfulness to the LTG theme -- was immediately identified as part of the LTG lineage and perceived as a recipe for zero economic growth. Consequently, when calls were made for reductions in greenhouse gas emission during the mid 1980s, decision-makers assumed that this would require the elimination of industrial growth and they therefore attached significant economic costs to such a policy. Indeed, at the outset of the global warming debate, members of the camp underscoring the substantial economic costs of greenhouse gas regulations were able to present a persuasive case, partially because intuition and common-sense seemed to support their arguments.

A state's welfare (or, at least, its 'economic performance') is, in many cases,

---

[191] See the arguments developed on the ozone layer issue in Chapter 3.1 of this thesis -- these sorts of secondary benefits could also be achieved on the global warming issue. In addition, it should also be noted that what is presented here is simply a rudimentary outline of potential costs and benefits. The identification of these elements precludes neither the inclusion of other factors nor the use of a more complex structure. For a further discussion about the utility of cost-benefit analysis on the global warming issue, see, for example, Pearce, *op. cit.*, in note 5.

[192] See Chapter 2.2.3 of this thesis.

[193] Donella H. Meadows, Dennis L. Meadows, Jorgen Randers and William W. Behrens III, *The Limits to Growth* (New York: Universe Books, 1972).

measured primarily by its Gross Domestic Product (GDP) level.[194] This variable represents the value of all of the goods and services that are produced by a state's inhabitants during one year. In order to create a good or a service of some value, an input of at least a minimal quantity of energy is required. For reasons of cost efficiency, the most attractive means of producing that energy have been, since the Industrial Revolution, the burning of fossil fuels (coal, oil and gas). However, rudimentary logic suggests that if a reduction in carbon dioxide emissions is required, then the incidence of combustion should be reduced, which in turn means that less fossil fuels should be burned. With less fossil fuels being burned, however, less energy will be produced, which in turn means that fewer goods and services will be provided. The state will thus have a lower GDP and also a lower level of welfare. This elementary analysis is presented simply to demonstrate the dominant line of reasoning, inspired by the LTG debate of the 1970s, that ruled during the mid 1980s -- namely, that less greenhouse gas emissions necessarily meant higher net economic costs and therefore lower welfare.[195]

Given the magnitude of the potential consequences of global warming, it is not surprising to discover that the debate about the economic costs of action to deal with global climate change was spirited during the second half of the 1980s. Once specific targets for greenhouse gas emission reductions were voiced in international fora (for example, the 'Toronto target' of a 20 per cent reduction of 1988 levels of carbon dioxide emissions by 2005[196]), decision-makers demanded studies that would not only calculate the cost of the changes that would be

---

[194] Although some claim that GDP is not the most appropriate indicator of human welfare (see, for example, the reference in Pearce, *op. cit.*, in note 12, p. 375), it is, nevertheless, one of the most commonly used indices to measure a state's 'development'.

[195] United States Environmental Protection Agency Administrator William K. Reilly recalls that:

> Twenty years ago, when the original Clean Air Act was being debated in the House of Representatives, one of the bill's opponents took the floor to insist that pollution control is incompatible with economic growth. The congressman quoted a constituent, a small-town mayor, as saying: 'If you want this town to grow, it has got to stink.'

(William K. Reilly, 'A World in Our Hands', *The Washington Post*, 20 April 1990, p. B1.) Although the quotation is from 1970, this idea persisted through the 1970s and (at least) the first half of the 1980s.

[196] See 'Conference Statement', *The Changing Atmosphere: Implications for Global Security* (Toronto: Environment Canada, 27-30 June 1988), p. 5.

necessary to achieve such goals,[197] but also estimate the value of the benefits that would thus be derived.[198] From these studies, two general, and opposite, sets of conclusions were reached.

On the one hand, many reports suggested that the costs of the necessary changes in the economies of the world's major industrialised states would be significant, greatly surpassing the value of any benefits that might be accrued by avoiding a warmer world.[199] Capturing the general spirit of these conclusions, William Fulkerson of the US Energy Department's Oak Ridge National Laboratory noted: 'My overall view is that [reducing carbon dioxide emissions] will be very difficult and very expensive ... It's not any accident that the world depends on fossil fuel. We're still hooked on fossil fuel because it is marvellous.'[200] These studies served to reinforce the (as I have called it) 'traditional' view that the introduction of regulations reducing greenhouse gas emissions would be extremely costly.

This assertion, however, did not go unchallenged, for there was a second group of reports that argued that environmental protection and economic growth could, indeed, be compatible. Perhaps the single most important document to put forth this view was the report of the World Commission on Environment and Development (WCED), entitled *Our Common Future*.[201] In this report, the WCED's members argued for 'a new era of economic growth -- growth that is forceful and at the same time socially and environmentally sustainable'.[202] The Report's impact was substantial, and its popularisation did much to erode the automatic tendency to equate 'protection of the environment' with 'stagnation of the economy'. Instead, its focus on 'sustainable development'[203] brought the idea of economic growth that was compatible with environmental preservation to

---

[197] For a survey of some of these studies, see Peter Hoeller, Andrew Dean and Jon Nicolaisen, *A Survey of Studies of the Costs of Reducing Greenhouse Gas Emissions* (Paris: OECD Working Paper No. 89, December 1990).

[198] Some of these studies are cited *infra*, in note 258.

[199] Some of these studies are cited *op. cit.*, in note 197.

[200] Quoted in William Booth, 'Carbon Dioxide Curbs May Not Halt Warming', *The Washington Post*, 10 March 1990, p. A8.

[201] The World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987).

[202] *Ibid.*, p. xii.

[203] *Ibid.*, Chapter 2 ('Towards Sustainable Development'). See, also, David Pearce *et al.*, *op. cit.*, in note 8, pp. 173-185.

the attention of decision-makers.[204] A number of studies released during the late 1980s and 1990 attempted to further that notion by showing that a reduction in the level of greenhouse gas emissions would not be economically unbearable.[205] The authors of these reports argued that the costs of regulatory action inspired by emerging international principles were, indeed, tolerable. Moreover, they argued that the secondary benefits that could be gained justified policy action, even in the absence of any primary benefits that might be accrued by avoiding a warmer world.[206] Thus, during the mid and late 1980s, numerous studies were informing decision-makers' perceptions of the domestic economic costs of policy action to reduce greenhouse gas emissions.

By the end of 1991, therefore, two different sets of attitudes with regard to policy action on global warming were evident among leaders of the industrialised world. On the one hand, decision-makers in some OECD countries had taken unilateral actions to regulate the emissions of greenhouse gases in their particular states.[207] On the other hand, decision-makers in other OECD states had not made any policy commitments on the global warming issue. Although numerous factors could have influenced their respective stances, let us look at the manner in which the cost estimates of policy action were being perceived, to see if cost-benefit analysis helps to explain this difference.

### 3.2.2 -- Tolerable Domestic Economic Costs to Some Industrialised States, 1991

Among those OECD countries that had made unilateral policy commitments on the global warming issue, the target set by the government of Germany was, at the

---

[204] There were, nevertheless, substantial critiques of some aspects of the Report. See, for example, Herman E. Daly and John B. Cobb Jr., *For the Common Good: Redirecting the Economy Towards Community, The Environment and a Sustainable Future* (London: Green Print, 1990), pp. 75-76.

[205] Some of these studies are cited *op. cit.*, in note 197.

[206] This has been called a 'No Regrets Policy' (C. Boyden Gray and David B. Rivkin Jr., 'A "No Regrets" Environmental Policy', *Foreign Policy* (No. 83, Summer 1991), pp. 47-65). See, also, the work of Stephen Schneider -- for example, Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco, CA: Sierra Club Books, 1989).

[207] For a view that suggests that those who had set targets were, however, perhaps more 'talk than action', see Emilio Gerelli, 'Economic Responses to Global Warming: A European Perspective', in Rudiger Dornbusch and James M. Poterba (eds.), *Global Warming: Economic Policy Responses* (London: The MIT Press, 1991), pp. 167-90.

end of 1991, the most ambitious.[208] We can hypothesise that German leaders took policy action because they viewed its net costs to be tolerable. An examination of the costs and benefits as perceived by German decision-makers in 1991 substantiates this assertion.

First, members of the German business community did not necessarily subscribe to the 'traditional' view that energy use and economic growth were positively correlated.[209] Indeed, their experience suggested that, in fact, the two had been decoupled to a significant degree. More specifically, because West Germany was primarily an importer of energy resources, the rising costs of imported oil in light of the crises of 1973-74 and 1979-81 had encouraged German industry to make more effective use of its energy inputs.[210] Although not referring specifically to the German experience, MacNeill, Winsemius and Yakushiji describe the evolution that took place in the market economies that were open to change in light of the challenges posed by the oil crises:

> Industries, pressed by the rising costs of energy, materials, and capital, found that they could invent products that use lighter and more durable materials and require less energy to produce. They found that they could redesign production processes to require less and more flexible capital plant and to recycle and reuse by-products internally -- with benefit to their bottom line. They also found that, when they reduced the energy and material content of their products, they saved on overall costs per unit of production *and* reduced environmental emissions and wastes. This often proved to be a far more effective way of reducing emissions than expensive end-of-pipe technologies that served no other purpose. Moreover, the environmental benefits of resource reduction and recycling extend back to the beginning of the production cycle. They manifest themselves in decreased mining and mining wastes, decreased water consumption and

---

[208] On 13 June 1990, the then West German Cabinet committed the country to a 25 per cent reduction in carbon dioxide emissions from 1987 levels by the year 2005. Moreover, on 7 November 1990, the Cabinet of the recently-reunified German Republic announced that its original target would remain for the former West Germany, but that 'in view of the high potentials for $CO_2$ reduction which is possible' in the former East Germany, 'higher reduction' targets would apply to this area (*Der Bundesminister fur Umwelt, Naturschutz und Reaktorsicherheit*, 'Federal Cabinet Agrees on a National $CO_2$ Reduction Programme for Climate Protection' (*Pressemitteilung*) (Bonn, 7 November 1990)).

[209] By 1991, it was becoming increasingly accepted that there was not necessarily a positive correlation between GDP and energy consumption, as many had assumed (Bundesverband der Deutschen Industrie e. V., 'Industry's Attitude', in H-J Karpe, D. Otten, S.C. Trinidade (eds.), *Climate and Development: Climatic Change and Variability and the Resulting Social, Economic and Technological Implications* (London: Springer-Verlag, 1990), p. 298).

[210] *Ibid.*, p. 298.

water pollution, and decreased air pollution, deforestation, and erosion.[211]

The result for West Germany was not only that it became one of the world's most energy-efficient industrialised nations,[212] but German industrialists also began to believe that 'energy efficiency [was] an investment and not a bar to economic growth.'[213]

It can therefore be suggested that German businesspeople simply saw the global warming challenge at the end of 1991 as an additional reason for travelling further along the path that they were already on. Reducing greenhouse gas emissions would not only mean lower, long-term, variable costs of production,[214] but it would also inspire more efficient industrial processes. William Reilly (US Environmental Protection Agency Administrator), for example, maintains that:

> Strong environmental programs, especially those that encourage the prevention of pollution before it's generated, can help stimulate the improvements needed to increase efficiency, productivity and competitiveness.[215]

In addition, industry representatives also accepted the view that action to reduce greenhouse gas emissions today would increase the probability of a future in which there was environmental stability -- and thus of a future in which their company would be able to sustain operations.[216] Accordingly, the level of future benefits would be augmented by present policy action. Taken together, these observations suggest that there were economic incentives for German businesses to reduce

---

[211] Jim MacNeill, Pieter Winsemius and Taizo Yakushiji, *Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology* (Oxford: Oxford University Press, 1991), pp. 24-25. Emphasis in original.

[212] In 1985, West German energy intensity was 0.31 TOE/US$1000 of GDP at constant 1980 prices and constant exchange rates. This was 4th of the 21 IEA nations (IEA, *Energy Conservation in IEA Countries*, (Paris: OECD, 1987), p. 43).

[213] Andrew Warren, 'How Germany is Rising to the Carbon Challenge', *The Guardian* (London), 19 October 1990, p. 31. See, also, Ulrich Steger, 'The Greening of the Board Room: How European Companies are Dealing with Environmental Issues', *mimeo.* (also published in *Business and Society Review* (1990)).

[214] Although the marginal costs of additional cutbacks in greenhouse gas emissions would obviously be higher than those already achieved (Hoeller *et al*, *op. cit.*, in note 197, p. 17), the lower requisite input of energy would decrease costs over longer time periods. For more information about the short- and long-term costs of adaptation, see, for example, W.D. Nordhaus, 'Greenhouse Economics: Count Before You Leap', *The Economist*, 7 July 1990, p. 19.

[215] Reilly, *op. cit.*, in note 195, pp. B1 and B4.

[216] Steger, *op. cit.*, in note 213.

their levels of greenhouse gas emissions.

A reduction in the level of greenhouse gas emissions would also have a number of secondary or 'spin-off' benefits for society more generally. While considering a case-study of Norway, David Pearce draws attention to a number of these '"domestic" benefits' -- they include: reduced forest/lake damage due to acid rain; health improvements from reduced nitrous oxides, sulphur dioxide, carbon monoxide and particulates; reduced corrosion; reduced traffic accidents; reduced traffic congestion; reduced road damage; and reduced noise.[217] Because of geographical constraints, Germans were not easily able to externalise their societal costs of pollution. Therefore, these kinds of secondary benefits were also being accorded greater value by the country's leaders at the end of 1991.[218]

Moving beyond the national level, it is probable that potential international benefits also encouraged German decision-makers to regulate greenhouse gas emissions at this time. The most significant benefit that could be obtained at the international level would result from gains made in international trade. By the end of 1991, many believed that an environmental juggernaut had been unleashed and that concern for the earth's natural systems would continue unabated. It therefore followed that substantial economic gains could be made by helping others to curtail their output of any harmful substances, including greenhouse gases.[219] As the histories of various environmental issues had shown, the

> greenest countries, indeed, can expect an added bonus. Their firms have to meet tough regimes at home, so they will be well poised to clean up (in both senses) when dirtier countries see the light. ... The country that pioneers the taxes and charges that make polluters pay will enjoy a boom as purveyor of greenness to a dirty world.[220]

Indeed, if we draw parallels with the findings from the ozone layer experience in

---

[217] David Pearce, 'The Global Commons', in Pearce (ed.), *op. cit.*, in note 78, p. 21, Box 2.5.

[218] Steger, *op. cit.*, in note 213.

[219] See, for example, Keith A.J. Hay, Colin A. Saravanamuttoo and David R. Avon, 'Environmentally Sustainable Technology Transfer of Coal-Fired Energy Techniques: Canada and Asia', *Energy Studies Review* (Vol. 3, No. 2, 1991), pp. 178-83.

[220] 'Growth Can Be Green', *op. cit.*, in note 8, p. 15. It is significant that this comment was made by the writers at *The Economist*, a publication which had belittled the first environmental revolution during the late 1960s and early 1970s as 'fashionable nonsense'. See, for example, 'Changing Colour', *The Economist*, 15 October 1988, pp. 15-16.

particular, then two hypotheses can be suggested. First, wherever there were nationally-imposed greenhouse gas regulations, there would also be incentives to develop technologies and substitutes that could help both to reduce emission levels and to increase energy efficiency.[221] And, second, whatever company was able to manufacture new products successfully would subsequently have access to significant foreign markets,[222] and its home state's trade balance would thus be shifted positively. In reality, such opportunities for significant benefits in international trade were being increasingly recognised in Germany by the end of 1991.[223] Taken together, therefore, these domestic and international considerations suggest that the economic cost analysis was a key determinant of policy action in Germany.

Although the focus here is, thus far, upon Germany, it is evident that, at the end of 1991, the economic cost-benefit calculation was moving in a similar direction in other countries. In October 1990, for example, the Japanese government set a target of stabilisation of 1990 per capita emission levels by 2000.[224] This was, according to a representative of the Association for the Conservation of Energy, a 'signal that consensus between the Japanese industry and government has been reached, and *that they do not feel that setting this target is something they cannot cope with economically*'.[225] In this way, we can speculate that the values of the perceived costs and benefits in Japan were shifting for similar reasons.[226]

---

[221] Findings from the ozone layer experience suggest that as the prospects for regulation increase, research into alternatives and substitutes for environmentally-destructive products and practices also increases (*op. cit.*, in notes 84-93, and accompanying text).

[222] A study of the ozone layer issue reveals that the desire for international markets motivated US policy-makers to press for stringent international controls on CFCs (*op. cit.*, in note 117, and accompanying text).

[223] Warren, *op. cit.*, in note 213, p. 31. See, also, Steger, *op. cit.*, in note 213; and, much more generally, the report of GLOBE '90 (a conference designed to integrate business and the environment): Barry Sadler and Brian Hull, *In Business for Tomorrow: The Transition to Sustainable Development* (Ottawa: Government of Canada, 1990).

[224] Karen Schmidt, 'How Industrial Countries are Responding to Global Climate Change', *International Environmental Affairs* (Vol. 3, No. 4, Fall 1991), pp. 303-04.

[225] Quoted in Mary Fagan, 'Britain Further Isolated over $CO_2$ Controls', *The Independent* (London), 24 October 1990, p. 2. Emphasis added.

[226] It is instructive to note that in 1990, the Japanese government announced plans to open an 'Institute of Industrial Technology for the Global Environment' (David Swinbanks, 'Japan Looking for a Profitable Solution', *Nature* (Vol. 344, 15 March 1990), p. 182).

### 3.2.3 -- Intolerable Domestic Economic Costs to Some Industrialised States, 1991

Meanwhile, not every industrialised state had, by the end of 1991, agreed to take policy action to regulate emissions of greenhouse gases. The United States, which was the world's largest emitter of greenhouse gases in absolute terms and eighth largest in per capita terms,[227] was the most significant country among this group.[228] Once again, although many factors probably encouraged policy inaction, we can hypothesise that the American leaders viewed the economic sums differently, perceiving the costs of regulatory action to be intolerable. An examination of US decision-makers' attitudes and perceptions at this time substantiates this assertion.

American officials often cited the significant costs of policy action as a reason for their cautious stance on the global warming issue. At a conference in Bergen, Norway in May 1990, for example, the American representative -- Timothy Atkeson, Assistant Administrator of the US Environmental Protection Agency -- referred to 'studies suggesting that it would cost between [US]$800 billion and [US]$3.6 trillion to cut America's carbon emissions 20% by the year 2000'.[229] Some degree of wariness was also in evidence during the formal negotiations working towards an international response. Most notably, the US's principal contribution to the Intergovernmental Panel on Climate Change was its chairing of the third Working Group, on 'Response Strategies'. In May 1990, when the Working Groups' interim reports were released, one commentator noted:

> The United States stands accused of allowing its national interests to blind it to the need for international action to combat a global threat. US officials have been emphasising at a series of ministerial-level international conferences that cuts in emissions could cause severe damage to their

---

[227] Moreover, the US was third in per capita emissions among OECD countries (behind Canada and Luxembourg). These data are from World Resources Institute, *World Resources 1990-91* (Oxford: Oxford University Press, 1990), Tables 2.2 (p. 15) and 2.3 (p. 17).

[228] Only one other OECD country (Turkey) had not, by this time, made any commitment to stabilise or to reduce greenhouse gas emissions. Although five other countries (Greece, Ireland, Luxembourg, Portugal and Spain) had also not set unilateral targets, they had, nevertheless, agreed to the European Communities' target of the stabilisation of carbon dioxide emissions at the 1990 level by the year 2000. See, Schmidt, *op. cit.*, in note 224.

[229] Quoted in 'The World Through Green-Tinted Specs', *The Economist*, 19 May 1990, p. 94. The study is U.S. Council of Economic Advisors, *Economic Report of the President* (Washington, DC: U.S. Government Printing Office, February 1990).

economy.[230]

Upon release of its final report in the summer of 1990,[231] further criticism was immediately forthcoming. Stewart Boyle, then of the Association for the Conservation of Energy, noted:

> The report appears to have been severely watered down in response to pressure from oil and coal-producing nations led by the US. The group's working practice has been weak and uncoordinated and failed to come up with an adequate response.[232]

Many placed the responsibility for the report's conservative pitch squarely upon the shoulders of the Americans. Nevertheless, United States' decision-makers maintained their position at the Second World Climate Conference in Geneva in November 1990, when they expressed concern that 'actions we agree to take do not unduly curtail economic growth'.[233] Taken together, these observations suggest that the economics were, at least superficially, an important part of the US policy calculation. Let us consider some of the elements of the Americans' perceived costs and benefits to try to discern the extent to which the economic factor actually influenced the policy position.

The primary domestic consideration related to the general health of the US economy. Some American decision-makers believed that the policies that would have to be imposed in order to cut greenhouse gas emissions -- for example, taxes on energy consumption -- might cause inflation,[234] create unemployment[235]

---

[230] 'Inquiry into Global Warming Condemned as a Climb-Down', *The Independent* (London), 24 May 1990, p. 6. See, also, Peter Aldhous, 'Modest Response to Climate Change Threat', *Nature* (Vol. 345, 31 May 1990), p. 373.

[231] *Climate Change: The IPCC Response Strategies* (Geneva: WMO and UNEP, 1990).

[232] Quoted in Andrew Morgan and Robert Matthews, 'Global Warming Plan "Watered Down"', *The Sunday Correspondent* (London), 22 July 1990, p. 2.

[233] Paul Brown, 'Still Poles Apart', *The Guardian* (London), 2 November 1990, p. 29. See, also, David Nicholson-Lord, 'Bush Defies Alert on Global Warming', *The Independent on Sunday* (London), 4 November 1990, p. 6.

[234] Former US White House Chief of Staff John Sununu explicitly expressed this fear. See, for example, Ian Guest, No Title, *The Guardian* (London), 9 February 1990, p. 23.

[235] Although often overlooked, it should be recognised that the US is a significant energy producer. A fall in demand would necessitate cutbacks in supply, and for reasons cited *infra*, in note 255, and accompanying text, domestic supplies (rather than foreign supplies) would be the first to be reduced.

and thus increase the chances of economic recession or depression.[236] Indeed, one commentator noted that US President George Bush had 'assumed a cautious stance in office, bowing to advisers who view[ed] global warming as a scientific fad and [saw] proposals to curb greenhouse gases ... as *potentially ruinous to the U.S. industrial base.*'[237]

Second, in the US, there were also significant political costs associated with the policies that would be required in order to reduce greenhouse gas emissions. Although by the end of 1991, it had become fashionable to talk of 'market-based instruments' for reducing greenhouse gas emissions (*e.g.*, tradeable permits), it remained that command-and-control mechanisms (*i.e.,* direct government regulation) were still regarded as some of the most viable means of achieving a government-proclaimed goal. And one of the first targets of any regulatory policies would probably be the transport sector, because direct taxes upon petrol offered an immediate way of reducing emission levels. Taxes, however, are not particularly popular in the United States,[238] and it was generally acknowledged that any 'tax-attack' upon private motoring would be a 'domestic electoral disaster',[239] akin

---

[236] Some studies that suggest that greenhouse gas abatement would be growth-retarding are noted *op. cit.*, in note 197. In addition, Schelling maintains that, in the US, the magnitude of the potential costs were *perceived* as immense. He says

> 'perceived' because estimates invite comparisons with something like the federal budget of the United States. At the present time 2 percent of GNP is 100 billion dollars per year, a currently unmanageable amount politically, even though a 2 percent loss of GNP through reduced productivity, phased in over a decade or two and maintained in perpetuity, would not be much noticed.

(T.C. Schelling, 'Economic Responses to Global Warming: Prospects for Cooperative Approaches', in Dornbusch and James (eds.), *op. cit.*, in note 207, p. 198.) One such investigation was undertaken in 1989. At that time, Alan Manne and Richard Richels published the first major study of the macroeconomic impact of structural changes to limit carbon dioxide emissions in the United States. Taking the period from 1990 to 2100, they found that the costs of restricting carbon emissions to the 1990 level through 2000, reducing them gradually to 80 percent of this level by 2020 and stabilising them thereafter to be US$3.6 trillion, discounting to 1990 at 5 per cent per year. (Cited in MacNeill *et al*, *op. cit.*, in note 211. The study is: Alan S. Manne and Richard G. Richels, '$CO_2$ Emissions Limits: An Economic Analysis for the USA', *The Energy Journal* (Vol. 11, No. 2, 1990).)

[237] Michael Weisskopf, 'Bush Says more Data On Warming Needed', *The Washington Post*, 18 April 1990, pp. A1 and A23. Emphasis added. In 1989, it was noted that this sort of attitude reflected 'the views of the White House Science Adviser's Office, the Energy and Agriculture Departments and the Office of Management and Budget, which have argued that more needs to be known regarding the implications of a global convention or treaty for the domestic US economy' ('Opposition to Global Warming Convention', *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), pp. 115-16).

[238] George Bush's famous 1988 election pledge was: 'Read my lips, no new taxes.'

[239] Paul Brown, 'Global Slow-Step Trips Up', *The Guardian* (London), 18 May 1990, p. 27.

to committing 'political suicide'.[240] Thus, the political cost of policy action, in light of the anticipated reaction by individual Americans, was similarly viewed as significant by policy-makers.

Third, powerful industrial interests -- particularly, energy producers -- perceived significant costs associated with reductions in greenhouse gas emissions. Although the ozone layer experience might lead one to believe that initial opposition should be expected, significant differences between the two issues of global atmospheric change suggest that industry opposition was much more firmly entrenched on the global warming issue. Recall that, on the ozone layer issue, the large chemical companies eventually supported CFC regulation, because their representatives realised that they would be the ones that would manufacture the substitute chemicals.[241] In light of CFC restrictions, it was anticipated (correctly, as it turned out) that the collapse of one market would be compensated by the emergence of another.

> In contrast, much of the energy industry -- unless they venture radically into new areas -- will simply lose business. Apart from some investment in alternative technologies, the primary prescriptions to combat global warming do not involve replacement (as in the CFC case), but rather reduction. Thus, certain powerful organizations will have little incentive to advance the global commitment to slow climatic change.[242]

In the United States, energy interests had, by the end of 1991, mobilised effectively

---

[240] Paul Brown, 'Between the Devil and the Deep Blue Sea', *The Guardian* (London), 24 August 1990, p. 19. It is instructive to note that the pump price of a litre of gasoline in 1989 was US$0.28 in the United States and US$0.65 in Germany (author's calculations from IEA, *Energy Efficiency and the Environment* (Paris: OECD, 1991), Figure III.20, p. 76). See, also, Michael P. Walsh, 'Motor Vehicles and Global Warming', in Jeremy Leggett (ed.), *Global Warming: The Greenpeace Report* (Oxford: Oxford University Press, 1990), pp. 260-294.

[241] See the discussion in Chapter 3.1.3 of this thesis.

[242] Ian Rowlands, 'The Security Challenges of Global Environmental Change', *The Washington Quarterly* (Vol. 14, No. 1, Winter 1991), p. 111. See, also, James K. Sebenius, 'Designing Negotiations Toward a New Regime: The Case of Global Warming', *International Security* (Vol. 15, No. 4, Spring 1991), pp. 133-34, where he identifies industry as a possible 'blocking coalition' on the global warming issue. In addition, Cairncross relates a telling story:

> While the CFC manufacturers have come to international conferences on CFCs to stiffen the resolve of governments to phase out their own product, an oil company representative at the Second World Conference on Climate Change in Geneva in November 1990 acted as go-between for the Saudi Arabian and American governments, two of the main opponents of targets to reduce carbon-dioxide output.

(Frances Cairncross, *Costing the Earth* (London: Business Books, Ltd. in association with The Economist Books, Ltd., 1991), p. 129.)

in their fight against policies that would require reductions in greenhouse gas emissions.[243] Not only had representatives from 60 US corporations and interest groups come together to form the Global Climate Coalition (which aimed 'to provide the business perspective' on the global warming issue),[244] but explicit threats about the political cost of restrictive policies had been made to decision-makers.[245] Thus, although some utilities in the United States were beginning to recognise the value of energy conservation,[246] the US energy industry did not support any kind of regulation. Therefore, the political cost of policy action, in light of the anticipated reaction by American industry, was also viewed as significant by policy-makers.

Additionally, at the end of 1991, it was perceived that any action to reduce greenhouse gas emissions would have substantial international costs, for primarily three reasons. First, the United States was one of the most inefficient users of energy in the industrialised world.[247] Although this suggests that the US would have had lower marginal costs (*vis-a-vis* other countries) in light of an across-the-board percentage cut in greenhouse gas emissions,[248] the US, in reality, might have experienced significant costs in order to achieve *any* reductions. The US cut back much of its research and development into energy conservation and

---

[243] Allen and Christensen note that '[p]owerful vested interests are likely to oppose the necessary increases in energy prices' (Myles R. Allen and John M. Christensen, 'Climate Change and the Need for a New Energy Agenda', *Energy Policy* (Vol. 18, No. 1, January/February 1990), p. 23).

[244] Nicholas Schoon, 'Delaying Tactics Feared on Global Warming', *The Independent* (London), 17 April 1990, p. 8; and Khristine Hall, Nina Kogan and Jonathan Plaut, 'A Business Approach to Global Climate Change', *International Environmental Affairs* (Vol. 2, No. 4, Fall, 1990), pp. 298-302. Moreover, in July 1991, a 'coalition of US coal companies and electricity utilities [was] considering a national advertising campaign ... to reduce public support for energy policies designed to slow global warming' (Peter Aldhous, 'Power Lobby Pressure', *Nature* (Vol. 352, 4 July 1991), p. 3).

[245] In May 1989, 'Mr. William Fay, who heads a coalition representing US coal and other firms, gave a warning that, if Mr. Bush supports a strong [Clean Air] Bill which adds to industry's costs, his chances of re-election in 1992 will be diminished' (Guest, *op. cit.*, in note 234, p. 23). Moreover, it is instructive to note that US President Bush made much of the fact that Texas had become his 'adopted home'. Texas, however, was also the home of the oil lobby.

[246] Tim Woolf, Association for the Conservation of Energy, London, personal communication.

[247] In 1985, American energy intensity was 0.61 TOE/US$1000 of GDP at constant 1980 prices and constant exchange rates. This was 19th of the 21 IEA nations (IEA, *op. cit.*, in note 212, p. 43).

[248] See *op. cit.*, in notes 123-125, and accompanying text.

alternative energy sources during the 1980s,[249] and, thus, compared with other major states, the US had had its competitive position in the manufacturing and marketing of key products eroded. Although the Administrator of its EPA recognises that 'there is money to be made in cleaning up the environment',[250] there were suggestions that those helping to reduce greenhouse gas emissions in the US would be, among others, the Germans and the Japanese.[251] Consequently, the Americans foresaw substantial increases to its trade balance problems as a result of any policy to curb its level of greenhouse gas emissions.[252]

Second, studies suggested that an internationally-uniform carbon tax would cause end-use prices of energy to increase significantly more in the United States than, for example, those in Japan and Germany. The authors of one particular report contend that the 'large differences in end-use prices mainly reflect the effects of existing energy policies, which are only to a minor extent geared towards internalising the external cost of fuel use [in the United States]'.[253] Thus, the price of goods produced in the United States would rise more than the price of goods produced elsewhere. This would make American exports less attractive and foreign imports more attractive -- thereby adversely affecting the country's trade balance.

Third, international financial difficulties in light of regulatory action would also

---

[249] For example, Oppenheimer and Boyle note that:

> Funding subsequently dried up when the Reagan Administration slashed the Department of Energy's efficiency-research budget by half and outlays for renewable energy by 82 percent. For example, federal support for photovoltaics dropped from [US] $160 million in 1981 to [US] $35 million in 1988, while most of the tax credits for renewable-energy systems were terminated in 1985.

(Oppenheimer and Boyle, *op. cit.*, in note 86, p. 164.)

[250] Reilly, *op. cit.*, in note 195, pp. B1 and B4.

[251] 'American industrialists might note that Germany has replaced the United States as the principle manufacturer of photovoltaic cells ...' (Norman Moss, *The Politics of Global Warming* (London: London Defence Studies No. 9, Brassey's for the Centre for Defence Studies, December 1991), p. 33).

[252] In this way, we must recognise that international trade can, at times, be modelled as a zero-sum game, because one country's trade balance surplus must come at the expense of another country's deficit. Therefore, with non-American firms being at the forefront of new technology to reduce greenhouse gas emissions, some American decision-makers were resistant to any regulation.

[253] Peter Hoeller and Markku Wallin, *Energy Prices, Taxes and Carbon Dioxide Emissions* (Paris: OECD, Economics and Statistic Department Working Paper No. 106, 1991), pp. 26 and 11.

result from the fact that the US was a substantial producer and consumer of coal.[254] Because coal is the 'dirtiest' fossil fuel, to achieve a given reduction in carbon dioxide emissions from coal-fired power plants would require a greater cut in output than in either oil-fired or gas-fired plants.[255] Indeed, reports were suggesting that European countries would be able to adjust to carbon constraints more easily than the United States, because they had a 'relatively higher proportion of undiscovered oil and gas reserves, and their nuclear power industry is larger. Moreover, they have a lower energy/GDP ratio in the base year of 1990'.[256] Thus, if coal production and use had to be curtailed, the American trade position would be weakened not only by a decrease in the international demand for coal, but also by an increase in the domestic demand for imported oil and gas. Such comparisons did not go unnoticed in American policy-making circles. In 1990, for example, it was reported that the US 'president's men are impressed by a report from the Council of Economic Advisors, arguing that a uniform cut in emissions would bear more heavily on coal-intensive America than on its main competitors'.[257]

Two other factors seemed to be particularly persuasive in the calculations of American decision-makers at this time. First, because of the substantial costs

---

[254] In 1989, 530.0 MTOE of the American energy supply was met by 'solid fuels'. In West Germany, by comparison, the figure was 75.9 MTOE (OECD, *Environmental Data Compendium* (Paris: OECD, 1991), p. 183).

[255] The amount of carbon dioxide emitted by the production of one GW/hour of electricity depends upon the fuel used:

| | |
|---|---|
| Conventional coal | 962.0 tonnes |
| Oil | 726.2 tonnes |
| Gas | 484.0 tonnes |

(Carlo LaPorta, 'Renewable Energy: Recent Commercial Performance in the USA as an Index of Future Prospects', in Leggett (ed.), *op. cit.*, in note 240, p. 230, Table 11.2.)

[256] Alan S. Manne and Richard G. Richels, 'Global $CO_2$ Emission Reductions -- the Impacts of Rising Energy Costs', *The Energy Journal* (Vol. 12, No. 1, 1991), p. 99.

[257] 'The World Through Green-Tinted Specs', *op. cit.*, in note 229, p. 94. In the carbon tax simulations that were undertaken at this time, coal was always the fuel that was taxed the most. In one scenario, 'the tax would raise coal prices by 263 percent, and oil and gas prices by between 70 and 100 percent' (James Poterba , 'Tax Policy to Combat Global Warming: On Designing a Carbon Tax', in Dornbusch and Poterba (eds.), *op. cit.*, in note 207, p. 86). In addition, there was also a fear that any nationally-based measure might be the 'thin edge of the wedge'. If, for example, there was eventually a global tax on carbon, which would then be redistributed by a global authority to poorer countries, then the US would have to pay large amounts. In one such study, net transfers out of states of the EC over the period 1990-2030 amounted to 3,222.2 billion 1990 US dollars; while the same figure for North America was 9,059.4 billion 1990 US dollars, almost three times as much (John Whalley and Randall Wigle, 'The International Incidence of Carbon Taxes', in Dornbusch and Poterba (eds.), *op. cit.*, in note 207, Table 7.7, p. 252).

associated with reducing greenhouse gas emissions, policy action could only be justified on economic criteria if the benefits were perceived to be significant. Moreover, given the observations made above, it seemed that no major secondary benefits would be accrued by policy action; thus, the primary benefits would have to be large enough to 'tip the balance'. However, a number of reports published at this time[258] suggested that the size of the primary benefits -- that is, the magnitude of the changes that a warmer world would bring about -- did not justify any policy action on global warming.[259] Thomas Schelling, for example, argues that, in the United States 'it will be exceedingly difficult to demonstrate serious adverse impacts of climate change'.[260] Indeed, not only were there questions about the magnitude of the estimated benefits, but there were also those who were questioning whether proposed policy action might bring about future costs, rather than benefits. Unlike the ozone layer experience, there were some who might actually be better off in a warmer world.[261] Although no politician was proposing (at least, in public) that his or her country was in favour of global warming, there were certainly those who were maintaining that the benefits of policy action (that is, the costs of policy inaction) were not large enough to warrant any significant disruption to their particular society. Instead, they argued that it might make more

---

[258] In 1988, for example, the United States Environmental Protection Agency released a study that estimated the costs of adapting to a rise in sealevels (Joel B. Smith and Dennis A. Tirpak (eds.), *The Potential Effects of Global Climate Change on the United States, Volume 2: National Studies* (Washington, DC: United States Environmental Protection Agency; Office of Policy, Planning and Evaluation; Office of Research and Development, Draft Report to Congress, October 1988), p. 9-1). See, also, the chapters in OECD, *op. cit.*, in note 5; and Frank Rijsberman, 'Potential Costs of Adapting to Sea Level Rise in OECD Countries', in OECD, *Responding to Climate Change: Selected Economic Issues* (Paris: OECD, 1991), pp. 11-49.

[259] See, *op. cit.*, in note 190. In addition, William Nordhaus argues that:

> In sum, the economic impact upon the U.S. economy of the climatic changes induced by a doubling of $CO_2$ concentrations is likely to be small. The point estimate today is that the impact, in terms of variables that have been quantified, is likely to be around one-fourth of 1 percent of national income. However, current studies omit many potentially important effects, so this estimate has a large margin of error.

(William D. Nordhaus, 'Economic Approaches to Greenhouse Warming' in Dornbusch and Poterba (eds.), *op. cit.*, in note 207, p. 44.) Beckerman puts forth a similar argument (Wilfred Beckerman, 'Global Warming: A Sceptical Economic Assessment', in Dieter Helm (ed.), *Economic Policy Towards the Environment* (Oxford: Blackwell, 1991), pp. 52-85).

[260] Schelling, *op. cit.*, in note 236, p. 202.

[261] This relates to the so-called 'winners and losers' debate. See, for example, Allen and Christensen, *op. cit.*, in note 243, p. 21; and Edward B. Barbier and David W. Pearce, 'Thinking Economically About Climate Change', *Energy Policy* (Vol. 18, No. 1, January/February 1990), p. 16.

sense to 'adapt' to global warming, rather than to 'prevent' global warming.[262]

In addition, the Americans were also concerned about the substantial uncertainties associated with the estimates of both costs and benefits.[263] On the one hand, the ozone layer experience suggests that the chances for co-operative action increase once policy-makers have an idea about, at the very least, the size of the projected costs associated with regulation.[264] Because the ozone-depletion theory challenged only one small part (CFC-production) of a single industry (production of industrial chemicals), it was relatively easy to identify, to isolate and to estimate the projected net economic costs of regulatory action.[265] The same was not true on the global warming issue. All industrial activity in a state would be affected by policies that reduced greenhouse gas emissions.[266] Therefore, it was necessary for policy-makers to consider the impact that regulation would have upon all of these organisations. In 1991, meanwhile,

> the economic costs and consequences of introducing those alternatives, how to make them accessible, how to encourage their diffusion in industrial systems, and, most important, how to achieve international agreement on the technological, economic, and social impacts are all poorly known ... Now is the time for a broad international effort to explore the technological and economic ramifications of mitigation and adaptation strategies.[267]

Initial efforts revealed that the task of collecting the relevant data was, thus, much more daunting on the global warming issue than it had been on the ozone layer

---

[262] Haas, *op. cit.*, in note 74, p. 359.

[263] Haas notes the importance that policy-makers in the global warming negotiations were placing upon accurate and reliable costing estimates (*ibid.*, p. 363, note 27).

[264] See the discussion in Chapter 4.2.4 of this thesis, particularly notes 88-93, and accompanying text. See, also, Gerelli, *op. cit.*, in note 207, p. 186; and interview with L.P.J. Mazairac, Ambassador and Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 2 August 1991.

[265] Interview with Usher, *op. cit.*, in note 103. In addition, individuals in the US White House maintain that they are willing to pursue environmental regulations when 'the resources needed to address the problem are reasonable and predictable' (noted in Scott Barrett, 'Economic Analysis of International Environmental Agreements: Lessons for a Global Warming Treaty', in OECD, *Responding to Climate Change: Selected Social Issues* (Paris: OECD, 1991), p. 135).

[266] Skolnikoff suggests that the first thing to realise is 'that global warming epitomizes the idea that everything relates to everything else' (Eugene B. Skolnikoff, 'The Policy Gridlock on Global Warming', *Foreign Policy* (No. 79, Summer 1990), p. 81).

[267] Robert M. White, 'Our Climatic Future: Science, Technology, and World Climate Negotiations', *Environment* (Vol. 33, No. 2, March 1991), pp. 40-41.

depletion issue.[268]

In addition, the uncertainties that were associated with the scientific understanding of global warming at the time[269] created significant uncertainties in the value of any primary benefits that were estimated at the time.[270] As Frances Cairncross notes:

> Calculations of the costs of curbing carbon dioxide may be difficult, but they are easy compared with the task of estimating the benefits. Here language can be muddling: a benefit of curbing greenhouse gases may take the from of avoiding some of the costs of adapting to a hotter world. Thus, while building sea walls is a cost of adapting to the rise in sea levels that global warming may bring, avoiding the need for the expense of building sea walls appears in the arithmetic as a benefit.[271]

These comments suggest that, at the end of 1991, there were substantial uncertainties involved in the analysis. Indeed, one commentator at this time argued that:

> The economic analysis of strategies to limit and adapt to a changing climate is also largely an uncharted wilderness -- such studies as there have been (mostly by advocates of one policy or another) have produced wildly different answers.[272]

Consequently, some used these uncertainties to justify avoiding a significant change in American policy.

In these ways, a number of observations suggest that the domestic economic costs of regulatory action to reduce national emissions of greenhouse gases were not viewed as 'tolerable' by American decision-makers at the end of

---

[268] UNEP officials had attempted to converge the economists' estimates. (UNEP Executive-Director Mostafa Tolba hosted a meeting in London in early 1991, which brought together many of the world's economists who were working on the costing issue. Although the differences in their estimates were reduced, large variations nevertheless remained (interview with Usher, *op. cit.*, in note 103).)

[269] See Chapter 2.2.5 of this thesis.

[270] See, for example, Manne and Richels, *op. cit.*, in note 256, p. 89.

[271] Cairncross, *op. cit.*, in note 242, p. 132. Further, Skolnikoff maintains that '... if policies are especially costly, affected interests are apt to use the absence of a definitive analysis of effects as an argument to defer or prevent action' (Skolnikoff, *op. cit.*, in note 266, p. 84). It should be recognised, however, that attempts were being made to cost these benefits. See, for example, *op. cit.*, in note 258.

[272] 'Global Warming Makes Its Mark Everywhere', *Nature* (Vol. 349, 3 January 1991), p. 3.

1991.[273] We can further speculate that this calculation was a key determinant of their policy position on the issue.

This focus upon the United States should not, however, lead one to believe that the US was the only industrialised state whose policy might be partially explained by use of a cost-benefit analysis. Indeed, any country that either had inefficient industry or was a producer of fossil fuels could well have found it in its domestic economic interest to avoid substantial unilateral regulatory action.[274] Consider, for example, the United Kingdom. In 1990, British officials announced that Britain would stabilise its 1990 level of carbon dioxide emissions by 2005 -- five years after many other members of the European Communities.[275] The hesitancy on the part of the British decision-makers to go beyond this target was directly motivated by fears about inflation,[276] job losses (particularly in the coal industry)[277] and the disturbance that a stricter target might have caused to the privatisation of the UK electricity industry.[278] The mindset and priority of British policy-makers at the time are usefully captured by the comments of the UK Environment Minister, David Trippier, who said in 1990: 'We could go for [stabilisation in] 2000, if we wanted to close down half of the coal mines in Britain and go for no economic growth.'[279] These few observations thus suggest that the economic costs might have been a key determinant of British policy on global warming.

So they went for closing down all the mines and economic recession instead!

---

[273] It is instructive to note that a 1990 OECD report that compared the effects of four different policies to reduce emissions by 50 per cent over 1990-2030 found that North America was the only region to be worse off in *every* scenario. This finding helps to substantiate the argument being developed here (Hoeller *et al*, *op. cit.*, in note 197, p. 42).

[274] Among non-OECD countries, there were also 'developed' states that might have found that a cost-benefit analysis did not yield 'tolerable' outcomes. Saudi Arabian officials, for example, voiced their doubts about the virtues of any policy changes to reduce greenhouse gas emissions -- concerned about their loss of oil revenues (David Thomas, 'Split Arises on Global Warming Action as Governments Meet', *The Financial Times* (London), 8 June 1990, p. 1; and Phillipe Sands, Centre for International Environmental Law, London, personal communication, 8 December 1991).

[275] United Kingdom Department of the Environment, *This Common Inheritance: Britain's Environmental Strategy* (London: HMSO, 1990).

[276] Colin Brown, 'Risk of Losing Votes Keeps Road Pricing out of "Green" Plan', *The Independent* (London), 29 May 1990, p. 3.

[277] *Ibid.*, p. 3.

[278] Colin Brown and Nicholas Schoon, '"Missed Chance" for Cleaner UK', *The Independent* (London), 26 September 1990, p. 1.

[279] Quoted in John Pieraar and Colin Brown, 'Britain and EC Head for Row over "Green taxes"', *The Independent* (London), 21 September 1990, p. 1.

Thus, at the end of 1991, two different sets of attitudes with regard to policy action on global warming were in evidence among leaders of the industrialised world. While some decision-makers in some OECD countries had taken unilateral actions to regulate the emissions of greenhouse gases in their particular states, others had yet to make any policy commitments on the issue. Although numerous factors could have influenced their respective stances, the findings suggest that the perception of costs and benefits were important contributing factors. Thus, because a few key players still regarded the domestic economic costs of reducing greenhouse gas emissions to be 'intolerable', the second hypothesised precondition for international regime formation was, at the end of 1991, still unsatisfied.

### 3.3 -- Summary

In this chapter, a proposition about the need for 'tolerable' domestic economic costs of policy action is initially put forth. An examination of the costs and benefits of policy action on the issues of ozone layer depletion and global warming, as perceived by the industrialised states' leaders, is subsequently undertaken in order to explore this hypothesis. The study of the ozone layer experience reveals that the potential impact upon the major states' domestic chemical industries was a key determinant of governments' willingness to take regulatory action, because the consequences for the individual states' wider economy as a whole were held to be important. By the middle of 1988, however, the perceptions had changed, and with net costs deemed to be tolerable by the industrialised states' leaders, the second hypothesised precondition was finally satisfied. Further, as regulatory controls were strengthened, up through to the end of 1991, communicatory links between government and industry were key requirements for continued policy co-ordination.

On the global warming issue, meanwhile, the findings reveal that the economic costs of regulatory action to address global warming extend beyond a single business sector. Indeed, because greenhouse gases are produced by almost every industrial process, the ramifications of abatement policies would be all-pervasive. A study of the issue reveals that as of the end of 1991, although some states' leaders viewed the net economic cost of regulatory action to be 'tolerable', this view was not shared by leaders of *all* of the world's major

industrialised states. Accordingly, the second hypothesised precondition for international regime formation remained unsatisfied on the global warming issue at the end of 1991.

## Chapter 4 -- Global Equity

In this chapter, the third and final precondition for international regime formation is examined.[1] Termed 'global equity', its presence is inspired by the 'global' writers in the literature on international regimes.[2] Like the propositions advocated by the Hegemonic Stability Theorists and the Dependency Theorists, the hypothesis examined here contends that an international regime cannot possibly be formed unless certain system-wide conditions have been satisfied. But unlike the propositions of these other theories' adherents, the hypothesis does not look for hegemonic action (either malevolent or benign) at the global level in order to explain international regime formation. Instead, it is proposed that demands for 'equity' across international borders must be adequately met before the formation of an international regime is possible.

Some scholars in the literature of international relations put forth the argument that equity is needed in order to build international arrangements.[3] The definition of the term 'equity' is, however, problematic. In the absence of a compilation of all of the difficulties that are unleashed by the application of such a value-laden term, the sheer recognition of its subjective nature is sufficient to warn us of the dilemmas that could arise from its use. This fact should not, however, deter us from examining the concept. Oran Young notes that:

> While it is important to recognize that there are no objective standards of equity which can be applied to human affairs, it is also worth noting that identifiable community standards regarding equity do exist in specific social settings. And there is much to be said for the proposition that satisfying these standards is a necessary condition for international regime formation, whatever outside observers may think of the long-term consequences of the resultant arrangements with respect to allocative efficiency.[4]

Because the world can be considered to be a community, we can try to identify

---

[1] See Chapter 1.3 of this thesis.

[2] See Chapter 1.2.1 of this thesis.

[3] While examining the prospects for regime formation, Oran Young, for example, contends that the 'availability of arrangements that all participants can accept as equitable (rather than efficient) is necessary for institutional bargaining to succeed' (Oran R. Young, 'The Politics of International Regime Formation: Managing Natural Resources and the Environment', *International Organization* (Vol. 43, No. 3, Summer 1989), p. 368).

[4] *Ibid.*, p. 369.

some standards regarding equity.

Equity is, of course, multidimensional. We can propose that actors in international society determine whether an arrangement is equitable by undertaking a comparative analysis of costs and benefits across all participants. Not only are tangible factors part of the calculation,[5] but immaterial elements, such as history and ideology, also enter the computation. Our study should be, therefore, both historical and aware of the fact that equity is perceived differently by different players.

Given some sort of broad conceptualisation of the term, the next task is to determine which players in international society should be the focus of our study. If we did not impose any sort of restriction upon the analysis, then we might be overwhelmed by numbers, for there are many instances imaginable when one actor (or group of actors) might press for a more equitable arrangement *vis-a-vis* another actor (or group of actors) in international society. The examination in Chapter 3 of this thesis reveals, for example, how the term 'equity' was interpreted by various industrial interests. Additionally, we could think about the term not only across space, but also across time, for intergenerational equity problems are made more pressing by many environmental concerns. (This is a point to which I return in the Conclusions of this thesis.) Thus, because the issues of global atmospheric change are pervasive throughout international society, we can be sure that every actor will be concerned with the issue to at least some extent. Consequently, every actor will have their own interpretation of what would be a fair and equitable resolution to the problem. However, consideration in this study of every demand for equity would clearly be impractical. Instead, we should focus upon the dominant issue.

To this end, therefore, it is suggested that the demands for equity as interpreted by 'the state' are the most significant considerations of equity in the process of international regime formation. The justification for this qualification stems from an assumption that the decisions of countries' governments are not reached irrespective of transnational circumstances. Although notions of global 'common futures' may, at times, be influential, it is maintained that the anarchical

[5] See the discussion in Chapter 3 of this thesis.

nature of the international system[6] means that competition among states still exists. A government is expected, therefore, not only to further the interests of its own people (hence the recognition, in Chapter 3 of this thesis, of the role that economic costs and benefits play in the process of international regime formation), but it is also not expected to afford other states a disproportionate share of any mutual benefit arising from an international arrangement. Accordingly, states will not form international regimes until their leaders expect not only to achieve an absolute gain, but also to avoid a relative loss. It is thus maintained that this will be the way in which states' leaders will call for arrangements that they perceive to be 'equitable' at the international level.

But, even with this seemingly restrictive qualification, we still find that numerous different calls for equity are apparent. In Chapter 3, for example, it is shown that transnational considerations of fairness were important factors in the negotiations among the leaders of the industrialised states.[7] On environmental issues, however, these kinds of debates that have arisen among small groups of states are not the most significant in the broader international negotiations. Rather, the most important questions of equity in the international negotiations on the ozone layer depletion and global warming issues have arisen across those groups of states that hold markedly different perceptions of the costs and benefits of global atmospheric change -- namely, the industrialised states ('the North') and the

---

[6] Hedley Bull, *The Anarchical Society: A Study of Order in World Politics* (Basingstoke: Macmillan, 1977).

[7] In this instance, I am referring to two different types of demands for equity. First, there were instances in which certain Northern states' representatives were opposed to the implementation of any policies that would leave their citizens at a competitive disadvantage in international society. In this situation, the demand for equity derived from a straightforward comparative analysis of costs and benefits across different states. (See, for two examples, the debate between the European and the American negotiators about end uses of CFCs (Chapters 3.1.1 and 3.1.3 of this thesis) and the similar debate between these two sets of negotiators during the early 1990s about the reduction of greenhouse gas emissions (Chapters 3.2.2 and 3.2.3 of this thesis).) Second, however, there were also instances in which one state's leaders felt that uniform standards should not be applied across all states, because such a policy would overlook the actions that that state had taken in the past. In these situations, the demand for equity also derived from a consideration of historical factors. (See, for two examples, the Americans' demand that their 1970s 'can ban' be taken into consideration in the formulation of international regulations during the 1980s (Chapter 3.1.3 of this thesis) and a similar call for consideration of historical action by the Japanese on the global warming issue during the late 1980s (Michael Grubb, 'The Greenhouse Effect: Negotiating Targets', *International Affairs* (Vol. 66, No. 1, January 1990), p. 75)).

developing world ('the South').[8]

Thus, the purpose of this chapter is to explore the hypothesis that international regime formation on either the issue of ozone layer depletion or the issue of global warming is not possible until the demands for global equity, in terms of North-South issues, have been met to the satisfaction of all members of international society. In this way, it is proposed that global equity is a necessary (though not sufficient) condition for international regime formation. To consider the proposition, the chapter is divided into three sections. In the first section, a brief overview of the North-South dimensions of the broader debate concerning the international politics of the environment is provided in order to help explain the absence of the North-South question from the agenda of global atmospheric change issues before the mid 1980s. In the second section, the manner in which the members of international society attempted to meet the calls for global equity on the ozone layer depletion issue is reviewed. Finally, the third section of this chapter provides an overview of similar aspects on the global warming issue. By considering the issues in these ways, it is anticipated that our knowledge about international regime formation on issues of global atmospheric change can be advanced.

### 4.1 -- North-South Issues in International Environmental Politics

North-South issues first became a significant component of the broader discussions concerning the international environment during the preparations for the United Nations Conference on the Human Environment (which was held in Stockholm in June 1972).[9] In order to understand what took place both before and during this conference, it is helpful to recall the international setting at this time.

First, the 1960s had witnessed a wave of decolonisation in the Third World. Leaders of the newly-independent states in the South, motivated by nationalistic

---

[8] By the end of 1991, it was becoming evident that the relationships between the countries of Eastern Europe and the West, and these same countries and the South, could become the dominant global equity issues in the negotiations. Although this question is not pursued in this chapter, its potential significance is nevertheless highlighted. For more information, see Craig ZumBrunnen, 'The Environmental Challenges in Eastern Europe', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), pp. 389-412.

[9] See, for example, 'United Nations Conference on the Human Environment: Final Documents', *International Legal Materials* (Vol. 11, No. 6, November 1972), pp. 1416-69; and Peter Stone, *Did We Save the Earth at Stockholm?* (London: Earth Island Ltd., 1973).

feelings and a strong desire for state self-determination, were eager both to obtain a better deal in international society and to redress some of the perceived injustices instituted during the colonial period. Their aspirations are perhaps best exemplified by two particular demands. First, at the United Nations in 1967, the Maltese ambassador, Arvid Pardo, put forth the idea of the Common Heritage of Mankind.[10] Pardo argued that the vast resource potential that lay beneath the world's oceans beyond the limits of national jurisdiction should be shared among all states of the world; not just among those with the technological ability to exploit them. This concept was a source of much inspiration for Southern decision-makers during the subsequent international negotiations on the Law of the Sea.[11] Second, during the early 1970s, Southern states' leaders also issued calls for a New International Economic Order (NIEO). At meetings of the Non-Aligned Movement, the United Nations General Assembly and other international bodies, representatives from the developing world argued for reforms in the international economic and trade systems.[12]

Additionally, the late 1960s and early 1970s had witnessed a vigorous debate about global population growth and resource depletion, which was inspired in no small part by the image of 'Only One Earth'.[13] Perhaps the publication of the Club of Rome's *Limits to Growth* report[14] -- a neo-Malthusian analysis, which, among other things, focused attention upon the dwindling supplies of the Earth's natural resources -- is the most famous of the many studies from this period. Although there were numerous methodological and technical problems with the

---

[10] UN Doc. 22 GAOR A/6695 (17 August 1967), cited in Markus G. Schmidt, *Common Heritage or Common Burden?: The United States Position on the Development of a Regime for Deep Sea-Bed Mining in the Law of the Sea Convention* (Oxford: Clarendon Press, 1989), pp. 22-23.

[11] For more information about the United Nations Conference on the Law of the Sea (and, in particular, the proposed International Seabed Authority), see, for example, Kilaparti Ramakrishna, 'North-South Issues, Common Heritage of Mankind and Global Climate Change', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), pp. 429-45; and Mark W. Zacher and James G. McConnell, 'Down to the Sea with Stakes: The Evolving Law of the Sea and the Future of the Deep Seabed Regime', *Ocean Development and International Law* (Vol. 21, No. 1, 1990), pp. 71-103.

[12] See, for example, William G. Tyler (ed.), *Issues and Prospects for the New International Economic Order* (Lexington, MA: Lexington Books, 1977).

[13] This is the title of a book written by Barbara Ward and Rene Dubos (Harmondsworth: Penguin, 1972), which was commissioned by the Secretary-General of the Stockholm Conference. This term also gained greater popularity after the first photographs of Earth as seen from outer space were brought back by US astronauts during the 1960s.

[14] Donella H. Meadows, Dennis L. Meadows, Jorgen Randers and William W. Behrens III, *The Limits to Growth* (New York: Universe Books, 1972).

report,[15] it nevertheless drew further attention to the issues of resource depletion, pollution and overpopulation. The concerns raised in the *Limits* publication, which were given further gravity by the food and oil crises at this time, suggested that statespeople in the North could not afford to ignore the demands coming from the South. And the initial 'gains' made by the members of the Organization of Petroleum Exporting Countries suggested that other resource-producing cartels might also be successful.

Against this setting, two important themes emerged at the Stockholm Conference. First, it became clear that the perceived priority or importance of many environmental issues was not uniform throughout the world. Although Southern decision-makers were cognizant of the environmental problems afflicting their countries,[16] their primary objective (at least outwardly) was to achieve a higher standard of living for their peoples. At this time, it was clear that 'the kind of environmental problems that are of importance in developing countries are those that can be overcome by the process of development itself'.[17] Worrying about international pollution and environmental problems that did not appear to impact their citizens' well-being directly was thought to be a luxury that leaders in the developing world could not afford. Indira Gandhi, the Indian Prime Minister, best captured this sentiment when she said, in Stockholm: 'How can we speak to those who live in villages and in slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at the source?'[18]

Second, the Southern politicians were also suspicious of the Northern leaders' rhetoric about pollution control -- wondering if it was a disguise for Northern ambitions to retard their prospects for development. Citizens of the developed world had exploited their resources and damaged their environment in

---

[15] See, for example, H.S.D. Cole *et al*, *Thinking About the Future: A Critique of The Limits to Growth Model* (London: Chatto & Windus, 1973).

[16] The environmental issues that were perceived to be most significant were the ones associated with the Green Revolution in particular, and food and water security more generally. See, for example, Centre for Science and Environment, *The State of India's Environment 1982: A Citizen's Report* (New Delhi: Centre for Science and Environment, 1982).

[17] Report of a Panel of Experts Convened by the United Nations Conference on the Human Environment Secretary-General, held at Founex, Switzerland in 1971 (quoted in Lynton Keith Caldwell, *International Environmental Policy: Emergence and Dimensions*, Second Edition (London: Duke University Press, 1990), p. 52).

[18] Quoted in 'What They Said -- Indira Gandhi, India', *Bulletin of Atomic Scientists* (Vol. 28, No. 7, September 1972), p. 36.

order to obtain a higher standard of living, and therefore some Southern politicians wondered what gave the North the moral right to tell the South that they could not do the same. Thus, Southern states' leaders, in Stockholm and elsewhere at this time, forcefully enunciated their desire to exploit their natural resources in ways that they saw fit. The words from a speech by Tang Ke, from the People's Republic of China, are representative of this feeling among the South's decision-makers. In his address at Stockholm, he argued that '... no country whatsoever should undermine the interests of the developing countries under the pretext of protecting the environment.'[19] These two themes -- the question of the development and environment trade-off, and the concept of resource sovereignty -- dominated the North-South aspect of the Stockholm Conference and hence set the tone for ensuing political discussions about the international environment.

The rise of the Second Cold War during the late 1970s and the first half of the 1980s served to decrease the visibility of both environmental and North-South issues.[20] During the mid 1980s, however, the relative standing of these issues again shifted; the Cold War waned, and environmental and North-South issues ascended the international agenda once more. Even more importantly for our discussion, however, North-South issues entered the politics of both ozone layer depletion and global warming during the mid and late 1980s. The reasons for this development are suggested in the next two sections.

### 4.2 -- Global Equity and Ozone Layer Depletion

The roles that global equity and North-South questions played in the politics of the ozone layer issue up to the end of 1991 can be examined most effectively by identifying two periods, with the time between the openings for signature of the Vienna Convention (1985) and the Montreal Protocol (1987) being a grey area which marks the boundary between the two.[21]

---

[19] Quoted in 'What They Said -- Tang Ke, People's Republic of China', *The Bulletin of Atomic Scientists* (Vol. 28, No. 7, September 1972), p. 55.

[20] See, for example, Fred Halliday, *The Making of the Second Cold War* (London: Verso, 1983).

[21] The 'Vienna Convention for the Protection of the Ozone Layer' is reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1516-40; while the 'Montreal Protocol on Substances that Deplete the Ozone Layer' is reprinted in Appendix A.3 of this thesis.

### 4.2.1 -- The Non-Involvement of Southern States Before 1986

Before 1986, developing countries were not significant players in the international political negotiations on the ozone layer. A review of some of the key meetings' 'roll calls' goes some way towards substantiating this observation. For example, at a conference in Washington, DC in 1977, which was the first international gathering to examine the ozone layer issue explicitly, only 24 of the 65 participants were from the South -- and 20 of those 24 individuals were either from their respective country's embassy in Washington, DC or UN mission in New York.[22] An examination of the attendance records from subsequent meetings, right up to the Vienna Conference in March 1985, reveals similar patterns.[23]

There are a number of explanations for this non-involvement.[24] First, it was thought that the only necessary participants in the negotiations were the leaders of the states that were producing the ozone-depleting chemicals. In 1977, the only Southern countries that manufactured chlorofluorocarbons (CFCs) were Argentina, Brazil, India and Mexico.[25] Indeed, even in 1985, the developing world produced only a little more than 16 per cent of the worldwide total of CFCs.[26] In order to address the ozone layer depletion issue effectively, therefore, some believed that the primary objective should be to forge an agreement among the few states that

---

[22] Author's calculations from 'List of Participants', in Asit K. Biswas (ed.), *The Ozone Layer* (Oxford: Pergamon Press, 1979), pp. xiii-xviii.

[23] At the Vienna Conference, only one-third of the participating countries (12/36) were from the developing world (author's calculations from *op. cit.*, in note 21, p. 1520).

[24] This is not to suggest, however, that there was *no* recognition of the North-South dimension of the issue at this time. One of the papers presented at the 1977 conference in Washington, DC, for example, was entitled 'Ozone Layer and Development'. It argued that the issue had potentially significant implications for developing states ('Ozone Layer and Development', in Biswas (ed.), *op. cit.*, in note 22, pp. 137-39). Its impact was, however, minimal.

[25] Kenneth J. Vandevelde, 'International Regulation of Fluorocarbons', *The Harvard Environmental Law Review* (Vol. 2, 1977), p. 487, note 79.

[26] The absolute amount was 367 million pounds. This is a US Environmental Protection Agency (EPA) estimate, cited in Diane M. Doolittle, 'Underestimating Ozone Depletion: The Meandering Road to the Montreal Protocol and Beyond', *Ecology Law Quarterly* (Vol. 16, No. 2, 1989), p. 425, note 152. Moreover, a study for the EPA demonstrated the wide difference in per capita use of CFCs among selected developed and developing nations:

| | | | | | |
|---|---|---|---|---|---|
| China | 0.02 | Japan | 0.48 | Egypt | 0.06 |
| USA | 0.84 | Mexico | 0.07 | EEC | 0.85 |

(All figures in kg/capita from either 1984 or 1985. Study cited in James T.B. Tripp, 'The UNEP Montreal Protocol: Industrialized and Developing Countries Sharing the Responsibility for Protecting the Stratospheric Ozone Layer', *New York University Journal of International Law and Politics* (Vol. 20, 1988), p. 744, note 38.)

produced CFCs.[27]

This relates to the second possible reason for non-involvement -- namely, that the emerging problem of ozone layer depletion was viewed through the standard frameworks of the day. By 1977, only five years had elapsed since the Stockholm conference had brought the idea of an 'international' environmental issue (versus merely a 'local' or, at most, a 'national' environmental issue) onto the political agenda.[28] We should not, therefore, assume that decision-makers might have been able to make another quantum leap in their understanding in order to grasp the concept of a 'global' environmental issue. Indeed, at this time, Southern decision-makers thought that the issue of ozone layer depletion was of no consequence to their citizens.[29] This suggests that the geographical reach of this class of environmental issue had, during the late 1970s, yet to be recognised fully.

Finally, and in echo of one of the themes of the 1972 Stockholm conference, Peter Haas reports that between 1971 and 1990, many less-developed country spokespeople 'expressed concern that the new environmental issue area would reproduce the historical materialist patterns of political and economic dependency on the North, which they were seeking to reverse'.[30] Interpreting a concern for the environment to be a ploy by the North's leaders to attempt to retard the development plans of their governments, some decision-makers in the South sought to avoid this perceived trap.

For these reasons, most leaders in the South did not take an interest in the ozone layer issue before the mid 1980s. Those few that did become involved perceived the efforts of Northern politicians in the debate to be an attack upon their sovereignty, and they argued that they 'did not want any restrictions whatsoever

---

[27] David Pearce, 'Economics and the Global Environmental Challenge', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 380.

[28] I attempt to develop this case further in Ian H. Rowlands, 'Environmental Issues in World Politics', in N.J. Rengger and John Baylis (eds.), *Dilemmas of World Politics: International Issues in a Changing World* (Oxford: Oxford University Press, 1992), pp. 287-309.

[29] Usher recalls that when he discussed the ozone layer depletion issue with representatives of developing countries at this time, they responded that it was interesting, but obviously of no concern to their citizens (interview with Peter Usher, Co-ordinator, Global Environmental Monitoring Service (Atmosphere), United Nations Environment Programme, Nairobi, Kenya).

[30] Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990), pp. 190-91.

placed on the use of CFCs'.[31] More often than not, their views were similar to those of the Bangladesh representative who spoke at the 1977 meeting of the United Nations Environment Programme's Governing Council. He seemed perplexed by the Council's preoccupation with the ozone layer issue:

> Bangladesh reminded the Governing Council of the real priorities as seen by a poor nation with repeated natural disasters such as floods and tidal waves. To us, said the Bangladesh representative, the controversy over harm caused to the ozone layer by spray products is simply not relevant. Increasing soil productivity, coping with natural disasters and meeting basic human needs are the areas in which the country must concentrate.[32]

The language of the documents being agreed internationally during this period also demonstrates that the North-South issue was not dominant. Even in the Vienna Convention of 1985, little attention is paid to any special needs that the countries of the developing world might have. Although Article 4, paragraph 2 registers the necessity to take 'into account in particular the needs of the developing countries, in promoting, directly or through competent international bodies, the development and transfer of technology and knowledge',[33] such statements are, however, notably unexplicit; nothing more concrete is proposed.[34] It thus appears that North-South questions dominated neither the discussions working towards,[35] nor the final text of, this framework convention. At least until 1985, therefore, global equity was not a point of political contention in international

---

[31] John Warren Kindt and Samuel Pyeatt Menefee, 'The Vexing Problem of Ozone Depletion in International Environmental Law and Policy', *Texas International Law Journal* (Vol. 24, No. 2, Spring 1989), p. 277.

[32] Quoted in Allan L. Springer, *The International Law of Pollution: Protecting the Global Environment in a World of Sovereign States* (London: Quorum Books, 1983), pp. 23-24. It is instructive to recognise that the three concerns raised by the Bangladesh representative are all exacerbated -- quite directly -- by stratospheric ozone depletion, by 'spray products'. The fact that this particular individual did not make this connection helps to substantiate my 'second reason for non-involvement' made above -- namely, that the significant interdependent, and indeed global, nature of the issue was not generally perceived.

[33] 'Vienna Convention', *op. cit.*, in note 21. See, also, the Preamble of the same document.

[34] See, for example, Patrick Szell, 'Ozone Layer and Climate Change', in Winfried Lang, Hanspeter Neuhold and Karl Zemanek (eds.), *Environmental Protection and International Law* (London: Graham & Trotman Limited, 1991), p. 167.

[35] Clarke and Timberlake noted in 1982 that 'non-Western countries ... had paid little attention to the scientific debate' (Robin Clarke and Lloyd Timberlake, *Stockholm Plus Ten: Promises, Promises?* (London: Earthscan for the International Institute for Environment and Development, 1982), p. 44); and Roan maintains that in the lead-up to the Vienna Conference, 'several Third World countries were merely not interested' (Sharon L. Roan, *Ozone Crisis: The 15 Year Evolution of a Sudden Global Emergency* (Chichester: John Wiley & Sons, Inc., 1989), p. 154).

society. Although different states' leaders held different perceptions of what they thought would be equitable,[36] these divergent views did not clash at the level of policy during this period.

### 4.2.2 -- The Emergence of Global Equity as a Political Issue, 1986-1988

Nevertheless, as negotiations towards the Montreal Protocol proceeded during 1986 and 1987, it became clear both that the situation of the Southern states posed special difficulties and that these problems would have to be resolved adequately in any Protocol. The recognition of these two priority concerns arose for a number of reasons, all of them related to the explanations offered for the developing world's previous non-involvement on the issue.

First, not only was the level of production of ozone-depleting chemicals increasing in the developing world, but there were also plans for even greater future use.[37] Thus, CFC production and consumption, which was previously concentrated in the North, was gradually being diffused around the globe. Therefore, if one accepted the notion that any agreement should involve all CFC-producing states, then officials from the newly-producing states in the South had to become participants in the negotiating process.

Second, the true nature of the problem -- its global extent -- was beginning to be recognised. Decision-makers were starting to view environmental issues through new paradigms that stretched beyond their traditional, 'local' frameworks. The discovery of the ozone crater above Antarctica in 1985 clearly demonstrated

---

[36] Compare, for example, the comments in *op. cit.*, in note 32, and accompanying text, with the efforts of Northern statespeople at this time to impose restrictions.

[37] In March 1989, for example, Cheng Zheng-Kang (professor of law at Beijing University, the scholar who drafted many of China's environmental laws) 'told an American meeting that his country planned a tenfold increase in the output of loaded refrigerators in the coming decade' (Fred Pearce, 'Plugging the Hole in our Sun-roof', *The Sunday Times* (London), 5 March 1989, p. F1). Benedick also notes, in 1991, that 'China's CFC consumption had been rising by 20 percent annually in recent years, and the number of its refrigerators reportedly increased by over 80 percent in 1988 alone' (Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991), p. 150). Finally, a Friends of the Earth report maintains that:

> By 2000, without controls, consumption by developing states is expected to be 28.8 per cent of the world total ... [rising to] around 43.5 per cent of the world total [in 2008] ... The key countries here are likely to be India and China, with an expected joint consumption of 694,000 tonnes or around one third of the world total.

(Friends of the Earth, *Funding Change: Developing Countries and the Montreal Protocol* (London: Friends of the Earth, June 1990), pp. 10-11.)

that hair-spray use in Europe *did* have a direct effect upon the incidence of skin cancer among the people of Chile (and vice versa).[38] Thus, it was gradually being accepted that all states of the world were affected by the ozone layer depletion issue.

Because of the previous two facts, some suggested that the power capabilities in the international negotiations had been considerably transformed. Although the Southern states' leaders were still sceptical in their attitude to Northern pronouncements on 'sustainable development' and so on (because they viewed them suspiciously as excuses to retard development efforts in their countries), these leaders also started to recognise that they now possessed a significant 'bargaining chip' in the negotiations. It was well-known that any state could become a manufacturer of CFCs quite rapidly, because the production plants are typically small, they can be erected quickly and they can pay for themselves within a short time period as well.[39] The Southern states therefore had the potential to produce large quantities of ozone-depleting chemicals in the near future. For this reason, some Northern states' leaders felt that they had to ensure the participation of the Southern states in any future agreement.[40]

In April 1987, the special situation of the developing world was recognised by specific recommendations for the first time.[41] A Canadian proposal[42] under

---

[38] The discovery of the ozone crater made it clear that the ozone layer problem could not be contained in spatial terms (J.C. Farman *et al*, 'Large Losses of Total Ozone in Antarctica Reveal Seasonal $CLO_x/NO_x$ Interaction', *Nature* (Vol. 315, 16 May 1985), pp. 207-10). Additionally, the report published by the World Commission on Environment and Development in 1987 argued that problems of this type could not be contained within any single issue-area either (World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987)).

[39] 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', *Virginia Journal of International Law* (Vol. 29, 1989), p. 235, note 160. See, also, Richard Elliot Benedick, 'Protecting the Ozone Layer: New Directions in Diplomacy', in Jessica Tuchman Mathews (ed.), *Preserving the Global Environment: The Challenge of Shared Leadership* (London: W.W. Norton & Company, 1991), p. 140.

[40] Interviews with officials in Nairobi, Kenya, July and August 1991.

[41] By 'specific', I mean 'numerical' references. The evolution from vague prose to concrete numbers represents a significant step. This occurred at the Third Session of the Vienna Group, which met in Geneva on 27-30 April 1987; there is a general consensus that this was the first meeting at which Southern states became significant factors in the politics of ozone layer depletion (interview with Fiona McConnell, UK Department of the Environment, London, 27 March 1990; and Geoffrey Lean, *Action On Ozone* (Nairobi: UNEP, 1989), p. 8).

[42] James T.B. Tripp, Daniel J. Dudek and Michael Oppenheimer, 'Law: Equity and Ozone Protection', *Environment* (Vol. 29, No. 6, July/August 1987), p. 44.

consideration called 'for developing countries to be exempt from the provisions of the convention for five years, or until their annual use of CFCs reaches 0.1 kg per head of population'.[43] During the ensuing four months, special arrangements for Southern states were discussed, and they were the subject of '[m]any hours of intense discussions' during the conference proceedings in Montreal in September 1987.[44] Participants in the negotiations began to recognise that 'without some preferential treatment such countries [Southern states] would not become Parties to the Protocol. The result would be an unrestricted growth in [CFC] consumption outside the Protocol.'[45]

In the terms of the Protocol agreed at the Montreal meeting, two special provisions were made for Southern states. One permitted these states to delay their compliance with the control measures restricting CFC production and consumption for 10 years.[46] The other, spread over two paragraphs, asserted the need for an effort to facilitate access to both technology and financial schemes to enable developing countries to use alternative technologies and to introduce substitute products more easily.[47] These two devices -- a period of grace and a promise of future access to technology and money -- were the only special provisions made for the Southern states.

On the day that the Protocol was opened for signature, eight Southern states' representatives signed the document.[48] Peter Usher speculates about the motivation that prompted their ascent:

> Developing countries were persuaded to sign the protocol because of the prospect of preferential treatment in the continued use of the suspect

---

[43] Kathy Johnston, 'Ozone Layer Protection Deal Still up in the Air', *Nature* (Vol. 327, 7 May 1987), p. 3. Compare the figure of 0.1 kg/capita with the amounts noted *op. cit.*, in note 26.

[44] Kathy Johnston, 'First Steps in Ozone Protection Agreed', *Nature* (Vol. 329, 17 September 1987), p. 189.

[45] G. Victor Buxton, 'The Montreal Protocol on Substances that Deplete the Ozone Layer', paper presented at the 81st Annual Meeting of the Air Pollution Control Association, Dallas, TX, 19-24 June 1988, pp. 11.

[46] They could delay, that is, providing their annual level of consumption did not exceed 0.3 kg/capita. See Article 5 of the Montreal Protocol, *op. cit.*, in note 21.

[47] *Ibid.*, Article 5.

[48] The Protocol was opened for signature on 16 September 1987. The Southern countries that signed the document on that day were Egypt, Ghana, Kenya, Mexico, Panamá, Senegal, Togo and Venezuela (author's calculations from Stewart Boyle and John Ardill, *The Greenhouse Effect: A Practical Guide to the World's Changing Climate* (Sevenoaks: New English Library, 1989), Appendix 3, pp. 258-59).

chemicals, at least for the next twenty years, coupled with no trade discrimination and access to alternative technology and substitute safe chemicals.[49]

There was a feeling pervasive among the negotiators that the provisions contained in the Montreal Protocol would be enough to make other developing countries sign on to the document. Richard Benedick observes that: 'From the interest shown by developing-country delegates at Montreal, including even those who had not received authorization to sign on the spot, it seemed likely that most would eventually ratify.'[50] Winfried Lang, head of the Austrian delegation, believes that the Southern countries had only one choice: 'Unless you join, you won't get those substances you need to meet your domestic needs, ... [and because technology transfers are prohibited to non-Parties,] countries not signing the Protocol will be unable to produce their own.'[51] The problem of Southern state participation in the process and thus the dilemmas of global equity were, in these ways, thought to be resolved.

Other observers in the North, however, soon began to recognise that the Southern states' involvement was not a foregone conclusion. A number of reasons were cited. First, there was an economic incentive for Southern states to fill the market niche created by the Protocol, which might lead them both to produce ozone-destroying chemicals and to discourage any future strengthening of the agreement.[52] Second, the 'protocol's restrictions on international trade in these chemicals would have no inhibiting effect on China and India because of their huge potential domestic markets',[53] and therefore, the efficacy of the trade restriction incentives was placed in doubt. Finally, even if Southern states became Parties to the Protocol, but nevertheless increased the level of their production up to their allowable limits, then efforts to protect the atmosphere would still be hindered

---

[49] Peter Usher, 'Climate Change and the Developing World', *Southern Illinois University Law Journal* (Vol. 14, 1990), pp. 262.

[50] Benedick, *op. cit.*, in note 37, p. 99.

[51] Quoted in Capretta, *op. cit.*, in note 39, p. 232, note 138.

[52] One commentator contends that the '10-year exemption and the possible scarcity in the supply of chemicals likely could render it profitable for developing countries to invest in CFC industrial facilities for use during the 10-year waiting period' (*ibid.*, p. 235).

[53] Benedick, *op. cit.*, in note 37, p. 100.

considerably.[54]

Meanwhile, the predominant view among Southern analysts was also that the Protocol was unsatisfactory, but for different reasons. Many began to argue that the so-called 'concessions' in the Montreal Protocol did not address their special needs in a just manner. Kilaparti Ramakrishna notes that:

> Even among those countries that have signed on as parties to the agreements, a feeling that they were 'caught napping' before and during the negotiations is gaining ground. If another opportunity were to present itself, many believe that they should react differently.[55]

Southern decision-makers, therefore, became more interested in the politics of the ozone layer, because they realised that the text agreed in Montreal would have significant consequences for their countries: without changes to the document, their industrial production, their economies and their overall plans for development would be affected by the phasing out of CFCs. This was deemed to be unsatisfactory, because Southern decision-makers were not necessarily willing to forego the use of these chemicals without compensation. Promises of technology transfer and financial assistance from the North to the South were, meanwhile, exceedingly vague.[56]

In 1988, therefore, starkly different conceptions of equity were held by different states' leaders in international society. This incongruity, coupled with the fact that new scientific evidence was suggesting that the Montreal Protocol would

---

[54] The terms of the original Montreal Protocol permit developing countries to increase their production of CFCs substantially. For example, if the Chinese were to take full advantage of their allowance, they could, in good faith of the Montreal Protocol, produce approximately 350,000 tonnes of CFCs per year in 1999 (greater than pre-Protocol, US production). Modelling runs performed at the Wurzburg seminar in 1987 (see Chapter 2.1.6 of this thesis) had effectively demonstrated that the continued growth of CFC use in the developing world (even to levels well below that of the developed world) would cause the destruction of large amounts of stratospheric ozone (Tripp *et al*, *op. cit.*, in note 42, p. 43).

[55] Kilaparti Ramakrishna, 'North-South Issues, the Common Heritage of Mankind and Global Environmental Change', in Ian H. Rowlands and Malory Greene (eds.), *Global Environmental Change and International Relations* (Basingstoke: Macmillan, 1992), pp. 152-53. Scott Hajost echoes this view (interview with Scott Hajost, Environmental Defense Fund, Washington, DC, 20 April 1990).

[56] Many in the South feared that the only products that would be transferred would be out-of-date technology. (See, for example, V. Shiva, *Transfer of Technology*, Briefing Paper for UNCED, Third World Network, Penang, 1991, cited in Patrick McCully, 'The Case Against Climate Aid', *The Ecologist* (Vol. 21, No. 6, November/December 1991), p. 250.) Indeed, on the ozone layer issue in particular, the Indian Environment Minister notes that Allied Chemical (an American multinational corporation) sold CFC technology to India when CFCs were 'perceived as immoral' in the North (comments of Maneka Gandhi, press conference, London, 28 June 1990). See, also, Benedick, *op. cit.*, in note 37, pp. 100-01.

need to be strengthened in order to preserve the ozone layer,[57] propelled the global equity issue up the general ozone layer agenda.

### 4.2.3 -- Greater Calls for Global Equity, 1989

The visibility accorded the global equity issue increased rapidly during the second half of 1988, and it came to be one of two dominant themes[58] at two conferences during the first half of 1989.[59] In March of that year, the United Kingdom government and the United Nations Environment Programme (UNEP) co-sponsored a conference on 'Saving the Ozone Layer'. The primary purpose of this gathering, as outlined by British officials, was to encourage the developing states' representatives to sign and to ratify the Montreal Protocol.[60] This was to be achieved by showing them that substitute chemicals existed and that 'it is in [the developing world's] own interests, as well as in the interests of the developed world, not to use chemicals that damage the ozone layer'.[61] This conference was unique for its 'unofficial status', something that was promoted:

> British government ministers have been going out of their way to emphasise that the conference is in no way intended to put any sort of pressure on the Third World but rather to inform these countries and give them greater

---

[57] The startling scientific discoveries (see the discussion in Chapter 2.1.6 of this thesis) had not escaped the attention of statespeople in the South. At a meeting of 70 leading atmospheric scientists in The Hague on 17-18 October 1988, for example, '[r]epresentatives of the developing countries expressed concern about the availability of food and other resources which will be adversely affected by ozone depletion' ('Scientists at Hague Meeting Find 1988 Ozone Hole is Smaller', *Climate Alert* (Vol. 1, No. 4, Winter 1988), p. 5). Peter Usher maintains that this is the same argument that UNEP officials employed to try to get developing countries involved in the international negotiations during the early 1980s (interview with Usher, *op. cit.*, in note 29).

[58] The other theme was the need for accelerating the controls' timetable.

[59] At a conference in Toronto in June 1988, the idea of an 'international fund' was mooted for the first time at an international gathering of policy-makers (*infra*, in note 142, and accompanying text). Although most of the attention at this time was focused upon climatic change, it is also notable for its reference to the ozone layer issue ('The Changing Atmosphere: Implications for Global Security' (Toronto, Canada, 27-30 June 1988), *Conference Statement* (Ottawa: Environment Canada, 1988)). The first time, however, that the global equity issue emerged as a theme of a major conference specifically devoted to the ozone layer problem was in November 1988 (Ozone Depletion Conference, London, 28-29 November 1988). Although this meeting was formally organised for scientific matters, the North-South issue dominated much of the coffee-break chatter (author's observations).

[60] At this time, only eight Southern states (Egypt, Kenya, Malta, Mexico, Nigeria, Singapore, Uganda and Venezuela) had ratified the Montreal Protocol (author's calculations from Boyle and Ardill, *op. cit.*, in note 48, Appendix 3, pp. 258-59).

[61] Michael McCarthy, '"Disaster Recipe" if Third World Uses CFCs', *The Times* (London), 6 March 1989, p. 6.

awareness of the problem.[62]

The theme of the conference was firmly established in the opening address by Kenya's President Moi. He argued that the Northern states must be prepared to help the developing world 'make the right choice and order their priorities properly'.[63] This point was picked up more specifically on the second day of the conference by the Chinese and Indian delegation heads. Each individual indicated that a fairer arrangement was a precondition of their countries' participation in the process. Liu Ming Pu, the Chinese vice-chairman of the state commission for environmental protection, called for an 'International Ozone Layer Protection Fund'. Paid for by the Northern states, this fund would sponsor research into alternative methods and would also transfer the technology, free of charge, to those Southern countries that agreed to limit their use of CFCs.[64] Further, Ziul Rahman Ansari, the Indian minister of environment and forests, said that: 'Lest someone think of this [fund] as charity, I would like to remind them of the excellent principle of "polluter pays", adopted in the developed world.'[65] Thus, representatives from the two largest states in the developing world made it clear that their governments would not accede to the Montreal Protocol process until there was 'a fairer deal on the use of CFCs and unless firm commitments [were] made to provide them with financial aid and technical aid for substitutes'.[66] In this way, the manner in which equity was perceived by leaders of the two largest Third World countries was forcefully made clear.

The response from officials of the developed world can, at best, be described as evasive. Although they seemed to acknowledge that there was a greater responsibility upon the states of the North (because their citizens had

---

[62] *Ibid.*

[63] Quoted in Judy Jones, 'Moi Appeals for West to Help the Third World', *The Independent* (London), 6 March 1989, p. 3.

[64] Richard North, 'Appeal for Fund to Help Third World Cut CFCs', *The Independent* (London), 7 March 1989.

[65] Quoted in *ibid.*

[66] John Hunt, 'Solutions Elude Delegates but Event is "Success"', *The Financial Times* (London), 8 March 1989.

damaged the ozone layer[67]), specifics were not proposed. Indeed, the two sides seemed to be out of step: the developing world's delegates, as noted above, were calling for a new fund; while the developed world's representatives were looking simply to enhance existing institutions.[68] In the end, the delegates could only agree that 'ways of helping developing countries should be a major feature of the protocol review and urgently examined in all appropriate international contexts ... [and] ... technical solutions are needed to help solve Third World human problems'.[69] Leaving the conference, however, officials realised that the issue of global equity was now of the utmost priority.[70]

The global equity question was next considered in an international forum at the first official meeting of the Parties to the Montreal Protocol in Helsinki in May 1989. At this conference, the two sides on this pivotal issue were even more polarised. On the one hand, officials from the US, the UK, Japan, West Germany, France and other countries were opposed to the idea of any international fund, but instead continued to favour the use of existing mechanisms in order to address the problem.[71] Their representatives were afraid that any new institution to govern the proposed fund would be a bureaucratic nightmare: inefficient, unaccountable and out of the control of the developed world. This side's reservations were summed up by the British Environment Secretary, Nicholas Ridley:

---

[67] For example, British Prime Minister Margaret Thatcher, in her closing remarks at the conference, acknowledged that: 'Clearly, it would be intolerable for the countries which have already industrialised, and have caused the greater part of the problem we face, to expect others to pay the price in terms of their peoples' hopes and well being.' (Quoted in Judy Jones, 'Thatcher Calls for Concerted World Action', *The Independent* (London), 8 March 1989.)

[68] Northern officials' ideas included: increasing bilateral development assistance, refocussing that assistance to environmentally-friendly projects or increasing the responsibilities of the World Bank ('Saving the Ozone Layer', *Environmental Policy and Law* (Vol. 19, No. 2, April 1989), pp. 45-46).

[69] From the conference's final communique, reprinted in Pearce Wright, 'Banning CFCs is Only Remedy', *The Times* (London), 8 March 1989, p. 6.

[70] Despite the rather vague conclusion of the final communique, organisers could claim success in the fact that, by the end of the conference, '20 additional countries said they would ratify the Montreal Protocol; more than a dozen others promised to seriously consider joining' (Doolittle, *op. cit.*, in note 26, p. 441, note 268). The new signatories that were from the South were: Brazil, Chile, Ethiopia, Gambia, Ghana, Malaysia, Morocco, Nigeria, the Philippines, Senegal, Tonga, Trinidad, Tunisia and Zambia (Tim Radford, '20 Nations to Sign Protocol', *The Guardian* (London), 7 March 1990, p. 4).

[71] To demonstrate commitment to the view that there was a 'need to work through "existing institutions" and for bilateral direct help', the UK government, at the end of April 1989, announced that it would be sending a £40 million package to India -- to be spent on, among other things, 'alternative technologies to CFCs' (Tim Radford, '80 Nations Agree to Phase Out CFCs by End of Century', *The Guardian* (London), 3 May 1989).

> The major donors do not seem keen on the rather simplistic idea of a fund, even one limited to CFCs. No one has yet addressed a number of fundamental questions about this idea. It has not been suggested who would run such a fund, how it would operate, on what criteria funds would be raised, and from whom, and what would happen if they did not contribute. Nor have we heard how it would be administered. Would it not take too long to set up, let alone to start disbursing? These questions will take much time to answer ... I have no doubt that the donor nations recognise that there is an onus on us, but we must co-ordinate our policies.[72]

On the other hand, officials from China and other countries (including, from the North, Finland, the Netherlands, New Zealand and Norway[73]) urged the creation of a fund, and a motion was put forth that called for subsidies, aid, credits and insurance programmes to deal with the ozone layer problem.[74] Members holding this view argued that because such a large amount of money was needed, a single central organisation should be in charge. At the same time, many in the South were suspicious of the International Monetary Fund, the World Bank and other established organisations; they thought that a new institution might be more 'neutral'.

As in London two months earlier, however, no specifics could be agreed. The delegates did, nevertheless, recognise the special circumstances of the developing countries in the final declaration,[75] and they established a committee to work on detailed proposals. This newly-formed working group was mandated:

> to develop modalities for such mechanisms, including adequate international funding mechanisms which do not exclude the possibility of an international Fund and to report the results of their deliberations to the Conference of the Parties at its second meeting in 1990 [in London in June].[76]

Negotiations in preparation for the Second Meeting of the Parties in London in June 1990 thus proceeded in working group meetings in August and November

---

[72] Quoted in Tim Radford, 'Ridley Pledges CFC Aid for Third World', *The Guardian* (London), 4 May 1989.

[73] Benedick, *op. cit.*, in note 37, p. 126.

[74] Michael McCarthy, 'Working Party Will Consider World Fund to Save Atmosphere', *The Times* (London), 6 May 1989.

[75] The declaration agreed to phase out chemicals more quickly while 'taking due account of developing countries' ('Helsinki Declaration on the Protection of the Ozone Layer', reprinted in *Environmental Policy and Law* (Vol. 19, Nos. 3/4, July 1989), p. 137).

[76] UNEP/OzL.Pro.1/5, p. 20.

1989, and February and May 1990. With regard to the major questions surrounding the quest for a satisfaction of every states' demands for global equity, the negotiators had a number of issues to resolve.[77]

### 4.2.4 -- The Satisfaction of Demands for Global Equity, 1989-1990

Most fundamentally, the first issue to be resolved was whether or not a fund should even exist. Although the idea of an international fund, to help Southern states use substitute chemicals and ozone-friendly processes, was attracting more supporters, some US officials remained resistant to the idea. Evidently, John Sununu (White House Chief of Staff) and Richard Darman (Office of Management and Budget Director) were continuing to win bureaucratic battles with William Reilly (Administrator of the Environmental Protection Agency) and top State Department officials. Although Reilly and the others supported the idea of some sort of fund, Sununu and Darman convinced the American Administration that the US should try to work through existing institutions, such as the World Bank.[78] They harboured fears about the precedent that any ozone layer fund might set for subsequent negotiations on global warming.[79]

As the Americans continued their defiance through the first five months of 1990, the stakes in the issue increased, for it became even clearer that Southern states would not participate in the Montreal Protocol process unless an international fund was agreed.[80] US officials, meanwhile, reiterated their view that

---

[77] Benedick notes the way in which the negotiating stances of the developing countries had changed by the middle of 1989:

> By 1989 the objectives of the developing-country negotiators had undergone significant change. At Montreal their preoccupation, reflected in the negotiations over article 5, was primarily to *maintain maximum usage of CFCs for the longest possible grace period*. But with industrialized countries now on a fast track toward phaseout ... the grace period became almost irrelevant. [Their representatives wanted to] *move as rapidly as possible to new technologies -- and to ensure that help was available to accomplish this*.

(Benedick, *op. cit.*, in note 37, p. 148. Emphasis added.)

[78] Michael Weisskopf, 'U.S. to Fight Aid to Halt Global Warming', *International Herald Tribune*, 10 May 1990, p. 7.

[79] *Infra*., in note 175, and accompanying text.

[80] This view was most adamantly put forward at a conference in Bergen, Norway in mid-May 1990. (See, for example, Paul Brown, 'Global Slow-step Trips Up', *The Guardian* (London), 18 May 1990, p. 27.) Because of US resistance, however, only a vague and abstract reference to 'additional resources and technology' could be agreed in the final declaration ('Bergen: Weak Declaration

they 'simply believe that [the] use of existing, established institutions is a more appropriate course'.[81]

The US Administration finally, in mid June 1990, accepted the principle of a fund. What caused this *volte-face* is unclear, although the influence of pressure from Congress,[82] environmentalists,[83] industry,[84] British Prime Minister Margaret Thatcher[85] and the criticism of the wider international community all played a role.[86] Nevertheless, in London, the United States' representatives made it clear that they were not entering into anything that was open-ended and that the financial mechanism was 'without prejudice to any future arrangements that may be developed with respect to other environmental issues'.[87]

Given agreement upon a fund, another important question related to how much money would be necessary to help the states of the South meet their obligations as outlined in the terms of the Montreal Protocol. A number of different groups put forth a variety of estimates, ranging from US$2 billion to US$7 billion.[88] Because the estimates being aired were so large and varied, it was

---

Adopted', *Environmental Policy and Law* (Vol. 20, No. 3, June 1990), p. 84; and 'The World Through Green-Tinted Specs', *The Economist*, 19 May 1990, p. 94).

[81] US White House spokesman Roman Popadiuk, quoted in G. Christopher Anderson, 'US Says No to International Ozone Plan', *Nature* (Vol. 345, 17 May 1990), p. 193.

[82] 'London Conference Agrees to Complete CFC Phaseout', *Climate Alert* (Vol. 3, No. 1, Spring 1990), p. 1.

[83] See Chapter 5.3 of this thesis for a further discussion.

[84] Atchley notes that Du Pont officials pointed out to John Sununu (US White House Chief of Staff) that if the developing world did not have the money to buy the substitute products, then the markets for the chemical companies would not be as large as they potentially otherwise could be (interview with John Kristian Atchley, Counselor of Embassy and Permanent Representative to UNEP, American Embassy, Nairobi, Kenya, 15 August 1991). See, also, the discussion in Chapter 3 of this thesis.

[85] She warned US President Bush that everyone would suffer if he maintained his position (Geoffrey Lean, 'British Cash Boost for War on Ozone Threat', *The Observer* (London), 24 June 1990, p. 2).

[86] No US government wanted to be seen to scuttle the entire international process (interview with United Nations Environment Programme official, Nairobi, Kenya, July 1991).

[87] Quoted in Benedick, *op. cit.*, in note 37, p. 184. Mateos recalls that the Americans were insistent that the issue not be viewed as any kind of precedent. Regardless of the Americans' position, however, he feels that it was generally agreed that a precedent had been set (interview with Juan Antonio Mateos, Ambassador and Permanent Representative to UNEP, Embassy of Mexico, Nairobi, Kenya, 31 July 1991).

[88] In a speech in early 1990, for example, UNEP Executive-Director Mostafa Tolba noted that the 'cost of using the substitutes will be high -- very preliminary estimates show that from [US]$2 billion to [US]$5 billion will be needed over the current decade' ('Global Partnership and the Road to Save the Ozone Layer', statement by Mostafa Tolba, Penang, 21 February 1990 (Nairobi: UNEP)).

difficult to find a common starting point for negotiations. A turning point came, however, when it was decided to focus upon 'incremental costs', rather than 'full costs',[89] and when an initial three-year period was also considered. Given these more restrictive parameters, the estimates fell, and an initial UNEP suggestion of US$400 million annually was used as a starting point.[90] Even this figure, however, was questioned, and therefore studies of representative countries were contracted and undertaken.[91] The results of these investigations were presented at the second meeting of the Working Group, where it was revealed that the required amount of money to cover costs would not be astronomical. With this discovery, the issue ceased to be a source of conflict,[92] and in the end, a figure of US$160 million over an initial three year period was agreed. This amount would rise to US$240 million in the event that China and India became Parties to the Protocol.[93]

A third point of discussion related to the question of upon whom the burden of financing the fund should fall. One suggestion that was put forward was that the

---

For their country alone, meanwhile, Indian representatives demanded US$2 billion -- 'a number related to its cost of using more ozone-friendly technology in the future -- as its price to join the 1987 protocol' (James K. Sebenius, 'Designing Negotiations Toward a New Regime: The Case of Global Warming', *International Security* (Vol. 15, No. 4, Spring 1991), p. 146). Also, interview with Yusuf Ahmad, Senior Advisor to the Executive-Director, United Nations Environment Programme, Nairobi, Kenya, 14 August 1991.

[89] This was taken to be the difference between the cost of ozone-benign processes and the cost of processes that use CFCs.

[90] Benedick, *op. cit.*, in note 37, p. 154. This figure is the same as the one arrived at in McKinsey and Company, *Protecting the Global Atmosphere: Funding Mechanisms. Interim Report to Steering Committee for Ministerial Conference of Atmospheric Pollution and Climate Change (The Netherlands, November 1989)*, 27 June 1989, p. 10.

[91] The German and the Japanese delegates were the two states that were most concerned with the cost estimates. Mateos nevertheless notes that this issue did not give rise to serious confrontation, because all Parties agreed that it was reasonable to want to have an idea about the magnitude of the figures under consideration (interview with Mateos, *op. cit.*, in note 87). Consultants were therefore hired to do country reports, which helped reduce 'uncertainties regarding the required size of the financial mechanism' (UNEP/OzL./Pro.Bur. 2/2).

[92] Interview with United Nations Environment Programme official, Nairobi, Kenya, July 1991. In London in June 1990, however, Maneka Gandhi did, at one point, demand that India be allowed to draw UK£350 million from any fund in order to eliminate the use of CFCs totally (comments of Gandhi, *op. cit.*, in note 56).

[93] One influential study was undertaken by an organisation called Metroeconomica (*The Costs to Developing Countries of Joining the Montreal Protocol* (Nairobi: UNEP, 1989), cited in UNEP/OzL.Fin.1.). Markandya notes that their figure was supported by an independent study carried out by the US Environmental Protection Agency (*Preliminary Analysis of Capital Costs for CFC Reduction for the First Three Years* (Washington, DC: EPA, 1990).) 'On the basis of a sector-by-sector analysis, the study concluded that the total for the first three years would be between [US]$162 and [US]$262 million.' (Anil Markandya, 'Economics and the Ozone Layer', in David Pearce (ed.), *Blueprint 2: Greening the World Economy* (London: Earthscan, 1991), pp. 69-70.)

contribution to the fund should be dependent upon 1986 levels of consumption, weighted by ozone-depleting potential.[94] In the end, however, it was decided, for reasons of both precedence and simplicity, that the traditional UN scale of assessment would be used.[95]

Further, a fourth significant set of issues to be resolved related to the form that each country's contribution should take. For one, negotiators had to decide whether bilateral aid could be counted as part of a country's contribution to the fund; the larger donor countries supported this idea, for their officials were eager to keep close controls upon some of the aid. In the end, it was agreed that up to 20 per cent of a country's obligation could be met by bilateral aid.[96] Second, the question of 'additionality' arose during the meetings of the Working Group. The Americans, in particular, were vocal on this issue, arguing that funds should come from existing resources and that 'no additional funding should be required from donor countries, although voluntary contributions could be accepted'.[97] Additionality was, nevertheless, finally accepted by all Parties.[98] This relates to a third question about the form of each country's contribution that became an issue -- namely, whether the contributions to the fund should be voluntary or obligatory.[99] Benedick reports how this question was resolved:

> On the issue of mandatory versus voluntary contributions Tolba attempted to bridge the gap between developing countries and major donors by promoting the concept of 'voluntary contributions on an assessed basis,' which conveyed a sense of implicit obligation.[100]

Thus, by the time that ministers gathered in London in June 1990, these three questions about the form of each country's contribution had been resolved to the satisfaction of all participants.

A fifth issue to be considered during this year-long process was with regard

---

[94] In 1989, one delegation had suggested a minimum contribution of US $1000 plus a premium on each kilogramme of CFCs produced equal to one cent (UNEP/OzL.Pro.1/5, p. 8). See, also, UNEP/OzL.Pro.Bur. 1/2, p. 4.

[95] UNEP/OzL.Pro. 2/3, Annex IV, p. 51, Point C8.

[96] UNEP/OzL.Pro. 2/3, Annex IV.

[97] UNEP/OzL.Pro.WG.III(2)/3, p. 4.

[98] Szell, *op. cit.*, in note 34, p. 174.

[99] UNEP/OzL.Pro.WG.III(2)/3.

[100] Benedick, *op. cit.*, in note 37, p. 161.

to how this money -- the new fund -- would be administered.[101] The question initially focused upon whether or not a new organisation should be established. As had been the case at the Helsinki meeting in May 1989, the South's leaders wanted a new organisation, while the North's representatives were opposed to this.

> Representatives of major donor countries stressed the difficult and time-consuming process involved [in the establishment of a totally new institution]. Some donor governments favored only the establishment of a 'clearinghouse' to provide objective information to article 5 [Third World] parties on the availability of aid from existing bilateral and multilateral sources and to facilitate requests for assistance.[102]

Although it appeared that the developing countries' officials would not withdraw their demand for the creation of a new administrating organisation, they eventually

> accepted the concept of a tripartite division of responsibilities among the World Bank, UNDP [United Nations Development Programme] and UNEP. ... UNEP would pursue 'political promotion of the objectives of the Protocol,' as well as research, data collection, and clearinghouse functions. UNDP would take charge of the feasibility studies and other technical assistance activities. Other multilateral agencies, including regional development banks, could be invited by the executive committee to cooperate with the fund. But the World Bank, and specifically the president of the bank, was clearly designated as the administrator and manager of the central function of the fund: financing projects and programs to meet the incremental costs of article 5 parties [developing countries].[103]

Whereas negotiators were able to agree an arrangement for the day-to-day administration of the fund, disagreement about who would control the fund's executive council persisted throughout the working group's four meetings.[104] The Americans, as potentially the largest contributor to the fund, said that they should have a permanent seat on the council as a right. The Southern states' representatives, in response, argued that no one country should have a unique

---

[101] Possibilities ranging from administration by the World Bank (UNEP/OzL.Pro.Bur. 3/2) to administration by a new organisation (UNEP/OzL.Pro.WG.I(1)/3), and everything 'inbetween', were being considered.

[102] Benedick, *op. cit.*, in note 37, pp. 155-56.

[103] *Ibid.*, pp. 161 and 186. See, also, UNEP/OzL.Pro.2/3, Annex IV, p. 50, Paragraphs B2 and B3.

[104] Mateos argues that 'this issue proved to be the most difficult to resolve' (interview with Mateos, *op. cit.*, in note 87). See, also, David Reed, *The Global Environmental Facility: Sharing Responsibility for the Biosphere* (Multilateral Development Bank Program, WWF-International, 1991), p. 5.

advantage -- rather, there should be a democratic executive.[105] By the beginning of the London conference in June 1990, a 14 member executive had been agreed, but just how the representatives should be chosen and how the voting should be weighted (if at all) remained unresolved. Agreement was finally reached which allowed representatives to be chosen from defined regions -- with, in total, seven from the North and seven from the South. Because the US was itself declared a 'region', a permanent seat was thus assured in a face-saving manner. Within the council, 'it was decided that a two-thirds majority, comprising separate simple majorities among North and South, would apply both to votes of the 14-member executive committee and to votes of the parties as a whole concerning the financial mechanism.'[106]

A sixth significant point of contention concerned the question of guaranteed access to technology for Southern states. In order for Southern states to reduce their consumption of CFCs, officials recognised that they had to be 'made privy to know-how and have easy access though subsidies, preferential loans or other means to acquire plant and equipment'.[107] This is, however, not assured, because there are strong forces that discourage the transfer of technology. Benedick identifies the dilemma faced by decision-makers in the Northern states:

> Entrepreneurs would be reluctant to invest sizable sums in research and development of new products, only to have their results given away to companies in developing countries that could then undercut potential markets. There was a principle involved here also: the private sector had to be able to recoup its costs in order to maintain an incentive for investment in technology development. In addition, it was puzzling for Western officials to contemplate how governments could enforce transfer of private-sector technology on noncommercial terms. The World Intellectual Property Organization agreed that in such matters governments have little influence with private companies beyond persuasion and incentives.[108]

Throughout the working groups' meetings, the representatives of Southern states made it clear that they wanted an assurance that, if they did not receive sufficient financial and technical assistance, then they would not be required to

---

[105] Comments of Mexican representative Juan Mateos, cited in John Hunt, 'US Clashes with Third World Over Ozone Fund', *The Financial Times* (London), 22 June 1990, p. 10.

[106] Benedick, *op. cit.*, in note 37, p. 185.

[107] Mostafa Tolba, quoted in 'Cleaning up the Atmosphere: The Business World's View', *Our Planet* (Vol. 2 No. 1, 1990), pp. 4-5.

[108] Benedick, *op. cit.*, in note 37, p. 157. See, also, the discussion in Chapter 3 of this thesis.

meet their obligations in the Montreal Protocol. At the conference in London in June 1990, furthermore, Indian Environment Minister Maneka Gandhi demanded explicit guarantees of technology for Southern states. She maintained that: 'Money is irrelevant if we don't have access to the knowledge. Survival is about the spread of knowledge, not money.'[109]

After late-night negotiation sessions in London, a compromise solution was finally agreed, and the Indian representative stated that she would recommend that her country accede to the Protocol.[110] According to Benedick, resolution 'of the impasse was ingenious, realistic, and acceptable to all'.[111] The compromise could not guarantee technology transfer, but accepted that if Southern states had problems gaining the technology to make CFC alternatives and thus found it difficult to meet their obligations under the agreement, then a meeting of the Parties to the Protocol would be convened in order to consider alternative paths of action.[112]

By tackling these major issues -- the fund's existence, size and other financial details, the structure of administration for the fund, and technology transfer -- negotiators in London made significant progress towards answering fully the

---

[109] Quoted in Paul Brown, 'India Insists on Recipe for Green Fridges', *The Guardian* (London), 29 June 1990, p. 4.

[110] At the conclusion of the conference:

> Following the adoption of decision II/2, the representative of India said that the original text of the Protocol had contained provisions which discriminated against developing countries: the amended text met many of their concerns. She would therefore recommend it to the Government of India for signature.

(UNEP/OzL.Pro.2/3, p. 18.) The Chinese representative had, a day earlier, said that he would 'recommend to the Chinese Government that it should ratify the amended text' (UNEP/OzL.Pro.2/3, p. 18).

[111] Benedick, *op. cit.*, in note 37, p. 196.

[112] The new amended protocol states:

> A Meeting of the Parties shall review, not later than 1995, the situation of the Parties operating under paragraph 1 of this Article [5], including the effective implementation of financial co-operation and transfer of technology to them, and adopt such revisions that may be deemed necessary regarding the schedule of control measures applicable to those Parties.

('Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer' (London: 27-29 June 1990), Article 5, Paragraph 8, reprinted in *International Legal Materials* (Vol. 30, No. 2, March 1991), pp. 539-554.) Although this development was termed 'revolutionary' by some, most officials recognised that there was still further work to be done on this issue (interview with Mateos, *op. cit.*, in note 87; and Sebenius, *op. cit.*, in note 88, p. 147).

developing world's calls for global equity on the ozone layer depletion issue.[113] The success of their work can be measured by the fact that at the conclusion of the London conference in June 1990, '59 nations had signed [the Montreal Protocol] and most of the other 39 [nations] at the conference were expected to [sign] soon'.[114] Even China and India, the two most significant antagonists during the negotiations, indicated that they would soon join the process.[115] Indeed, these observations suggest that the demands for global equity, as perceived by representatives of all states of the world, had been met at the London conference, and thus the third hypothesised precondition for international regime formation had been satisfied by the end of June 1990.

### 4.2.5 -- Weakening Consensus About Global Equity, 1990-1991

The story, however, did not finish with the conclusion of the London conference in June 1990, because it soon became evident that a number of issues remained outstanding with regard to global equity and the politics of ozone layer depletion. First, the agreed Multilateral Fund for the ozone layer had a less than auspicious start. The Fund, which began to take shape after a meeting in Canada in September 1990 and which had its administrative centre in Montreal,[116] was, according to one report, 'bedevilled by bureaucratic arguments. By [May 1991] it had attracted only [US]$10m of its 1991 target of [US]$53m.'[117] By the end of 1991, furthermore, it was not clear that the Fund would be able to function to the satisfaction of both the donor and the recipient countries.[118]

Second, at the London conference in 1990, the members of international

---

[113] See, also, the discussion in Szell, *op. cit.*, in note 34, pp. 173-74.

[114] Paul Brown, 'World Unites on Ozone Deal', *The Guardian* (London), 30 June 1990, p. 1.

[115] *Op. cit.*, in note 110.

[116] 'Green Aid', *Our Planet* (Vol. 2, No. 4, 1990), p. 9.

[117] David Nicholson-Lord, 'Britain to Block Rainforest Fund', *The Independent on Sunday* (London), 9 June 1991, p. 4. Moreover, in June 1991, the UNEP Executive Director 'complained about delayed contributions to the Fund' (noted in David M. Miller, 'Montreal Protocol: Third Meeting of Parties', *Environmental Policy and Law* (Vol. 21, Nos. 5/6, December 1991), p. 200).

[118] To be fair, however, other reports expressed faith in the fund. Mateos, for example, notes that states are committed to the Fund, and thus he expects that it would be fully funded and would be successful (interview with Mateos, *op. cit.*, in note 87). These thoughts are also echoed by some officials from the North (interview with Philippe Orliange, Representant Permanent Adjoint de la France, Aupres de l'Office des Nations-Unies a Nairobi, Ambassade de France au Kenya, Nairobi, Kenya, 15 July 1991).

society only committed themselves to the fund for an initial period of three years. This fact may seem of little consequence, particularly when placed alongside the sheer achievement of getting the members of international society to agree to the principle of the fund. Once attention is drawn to the size of the fund's future needs, however, it becomes evident that conflict in this area could resurface. More specifically, analysts suggest that the most significant costs of cutting CFC emissions will be incurred towards the end of the twentieth century.[119] Anil Markandya, furthermore, maintains that:

> In the longer term, assistance will also be needed to meet the higher costs of CFC substitutes. Estimating this is difficult, given that many of the substitutes are not even available in developed countries on a commercial basis. However, given estimates of expected market prices, and their fall over time as economies of scale came into operation, a figure of around [US]$1.8 billion over the period 1990-2008 was arrived at in the Metroceconomica Study.[120]

He also points out that the bulk of these costs will be concentrated in the period between 1998 and 2010.[121] David Runnalls's view is even more dramatic, for he estimates that 'the annual costs of implementing the Montreal Protocol could run to [US]$400 million'.[122] Moreover, there were significant uncertainties associated with all of these future projections, which suggested that the actual amount of money needed might even be higher. In addition, there were those who were highlighting the fact that developing countries representatives might someday demand financing for the full costs of CFC replacements, rather than just the incremental costs:

> If, for example, a developing country wishes to build a refrigerator plant to take the place of an existing facility that makes CFC-based refrigerators, it must pay what a new CFC facility would have cost; the fund makes up the difference. But the developing nation must still invest a large amount of capital in the new plant -- and swallow the costs of shutting down the old

---

[119] The cost was put at US$995 million by the year 2000 by Metroeconomica (Debora MacKenzie, 'Cheaper Alternatives for CFCs', *New Scientist* (Vol. 126, 30 June 1990), p. 39).

[120] Markandya, *op. cit.*, in note 93, p. 70.

[121] *Ibid.*, p. 70.

[122] David Runnalls, *United Nations Conference on Environment and Development: Institutional and Financial Options for Sustainable Development* (Ottawa: United Nations Association in Canada, Briefing Paper No. 30, July 1991), p. 4.

one.[123]

Taken together, then, these comments suggest that possible demands for assistance in the future could place significant stresses upon the fragile consensus for an international fund, perhaps even causing it to disintegrate.

Finally, the question of technology transfer remained unresolved at the end of 1991. Despite Benedick's encouraging report in the aftermath of the London conference in June 1990,[124] the amendment to the Protocol agreed at that time simply postponed the time at which Parties would have to deal with the issue until 1995.[125] In December 1990 -- six months after the London conference -- a UNEP document reported that:

> The Working Group was of the opinion that the issues of technology transfer and intellectual property required careful attention and detailed discussion. It therefore decided to defer consideration of those issues to a subsequent meeting, when it could also take into account the results of the efforts undertaken under the interim financial mechanism established by decision II/8 of the parties and any deliberations under the auspices of GATT and WIPO [World Intellectual Property Organization].[126]

The challenges facing international negotiators on this dilemma were, at the end of 1991, still substantial.[127]

In light of these facts, it is not surprising to find that the enthusiasm for the amendments to the Protocol diminished after the London conference in June 1990. Indeed, China did not immediately sign the document, as its representative had suggested it would. Instead, it was not until almost a year later, on 19 June 1991, that China announced, at UNEP Headquarters in Nairobi, its intention to accede to the Montreal Protocol.[128] This country's ratification was, at the end of 1991, still pending. India's story was even more striking. Despite the comments made by

---

[123] Robert Pool, 'A Global Experiment in Technology Transfer', *Nature* (Vol. 351, 2 May 1991), p. 6.

[124] *Op. cit.*, in note 111.

[125] *Op. cit.*, in note 112.

[126] UNEP/OzL.Pro/WG.1/5/3, p. 5.

[127] See, for example, Jim MacNeill, Pieter Winsemius and Taizo Yakushiji, *Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology* (Oxford: Oxford University Press, 1991), p. 64; Pool, *op. cit.*, in note 123; and the discussion in Chapter 4.3.4 of this thesis.

[128] 'China Joins Fight Against Ozone Depletion', *Our Planet* (Vol. 3, No. 4, 1991), p. 14.

Maneka Gandhi in June 1990, India did not sign the Protocol during either 1990 or 1991. More significantly, in September 1991,

> India's environment minister, Kamal Nath, ... said his government would not sign the Montreal Protocol, ... His stance is worrying many governments who have signed. Mr Nath said he was unhappy about the conditions governing aid to developing nations to help them develop alternatives to chlorofluorocarbons. He said the conditions may infringe India's sovereignty.[129]

This position, however, was further elucidated by Indian officials, who said that they would sign the protocol, but not until the London amendments had come into effect.[130] Thus, because this document had yet to be ratified, India remained outside of the process at the end of 1991.

Taken together, these three sets of observations suggest that during the second half of 1990 and all of 1991, the strong worldwide consensus about the issue of global equity with respect to ozone layer depletion had weakened significantly. Although it had not decayed to such an extent that the third hypothesised precondition was no longer satisfied, it was nevertheless evident that, at the end of 1991, the global equity precondition for international regime formation was only precariously met.

### 4.3 -- Global Equity and Global Warming

Questions of global equity and North-South relations did not play significant roles in the politics of global warming until the late 1980s.

#### 4.3.1 -- The Non-Involvement of Southern States Before 1987

The question of global equity in the broader global warming debate was not a significant concern for international negotiators before 1987. An examination of the declarations being agreed during this period helps to substantiate this assertion. For example, at one of the first major international gatherings on climatic change -- the First World Climate Conference in Geneva in 1979 -- the North-South theme

---

[129] Nicholas Schoon, 'India Refuses to Sign Ozone Layer Protocol', *The Independent* (London), 21 September 1991, p. 10.

[130] Indian High Commission official, London, personal communication, 20 March 1992. See, also, Peter Aldhous, 'Montreal Protocol Still Too Lax?', *Nature* (Vol. 353, 24 October 1991), p. 688.

was not dominant. The Declaration that was agreed at this conference set forth an agenda for research into various issues surrounding climatic change, which included the socio-economic impacts of climatic variability. The closest reference to the North-South question, however, was a stated desire to improve the understanding of the 'characteristics of human societies at different stages of development and in different environments that make them especially vulnerable or resilient in the face of climate variability and change'.[131] Nevertheless, there were no explicit recommendations for political actions to address any special needs that the Southern states might have had.

During the middle part of the 1980s, the concept of transnational assistance for developing countries in light of projected global climate change began to be mooted at international gatherings. At the Villach-Bellagio conferences in 1987, for example, it was recognised that '[i]nternational assistance would be needed to pay for anticipatory adaptation in many developing countries, so additional bilateral and multilateral funding would be required'.[132] We should recall, however, that these meetings were attended mostly by scientists.

The primary reason for the relatively small amount of attention accorded to the global equity question during the period before 1987 is that the broader global warming issue had yet to take on significant political dimensions. As is argued in Chapter 2 of this thesis, it was not until the wake of the 1987 Villach-Bellagio conferences that states' leaders began to be concerned with the global warming issue.[133] Thus, because the world's decision-makers were not discussing any political issues to a significant extent, it is clear why the question of global equity was not a focus of their attention. Granted, this disregard means that there was no disagreement about perceptions of global equity among the world's decision-makers during the period before 1987, but neither was there any agreement.

### 4.3.2 -- The Emergence of Global Equity as a Political Issue, 1987-1988

The global warming issue became highly political at the international level during

---

[131] 'Declaration of the World Climate Conference', reprinted in *Environmental Policy and Law* (Vol. 6, 1980), p. 103.

[132] World Climate Programme (Impact Studies), *Developing Policies for Responding to Climatic Change* (Geneva: WMO/TD, No. 225, April 1988), p. 31.

[133] See Chapter 2.2.3 of this thesis.

1987 and 1988.[134] More significantly for this discussion, however, the issue of global equity also appeared upon the broader global warming agenda almost immediately. There are a number of reasons for its rapid emergence at this time.

First, Southern states' citizens were contributing to the problem to a significant extent, and their leaders' policy plans suggested that their share would increase in the future. In 1987, for example, Southern states were responsible for 27.7 per cent of all carbon dioxide emissions in the world.[135] Moreover, the Chinese government had plans to expand its coal consumption fivefold between 1990 and 2020. Realisation of this policy proposal would add nearly 50 per cent to the 1990 level of global carbon emissions.[136] In 1990, the significance of this type of policy was noted:

> [I]f China and India were to increase their greenhouse gas emissions to the global average per capita rate, today's global total would rise 28 percent; if these two countries matched France's per capita rate, the total would be 68 percent higher.[137]

Ambitions like these, reflecting a desire for higher standards of living, suggested that, depending upon the path of development that they followed, citizens of the Southern states had the potential to contribute significantly to the global warming problem.

Second, the mounting persuasiveness of the scientific evidence had increased awareness of the global nature of the problem.[138] Thus, given both the recognition that global systems were at work and the increased contribution of Southern states to the readjustment of these global systems, some analysts began to suggest that North-South issues were an indispensable component of the

---

[134] See Chapter 2.2.3 of this thesis.

[135] Geoffrey H. Kats, 'Slowing Global Warming and Sustainable Development: The Promise of Energy Efficiency', *Energy Policy* (Vol. 18, No. 1, January/February 1990), p. 26. There is no general agreement with regard to the contribution that Southern states make to global warming. Another observer, for example, notes that about '40 percent of the expected warming now comes from activities in the developing countries' (Sebenius, *op. cit.*, in note 88, p. 121). This higher value may be accounted for by the inclusion of methane emissions and deforestation in the calculation. A report from the South, meanwhile, suggests still different proportions (Anil Agarwal and Sunita Narain, *Global Warming in an Unequal World* (New Delhi: Centre for Science and Technology, 1990)). Nevertheless, most observers agreed that the Southern contribution was significant.

[136] Sebenius, *op. cit.*, in note 88, p. 129.

[137] James Gustave Speth, 'Toward A North-South Compact for the Environment', *Environment* (Vol. 32, No. 5, June 1990), pp. 16-17.

[138] See Chapter 2 of this thesis; and *op. cit.*, in note 38 and accompanying text.

broader international discussions concerning worldwide climatic change.[139]

Third, the global equity issue arose rapidly at this time in the discussions on global warming, because North-South questions had already been raised in the political negotiations on other environmental issues. Not only was the global equity issue being discussed in the ozone layer negotiations,[140] but the broader 'environment and development' debate that emerged in 1987 had pushed North-South issues up the international environmental agenda.[141] Therefore, the global equity issue was already on the minds of decision-makers when they embarked upon the global warming negotiations. Thus, together, these three comments suggest why this element of the climate change issue gained prominence and became a significant concern during the late 1980s.

### 4.3.3 -- Different Interpretations of Global Equity, 1988-1990

In the spate of conferences during 1988, 1989 and 1990, the question of global equity with respect to North-South issues was a highly visible part of the discussions. The first time that the concept of a 'climate fund' to deal explicitly with global warming arose at a gathering of policy-makers was, as mentioned above, at the Toronto Conference on the Changing Atmosphere in June 1988.[142] In the final conference statement, delegates agreed to establish a 'World Atmosphere Fund, financed in part by a levy on fossil fuel consumption of industrialized countries, to mobilize a substantial part of the resources needed for implementation of the *Action Plan for the Protection of the Atmosphere*'.[143] Further, the conference statement also recognised that the North had an obligation to bear the main responsibility to ensure that the problem was addressed, but not at the

---

[139] Sebenius argues that 'the developed world cannot solve the climate problem in the long run without the cooperation of the [South]' (Sebenius, *op. cit.*, in note 88, p. 129). See, also, Peter H. Gleick, 'Climate Change and International Politics: Problems Facing Developing Countries', *Ambio* (Vol. 18, No. 6, 1989), p. 338.

[140] See Chapter 4.2 of this thesis.

[141] See, for example: the address of Maumoon Abdul Gayoom, President of the Maldives, to the United Nations General Assembly on 19 October 1987 (UN Doc A/42/PV.41); Resolution 42/187 of the United Nations General Assembly, which highlighted the idea of sustainable development (UNGA 42/187, 'Report of the World Commission on Environment and Development', *General Assembly -- 42nd Session*, 11 December 1987); and, more generally, the report of the Brundtland Commission (World Commission on Environment and Development, *op. cit.*, in note 38).

[142] 'The Changing Atmosphere', *op. cit.*, in note 59.

[143] *Ibid.*, p. 6.

expense of development opportunities in the South.[144] Although this declaration was not legally binding upon the participating states, it nevertheless set the terms of reference for the ensuing debate by putting forth the idea of a climate fund to assist the developing world.

After the UN General Assembly approved its first resolution on climate change -- thus entrenching the global scope of the political discussions[145] -- a conference of legal experts was convened in Ottawa, Canada in February 1989 to discuss the possible legal responses to global warming. One of the principles identified in Ottawa endorsed the

> possibility of establishing a World Climate Trust Fund for use in initiating and supporting all necessary activities to reduce emissions of greenhouse gases and to mitigate effects of climate change. The beneficiaries of that Fund should be developing countries. The Trust Fund should be funded from three possible sources: contributions by countries (voluntary or assessed), 'user fees' for activities causing climate change, and fines for violations of the convention.[146]

Although this declaration further reinforced the visibility of the equity issue, it is important to recognise that the proposals being mooted at this time only focused upon the validity of various principles, rather than upon detailed and specific recommendations.

A month later, in March 1989, the governments of Norway, France and the Netherlands hosted an international conference in The Hague, the Netherlands. One commentator notes that this conference was

> the first public attempt to think through the effects on North-South relations of greenhouse warming, and its proposal for a new world environment authority with teeth, sets the agenda for an international debate on the international politics of the environment that seems certain to grow louder and louder.[147]

---

[144] *Ibid.*

[145] UNGA Res. 43/53 (*Resolutions and Decisions Adopted by the General Assembly During its Forty-Third Session, Volume I, 20 September - 22 December 1988* (New York: United Nations, 1989), pp. 133-34). Although demands for global equity were not explicit (like the Climate Conference Declaration agreed nine years earlier, the only hint at the North-South issue was an intent to study socio-economic effects), the declaration nevertheless ensured that the global warming issue was a subject of truly global debate.

[146] 'Protection of the Atmosphere: International Meeting of Legal and Policy Experts', *Meeting Statement* (Ottawa, Canada, 20-22 February 1989), p. 11.

[147] Quoted in 'The Hague Environment Summit', *Environmental Policy and Law* (Vol. 19, No. 2, April 1989), p. 45.

The final declaration attempted to highlight the importance of the issue, for 'calls for help from industrialized nations to help developing countries in pollution abatement' were made.[148] But the importance of this conference should not be overstated. It did not have broad-based support (the Americans and the Soviets were not invited, and the British did not attend), and its haughty declarations again lacked specifics.[149]

In the introduction to this section, the political linkage between the two issues of global atmospheric change is flagged.[150] Mostafa Tolba, Executive-Director of UNEP, is one of the individuals who identified this linkage in order to try to achieve agreements on the global warming issue by directing officials towards the wake left by the ozone layer negotiators.[151] At the 1989 Helsinki Meeting of the Parties to the Montreal Protocol, Tolba called for the creation of a climate fund, which would be similar to the ozone layer fund being called for at the same time. In response, the Northern states' decision-makers were non-committal on the issue (recall that they had sidetracked the ozone layer issue to a working group), and British Environment Secretary Nicholas Ridley not only mocked the idea as simplistic, but he also highlighted its perceived infeasibility[152] and argued that a climate fund 'implies a degree of sovereignty over sovereign nations which can never really be there'.[153] Although the establishment of a link between global warming and ozone layer depletion brought attention to the former, perceptions of equity on this issue were just as divergent as they were on the latter.[154]

---

[148] *Ibid.*, p. 45.

[149] *Ibid.*; and Glen Plant, 'Institutional and Legal Responses to Global Climate Change', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), pp. 413-14.

[150] *Op. cit.*, in note 140

[151] At the UK-UNEP conference to 'Save the Ozone Layer', in London in March 1989, Tolba used his concluding remarks to argue that the world's states should spend an agreed additional percentage of development assistance to deal with the broader issue of climate change (John Hunt, 'Conference Urges Faster Action on CFCs', *The Financial Times* (London), 8 March 1989). Tolba said to British Prime Minister Margaret Thatcher: 'As the leader of the first industrial nation to use coal burning extensively, you may deem it appropriate for the UK to support -- or even take a lead -- in an initiative of this nature.' (Quoted in Richard North, 'UN Chief Backs Aid for the Third World', *The Independent* (London), 8 March 1989.) There was, however, no response from any Northern decision-maker at this time.

[152] 'Nations Seek Chemical Ban by Year 2000', *The Globe and Mail* (Toronto), 4 May 1989, p. A8.

[153] Quoted in Radford, *op. cit.*, in note 72.

[154] See *op. cit.*, in notes 71-76, and accompanying text.

During the negotiations in intergovernmental fora about global equity in 1988 and the beginning of 1989, the issues were only being discussed in a general manner; vague statements of intent were being made, but specific proposals were not the subjects of much debate. During 1989, however, there were signs that some statespeople in the North were becoming somewhat more receptive to the idea of a formal mechanism to attempt to satisfy demands for global equity, even going so far as to make concrete proposals. In April of that year, for example, the Norwegian government 'called for the establishment of a UN fund to support measures aimed at alleviating global climate changes, and pledged the equivalent of [UK]£60 million [0.1 per cent of its GNP] for the project.'[155] Their officials reiterated the fact, however, that any Norwegian policy action was conditional upon the concurrent involvement of other developed countries. Further, Jim MacNeill identifies two other unilateral proposals from Northern states:

> The 1989 budget of the Netherlands included provision for an annual contribution of 250 million guilders to a global climate fund, and the government is currently assessing the various options for financing and managing such a fund ... At the September 1989 meetings of the World Bank and the International Monetary Fund in Washington, DC, the French finance minister announced that France would contribute a similar amount, about US $140 million.[156]

But, in 1989, responses like these from statespeople of the North were rare. More indicative of the feeling of most of these decision-makers is the Declaration that emerged from the Group of Seven's (G7) Paris Summit in July 1989. Although many commentators have noted that the 'green issue' came upon the G7's agenda for the first time in Paris,[157] a closer look at the fine print provides insights into the group's primary priorities. The seven nations' leaders did recognise that some sort of assistance from the North to the South was needed -- they specifically noted 'economic incentives may include the use of aid mechanisms and specific transfer of technology [and] in special cases, ODA debt forgiveness and debt for nature swaps can play a useful role in environmental protection'.[158] In the section

---

[155] Tony Samstag, 'Climate Call', *The Independent* (London), 29 April 1989.

[156] Jim MacNeill, 'The Greening of International Relations', *International Journal* (Vol. 45, No. 1, Winter 1989-90), p. 32.

[157] See, for example, Larry Tye, *The Citizen* (Ottawa), 22 July 1989, p. B5.

[158] Reprinted in 'Economic Declaration: Section on the Environment', *Environmental Policy and Law* (Vol. 19, No. 5, 1989), p. 183.

that elaborated specific recommendations, however, no mention was made of a climate fund. It is clear that they believed that the demands for global equity by Southern states should be met by use of traditional routes and channels, most notably bilateral aid.

Decision-makers in the South, however, continued to perceive an adequate resolution of the calls for global equity in a different manner. Indian Prime Minister Rajiv Gandhi, for example, put forward a proposition at the Non-Aligned Movement's meeting in Belgrade in September 1989. He proposed a 'Planet Protection Fund': this fund, under UN control, would promote the development of environmentally-friendly technologies, which would in turn be given, free of charge, to states. He argued that all UN members should contribute one-one thousandth of their GDP to the fund, and he thus arrived at the figure of US$18 billion per year.[159]

Because of Gandhi's party's subsequent defeat in the Indian parliamentary elections, he was not able to press his case at the Commonwealth Heads of Governments gathering at Kuala Lumpur in the following month. Nevertheless, the declaration agreed there did acknowledge that the North was responsible for a great deal of global pollution and should thus bear most of the burden of cleaning it up.[160] Further, MacNeill maintains that this 'was the first intergovernmental meeting, to my knowledge, at which world leaders talked about this question [a climate fund] using numbers that bear some relationship to the needs'.[161] British officials, however, were able to 'water-down' an original endorsement of a fund, so that the final declaration did not refer to specific sums. Instead, the Commonwealth Heads of Government agreed to

> strengthen and support the development of international funding mechanisms and appropriate decision-making procedures to respond to environmental protection needs which will include assisting developing countries to obtain access to and transfer of needed environmental technologies and which should take account of proposals for an international environment fund/Planet Protection Fund.[162]

---

[159] 'Gandhi Urges an Environment Fund', *International Herald Tribune*, 6 September 1989.

[160] Reprinted in 'The Langkawi Declaration on Environment', *Commonwealth Law Bulletin* (Vol. 15, No. 4, October 1989), p. 1546, paragraph 5.

[161] MacNeill, *op. cit.*, in note 156, p. 32.

[162] Reprinted in 'The Langkawi Declaration on Environment', *op. cit.*, in note 160, p. 1546, paragraph 8, second 'programme'.

British Prime Minister Margaret Thatcher noted that Britain was ready to contribute its share; however, she remained adamantly opposed to the creation of any new bureaucracy.[163]

Further calls for an international carbon fund were made at a ministerial conference in Noordwijk, the Netherlands, in November 1989. A consultant's report prepared for the conference estimated the 'costs of reducing $CO_2$ emissions significantly at roughly [US]$50 billion per year'.[164] The report also recognised, however, the difficulties in estimating the specific price of assistance required for the developing world. Although the authors could place a figure upon the cost of forest management (which, at full potential, they calculated at US$10-15 billion per annum[165]), there were greater problems in projecting costs in other areas, particularly the funding of fossil fuel conservation and methane emission reductions.[166] Although decision-makers seriously discussed the specific details of a fund to a greater degree, some Northern representatives, particularly the Americans, remained resistant to any substantive action (including movement on the question of global equity in North-South issues).[167]

The state of play on the global equity issue at the end of 1989 can be partially informed by examining a UN General Assembly resolution on 'the protection of global climate for present and future generations of mankind' from late December 1989. In this resolution, a number of general principles that had been voiced at previous meetings were identified, written down and adopted without a vote.[168] Generally, the resolution recognised that because the citizens of the North were responsible for causing global climate change, they should be primarily responsible for bearing the costs of combatting the problem. Any agreements, the resolution further noted, should also take into account 'the particular needs and development priorities of developing countries'. To this end,

---

[163] 'Thatcher Shifts her Ground on Environment', *The Independent* (London), 23 October 1989.

[164] Runnalls, *op. cit.*, in note 122, p. 4.

[165] McKinsey and Company, *op. cit.*, in note 90, pp. 10-11.

[166] *Ibid.*, pp. 11-13.

[167] See, for example, Glenn Frankel, 'U.S. Leads Way to Weaker Global Warming Plan', *The International Herald Tribune*, 8 November 1989.

[168] Although this should not suggest that the principles were necessarily agreed by all the states of the world, their articulation does, nevertheless, suggest that they were significant components of the broader debate at the time.

the resolution encouraged states 'to further the development of international funding mechanisms, taking account of proposals for a climate fund and other innovative ideas...'[169] This resolution stressed the global equity issue to a much greater degree than had been the case only one year earlier.[170] As such, it was beyond doubt that the North-South issue of global equity was, by the end of 1989, one of the dominant themes in the negotiations on global warming.[171]

At the beginning of the 1990s, however, there was no universal agreement as to what political actions should be taken in order to meet demands for global equity. In strong support of the just-passed UN General Assembly resolution, some statespeople from the South continued to call for a significant transfer of funds, to be administered by a new international organisation. In February 1990,

> the developing countries made it clear they would not agree to a convention limiting emissions of greenhouse gases until the developed countries state explicitly how they would help to sustain economic development in countries of the Third World.[172]

On the other hand, some statespeople in the North resisted these suggestions. The Americans were the primary force fighting any kind of new arrangement, and their opposition became more firmly entrenched in the beginning of 1990. Although in February of that year, US Secretary of State James Baker recognised that 'developing countries may need some additional aid in order to meet the incremental costs associated with fulfilling their international environmental obligations',[173] he nevertheless expressed doubts about 'dramatic calls by some for the establishment of new financial institutions or mechanisms to provide environmental assistance'.[174] Moreover, at the 1990 Bergen conference, American decision-makers disclosed that they 'feared being drawn into an "open-ended commitment" for virtually infinite sums of aid money to cope with global

---

[169] UNGA Res. 44/207, 'Protection of Global Climate for Present and Future Generations of Mankind', 22 December 1989.

[170] *Op. cit.*, in note 145.

[171] See, for example, Ian Guest, No Title, *The Guardian*, 9 February 1990, p. 23.

[172] Helen Gavaghan, 'European Nations Want Action Now on Global Warming', *New Scientist* (Vol. 125, 17 February 1990), p. 20.

[173] Secretary of State James A. Baker III, 'Diplomacy for the Environment' (Speech given in Washington, DC, 26 Feb 1990, p. 5), quoted in Speth, *op. cit.*, in note 137, pp 40-41.

[174] Secretary of State James A. Baker III, 'Diplomacy for the Environment' (Speech given in Washington, DC, 26 Feb 1990, p. 5), quoted in *ibid.*, pp. 40-41.

warming if they conceded the principle that environmental overseas aid should be in a separate category from other aid programmes'.[175] The Americans were, in part, hesitant about such commitments because they had, already in 1990, increased their contributions to the World Bank and the International Development Association -- both of which were intended to help Southern states. Timothy Atkeson, Assistant Administrator of the US Environmental Protection Agency, said that 'the American people have gone to the well twice already', and he believed that it would be bad political judgement to ask them to go again.[176] In addition, there was Stateside pressure (particularly from US Chief of Staff John Sununu) to avoid any sort of commitment on the question of funding. As Gus Speth notes, Baker's 'modest bow toward "additionality" [only three months earlier] seems to have lost out to competing views within the administration during May [1990]'.[177] In these ways, the Americans were leading the opposition to Southern calls for global equity.

Although American action precluded ambitious proposals from being endorsed in the final declaration, the Bergen conference is nevertheless noteworthy for an investigation into global equity for two particular reasons. First, one commentator argues that it was the first time that the North's leaders accepted the fact that massive amounts of money would need to be transferred from the North to the South;[178] and second, the declaration acknowledged that the South might have to have higher emission targets than the North, in order to allow for economic growth.[179] One observer, however, argues that these facts did not indicate any significant change, for Tom Burke (then of the Green Alliance) said that the conference had been a setback: 'It will send a signal to the developing world that

---

[175] Michael McCarthy, 'Global Warming to Cost "Trillions"', *The Times* (London), 16 May 1990, p. 22.

[176] Richard North, 'US Defends Stance on Global Warming Aid to Third World', *The Independent* (London), 16 May 1990, p. 6.

[177] Speth, *op. cit.*, in note 137, pp. 40-41.

[178] 'Facing up to Global Damage', *The Independent* (London), 17 May 1990, p. 26. Although there had been mention of 'specifics' at the 1989 Commonwealth Heads of Government meeting (*op. cit.*, in note 162), this was the first time that a meeting open to all European and North American leaders had considered the issue.

[179] Quoted in 'The World Through Green-Tinted Specs', *op. cit.*, in note 80, p. 94.

we don't care and that we will not take any measures that cause pain.'[180]

North and South next met in a major international forum to discuss the issue in August 1990,[181] when a meeting of the Intergovernmental Panel on Climate Change (IPCC) was convened in Sundsvall, Sweden. Mostafa Tolba set the scene during his opening remarks by arguing that there was a need to provide assistance to the South:

> No individual can protect its patch of sky or lower the level of greenhouse gases overhead. We need a truly global partnership in which the developing countries and those in Central and Eastern Europe are compensated, financially assisted and ensured access to efficient technologies through unambiguous technology transfer accords. This assistance is not international philanthropy but an investment in our planetary survival.[182]

At this conference, the Southern states' representatives continued to press their demands for global equity,[183] and, at the end of the conference, all of the IPCC members could agree that there was a need to use existing multilateral agencies (for example, the World Bank and UNDP) and bilateral agencies (for example, the US Agency for International Development) in order to assist developing countries. When, however, a 'number of delegations ... strongly advocated the need for new institutions, such as a Climate Fund, ... there was no agreement'.[184] Resistance to new institutions on the part of the leaders of particular Northern states (most significantly, the United States) prevented this call from being unanimous.[185]

At the final significant international gathering on global warming in 1990, the

---

[180] Quoted in Richard North, 'Fight Against pollution "Will Cause Anguish"', *The Independent* (London), 17 May 1990, p. 8.

[181] Leaders of the seven richest industrialised countries had considered the question further at the Group of Seven's (G7) Houston Summit in July 1990. David Runnalls reports that the politicians appeared to have come close to approving a suggestion from German Chancellor Helmut Kohl to create a global fund of US$5 billion at this meeting, but, in the end, the proposal was blocked by the Americans (Runnalls, *op. cit.*, in note 122, p. 4).

[182] Quoted in Paul Brown, 'Between the Devil and the Deep Blue Sea', *The Guardian* (London), 24 August 1990, p. 19.

[183] Mexican officials, for example, demanded that, 'preferential terms for technology transfer to the developing world [be] built into any agreement' (*ibid.*, p. 19).

[184] Jack Fitzgerald, 'The Intergovernmental Panel on Climate Change: Taking the First Steps Towards a Global Response', *Southern Illinois Law Journal* (Vol. 14, Winter 1990), p. 249.

[185] See, more generally, Chapter 10 on 'Financial Mechanisms', IPCC WG III, *Climate Change: The IPCC Response Strategies* (Geneva: WMO and UNEP, 1990). This working group (chaired by an American, F. Bernthal) was criticised for its conservatism. See, also, the discussion in Chapter 3.2.3 of this thesis.

Second World Climate Conference in Geneva in November, Tolba again called upon industrialised states to help poorer ones.[186] The final declaration recognised that the net greenhouse gas emissions of developing countries 'must grow from their, as yet, relatively low energy consumption to accommodate their development needs'.[187] Further, it recommended that the South be given 'adequate and additional financial resources ... [and that the] best available environmentally-sound technologies [should be] transferred expeditiously on a fair and most favourable basis'.[188] Significant resistance from the Americans, the Soviets and the Saudis,[189] however, prevented the delegates from doing more than giving 'consideration' to the need for funding facilities.[190]

The history of the discussions on global equity and global warming to 1990 suggests that the question was unfolding much as it had during the ozone layer negotiations: little attention initially paid to the issue; followed by its appearance upon the international political agenda; followed by demands for a fund, articulated by Southern states' leaders, but met with resistance or indifference by officials from the North. Taking the parallel to its furthest possible point, one might expect discussions on the global warming issue to have been heading towards the creation of some sort of massive, new 'climate fund'. Although up until the late 1980s, such a progression seemed not only possible, but even probable, events in 1990 and 1991 show a significant deviation from this postulated route.

More specifically, international attention about the means of addressing the global warming issue became primarily focused upon what is called the Global Environmental Facility (GEF). As mentioned above,[191] the GEF was first officially proposed by French and German representatives during the September 1989

---

[186] Frances Williams, 'UN Plea for Immediate Action to Curb $CO_2$', *The Independent* (London), 30 October 1990, p. 2.

[187] *Ministerial Declaration of the Second World Climate Conference* (Geneva: SWCC, 1990), point 15, p. 5.

[188] *Ibid.*, point 15, p. 5.

[189] Nicholas Schoon, 'International Law to Protect Climate "Ready by 1992"', *The Independent* (London), 8 November 1990, p. 6.

[190] *Op. cit.*, in note 187, point 17, pp. 5-6.

[191] *Op. cit.*, in note 156.

meeting of the World Bank's Development Committee.[192] Given the questionable interest accorded the environment by multilateral banking institutions during the 1980s,[193] it might come as a surprise to find the World Bank at the forefront of this new initiative. David Reed, however, notes that by 'the late 1980s, multilateral lending institutions had changed from being cautious, if not resistant, to seeking a more central role in the search for new sources and forms of international environmental funding'.[194] In this way, proposals for dealing with global environmental problems -- particularly those originating in the North -- began to call for greater World Bank participation.

The GEF was established by the World Bank, UNEP and UNDP. The fund financed projects and training programmes that would avert the ill effects upon global change of any development project. The original definition of 'global change' meant that the GEF was concerned with four specific areas: reducing the destruction of the ozone layer, countering global warming, halting the loss of biological diversity and preventing the pollution of the oceans. Valued at US$1.4 billion over a three-year period, the Fund was not meant to address *all* problems, but simply to fund *some* projects during the initial demonstration phase (1991-93).[195]

Each of the three organisations that were running the GEF took responsibility for projects that would normally fall within its mandate. Therefore

> UNDP coordinate[d] and manage[d] project preparation and technical assistance work. ... UNEP provide[d] scientific and technological guidance in identifying and selecting projects ... [and the] World Bank administer[ed] the GEF trust fund and [was] responsible for appraising and supervising investment projects.[196]

The Fund's administrators met twice a year, and to be eligible to send representatives to take part in these meetings, a country must have contributed

---

[192] For more information, see 'World Bank: Documents Concerning the Establishment of the Global Environmental Facility', *International Legal Materials* (Vol. 30, No. 6, November 1991), pp. 1735-77.

[193] Plant, *op. cit.*, in note 149, p. 415.

[194] Reed, *op. cit.*, in note 104, p. 4.

[195] 'World Bank', *op. cit.*, in note 192.

[196] 'Global Environmental Facility Prepares to Launch First Projects', *World Bank News Release* (Washington, DC: No. 91/S30, no date given).

about US$5.5 million to the Fund.[197] By 1991, more than 20 countries had contributed to the Fund and thereby taken a seat at the negotiating table.[198]

The focus here upon the GEF is not meant to suggest that it was the only means of addressing the calls for global equity that were being discussed at the time, for a number of other possible funding mechanisms were also being proposed. Intergovernmental organisations, such as the OECD's Group on Development Assistance and the Environment (which was operating under the auspices of the Organization's Development Assistance Committee),[199] were studying different alternatives. In addition, MacNeill, Winsemius and Yakushiji identify other proposals:

> A tax of 0.5 percent on the value of international trade has been suggested, which would yield about [US]$7 billion annually. Egypt has proposed a levy of 1 percent on international passenger and freight transport, which would provide approximately [US]$250 million per year, with a growth of 10 to 15 percent per annum. Other proposals would place a small levy on the commercial value of ocean fish catches, toxic incineration at sea, and river-borne wastes.[200]

Furthermore, nongovernmental organisations were also contributing to the discussions. In 1989, for example, the World Resources Institute in Washington, DC published a report which, one commentator argues, 'broadened the parameters of public debate on innovative financial mechanisms'.[201] In addition, other international environmental organisations were further expanding 'the menu of mechanisms for financing environmental programs through innovative approaches, including debt-for-nature swaps'.[202] Nevertheless, the GEF was the most

---

[197] Mohamed T. El-Ashry, 'The GEF and its Future', *Network '92* (No. 14, February 1992), p. 5.

[198] 'Global Environmental Facility Prepares to Launch First Projects', *op. cit.*, in note 196. The countries were: Austria, Brazil, China, Denmark, Egypt, Finland, France, Germany, India, Indonesia, Italy, Japan, Mexico, the Netherlands, Norway, Pakistan, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. See, also, Iain Guest, 'Good Money After Bad', *The Guardian* (London), 29 November 1991, p. 32.

[199] See Paul Brown, 'Rich States Seek Green Curb on Market', *The Guardian* (London), 1 February 1991, p. 9; and 'OECD: Agreement to Link Environment and Economy', *Environmental Policy and Law* (Vol. 21, No. 2, May 1991), pp. 57-60.

[200] MacNeill *et al*, *op. cit.*, in note 127, p. 101.

[201] Reed, *op. cit.*, in note 104, p. 4. The WRI report was entitled *Natural Endowments: Financing Resource Conservation for Development.*

[202] Reed, *op. cit.*, in note 104, p. 4. For more information on debt-for-nature swaps, see, for example, Alan Patterson, 'Debt for Nature Swaps and the Needs for Alternatives', *Environment* (Vol. 32, No. 10. December 1990), pp. 5-13 and 31-32.

significant proposal to deal with calls for global equity on global warming that was operational in 1991. As such, it had to be considered in any discussion of the issue.

### 4.3.4 -- The Remaining Points of Contention, 1991

In 1991, a number of different images of what arrangements would meet the demands for global equity were held by a number of different actors in international society. To examine further the major issues, it is useful to note that the dominant views in the debate about global equity in North-South terms were held by two sides: a group from the North (primarily individuals from OECD countries) and a group from the South (including, most significantly, Chinese and Indian governmental officials).[203] The differences were to do with five major issues: burden-sharing, transfer size, source of transfers, administration and technology transfer. Let us consider each of these issues in turn.

An important question in the debate about global equity related to who would bear the burden in any international arrangement. Although there was agreement that some sort of transfers from the North to the South would be necessary, it had yet to be determined, by the end of 1991, how the costs would be divided. One proposed method of division involved the use of historical rates of emissions. Because of the significant lifetimes of greenhouse gases, the substances that were causing enhanced global warming in 1991 had been expelled over the previous 200 years. A number of studies used historical data in order to estimate each countries' relative contribution to the enhanced greenhouse effect that the world was experiencing in 1991.[204] The major findings from one of these investigations are that:

---

[203] This bipartite division is performed for the purposes of analysis and is not meant to suggest that the 'North' and the 'South' were coherent blocs. Indeed, within the South, a significant 'break of ranks' on the climate change issue occurred at fourth meeting of the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change (INC) in Geneva in December 1991 (Daniel Bodansky, 'INC 3&4: Draft Convention on Climate Change', *Environmental Policy and Law* (Vol. 22, No. 1, February 1992), pp. 7-8). Nevertheless, the division helps us to identify the major points of contention with regard to the debate about global equity.

[204] Two of the more serious attempts are: the 'Princeton Protocol' (*Princeton Protocol on Factors that Contribute to Global Warming*, Woodrow Wilson School of Public and International Affairs Policy Conference on the Global Environment, Princeton University, December 1988); and a study by Yasumasa Fujii at the International Institute for Applied System Analysis, Laxenburg, Austria, reported in '$CO_2$: A Balancing of Accounts', *Options* (December 1990), pp. 10-13.

> First, North Americans bear the largest historical responsibility for the present carbon problem. Second, some regions currently emitting high amounts of carbon per capita, notably the USSR, Eastern Europe and Asia have contributed relatively little historically to the problem. Third, historic rebalancing of carbon emissions would require only modest annual per capita cuts in emissions by most industrialised regions, but major cuts by North America. Fourth, expected high rates of population growth in developing regions would quickly overwhelm any emissions credits inherited from past generations, leaving them with $CO_2$ allocations no greater than in most developed regions.[205]

A pattern of burden based upon past emissions, rather than present emissions, would thus change the figures significantly. For example, Western Europe was responsible for 16 per cent of the carbon dioxide added in 1990, but 26 per cent of the carbon dioxide rise since 1800. Similarly, Asia was responsible for 19 per cent of the rise in 1990, but only 9 per cent of the rise since 1800.[206] Although there was resistance to this idea from some Northern officials,[207] it was, nevertheless, an important negotiating tool for leaders of Southern states.[208]

Another proposed method of calculation for burden-sharing was based upon per capita allotments.[209] Some analysts argued that countries should be allowed to release a quantity of greenhouse gases into the atmosphere that was proportional to their population. In this way, those states that were above their quota would have to compensate those that were below their quota. Once again,

---

[205] *Ibid.*, p. 13

[206] *Ibid.*, p. 12.

[207] Many highlighted the political problems associated with this kind of approach. Michael Grubb, for example, maintains that:

> In the context of the greenhouse effect this is a political non-starter. It would also be impossible to determine a consistent level. In past decades nations were barely aware that they were degrading a finite resource. Furthermore, technology has advanced greatly: the technology of the industrial revolution rarely used energy at much above 5% efficiency for mechanical work or, later, for electricity generation. The technologies available to nations developing today are many times more efficient. Even if the political will existed, it would thus be very difficult to determine a rational level of 'compensation'.

(Michael Grubb, *The Greenhouse Effect: Negotiating Targets* (London: Royal Institute of International Affairs, 1989), p. 24, note 47.)

[208] Philippe Sands, Centre for International Environmental Law, London, personal communication.

[209] Agarwal and Narain, *op. cit.* in note 135; and Grubb, *op. cit., in note 207.*

decision-makers in the North were resistant to this sort of approach,[210] while those in the South felt that it was the most equitable manner in which the issue could be addressed. Thus, at the end of 1991, differences remained with regard to what a just form of burden-sharing should be.

Additionally, the proposed size of the transfers was being hotly debated in 1991. Although a wide range of cost estimates were being publicly voiced, it was clear that the agreed amount would make the ozone layer figure of US$240 million over three years pale in comparison. Even the GEF's US$1.4 billion over three years was perceived as only a starting point by some.[211] Indeed, a number of studies, from both the developed world and the developing world, attempted to put a price upon the potential transfers that would be needed.[212] Michael Grubb (UK) quotes a figure of US$100 billion annually,[213] while the Worldwatch Institute (US) proposed a US$28 billion fund to pay for 'massive investments in energy efficiency and reforestation in developing countries',[214] and Greenpeace advocated 'a [US]$30 billion fund to be made available to Third World signatories of a climate convention as well as to support the development of renewable energies'.[215] Meanwhile, in the South, a 1990 report published by the Centre for Science and Environment (India) argues that, under the scheme that they developed, the 'top 15 polluting nations would have to pay individual developing countries a total of [US]$20 billion dollars annually'.[216] A further analysis, under a different scenario, yields a figure of US$90 billion annually.[217] Indeed, leaders in the South were

---

[210] This is in opposition to the principle of 'grandfathering', which deems that 'rights to pollute are based on past emission levels' (Pearce, *op. cit.*, in note 27, p. 376) and which was supported by statespeople in the North.

[211] 'Bruce Rich of the Environmental Defense Fund notes that the [GEF] money is merely "a drop in the bucket" toward ameliorating the effects of projects.' (Quoted in 'World Bank Environment Fund', *Science* (Vol. 251, 22 February 1991), p. 870.) Additionally, another commentator argues that a 'new global fund of "only" a few billion dollars would be on the wrong scale, no matter how useful such a fund might be in its own right' (Skolnikoff, *op. cit.*, p. 85).

[212] Note the proposal put forward in Noordwijk in November 1989 (*op. cit.*, in note 164).

[213] Michael Grubb, *Energy Policies and the Greenhouse Effect. Volume One: Policy Appraisal* (London: Royal Institute of International Affairs, 1990), pp. 287-88.

[214] Christopher Flavin, *Slowing Global Warming: A Worldwide Strategy* (Washington, DC: Worldwatch Paper No. 91, 1989), pp. 70-71.

[215] 'Prevent Climate Holocaust -- Greenpeace', *Geneva ECO NGO Newsletter* (Vol. 3, 21 June 1991), cited in McCully, *op. cit.*, in note 56, p. 244.

[216] 'Environmental Colonialism to the Fore', *Ecoforum* (Vol. 15, No. 1, February 1991), p. 13.

[217] Agarwal and Narain, *op. cit.*, in note 135.

citing such figures to substantiate their claims that 'the international community must offer them funds and technological assistance'.[218] Among decision-makers in some Northern countries, meanwhile, the vision of an equitable quantity for transfer was closer to the GEF figure, which was only 1 per cent of some of the other amounts that were being mooted at the time.[219] Thus, at the end of 1991, there was no agreement among decision-makers as to what the size of the transfers should be.

Another point of contention among some Northern and Southern statespeople was the source of the money for the fund. One commentator observes that this was one of the most contentious questions during the intergovernmental meetings of 1991.[220] On the one hand, in June of that year, a meeting of Ministers from 41 developing countries had reiterated their demand for '*new and additional financial resources* to be able to address effectively the environmental and developmental problems confronting them'.[221] Some in the North, on the other hand, felt that 'the money should not come from governments, [but] that it should be provided by the private sector'.[222] In the United States, in particular, not only were there demands upon financial resources from domestic sources,[223] but there were also institutional hurdles that hindered the allotment of new and additional money.[224] The issue of 'additionality' thus remained

---

[218] Comments of Chinese Premier Li Peng (quoted in John Vidal, 'Putting the Boot in', *The Guardian* (London), 21 June 1991, p. 33).

[219] One official in the North argues that people in the North were 'scared stiff to find out what the final bill will be' (interview with L.P.J. Mazairac, Ambassador and Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 2 August 1991).

[220] 'The Impasse on Financial Issues', *Network '92* (No. 11, October 1991), p. 1.

[221] 'Letter dated 1 July 1991 from the Charge d'affaires a. i. of the Permanent Mission of China to the United Nations addressed to the Secretary-General', A/46/293, p. 4, note 9. Emphasis added.

[222] 'The Impasse on Financial Issues', *op. cit.*, in note 220, p. 1. This concern was explicitly put forward at the second meeting of the INC (in Geneva in June 1991) (Sebastian Oberthur, 'Climate Negotiations: Progress Slow', *Environmental Policy and Law* (Vol. 21, Nos. 5/6, December 1991), pp. 15 and 16).

[223] *Op. cit.*, in note 176.

[224] The United States could have difficulties in immediately fulfilling any financial commitment, because of the usual two-year lag-time between the time that any funds are requested and the time that the funds are available for dispersal (because of the forward-planning nature of the budgetary process). With regard to the Multilateral Ozone Fund, for example, 'supplementary appropriation' had to be employed in order to leapfrog the normal procedure and to secure the money: 'On 23 May [1990], the US House of Representatives passed Section 159D, a Clean Air Act amendment which mandates US aid and authorises the appropriation of not more than [US] $30,000,000 to carry out this section in fiscal years 1991, 1992, 1993.' (Friends of the Earth, *op. cit.*, in note 37, p. 21.)

contentious at the end of 1991.

A fourth issue that continued to be a matter of debate between the North and the South at this time was the question of administration. Although it was earlier noted that the GEF was run by three international organisations, many argue that, in reality, the World Bank dominated the Fund during 1991.[225] Representatives from the developing world, meanwhile, were not satisfied with this arrangement. Not only did they have problems with the decision-making procedures that the Bank used (in particular, its use of weighted voting),[226] but given the World Bank's dubious environmental record,[227] many in the South questioned the Bank's new-found commitment to 'greenness'. Instead, they believed that the assessment of projects would still be primarily based upon economic criteria -- the talk of Environmental Impact Assessment, they claimed, was merely window-dressing.[228] Although the new Scientific and Technical Advisory Panel (STAP) was meant to curtail some of the World Bank's initial

---

This was feasible, one official argues, because the ozone layer problem was a politically visible issue. If, however, a number of different funds (or even just secretariats) were to be set up (perhaps in June 1992 in Brazil), then the international negotiators' domestic supporters may not be able to secure the funds as readily (interview with Atchley, *op. cit.*, in note 84).

[225] Ahmad notes that at a 1991 meeting of the implementation committee, there were 2 people from UNEP, 4 or 5 from UNDP and 25 from the World Bank. Thus, he said, 'you are swamped' (interview with Ahmad, *op. cit.*, in note 88). In addition, Atchley notes that before the scientific committee which judged the worthiness of projects had been set up (the Scientific and Technical Advisory Panel, *infra*, in note 229, and accompanying text), the World Bank had committed about 30 per cent of the entire GEF in the first tranche (interview with Atchley, *op. cit.*, in note 84).

[226] Bodansky, *op. cit.*, in note 203, p. 13. Southern states' representatives also claimed that the decision-making was 'untransparent, [because] there is no access to documents and meetings' (*ibid.*, p. 13).

[227] For example, Sanchez claims that the World Bank's development policies -- boosted and funded by the international community -- encouraged some citizens of Latin American to clear forests in order to create grazing lands (interview with Vicente Sanchez, Ambassador and Permanent Representative to UNEP, Embassy of Chile, Nairobi, Kenya, 2 August 1991). See, also, *infra*, in note 228.

[228] Sanchez argues that even after the World Bank's initial public declarations about policy-changes (in light of the attack upon its environmental record), they still approved projects (Sanchez could think of two in particular) that were environmentally damaging (interview with Sanchez, *op. cit.*, in note 227). Runnalls also notes that environmental groups believed that 'the Bank's own commitment to sustainable development is so weak, that the additional GEF funds may be used as an excuse not to make the necessary changes in the Banks underlying philosophy of investment in large scale, capital intensive projects' (Runnalls, *op. cit.*, in note 122, p. 4). Furthermore, others maintain that some of the approved GEF projects were not truly 'environment and development', but instead were projects that had been previously rejected by the World Bank and were simply reincarnated with new 'dressing' so that they would be accepted by the GEF. This seemed to confirm many peoples' fears that the GEF was 'being used to "grease the skids" for prospective loans by superficially "greening" otherwise environmentally-destructive schemes' (McCully, *op. cit.*, in note 56, p. 251, note 25).

dominance, the majority of the members on the STAP came from the North. This fact did not escape the attention of some Southern decision-makers.[229] They therefore, continued to assert that some sort of restructuring of the Fund's decision-making process in order to make it more transparent -- more akin to the Multilateral Ozone Layer Fund[230] -- was a minimum requirement for their participation.[231] Some even went further, demanding 'a completely new institution, separate from the World Bank and under the authority of the contracting parties'.[232]

The position among Northern decision-makers, meanwhile, was that all support should be given to the GEF as it was then structured,[233] because Northern decision-makers wanted one fund, administered by an established international organisation, to address a broad range of issues. In light of the ominous start for the multilateral ozone fund,[234] they were even more determined to make the GEF succeed. In response to the South's demands for new, all-inclusive funds and organisations, statespeople in the North were frightful, at least in private, that the Southern politicians would try to place a multitude of issues under the broad environment umbrella, and thus demand a host of concessions.[235] Differences therefore persisted between decision-makers of the North and the South with respect to what an equitable form of governance for the financial mechanism should be.

The fifth major issue that related to the question of global equity concerned the transfer of technology. Grubb notes that:

Technology transfer is a more fundamental issue than many realise. The

---

[229] Interview with Sanchez, *op. cit.*, in note 227.

[230] See the discussion in Chapter 4.2.4 of this thesis.

[231] Interview with Ahmad, *op. cit.*, in note 88; interview with Sanchez, *op. cit.*, in note 227; and interview with Mateos, *op. cit.*, in note 87. Further, the Beijing Ministerial Declaration on Environment and Development notes that a new Green Fund should be established, which would 'be managed on the basis of equitable representation from developing and developed countries' ('Letter dated 1 July 1991', *op. cit.*, in note 221, p. 7, note 23).

[232] Bodansky, *op. cit.*, in note 203, p. 13.

[233] Interview with Mazairac, *op. cit.*, in note 219. In addition, Guest notes that 'European governments, including Britain, ... are enthusiastic [about the GEF]' (Guest, *op. cit.*, in note 198, p. 32).

[234] See the discussion in Chapter 4.2.5 of this thesis.

[235] Interviews with officials in Nairobi, Kenya, July 1991.

> dire predictions of future global carbon emissions cannot be avoided if the developing countries industrialise along the same broad path as the developed have done. They will need to 'leapfrog' directly to more advanced and efficient technologies than would occur naturally in the course of development.[236]

By the end of 1991, however, it remained unclear how developing countries would be able to obtain the relevant technologies.[237] During the Uruguay Round of the GATT negotiations, representatives from the Northern states -- in particular, the United States -- made it clear that they were eager to ensure that patents, copyrights or other trademarks were awarded to the owner or the investor in order to protect intellectual property. Their representatives continued to argue that such rights had to be conferred in order to provide incentives for research, development and innovation. Northern leaders also expressed their desires for *all* countries to adopt intellectual property laws, like those in the North, so that there could be one standard, which would be administered in the GATT.[238]

Developing countries' officials, for their part, were

> unhappy at that prospect. They [feared] that tighter protection for intellectual-property rights [would strengthen] the monopoly power of western multinationals, harm development by reducing technology transfer and hurt consumers who are already poor by raising the prices of essential medicines and other patented goods. ... Western arguments that stronger protection of ideas [would] boost foreign investment and technology transfer by reducing companies' fears of theft [did not convince] third-world sceptics.[239]

With 99 per cent of patents being held by citizens or companies in the North, Southern decision-makers remained sceptical that it would not just be the outdated and harmful technology that would be transferred to their countries.[240] A

---

[236] Grubb, *op. cit.*, in note 207, p. 24. Moreover, technology transfer might also be needed in order to 'combat climate change' (Oberthur, *op. cit.*, in note 222, p. 194).

[237] The forces that mitigate against the transfer of technology are described in *op. cit.*, in note 108, and accompanying text.

[238] See, for example, Martin Khor Kok Peng, 'The Uruguay Round and the Third World', *The Ecologist* (Vol. 20, No. 6, November/December 1990), pp. 208-13; and 'Thought Control: GATT and Intellectual Property', *The Economist*, 7 July 1990, p. 80. Officials of Northern corporations were also 'cautious about selling their latest and best technology to countries such as India and China, both of which have reputations for not being completely respectful of intellectual property rights' (Pool, *op. cit.*, in note 123, p. 6).

[239] 'Thought Control: GATT and Intellectual Property', *op. cit.*, in note 238. These comments are echoed by decision-makers in the South (interview with Sanchez, *op. cit.*, in note 227).

[240] See, for example, Peng, *op. cit.*, in note 238; and *op. cit.*, in note 56.

stalemate therefore resulted. Although the history of the politics of the ozone layer suggests that the global warming negotiators might have been able to learn from that experience, it was -- given that the pronouncement agreed in London in June 1990 had, by the end of 1991, yet to be put to the test -- still too early to allow it to serve as some sort of instructive model. Thus, despite the fact that discussions were taking place on the issue -- within the INC and the United Nations Conference on Environment and Development (UNCED) frameworks, and elsewhere -- it was still clear that by the end of 1991, all actors had yet to believe that calls for equity on this issue had been met.[241]

Taken together, these five points of contention -- burden-sharing, transfer size, source of transfers, administration and technology transfer -- thus suggest that a number of different images of what arrangements would meet the demand for global equity were held by a number of different actors within international society. Accordingly, the third hypothesised precondition for international regime formation remained unsatisfied at the end of 1991.

### 4.4 -- Summary

Worldwide interdependence ensured that calls for global equity in terms of North-South issues were an important part of the broader international political debate about global atmospheric change at the end of 1991. An historical overview of the politics of both the ozone layer depletion and the global warming issues is presented in order to illuminate the major questions and debates that arose during the process of international regime formation.

The North-South equity issue did not occupy a high position upon the broader ozone layer agenda until after the Montreal Protocol was opened for signature in 1987. At this time, leaders from the developing world maintained that the concessionary terms for their countries that were included in the Protocol were

---

[241] See, for example, The Preparatory Committee for the United Nations Conference on Environment and Development, 'Charting the Course for '92', *Environment* (Vol. 33, No. 1, January/February 1991), p. 18; and Touche Ross Management Consultants for the UK Department of Trade and Industry and Overseas Development Administration, *Global Climate Change: The Role of Technology Transfer* (London: Touche Ross, February 1991). In addition, Maurice Strong also notes that the technology issue is one of 'the prime issues we will tackle at the [UNCED] conference'. He, further, identifies the crucial role of the International Council of Scientific Unions (ICSU) in this issue (Peter Lennon, 'The Man who Would Save the World', *The Guardian* (London), 27 September 1991, pp. 29-30).

unsatisfactory. Thus, in working groups through the second half of 1989 and the first half of 1990, representatives from the North and the South negotiated amendments to the Montreal Protocol -- these were finalised in London in June 1990. Although the framework established by these negotiators had, by the end of 1991, yet to be tested fully, unprecedented proposals had -- at least 'on paper' -- been agreed. In this way, it appeared that the satisfaction of worldwide demands for equity on the ozone layer issue had been achieved, even if only precariously.

On our other issue, meanwhile, the question of global equity in terms of North-South concerns emerged soon after the global warming issue took on political dimensions of any significance. Between 1988 and 1991, furthermore, North-South matters were the focus of much attention in the international negotiations. At the end of 1991, however, a number of points of contention persisted. Although an international fund -- the Global Environmental Facility -- was operational, different leaders still retained divergent visions of global equity. Thus, the third hypothesised precondition for international regime formation on global warming remained unsatisfied at this time.

## Chapter 5 -- Four Catalysts

In this chapter, the four proposed catalysts for international regime formation are examined.[1] They are: political entrepreneurs, the solidity of the broader international political system, environmental pressure groups and the mobilisation of public opinion. The term 'catalyst', which is usually employed in the field of chemistry, is deliberately used to describe these four factors,[2] because it is proposed that the presence of any of them accelerates the rate at which an international regime is formed.[3] In contrast to the first three factors (preconditions) examined in this thesis, each of which, it is argued, is necessary (though not sufficient) for regime formation, it is hypothesised that no one of these four factors (catalysts) is a necessary element for the formation of an international regime.

This chapter is divided into four major sections, so that each of the proposed catalysts can be discussed individually. In each of these sections, further justification is given for the identification of the particular factor as a catalyst in the overall framework for international regime formation. In addition, the relevant parts of the histories of the ozone layer depletion and global warming issues are scrutinised in order to assess the relative catalytic contribution of each factor. In this way, it is anticipated that the means and extent to which each factor drove the process of international regime formation can be discovered.

### 5.1 -- Political Entrepreneurs

> There is something of a race on between the [1989 Economic] Summit leaders to see who can be the greenest.
>
> William K. Reilly
> Administrator of the US Environmental Protection Agency[4]

---

[1] See Chapter 1.3 of this thesis.

[2] A catalyst is defined as a substance which when present in small amounts increases the rate of a chemical reaction or process but which itself is chemically unchanged by the reaction (adapted from *The Concise Oxford Dictionary*).

[3] These proposed factors for international regime formation satisfy fully only the first part of the catalyst definition, because they may be, indeed, changed by the reaction. But as with the analogy used for the preconditions (see Chapter 1 of this thesis, particularly note 143), this fact does not affect the argument being developed.

[4] Quoted in P. Shabecoff, 'U.S. to Urge Joint Environmental Effort at Summit', *The New York Times*, 6 July 1989, p. A9.

A 'political entrepreneur' is usually defined as a person who for 'career reasons, find[s] it in [her/his] private interest to work to provide collective benefits to relevant groups'.[5] To utilise the concept more usefully in this thesis, two important changes to this established interpretation must be made.[6] First, the geographical reach must be extended from the study of groups *within* a particular country to the study of groups *across* different countries (that is, we must represent world society or any international subsection thereof as the 'relevant group'). Second, a restriction must be placed upon the means by which an individual achieves the desired ends, because, in this study, not everyone who helps a group accrue a benefit while personally reaping a private gain is considered to be a political entrepreneur. Instead, political entrepreneurs, it is proposed, are distinguished by the special, personal characteristics that they bring to the particular position that they occupy. These attributes allow them to achieve ends that others in the same role might not be able to realise.[7] Thus, for the purposes of this thesis, a political entrepreneur is defined as a person who finds it in her/his private interest to use his/her distinctive personal qualities to facilitate the formation of an international regime.

With the use of a little imagination, we can envisage numerous ways in which a political entrepreneur might accelerate the process of regime formation. Oran Young identifies four possible roles that the political entrepreneur could fulfil by answering his own question, 'What do individuals who act as entrepreneurial leaders do to help participants reap the bargainer's surplus in institutional bargaining processes?':

---

[5] Russell Hardin, *Collective Action* (Baltimore, MD: Johns Hopkins University Press, 1982), p. 35.

[6] This section expands upon an idea about 'political eco-entrepreneurs' I originally put forward in Ian Rowlands, 'The Security Challenges of Global Environmental Change', *The Washington Quarterly* (Vol. 14, No. 1, Winter 1991), pp. 112-13.

[7] In this way, it is clear that this catalyst is concerned with an individual-level influence. (Indeed, Young notes that his own motivation for including entrepreneurs in his analysis is 'to bring the individual back in to the study of an important area of international affairs, without in any way diminishing the role of collective entities...' (Oran R. Young, 'Political Leadership and Regime Formation: On the Development of Institutions in International Society', *International Organization* (Vol. 45, No. 3, Summer 1991), p. 281). I also identify the 'individualistic' inspiration for this catalyst in Chapter 1.3 of this thesis. However, this catalyst is distinct from the hypothesised, individual-level precondition (Chapter 2, 'Scientific Consensus') and other, proposed factors in this thesis by the focus that is placed upon the unique abilities that an individual brings to a position, not upon the individual's characteristics that can be considered prerequisites for his/her occupation of that position.

> For the most part, they function as (1) agenda setters shaping the form in which issues are presented for consideration at the international level, (2) popularizers drawing attention to the importance of the issues at stake, (3) inventors devising innovative policy options to overcome bargaining impediments, and (4) brokers making deals and lining up support for salient options.[8]

Political entrepreneurs thus perform tasks that, in turn, allow actors in international society to form international regimes more quickly. Obviously not just anybody will be able to act as a political entrepreneur, because in order to fulfil these functions successfully, the individual must possess particular skills.[9]

The political entrepreneur is willing to accept the costs associated with helping to advance the process of regime formation, because it is anticipated that these burdens will be smaller than 'the net discounted value of the benefits that the entrepreneur expects to capture for itself'.[10] These private benefits might include intangibles, of either a professional or a personal nature. Professional benefits might be in the form of an enhanced standing -- for example, the entrepreneur's reputation as a skilful negotiator might be heightened.[11] The personal benefits, meanwhile, might be more altruistic in nature -- for instance, the individual might profit simply by knowing that his/her actions have improved the welfare of others.[12] Alternatively, the benefits might come in the form of tangibles. These might include material gains or concessions in domestic or international matters that are outside of the issue-area of the potential regime. Finally, the entrepreneur might accrue benefits of both types.

Many scholars in the literature note the value of having a political entrepreneur present in international affairs. Robert Keohane, for one, recognises that '[i]nstitutional development is affected by particular leaders...'.[13] Young, in

---

[8] Young, *op. cit.*, in note 7, p. 294.

[9] In an earlier article, Young notes that 'it involves a combination of imagination in inventing institutional options and skill in brokering the interests of numerous actors to line up support for such options' (Oran R. Young, 'The Politics of International Regime Formation: Managing Natural Resources and the Environment', *International Organization* (Vol. 43, No. 3, Summer 1989), p. 355).

[10] Robert O. Keohane, 'The Demand for International Regimes', in Stephen D. Krasner (ed.), *International Regimes* (Ithaca, NY: Cornell University Press, 1983), p. 155.

[11] Young, *op. cit.*, in note 7, p. 297.

[12] *Ibid.*, p. 297.

[13] Robert O. Keohane, 'International Institutions: Two Approaches', *International Studies Quarterly* (Vol. 32, No. 4, December 1988), p. 389.

addition, points to 'the crucial role of entrepreneurship at the international level'.[14] Young strengthens this assertion in a more recent article, for he argues that 'the presence of leadership is a necessary condition, but not a sufficient one, for success in reaching agreement on the terms of constitutional contracts in international society'.[15] This proclamation appears to contradict my hypothesis, because I am maintaining that political entrepreneurship is simply a catalyst, rather than a precondition, for international regime formation. We should note, however, that Young's definition of the term is much broader than mine, for he not only considers 'entrepreneurial leaders', but also 'structural leaders' and 'intellectual leaders' within his wider study of 'leadership'.[16] The presence of his last two categories means that his 'leadership' factor cuts across my hypothesised preconditions,[17] and thus we should not consider the two classifications to be interchangeable. Nevertheless, the different stress placed upon the factor by myself and Young is still consequential; this makes subsequent consideration that much more important.[18]

Moving from the theoretical to the empirical, let us turn our attention to the international politics of the two issues of global atmospheric change under consideration in this thesis to find out if any individuals acted as political entrepreneurs during the process of international regime formation up to the end of 1991. First, let us consider the ozone layer depletion issue.

### 5.1.1 -- Political Entrepreneurs and Ozone Layer Depletion

Throughout the history of the international political negotiations on the ozone layer, United Nations Environment Programme (UNEP) Executive Director Mostafa Tolba was undoubtedly the most visible and dominant individual. Mere evidence of

---

[14] Young, *op. cit.*, in note 9, p. 373. See, also, Norman Frohlich, Joe A. Oppenheimer and Oran R. Young, *Political Leadership and Collective Goods* (Princeton, NJ: Princeton University Press, 1971).

[15] Young, *op. cit.*, in note 7, p. 302.

[16] *Ibid.*, pp. 288-93 and 298-302.

[17] There is a close parallel between his 'intellectual leadership' and my ideas on 'scientific consensus' in Chapter 2 of this thesis; less so, although still evident, between his 'structural leadership' and my ideas in Chapters 3 and 4 of this thesis.

[18] Young invites more testing of his hypotheses (Young, *op. cit.*, in note 7, pp. 307-08); I advance similar ideas in the Conclusion of this thesis.

visibility and dominance, however, does not necessarily demonstrate that he acted as a political entrepreneur. Indeed, these accomplishments may simply have been derived from his position as the head of a major UN organisation and not from his own, personal qualities. A closer investigation, however, reveals that Mostafa Tolba does indeed fit the theoretical model of a political entrepreneur quite closely.

Young, for example, reports that 'Tolba played a key link in translating the rapidly evolving scientific picture regarding ozone depletion into terms that were relevant to processes of institutional bargaining at the international level',[19] thus identifying the UNEP head as a key 'agenda setter'.[20] Richard Benedick, additionally, singles out Tolba for his unique efforts, particularly highlighting his role as a 'broker':[21]

> UNEP's Mostafa Tolba provided overall personal leadership, initiating critical consultations with key governments, private interest groups, and international organizations. During the negotiations, he moved from group to group, arguing for flexibility, applying pressure, often floating his own proposals as a stimulus to the participants.[22]

Others echo these sentiments. Tolba's ability to find creative ways around negotiating obstacles, for example, is recognised as an important contribution to the process of international regime formation by government officials who were involved in the ozone layer negotiations.[23] Additionally, others acknowledge that his inspiration and obvious desire to find ways to preserve the ozone layer, something more intangible which might not be discerned from official records and reports, were also central to the success of the process.[24] These observations suggest that particular organisational and management skills built upon a background of deep, personal commitment helped Mostafa Tolba function as an

---

[19] Young, *op. cit.*, in note 7, p. 294.

[20] See Young's definition of the term in Young, *op. cit.*, in note 8, and accompanying text.

[21] See Young's definition of the term in *ibid.*, and accompanying text.

[22] Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991), p. 208.

[23] Interview with Karen Jorgensen, United Nations Environment Programme, Nairobi, Kenya, 23 July 1991. In this way, Tolba could also be classified as an 'inventor' in Young's classification. (See Young's definition of the term in Young, *op. cit.*, in note 8, and accompanying text.)

[24] Interview with Jorgensen, *op. cit.*, in note 23; and interview with W-K. Hoogendoorn, Deputy Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 16 July 1991.

effective political entrepreneur. Indeed, some suggest that his actions not only accelerated the process of international regime formation, but were integral to it.[25]

Richard Benedick, US Deputy Assistant Secretary of State for environment, health and natural resource issues, and lead negotiator for the United States during the international political negotiations on the ozone layer of the late 1980s,[26] also played an important role during the process. Although Young identifies him as a 'structural leader', because of his role in using American power in order to 'urge' the Europeans to accede to an international agreement,[27] his performance was more multifarious than Young seems to give him credit for. Indeed, during the negotiations, there were a number of instances when Benedick drew upon his personal assets, rather than the power derived from the position that he occupied. At a small, informal meeting of delegation heads prior to the 1987 Montreal Protocol conference, for example, Benedick had suspected that the Soviet Union's representative was having difficulty with the group members' use of the English language. During a coffee break

> from the tense ... debate, which at that point looked hopeless, a Soviet delegate happened to overhear [Benedick] speak to an Austrian colleague in the latter's native tongue. With evident relief, the Soviet exclaimed, 'Ich habe's aber gar nicht gewusst, dass Sie Deutsch sprechen!' (I didn't know that you speak German). He was clearly more comfortable with German than English, the mystery of [a negotiating point of contention] unraveled, and thereafter informal communication on this and other issues improved dramatically.[28]

Evidently not every American representative would have been able to employ such linguistic skills in order to overcome negotiating stalemates. By providing a number of other such examples (in anecdotal form) in his own book on the ozone layer negotiations, Benedick's remarks suggest that he can also be considered, at least

---

[25] Interview with Hoogendoorn, *op. cit.*, in note 24; and interview with L.P.J. Mazairac, Ambassador and Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 2 August 1991. Although these two officials suggest that Tolba's entrepreneurial talents were a necessary precondition for regime formation, this view was not widespread among interviewed officials.

[26] David D. Newsom, 'Foreword', in Benedick, *op. cit.*, in note 22, p. x.

[27] Young notes that Benedick was able to make 'good use of threats to restrict access to the American market as a means of gaining acceptance of the principle of across-the-board cuts in the production and consumption of CFCs' (Young, *op. cit.*, in note 7, p. 290). See, also, Chapters 3.1.3 and 3.1.4 of this thesis.

[28] Benedick, *op. cit.*, in note 22, p. 83.

partially, a political entrepreneur.[29]

On the other side of the Atlantic Ocean, meanwhile, Laurens Brinkhorst, the European Communities' chief negotiator during the late 1980s, also played an important role. Although the Europeans were more hesitant about concluding an agreement than the Americans,[30] his ability to forge a common European view on the issue was a significant accomplishment that could not have been achieved by just anyone in his position.[31] Indeed, one European official feels that the Montreal Protocol was concluded owing, to a significant degree, to Brinkhorst's actions.[32]

Former British Prime Minister Margaret Thatcher is another individual whose efforts catalysed the process of regime formation on the ozone layer issue. Prior to her well-known speech to the United Kingdom Royal Society in September 1988,[33] Thatcher was not thought to harbour much concern for the environment. In 1985, for example, she labelled environmentalists as 'the enemy within',[34] and during the 1982 Falklands/Malvinas War, she remarked: 'when you've spent half your political life dealing with humdrum issues like the environment ... it's exciting to have a real crisis on your hands'.[35] Nevertheless, from the end of 1988 until the end of her tenure as British Prime Minister in November 1990, Thatcher adopted a noticeably different stance. She hosted two important conferences on the ozone layer depletion issue in March 1989 and June 1990,[36] at which significant progress towards regime formation and consolidation was made. The

---

[29] *Ibid.*; and interview with William Mansfield III, Deputy Executive Director of UNEP, Nairobi, Kenya, 13 August 1991.

[30] The reasons for this hesitancy are outlined in, primarily, Chapters 2.1 and 3.1 of this thesis.

[31] Brinkhorst's identification as a political entrepreneur redresses an imbalance that is evident in Benedick's book (Benedick, *op. cit.*, in note 22). In that work, it is suggested that Brinkhorst impeded the process of regime formation. Interviews with European officials revealed, however, that this was not the case. See also, more generally, the review of Benedick's book by a member of the British government's negotiating team: Fiona McConnell, 'Book Reviews', *International Environmental Affairs* (Vol. 3, No. 4, Fall 1991), pp. 318-20.

[32] Interview with Hoogendoorn, *op. cit.*, in note 24.

[33] See, for example, Martin Jacques, 'Why Thatcher Turned Green', *The Sunday Times* (London), 2 October 1988.

[34] Cited in Larry Tye, 'All Environmental Talk, No Action', *The Citizen* (Ottawa), 22 July 1989.

[35] Quoted in Jonathan Porritt, 'Can the Conservatives Go Green?', *Earth Matters* (No. 2, no date given), pp. 2-3.

[36] They were, respectively, the 'Saving the Ozone Layer Conference' and the 'Second Meeting of the Parties to the Montreal Protocol'. Both were held in London.

higher profile accorded these gatherings,[37] because of Thatcher's personal interest and involvement, was integral to their success.[38]

The list of individuals who acted as political entrepreneurs during the ozone layer negotiations up to the end of 1991 extends well beyond these four people. Indeed, a complete catalogue would include individuals who were not politicians associated with either national governments or international governmental organisations, for both pressure group leaders[39] and entertainment personalities played important catalysing roles.[40] Nevertheless, these four individuals were some of the entrepreneurs who contributed most to the formation of an international regime to preserve the ozone layer.

There were, nonetheless, other individuals connected with governments who also played important roles during the ozone layer negotiations up to the end of 1991. They are not, however, as easily identifiable by name, because they worked *within* the delegations of national governments. In contrast to the persons noted above, who were so dominant that they were identified not as part of state's delegations, but rather as individuals, these people worked more 'namelessly' while carrying out their duties on behalf of their respective governments. Their anonymity does not, however, reduce the importance of their involvement.

On the ozone layer issue, Benedick highlights the work of the United States' representatives, for he notes that strong leadership by a major state can be a strong catalyst in the drive for an international consensus.

> The U.S. government reflected its concerns over the fate of the ozone layer through stimulating and supporting both American and international scientific

---

[37] Both conferences were at a high level of officialdom, with the second one in particular attracting a large number of government ministers.

[38] The focus up to this point has been upon the actions that these political entrepreneurs took in order to accelerate the rate of international regime formation. If, however, these individuals did not derive any private benefits from their efforts, then they would not be 'true' political entrepreneurs as defined earlier. Although political secrecy hinders us from finding out exactly what the benefits accruing from their actions were, we can speculate that they included both personal elements (for example, a feeling that they were acting responsibly for their constituents) and professional elements (particularly the political mileage that could be made from being seen to embrace environmental issues).

[39] See, in particular, Chapter 5.3 of this thesis.

[40] Among others, Benedick maintains that '... negotiators [and] environmentalists ... also provided ideas, decisions, and actions that proved vital to the final outcome' (Benedick, *op. cit.*, in note 22, p. 208). Benedick also notes the roles of scientists and industry officials. Their impact is examined in Chapters 2 and 3, respectively, of this thesis.

> research. Then, convinced of the dangers, *it undertook extensive diplomatic and scientific initiatives to promote an ozone protection plan to other countries, many of which were initially hostile or indifferent to the idea.*[41]

Although many of the actions of the American diplomats were, like their leader, 'structurally-based', others were, nevertheless, 'entrepreneurially-based'.[42]

Additionally, some Scandinavians and Canadians also acted as important political entrepreneurs on the ozone layer issue, particularly during the period of negotiations before September 1987.[43] Vic Buxton, for example, argues that the Canadians and the Scandinavians had to spend many hours both explaining the ideas of 'environmental heritage', 'responsible care' and 'stewardship', and arguing their validity before the major states' representatives began to take them on board.[44] Without the Canadians' and the Scandinavians' active participation, the process of learning might have taken much longer and a consensus about the importance of preventative action on environmental issues might have formed more slowly.

Additionally, Serge Langdau maintains that the Canadians and the Scandinavians did much to 'build bridges' between the opposing American and European delegations.[45] While the Canadians generally had had a particularly close relationship with the Americans since the nineteenth century, the warmth of this friendship increased significantly in 1984 with the election of a pro-US, conservative government to Ottawa. On the other side of the Atlantic Ocean, meanwhile, the Scandinavians not only had had strong political, economic and geographical bonds with the states of the European Communities, but the fact that Denmark was a member of both the unofficial 'Nordic' grouping and the official 'European Communities' organisation provided a more direct link between

---

[41] Benedick, *op. cit.*, in note 22, pp. 205-06. Emphasis added. Peter Haas also recognises the role of 'able US diplomacy' in selling policy positions to other countries (Peter M. Haas, 'Obtaining International Environmental Protection through Epistemic Consensus', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 356).

[42] See the discussion in *op. cit.*, in note 27, and accompanying text.

[43] Interview with Vic Buxton, Executive Director, National Secretariat, 1992 UNCED, Environment Canada, Hull, Canada, 3 January 1991; and interview with Serge Langdau, Environment Canada, Hull, Canada, 14 December 1990.

[44] Interview with Buxton, *op. cit.*, in note 43.

[45] Interview with Langdau, *op. cit.*, in note 45. The conflict between these two groups is discussed in Chapters 2.1 and 3.1 of this thesis.

Scandinavia and Europe. Although this dual membership might sometimes give rise to crises of identity for the members of the Danish government, it was often used by the Nordics as a conduit to feed both research and policy ideas into the discussions of the European Communities.[46] These respective links meant that the conflicting Americans and Europeans had intermediaries through which they could negotiate and communicate.

Furthermore, the Canadians also forth put their own proposals in order to try to break the trans-Atlantic stalemate. A number of participants recognise that the Canadian compromise proposed during the Leesburg (VA) meeting in 1986[47] not only helped to resolve a negotiating impasse, but also helped to create a better atmosphere -- the 'Leesburg Spirit' -- in which the negotiations were subsequently conducted.[48] By drawing attention to important concepts, by building bridges and by inventing new policy options, particular individuals' creativity and ingenuity often helped the participants in the ozone layer discussions to clear negotiating hurdles, or simply to keep on track.

An examination of the history of the negotiations on the ozone layer issue reveals that a number of individuals played important roles in helping the members of international society form a regime. Although the findings do not decisively demonstrate that their actions were necessary for international regime formation, it is evident that their particular contributions helped to accelerate the rate of progress.

### 5.1.2 -- Political Entrepreneurs and Global Warming

Moving on to our other issue under consideration, let us consider the politics of global warming up to the end of 1991 in order to discover if any political entrepreneurs, identified either as individuals or as states' representatives, played

---

[46] Interview with Mazairac, *op. cit.*, in note 25.

[47] See G.V. Buxton *et al*, 'A Canadian Contribution to the Consideration of Strategies for Protecting the Ozone Layer', presented at the UNEP Workshop on Economic Issues Related to Control of CFCs, Leesburg, VA, 8-12 September 1986.

[48] Geoffrey Lean, *Action on Ozone* (Nairobi: UNEP, 1989), pp. 7-8; interview with Buxton, *op. cit.*, in note 43; and interview with Peter Usher, Co-ordinator, Global Environmental Monitoring Service (Atmosphere), United Nations Environment Programme, Nairobi, Kenya. We should also recognise that some UNEP officials fulfilled important entrepreneurial roles, particularly during the period when states' representatives were not extremely enthusiastic about the negotiations.

important catalytic roles. Because of the similar nature of the two issues, a logical place to begin the study is among the entrepreneurs from the ozone layer negotiations in order to find out if the same individuals acted in similar entrepreneurial fashions on the global warming issue.

First, Mostafa Tolba is identified as a key political entrepreneur on the ozone layer issue, for there is wide agreement that his actions during the negotiations leading to an international regime were factors in the success of the process. His methods for achieving this end have, however, been questioned by some. While Benedick refers to his manner of 'applying pressure',[49] others refer to this technique as 'bullying' or 'headbanging'.[50] Although Tolba's intelligence is recognised and respected, his overt involvement in the political process led some individuals, in hindsight, to resent his participation. Mark Imber describes the circumstances:

> Numerous individuals attest to the strong personality style of the Mostapha Tolba term of office, to his extraordinary work-rate, his reluctance to delegate authority, in particular in the matter of appointments, and to his single-mindedness in the promotion of the work and role of UNEP. Both praise and criticism have been applied to related characteristics of the Tolba style, most obviously to the consequences of his extended absences from Nairobi on UNEP business. A reluctance to delegate authority is acceptable, so is a pattern of frequent absences, however the two do not combine well together, but rather tend to limit the initiative of subordinates. A widely quoted anecdote asks 'What is the difference between God and Tolba? God is everywhere, Tolba is everywhere, except in Nairobi'. Very few UN staff keep company with the Almighty, if only in jest.[51]

Because many individuals -- particularly representatives of Latin American states -- feel that they were cajoled and manipulated by Tolba during the ozone layer negotiations, they subsequently harboured a resentment towards the man. By 1990, consequently, they had become automatically suspicious of any proposal that he put forward. This fact had important ramifications for the global warming issue, because, partially in order to minimise Tolba's involvement during the climate

---

[49] *Op. cit.*, in note 22, and accompanying text.

[50] Interviews with officials from the United Nations Environment Programme and country missions, Nairobi, Kenya, July and August 1991.

[51] Mark Imber, 'The UNEP Mandate and Dilemma', paper presented at Conference on International Arrangements for Reaching Environmental Goals, Strathclyde, 10-12 September 1991, p. 11.

change negotiations, UNEP was marginalised in the new arrangements.[52] The UNEP Executive-Director, accordingly, had his personal influence significantly curtailed; by the end of 1990, he had lost his ability to 'tweak the process', as he had done during the ozone layer negotiations.[53] A significant political entrepreneur who catalysed the formation of an international regime to protect the ozone layer had thus, by the end of 1991, not been able to play a similar role during the global warming negotiations.[54]

In lieu of solely UNEP, a number of institutions became involved in the political negotiations on global warming. It seems logical, therefore, to direct attention to the bureaucratic summits of these organisations in order to discover if a surrogate political entrepreneur had arisen on the global warming issue. At the end of 1991, the most significant institutions were the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change (INC) Secretariat (headed by Michael Zammit Cutajar, a Maltese national who had worked in the United Nations system for 20 years[55]) and the Secretariat for the United Nations Conference on Environment and Development (UNCED) (headed by Maurice Strong, a Canadian national who was Secretary-General of the 1972 United Nations Conference on the Human Environment in Stockholm[56]). In addition, similar claims of responsibility were being made by other international organisations, including UNEP.[57] Although no one doubted the capabilities of any of the individuals who headed these various bodies, the sheer fact that the climate change responsibilities were the concern of a larger number of international

---

[52] The climate change negotiations became the responsibility of the United Nations General Assembly during the latter part of 1990. See UNGA RES/44/207, 'Protection of Global Climate for Present and Future Generations of Mankind'; and interviews with officials from the United Nations Environment Programme, Nairobi, Kenya, July and August 1991.

[53] Interviews with officials from the United Nations Environment Programme, Nairobi, Kenya, July and August 1991.

[54] Tolba's term of office was due to expire in 1992. Should he retire at this time, he may fall further away from the process.

[55] 'UN Official Heads Climate Change Secretariat', *Our Planet* (Vol. 3, No. 2, 1991), p. 18.

[56] See, for example, Peter Lennon, 'The Man Who Would Save the World', *The Guardian* (London), 27 September 1991, pp. 29-30.

[57] Many analysts recognise that the international environmental agenda was becoming increasingly crowded during the late 1980s and early 1990s. Glen Plant reviews the numerous organisations involved in the climate change issue in particular (Glen Plant, 'Institutional and Legal Responses to Global Climate Change', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), pp. 413-28).

organisations lessened the ease with which any single individual might be able to play a strong, entrepreneurial role. Indeed, this increased politicisation of the global warming process *vis-a-vis* the ozone layer negotiations ensured that the same forces that propel bureaucratic politics made it difficult for a single entrepreneur to arise from amongst the international organisations involved.[58]

Political entrepreneurs during the ozone layer negotiations, however, also emerged from amongst the ranks of national governments. Once again, using this experience as a guide, we look to the United States to see if a significant individual had surfaced during the global warming negotiations by the end of 1991. Before we look at specifics, however, we should note that the question of whether American entrepreneurial efforts are needed in this area is addressed by Benedick:

> As the largest emitter of both ozone-destroying chemicals and greenhouse gases, the United States has enormous potential to influence the policy considerations of other governments in favor of environmental protection. In fact, because of the geographic size and population of the United States, its economic and scientific strength, and its international interests and influences, progress in addressing global environmental problems can probably not be achieved without American leadership.[59]

Although one may challenge his seemingly ethnocentric analysis, it seems reasonable to suggest that enthusiastic American participation would, *ceteris paribus*, quicken the rate of regime formation.[60] The chief negotiator for the United States on this issue, meanwhile, was William Reilly, who from 2 February 1989 had been the Administrator of the US Environmental Protection Agency. Like some others in the international negotiations, he was generally recognised to be a highly competent individual. His ability to act as an effective entrepreneur, however, was hindered during this period by the US Administration's position on the issue. Although it was generally believed that Reilly supported a more active policy posture on global warming,[61] the reluctance of individuals in the US White

---

[58] Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston, MA: Little, Brown, and Company, 1971); and interviews with officials from United Nations Environment Programme, Nairobi, Kenya, July and August 1991.

[59] Benedick, *op. cit.*, in note 22, p. 206.

[60] Benedick's comments point not only to entrepreneurial leadership, but also to the need for the United States' leaders both to find it in their national interest to help to build a global warming regime and to exercise structural leadership. See Chapter 3.2.3 of this thesis for a further discussion.

[61] See the discussion in Chapter 4 of this thesis, particularly note 78, and accompanying text.

House to endorse any policy commitments effectively served to suppress Reilly's entrepreneurial talents.[62] Once again, where there was an effective political entrepreneur catalysing the drive towards regime formation on the ozone layer issue, none existed on the global warming issue through its early political days.

The issue, nevertheless, was not totally devoid of such catalysts. The route that the negotiations had followed to the end of 1991, however, demonstrated that some of the most significant political entrepreneurs on this issue were European. More specifically, certain Dutch and French nationals took actions that suggest that they acted as political entrepreneurs during the process. With the Norwegian government, these two states' leaders hosted one of the first conferences to consider the issue of global atmospheric pollution, in The Hague in March 1989.[63] In addition, the Dutch, under the enthusiastic leadership of Ed Nijpels (Minister of Housing, Physical Planning and Environment), organised one of the most important gatherings to consider the global warming question -- namely, the 1989 Ministerial Conference on Atmospheric Pollution in Noordwijk, the Netherlands. The French, finally, by pushing for the creation of some sort of global environmental fund,[64] advanced a new idea that helped negotiators overcome some initial bargaining impediments.[65] By convening conferences and proposing policy options, therefore, these governments' officials helped both to create fora for discussions and to accelerate the process of negotiation. By their actions, both the leaders and the 'nameless' bureaucrats acted as political entrepreneurs.

Thus, a number of political entrepreneurs did play some role during the early days of the process of regime formation on the global warming issue. The findings suggest, however, that, at the end of 1991, the greater breadth of the issue (*vis-a-vis* the ozone layer issue) had hindered the ability of any single individual to attain

---

[62] See, for example, Michael Weisskopf, 'U.S. to Fight Aid to Halt Global Warming', *International Herald Tribune*, 10 May 1990, p. 7. More generally, the fact that the climate change issue became a highly-political issue 'earlier' than the ozone layer issue also meant that individuals were less able to exercise their own free will during the negotiations, but instead were being watched over more closely by their political superiors. Thus, spontaneity, ingenuity and creativity were suppressed and were replaced by standard-operating procedures (view derived from comments made by Peter Usher, in interview with Usher, *op. cit.*, in note 48).

[63] Conference on the Protection of the Global Atmosphere.

[64] See the discussion in Chapter 4.3.3 of this thesis.

[65] This is not meant to suggest that, at the end of 1991, this question had been resolved to the satisfaction of all involved. See Chapter 4.3.4 of this thesis for a further discussion.

the level of entrepreneurial effectiveness that either Mostafa Tolba or Richard Benedick had achieved during the ozone layer negotiations.

### 5.2 -- The Solidity of the Broader International Political System

> [P]rogress achieved in resolving some regional disputes and the general improvement in East-West relations offers promise of greater international co-operation on a wide range of issues.
>
> Javier Perez de Cuellar
> Former Secretary-General of the United Nations[66]

The proposition put forward in this section is that the rate of international regime formation in specific issue-areas is directly related to the solidity of the broader international political system. A simple analogy with house construction helps to elucidate this proposition. Let us draw a comparison between the broader issues of the day in international society, upon which negotiators attempt to construct a regime for their particular issue-area, and a plot of land, upon which a builder attempts to erect a dwelling. Although the solidity of either foundation will not be directly proportional to the chances for the successful erection of something upon it, it is suggested that there is a vaguely linear, and predominantly positive, correlation at work. Thus, just as the contractor's job is easier (and completed more quickly) when the bedrock is solid, so too is it maintained that the chances for international regime formation are increased when the broader international political system is relatively solid.[67]

The identification of this factor as a catalyst is by no means radical. Indeed, its omission would have caused us to overlook the fact that interdependence in international relations is evident not only within individual issue-areas, but also across different issue-areas. Oran Young maintains that:

> Contextual arguments provide a healthy reminder that regime formation in

---

[66] Javier Perez de Cuellar, 'The United Nations System and Sustainable Development', in David J.R. Angell, Justyn D. Colmer and Matthew L.N. Wilkinson (eds.), *Sustaining Earth: Response to the Environmental Threats* (Basingstoke: Macmillan, 1990), p. 171.

[67] 'Solid', in this instance, is not analogous to 'stable' (which is a more commonly used term in international relations). Indeed, a system may be 'stable' (in the sense of no changes over time), but not 'solid' (in the sense of cross-cutting links, which serve to reinforce the stability of that system). For example, consider a multipolar world. If there exists a 'Cold War' amongst all of the members, there will be stability, but not solidity. If, however, there are co-operative links amongst all of the members, then there will be both stability and solidity.

> international society never takes place in a vacuum. In fact, efforts to devise institutional arrangements are closely tied to an array of political, economic and scientific concerns that can, and often do, accelerate or block processes of regime formation.[68]

Some of the work in this area of the international relations literature is built upon the ideas about 'transnational and transgovernmental relations' developed by Robert Keohane and Joseph Nye during the 1970s.[69] In their work, they attempt to permeate the realists' billiard-ball by highlighting the importance of informal ties among different national elites in international society.[70] They argue that transgovernmental links facilitate the creation and maintenance of international regimes. Keohane explains this notion:

> Governments no longer act within such regimes as unitary, self-contained actors. 'Transgovernmental' networks of acquaintance and friendship develop, with the consequences that supposedly confidential internal documents of one government may be seen by officials of another; informal coalitions of like-minded officials develop to achieve common purposes; and critical discussions by professionals probe the assumptions and assertions of state policies. These transgovernmental relationships increase opportunities for cooperation in world politics by providing policy makers with high-quality information about what their counterparts are likely to do. Insofar as they are valued by policy makers, they help to generate demand for international regimes.[71]

The proposed reasoning is that if the representatives of different states' governments have more frequent contact, then there will be greater opportunities for them to attempt to bridge the differences in policy positions among states on a variety of issues. In a more recent publication, Keohane expands this idea:

> Close ties among officials involved in managing international regimes

---

[68] Oran R. Young, 'Global Environmental Change and International Governance', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), p. 341.

[69] See, for example, Robert O. Keohane and Joseph S. Nye, 'Transgovernmental Relations and International Organizations', *World Politics*, (Vol. 27, No. 1, 1974), pp. 39-62; and Robert O. Keohane and Joseph S. Nye, *Power and Interdependence: World Politics in Transition* (Boston, MA: Little, Brown, and Company, 1977). In addition, this idea also relates to a notion arising out of social science inquiry more generally -- namely, the By-Product Theory, which predicts that groups 'that happen to have been organized previously for other reasons, for example, for sociability, can occasionally cooperate to promote their interests' (Hardin, *op. cit.*, in note 5, p. 31). These observations suggest that the roots of the concept being put forward here run deep.

[70] At this point, the focus will be only upon the 'transgovernmental' aspect of this concept, because the role of other transnational actors is examined in Chapter 5.3 of this thesis.

[71] Robert O. Keohane, 'The Demand for International Regimes', *International Organization* (Vol. 36, No. 2, Spring 1982), p. 349.

> increase the ability of governments to make mutually beneficial agreements, because intergovernmental relationships characterized by ongoing communication among working-level officials, informal as well as formal, are inherently more conducive to exchange of information than are traditional relationships between closed bureaucracies.[72]

Similarly, Stephen Krasner summarises part of Keohane's argument by noting that an interdependent world is more receptive to efforts to construct international regimes, because 'there is [already] a high level of formal and informal communication among states...'.[73]

High levels of contact among states' officials are, however, not necessarily guaranteed, because such communication may, at times, be deemed to be damaging in the international system. Indeed, in order to be able to have a high level of interaction among countries' officials, the officials' particular political masters must allow such interaction. There will be a better chance that this permission will be granted if the general state of relations between countries is good. Thus, Gail Osherenko and Oran Young contend that:

> The state of the broader political environment is a key determinant of the prospects for regime formation in specific issue areas. Sometimes the political environment is conducive to efforts at institution building; it may even provide a powerful impetus toward regime formation, regardless of the content or coherence of specific proposals. ... By the same token, the broader political environment may impose severe constraints on regime building in specific issue areas.[74]

With greater solidity in the international system, then, it is proposed that the time required to form an international regime will be reduced.[75]

---

[72] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, NJ: Princeton University Press, 1984), p. 97.

[73] Stephen D. Krasner, 'Structural Causes and Regime Consequences: Regimes as Intervening Variables', in Krasner (ed.), *op. cit.*, in note 10, p. 12.

[74] Gail Osherenko and Oran R. Young, *The Age of the Arctic: Hot Conflicts and Cold Realities* (Cambridge: Cambridge University Press, 1989), pp. 260-61.

[75] One should recognise, however, that this idea is distinct from the notion of 'issue linkage':

> Issue-linkage in this sense involves attempts to gain additional bargaining leverage by making one's own behavior on a given issue contingent on others' actions towards other issues. Issue-linkage may be employed by powerful states seeking to use resources from one issue-area to affect the behavior of others elsewhere; or it may be employed by outsiders, attempting to break into what could otherwise be a closed game. Linkage can be beneficial to both sides in a negotiation, and can facilitate agreements that might not otherwise be possible.

In summary, then, some scholars suggest that if there are established governmental channels and contacts between states on one issue-area, then they can be more quickly and more easily co-opted and used in the effort to construct an international regime on another issue-area. In this way, they hypothesise, a generally warm climate in the international political system can accelerate the formation of an international regime. The converse is also likely to be true: as the international political climate cools, the chances for regime construction are lessened. This is because international channels are blocked or cut, making it necessary to construct new links. The effect is to cause an increase in both the cost and the time required for international regime formation.[76]

### 5.2.1 -- The Solidity of the Broader International Political System and Ozone Layer Depletion

Moving onto our two specific issues under consideration, let us first examine the ozone layer depletion issue. When political negotiations upon an ozone layer agreement commenced in 1982, they did so under the shadow of the Second Cold War. Although the international system at this time was fairly 'stable', there was no correspondingly high degree of 'solidity'. Our hypothesis suggests, therefore, that the rate of regime formation should not have been great at this time. The findings go some way towards confirming this prediction.

Although the relatively apolitical nature of the activities of the Coordinating Committee on the Ozone Layer (CCOL) during the early 1980s meant that Cold

---

(Robert Axelrod and Robert O. Keohane, 'Achieving Cooperation Under Anarchy: Strategies and Institutions', in Kenneth Oye (ed.), *Cooperation Under Anarchy*, p. 239.) The distinction is important: issue-linkage is primarily associated with conscious 'threats' or 'promises' (*ibid.*, p. 240), while the concept of the 'solidity of the broader international political system' is meant to direct attention to the system itself, not one actor's ability to manipulate it. In this way, it is clear that the impetus for the inclusion of this catalyst is to recognise that the condition of the international system as a whole can have a bearing upon the rate of international regime formation. In this way, the debt owed to the 'global' theorists in international relations scholarship is suggested. (See Chapter 1.2.1 of this thesis for an examination of their ideas.)

[76] One of the most persuasive pieces of historical evidence to support this proposition is the experience of the calls for an New International Economic Order (NIEO) during the 1970s and 1980s. It is generally accepted that one of the contributing factors to the 'failure' of the NIEO was the outbreak of the 'Second Cold War'. (See, for example, Fred Halliday, *The Making of the Second Cold War* (London: Verso, 1983).) By the end of the 1970s, attention had reverted back to East-West security issues, and questions of economic development and justice were bumped down the international agenda. Thus, the efforts to form a new regime on one issue-area (economics) were hindered by the changes in an existing regime on another issue-area (security).

War politics did not occupy centre-stage in the group's proceedings, Peter Usher recalls that they did, nevertheless, play some role:

> At every meeting of the CCOL, the Soviet Union's representatives would ask for a participants' list to be published. Once the Soviet Union's delegates got hold of this list and observed that the location of the West German Environment Ministry (in West Berlin) was recorded on this document (as it always was), they would register a formal protest.[77]

Efforts to preserve the ozone layer would thus be deflected, because the four powers' representatives would have to be brought together and the obligatory procedure would have to be enacted. Because Usher knew that this was likely, the participants' list would not be released until the last possible moment. Nevertheless, Cold War politics would still disrupt the proceedings, which were primarily directed at preserving the ozone layer.

The Cold War, however, dissipated during the middle of the 1980s, and the corresponding shifts in the attitudes of the Soviet Union's officials had important effects upon international relations. Sir Crispin Tickell, first of all, notes this transition:

> ... the Soviet Union has made fundamental changes in its foreign policy, including a new attitude towards the United Nations, as expressed most vividly in President Gorbachev's speech to the General Assembly in December 1988. Cooperation of the kind envisaged in the Charter is not only possible but has effectively begun.[78]

Second, Jim MacNeill further speculates about the potential consequences of this transition:

> *Glasnost*, *perestroika* and the tidal shift in East-West relations have also opened the doors of opportunity. For more than forty years, world affairs have been dominated by the contest between East and West. The goal of each was to contain the expansion of the other. Recent changes have not only deprived both sides of their main enemy, they have begun to release the energies of the superpowers and their allies, and have made it possible for them to cooperate meaningfully on the critical issues of global change

---

[77] Paraphrased from interview with Usher, *op. cit.*, in note 48. The Soviets would take such action, because, owing to the terms of the Quadripartite Agreement on Berlin (signed on 3 September 1971), individual West German ministries were not allowed to operate out of West Berlin (Henry Kissinger, *White House Years* (Boston, MA: Little, Brown, and Company, 1979), pp. 832 and 825).

[78] Crispin Tickell, 'Diplomacy and Sustainable Development', in Angell *et al*, *op. cit.*, in note 66, p. 174.

and human survival.[79]

With regard to the ozone layer negotiations, there are examples to suggest that the general warming of East-West relations during the mid-1980s -- and the consequential increased solidity of the international system -- catalysed the process of regime formation. To cite a specific example, the policy of *glasnost* contributed to the Soviet Union's decision to release its CFC production figures for the first time in 1986.[80] This is an important technical pre-requisite for an international accord. Additionally, 'ties between U.S. and Soviet scientist were created in 1987, when representatives from the two countries met and agreed to begin collaborative work on the climate and ozone'.[81] Such interaction, Benedick argues, 'contributed to a gradual weakening of Soviet opposition to international controls on ozone-depleting compounds'.[82] More generally, it is certainly clear that the political activities regarding the ozone layer during the second half of the 1980s, with their requisite ministerial level interactions, could not have been completed as quickly during the first half of the same decade. With regard to the politics of the ozone layer, therefore, the fundamental change in the solidity of the broader international political system derived from the thawing of the Second Cold War. The above reflections suggest that this thaw allowed the rate of international regime formation to quicken, at least in a minor way.

### 5.2.2 -- The Solidity of the Broader International Political System and Global Warming

Because global warming had the potential to affect so many areas of social activity, the process of international regime formation was influenced in its turn by other political and economic developments in the international system. Indeed, Stephen Schneider recognises the importance of building a 'diversity of political ties. Good rapport among nations will be absolutely necessary if an international consensus

---

[79] Jim MacNeill, 'Sustainable Development: Meeting the Growth Imperative for the 21st Century', in Angell *et al*, *op. cit.*, in note 66, p. 192.

[80] Tim Beardsley, 'Global Limit for CFC Emissions', *Nature* (Vol. 323, 25 September 1986), p. 286.

[81] Peter M. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', *International Organization* (Vol. 46, No. 1, Winter 1992), p. 193.

[82] Benedick, *op. cit.*, in note 22, p. 101.

to limit the $CO_2$ increase is eventually sought.'[83] His comments thus suggest the need for a solid international political system. Although, at the end of 1991, it was still too early to assess fully how broader developments in the international political system had influenced the negotiations, some initial observations could be made.

First, because of the later emergence of global warming as a political issue (*vis-a-vis* the ozone layer depletion issue), the rate of regime formation was able to benefit from the changes in East-West relations that took place during the late 1980s and that are described above. Thus, right from the time that global warming emerged as a significant international political issue, increasing solidity in the broader international political system drove the process of regime formation.[84] A consequence of the new detente, furthermore, had a more direct influence upon the process of regime formation on the global warming issue.

More specifically, the new 'independence' achieved by the East European states after the 1989 revolutions gave rise to a striking shift among the attitudes of some East European representatives during the global warming negotiations. One official from the West notes that the East European representatives were 'talking now', which was very different from their posture prior to 1989. He notes that there had formerly been hesitation on their part and not the same degree of openness as there was after 1989. This apparent wariness, he argues, gave other delegates a feeling that the East Europeans were 'not quite with us'. In 1991, however, he did not perceive the same feeling; instead, the East Europeans were generally perceived to be colleagues with similar problems. This increase of openness

---

[83] Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco, CA: Sierra Club Books, 1989), p. 257.

[84] It is nevertheless instructive to note that one of the most remarkable acts of international co-operation, which (in a small way) helped to advance the process of regime formation, took place during the early 1980s. In 1980, an ice core, more than two kilometres long and thus covering more than an entire glacial cycle (160,000 years), was recovered from a drillhole at Vostok in the Antarctic (C. Lorius *et al*, 'A 150,000-Year Climatic Record from Antarctic Ice', *Nature* (Vol. 316, 15 August 1985), pp. 591-96). From the *Soviet* station where it was drilled, the core was taken by a specially-equipped *American* transport to a laboratory in *France*, where it was analysed during the following three years. This co-operative, tripartite effort took place at the height of the Second Cold War. Thus, just as small huts can be built upon swampy marshes, so too can efforts to construct international regimes take place at times of deteriorating international solidity. See, also, Cheryl Simon Silver with Ruth S. DeFries, *One Earth One Future: Our Changing Global Environment* (Washington, DC: National Academy Press, 1990), pp. 24-25.

consequently had a positive impact upon the general negotiating environment.[85]

A subsequent outcome of these changes that occurred in Eastern Europe at the end of the 1980s, however, was the apparent disintegration of some of the former sovereign states in the region.[86] This development in the broader international political system could subsequently have had important retarding influences upon the rate of regime formation for two important reasons. First, because of the need to sort out responsibilities between different levels of government (for example, between Russia and the C.I.S.), there might have been instances when it was unclear as to who had the authority or the power to discuss international environmental issues, to negotiate international treaties and to implement contractual obligations.[87] Second, findings brought to light by Mancur Olson suggest that the sheer fact that there are a greater number of states in international society could have made it more difficult to achieve co-operative agreements.[88] At the end of 1991, furthermore, it was not clear if European 'unification' would be able to offset this trend. Institutional disintergration in Eastern Europe might have had, therefore, arresting effects upon the rate of international regime formation.

In summary, then, the investigation reveals that the unprecedented changes in the broader international political system that had occurred by the end of 1991 helped to accelerate the rate of international regime formation on global warming, to at least some degree. Other findings, however, also suggest that subsequent changes in the make-up of the international political system might have influenced the process in an opposite manner. At the end of 1991, it was difficult to conclude

---

[85] Interview with John D. Friend, First Secretary, High Commission of the United Kingdom, Nairobi, Kenya, 25 July 1991. Others, however, are quick to point out that there were still difficulties in dealing with East European representatives, for many of these diplomats were new to international diplomacy, were unversed in the issues or were viewing matters through inappropriate models of the world (interview with Mazairac, *op. cit.*, in note 25).

[86] By the end of 1991, the Union of Soviet Socialist Republics had become the Commonwealth of Independent States -- a new political grouping with constituent units which were individually sovereign, in contrast to the old Soviet republics. In addition, at the end of 1991, a civil war raged in Yugoslavia, where at least one group (the Croats) was fighting for the creation of its own sovereign state.

[87] Mazairac argues that such problems have affected the Belgium government's abilities to participate constructively in the international negotiations on environmental issues (interview with Mazariac, *op. cit.*, in note 25).

[88] Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965). See, also, the discussion in Chapter 1.2.2 of this thesis.

which contributing factor (if either) might eventually dominate.

### 5.3 -- The Elite-Level Activities of Environmental Pressure Groups

> The environment is too important to be left to the environmentalists.
>
> Helmut Sihler
> President of Henkel KGaA
> (a German chemical company)[89]

It is widely accepted that the state is not the only actor in international relations, for it is evident that other actors also influence the course of world politics.[90] Although the transnational or multi-actor perspective has deep roots, Robert Keohane and Joseph Nye are credited by many as being at the vanguard of its most recent re-emergence in the literature of international relations -- namely, in the form of the 'interdependence' school.[91] In 1971, they note that:

> The difference our world politics paradigm and the state-centric paradigm can be clarified most easily by focusing on the nature of the actors. The world politics paradigm attempts to transcend the 'level-of-analysis problem' both by broadening the conception of actors to include transnational actors and by conceptually breaking down the 'hard shell' of the nation-state.[92]

A number of writers associated with the literature on international regimes from the 1980s also explicitly cite the importance of non-state actors. Stephen Haggard and Beth Simmons, for example, observe that 'coalitions that span national boundaries' can play important roles in international regime formation.[93] Oran Young reinforces this point by arguing that 'it would be a serious mistake to overlook the role of transnational alliances among influential interest groups in developing and

---

[89] Quoted in *The Independent* (London), 30 June 1990.

[90] See, also, the discussion in Chapter 1.2.3 of this thesis.

[91] See, for example, the work of the interwar idealists -- their ideas about international organisations in general and the League of Nations in particular. With regard to this re-emergence, meanwhile, see, for example, Robert O. Keohane and Joseph S. Nye, *Power and Interdependence: World Politics in Transition* (Boston, MA: Little, Brown, and Company, 1977); and *op. cit.*, in note 69 and accompanying text.

[92] Joseph S. Nye, Jr. and Robert O. Keohane, 'Transnational Relations and World Politics: A Conclusion', in Robert O. Keohane and Joseph S. Nye, Jr. (eds.), *Transnational Relations and World Politics* (Cambridge, MA: Harvard University Press, 1972), p. 380.

[93] Stephan Haggard and Beth A. Simmons, 'Theories of International Regimes', *International Organization* (Vol. 41, No. 3, Summer 1987), p. 513.

maintaining international regimes at the international level'.[94] These observations suggest the need to include actors other than states in any analysis of world politics.

These remarks are, however, not meant to suggest that the present investigation has been blind, up to this point, to the role of non-state actors. The influence of international governmental organisations, for example, is explicitly acknowledged throughout this thesis, particularly in Chapter 5.1. In addition, the impact of nongovernmental bodies (either formal or informal) are also noted -- for example, transnational networks of scientists and industry representatives (in Chapters 2 and 3, respectively, of this thesis). One set of actors that is not, however to this point, studied is environmental pressure groups. They are therefore considered in this section.[95]

Environmental pressure groups (EPGs) are those organisations not tied directly to government, industry or university that have active programmes related to environmental protection.[96] In this section,[97] the activities of their members at the 'elite-level' are examined. It is proposed that by associating with scientists, industry officers, government officials, international civil servants and other political figures, members of EPGs could accelerate the process of international regime formation. I would like to suggest a number of ways in which they could do this, grouped generally into two categories.[98] These ideas are supported by specific

---

[94] Young, *op. cit.*, in note 9, p. 364.

[95] Because of the important contributions of both the 'global' and the 'individualistic' approaches, these two are identified as inspiration for the inclusion of EPGs as a catalyst in the overall theoretical framework. (See the discussion in Chapters 1.2.1 and 1.2.3 of this thesis.)

[96] Adapted from Michael Oppenheimer, 'Responding to Climate Change: The Crucial Role of the NGO's', in H-J Karpe, D. Otten, S.C. Trinidade (eds.), *Climate and Development: Climatic Change and Variability and the Resulting Social, Economic and Technological Implications* (London: Springer-Verlag, 1990), p. 340.

[97] This section and the following section (Chapter 5.4 of this thesis) expand upon some ideas I originally put forward in Rowlands, *op. cit.*, in note 6, p. 113.

[98] Another means by which EPGs are important is their role in monitoring, and thereby also promoting, compliance with international agreements. (See, for example, Lynton K. Caldwell, 'Beyond Environmental Diplomacy: The Changing Institutional Structure of International Cooperation', in John E. Carroll (ed.), *International Environmental Diplomacy: The Management and Resolution of Transfrontier Environmental Problems* (Cambridge: Cambridge University Press, 1988), pp. 22-24.) Indeed, the evidence from the ozone layer issue reveals their importance in this respect. (See, for example, Richard Elliot Benedick, 'Protecting the Ozone Layer: New Directions in Diplomacy', in Jessica Tuchman Mathews (ed.), *Preserving the Global Environment: The Challenge of Shared Leadership* (London: W.W. Norton and Company, 1991), p. 146.) Additionally, by the end of 1991, the need for bodies that could monitor and promote compliance on the global warming

examples from the histories of the politics of ozone layer depletion and global warming. The study of the EPGs' elite-level activities in this section is complemented by an investigation, in Chapter 5.4 of this thesis, of the ways in which EPGs help to educate and to mobilise public opinion (which, it is proposed in Chapter 5.4, can also catalyse the process). The present focus upon environmental pressure groups is thus intended to broaden further our recognition of the range of actors that are active in the process of international regime formation on both the ozone layer depletion and the global warming issues.

### 5.3.1 -- Environmental Pressure Groups Creating or Cleaning Channels of Communication

Environment pressure groups could accelerate the process of international regime formation by creating or cleaning channels of communication. These potential or actual channels might exist between any of a variety of actors in international society, and their quicker construction or clearing might hasten the process of regime formation by allowing signals to travel from one actor to another more swiftly. While considering the two most important such channels in theory,[99] I offer some examples from the experience of the international politics of both the ozone layer depletion and the global warming issues.

First, channels of communication might be built between EPGs of different countries. Their use might, in turn, accelerate the rate of regime formation. Suppose that one state (A) is 'behind' another state (B) in the political development of a particular issue. The EPG in state A can provide information about the successes that it has had in its campaigning experience so as to assist the EPG

---

issue was also recognised. (See, for example, Owen Greene, 'Building a Global Warming Convention: Lessons from the Arms Control Experience?', in Michael Grubb and Nicola Steen (eds.), *Pledge and Review Processes: Possible Components of a Climate Convention* (London: Royal Institute of International Affairs, 1990), pp. xxi-xxxiii.) Despite this importance, however, the role of EPGs as agents of compliance is not included as one of the two most important functions for EPGs, because their involvement in monitoring and promoting compliance has more to do with regime 'maintenance' (or 'strengthening') than regime 'formation' (interview with Iwona Rummel-Bulska, Ozone Secretariat, United Nations Environment Programme, Nairobi, Kenya, 1 August 1991).

[99] A third important set of channels might be created between EPGs and officials of foreign countries. Scott Hajost, for one, notes that in Washington, DC, there are links between EPGs and the environmental attaches of various embassies. For these foreign diplomats, EPGs provide a 'bell-weather indicator' of feeling in the host country and they can also provide important technical expertise to which the foreign diplomat may not have access (interview with Scott Hajost, Environmental Defense Fund, Washington, DC, 19 April 1990).

in state B to work towards the same ends. This would allow the EPG in state B to work more efficiently towards its goals. Consequently, the key actors in state B may 'learn' more quickly, and therefore the rate of regime formation in international society will be accelerated. This theoretical supposition was indeed played out during the process of international regime formation to preserve the ozone layer.[100]

To take one example, Buxton notes that in Canada, a public awareness campaign about the damage being done to the ozone layer was started well in advance of similar campaigns in the states of the European Communities. Therefore, once European EPGs started to campaign actively on the ozone layer issue, they were briefed and given information by their Canadian counterparts. More specifically, Buxton contends that the information that Friends of the Earth in Canada provided to Friends of the Earth International in the United Kingdom enabled, at least in part, the British group to promote the issue so successfully.[101] Oppenheimer identifies similar links between American and European EPGs. The construction of these channels of communication, he maintains, allowed 'technical information on ozone depletion and the potential availability of CFC substitutes [to be exchanged]'.[102] If these channels of communication between EPGs had not been constructed, then the European EPGs' campaigns might not have been as effective and an international regime might not have formed as quickly.

With the expansion of the information network for nongovernmental organisations during 1990 and 1991, meanwhile, more channels of communication among EPGs were in place during the politically formative years of the global warming issue than had been the case during the same stage of the ozone layer issue. The growth of the 'GreenNet' electronic mail network[103] and the formal

---

[100] It should be noted that the involvement of environmental pressure groups on the ozone layer issue in the United States can be traced back to the original SST debate during the late 1960s and early 1970s (see Chapter 2.1.2 of this thesis). Douglas Ross highlights, in particular, the involvement of the Citizens League Against the Sonic Boom, the Friends of the Earth and the Environmental Defense Fund (Douglas Ross, 'The Concorde Compromise: The Politics of Decision-Making', *The Bulletin of the Atomic Scientists* (Vol. 34, No. 3, March 1978), p. 49).

[101] Interview with Buxton, *op. cit.*, in note 43.

[102] Oppenheimer, *op. cit.*, in note 96, p. 345.

[103] This was an international electronic communication network for 'environment, peace and human rights' (GreenNet promotional material, London).

organisation of an EPG conference in parallel to the 1992 United Nations Conference on Environment and Development[104] are but two examples of this increase for environmental issues in general. Furthermore, Oppenheimer's observation that 'an incipient international [EPG] network on the atmosphere [was] in place [in 1990] which [could and did] serve as a mechanism for dissemination of information on climate warming'[105] demonstrates that there was also such expansion on the global warming issue in particular. Given these developments, EPGs were able to communicate among themselves more easily. Accordingly, the creation of such transnational links might have driven the process of international regime formation on the global warming issue as well.

As a second hypothesis, significant channels of communication between states' representatives might be built or cleansed by EPG officials. An EPG's envoy, for example, might act as a liaison between high ranking governmental officials of two different states. These officials, who would otherwise require authorisation and other elements of protocol and officialdom in order to communicate, could correspond by means of an unofficial EPG intermediary.[106] In this way, views, opinions and positions could be transmitted between states' representatives, and the negotiating process could thereby be advanced.

Tom Burke, for example, relates one such incident from the politics of the ozone layer that occurred in March 1989.[107] At the meeting of the European Communities at which it was decided to implement a 100 per cent ban on ozone-depleting chemicals,[108] word of the proposed restriction was somehow leaked prematurely. Burke heard the news and, subsequently in Brussels, he mentioned it to Eileen Claussen of the US Environmental Protection Agency (EPA). She consequently relayed this information to William Reilly, Administrator of the EPA, in a meeting. Reilly took this news to the White House, where individuals were

---

[104] The '92 Global Forum was scheduled to be 'a series of simultaneous events which [would provide] an opportunity for all sectors to express their independent views at the time of the Earth Summit [the UNCED]'. (See, for example, "92 Global Forum Underway', *National Secretariat UNCED'92 Newsletter* (Vol. 1, No. 4, Fall 1991), p. 3; and, more generally, the work of the 'Centre for Our Common Future' in Geneva.)

[105] Oppenheimer, *op. cit.*, in note 96, p. 345.

[106] Interview with Tom Burke, Green Alliance, London, 4 June 1991.

[107] *Ibid.*

[108] See, for example, John Palmer, 'Total Ban on CFCs in Europe', *The Guardian* (London), 3 March 1989, p. 1.

gathering to formulate the American position for the upcoming 'Saving the Ozone Layer' conference in London. US officials, not wanting to be overtaken at the forefront of this issue, also proposed a 100 per cent ban.[109] Thus, the United States joined the members of the European Communities in agreeing to eliminate ozone-destroying chemicals in a quite dramatic and sudden manner. Although this achievement cannot be solely credited to Mr. Burke, the actions of this EPG representative nevertheless did help to accelerate the process of international regime formation.[110]

During the early 1990s, however, opportunities for EPG representatives to play a similar role on the global warming issue decreased for two reasons. First, there was a greater number of meetings at the intergovernmental level, which afforded representatives of different states more opportunities for interaction. Second, EPGs' representatives found themselves becoming increasingly involved in these formal negotiations directly, which meant that they were catalysing the process in a slightly different manner.[111] Nevertheless, there were, no doubt, still some opportunities for EPGs' representatives either to create or to clean channels of communication between states' representatives, although the investigation did not reveal an example as striking as the one on the ozone layer issue that is cited above.

### 5.3.2 -- Environmental Pressure Groups' Involvement in the Technical Debate

As a second possible means of speeding up the process of regime formation, members of environmental pressure groups (EPGs) could constructively engage in the international negotiations in two significant ways. First, they could contribute to both the technical and the political discussions by presenting the results of their

---

[109] David Dickson and Eliot Marshall, 'Europe Recognizes the Ozone Threat', *Science* (Vol. 243, 10 March 1989, p. 1279).

[110] Although Ms. Claussen was unable either to confirm or to deny this particular incident, she noted that the US government receives 'information on various industry, government, and environmental group positions from a wide range of sources...'. Further, she maintains that 'environmental groups, and for that matter industry groups too, have provided an extremely useful source of information. In performing this function these groups have disseminated information extremely effectively and in that way have helped shape government policies.' (Eileen B. Claussen, Director, Office of Atmospheric and Indoor Air Programs, US Environmental Protection Agency, Washington, DC, personal communication, 28 February 1992.)

[111] See Chapter 5.3.2 of this thesis for a further discussion.

independently-conducted research, thereby raising the standard of the debate in the international deliberations. In theory, their interventions could help negotiators reach particular insights in a shorter time-period or provide the participants with a greater quantity of information and, possibly, more independently-verified conclusions. Granted, these statements are based upon the assumption that deems that the accumulation of knowledge will bring one closer to the 'Truth';[112] nevertheless, as is argued in Chapter 2 of this thesis, more research can generate consensual knowledge more quickly and thereby accelerate the satisfaction of the first hypothesised precondition. Additionally, the EPGs' research would not necessarily have to be restricted to the scientific aspects of the issues. The research undertaken might concern policy and treaty drafting and analysis (for example, the effects and ramifications of various proposed paths of action).

Second, members of EPGs could serve as appropriate 'checks and balances', thereby helping to ensure that the analyses of the issues under consideration are both rigorous and peer-reviewed. Although this might slow the process in the early stages, perhaps by challenging a preferred view, it is hypothesised that, in the end, it might accelerate the process. Extensive early scrutiny of the issue could well circumvent the future derailing of the negotiations and avoid the need to start the process all over again. Thus, because pressure group leaders have 'specialist knowledge of their subject',[113] they could, theoretically, enrich the technical debate and thereby accelerate the process of international regime formation either by presenting their own ideas or by challenging the ideas of others. To move from the speculative to the concrete, I would like to consider the more general activities of environmental pressure groups before specifically examining our two issues of global atmospheric change.

In 1991, the days when all environmental pressure groups were made up of 'fruit juice drinkers and sandal wearers'[114] appeared to have been long-

---

[112] Indeed, Young notes the positive impact that a 'veil of uncertainty' may have upon actors' willingness to enter into collective arrangements (Young, *op. cit.*, in note 68, p. 341).

[113] Peter Willetts, 'The Impact of Promotional Pressure Groups on Global Politics', in Peter Willetts (ed), *Pressure Groups in the Global System: The Transnational Relations of Issue-Orientated Non-Governmental Organizations* (London: Frances Pinter, 1982), p. 185.

[114] George Orwell, quoted in Editorial, *The Independent* (London), 26 May 1990, p. 18.

gone.[115] Instead, EPGs, at that time, were staffed by individuals who were well equipped -- both intellectually and materially -- to participate in the various debates. Lynton Caldwell contends that: 'Resources of money and appropriately skilled personnel have increased the ability of [EPGs] to influence the policy agendas of governments and to follow through to obtain action.'[116] In the United Kingdom, the appointment of a former Reader in Earth Science from Imperial College, Dr. Jeremy Leggett, as Director of Science at Greenpeace UK in 1989 demonstrates the increased importance that at least one EPG placed upon technical competence.[117]

A number of individuals have identified ways in which environmental pressure groups used their expertise effectively during the technical discussions on various environmental issues. Tom Burke argues that both by helping to separate the 'signal from the noise' and by building up constituencies for 'unpopular' science, EPGs increased the rigour of the scientific investigations.[118] He also believes that the EPGs built support for scientific inquiry and demanded answers to questions that governments did not want asked.[119] Additionally, Arthur Norman maintains that:

> [EPGs'] influence in many countries is considerable, and is on the increase in promoting environmental protection and improvement. Shrill publicity and exaggerated alarms are sometimes the tools of a minority of [EPGs], *but there is evidence of much powerful influence exerted by organisations which base their advocacy on careful scientific research and analysis.* Where these conditions exist new partnerships are replacing old confrontations; partnerships are now being formed between governments and [EPGs] and between [EPGs] and industry and commerce, resulting in numerous practical projects and in effective remedies for identified ills.[120]

---

[115] North observes that, by the end of the 1980s, American environmentalists had abandoned their sandals for suits (Richard North, 'Markets and Law Push US Towards Voluntary Change', *The Independent* (London), 27 September 1989, p. 26), while Ingram and Mann support this hypothesis with more substantive evidence (Helen M. Ingram and Dean E. Mann, 'Interest Groups and Environmental Policy', in James P. Lester (ed.), *Environmental Politics and Policy: Theories and Evidence* (London: Duke University Press, 1989), pp. 152-53).

[116] Caldwell, *op. cit.*, in note 98, p. 19.

[117] See, for example, Jeremy Leggett (ed.), *Global Warming: The Greenpeace Report* (Oxford: Oxford University Press, 1990).

[118] Interview with Burke, *op. cit.*, in note 106.

[119] *Ibid.*

[120] Arthur Norman, 'Interpreting the Signals', in Angell *et al*, *op. cit.*, in note 66, pp. 187-88. Emphasis added.

Oppenheimer, furthermore, contends that the EPGs had important roles to play in the 'development and implementation of specific solutions to problems'.[121]

The historical record lends credence to these views. During 1990, most importantly, EPGs began to take part in the formal, intergovernmental negotiations to a greater extent. The Bergen conference in May 1990 is particularly noteworthy.[122] At this meeting, Paul Brown notes that for 'the first time industry, trade unions, environmental groups, women and youth groups took part in the conference and were consulted by ministers in an attempt to bring democracy to the Bergen Process'.[123] Richard North, meanwhile, speculates that this 'was not meant to set a precedent, but almost certainly has'.[124] Taken together, these remarks and observations suggest that EPGs' involvement in the technical debate on environmental issues in general increased during the period to the end of 1991.

Moving on to the two specific issues under investigation in this thesis, let us first consider the politics of the ozone layer. Environmental pressure groups played a major role during these negotiations, particularly after the discovery of the ozone crater in 1985,[125] for they informed the technical debate, both in 'open' discussion and within the framework of the formal negotiations. Benedick recognises that environmental groups provided ideas, opinions and actions that 'often proved critical to the successful outcome' of the negotiations,[126] while Oppenheimer argues that, during the Montreal Protocol discussions, the EPGs' 'unique viewpoint probably swayed negotiators on not a few points'.[127] The groups that were particularly active in these regards were the Natural Resources

---

[121] Oppenheimer, *op. cit.*, in note 96, p. 343.

[122] See, for example, 'Bergen: Weak Declaration Adopted', *Environmental Policy and Law* (Vol. 20, No. 3, 1990), p. 84.

[123] Paul Brown, 'Global Slow-step Trips Up', *The Guardian* (London), 18 May 1990, p. 27.

[124] Richard North, 'Fight Against Pollution "Will Cause Anguish"', *The Independent* (London), 17 May 1990, p. 8.

[125] Sand reports that 'no conservation NGOs attended the Vienna Conference [in March 1985]', and that while 'industry spokesmen were also official members of several national delegations (for example, those of Japan and West Germany), not one of the more than one hundred national and EEC delegates and observers came from the environmental NGO community' (Peter H. Sand, 'Protecting the Ozone Layer: The Vienna Convention is Adopted', *Environment* (Vol. 27, No. 5, June 1985), p. 42).

[126] Benedick, *op. cit.*, in note 98, p. 146.

[127] Oppenheimer, *op. cit.*, in note 96, p. 345.

Defense Council (US)[128], the World Resources Institute (US)[129] and the Friends of the Earth (which was based in the United Kingdom, although it operated worldwide).[130]

On the climate change issue, meanwhile, the involvement of EPGs in the technical debate increased during the late 1980s and the beginning of the 1990s. Substantially researched and documented materials published at this time by, for example, the Worldwatch Institute[131] and Friends of the Earth[132] demonstrate that these organisations' interest in contributing to the technical discussions on global warming was significant. Oppenheimer also notes that the EPGs had 'a pivotal role to play in advocating the appropriate technologies for the future'.[133] During the global warming negotiations, in addition, EPGs contributed to the 'social science' aspects of the technical debate (and thus not simply the natural-scientific issues), for various organisations analysed negotiating prospects[134] and proposed draft articles for a possible international convention on climate change.[135] These observations suggest that the range of the EPGs' participation in the global warming negotiations was substantial.

In addition, the aforementioned increase in the level of participation by EPGs in the formal negotiations on the environment during this period[136] had particular

---

[128] The lawsuit against the EPA that the NRDC launched was instrumental in prompting US policy action. (See the discussion in Chapter 3.1.3.) In addition, Benedick notes particularly their contributions (Benedick, *op. cit.*, in note 22, p. 166). See, also, Diane M. Doolittle, 'Underestimating Ozone Depletion: The Meandering Road to the Montreal Protocol and Beyond', *Ecology Law Quarterly* (Vol. 16, No. 2, 1989), pp. 435-36.

[129] Lois R. Ember *et al*, 'Tending the Global Commons', *Chemical and Engineering News*, 24 November 1986, p. 56.

[130] Interviews with officials in Washington, DC, April 1990; and personal communications, officials in London, June 1990.

[131] Christopher Flavin, *Slowing Global Warming: A Worldwide Strategy* (Washington, DC: Worldwatch Paper 91, October 1989).

[132] Friends of the Earth, *The Heat Trap: The Threat Posed by Rising Levels of Greenhouse Gases* (London: Friends of the Earth, September 1989).

[133] Oppenheimer, *op. cit.*, in note 96, p. 343. See, also, the book that he co-wrote: Michael Oppenheimer and Robert Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (London: I.B. Tauris & Co. Ltd., 1990).

[134] See, for example, Jessica T. Mathews *et al*, *Greenhouse Warming: Negotiating a Global Regime* (Washington, DC: World Resources Institute, 1991).

[135] See, for example, William A. Nitze, *The Greenhouse Effect: Formulating a Convention* (London: The Royal Institute of International Affairs, 1990).

[136] *Op. cit.*, in notes 122-124

ramifications for the global warming issue. On the one hand, the constructive contributions that some of these representatives made during the meetings are recognised by a number of governmental negotiators who were participants in the discussions.[137] On the other hand, the actions of particular EPG representatives are not viewed so favourably by others. Andrea Imada reports on one such incident from the Second World Climate Conference in Geneva in November 1990:

> David McRobert, Pollution Probe's [a Canadian EPG] global warming programme coordinator, who attended some of the policy-making sessions [at the Second World Climate Conference in Geneva], caught Canadian bureaucrats red-handed trying to convince delegates from other countries to take a lenient line on the international response to global warming. At a drafting session for the ministers' statement, which all countries would sign, McRobert listened in disbelief as two Canadian delegates encouraged other countries to gut the wording of the final statement and eliminate all references to the Toronto target. McRobert, who released the details of the Canadian deception to the media, was later chastised by Kirk Dawson, a senior civil servant with Environment Canada.[138]

There was deep disappointment on the part of some Canadian government officials at this time.[139] To cite another example, Greenpeace's 'stunts' at the same conference irritated some of the other officials who attended.[140] By the end of 1991, therefore, such actions had caused some governmental negotiators to distrust the actions of some EPG representatives.[141] One effect was that the access of EPGs' representatives to some states' officials was restricted, thereby decreasing their participation in the formal process. This, in turn, curtailed the ability of some EPG representatives to act as effective catalysts on the global warming issue.[142]

---

[137] Interview with Philippe Orliange, Representant Permanent Adjoint de la France, Aupres de l'Office des Nations-Unies a Nairobi, Ambassade de France au Kenya, Nairobi, Kenya, 15 July 1991; and interview with Usher, *op. cit.*, in note 48.

[138] Andrea Imada, 'Canada's Cool Response to Global Warming', *Probe Post* (Spring 1991), p. 27.

[139] Interviews with officials from Environment Canada, Hull and Ottawa, Canada, January 1991.

[140] Interview, for example, with Usher, *op. cit.*, in note 48, 1 August 1991; and interview with Hoogendoorn, *op. cit.*, in note 24.

[141] Interviews with officials in Nairobi, Kenya, July and August 1991.

[142] On the ozone layer depletion issue, meanwhile, Benedick expresses similar feelings about Greenpeace's 'confrontational' techniques. He does admit, however, that Greenpeace 'focused needed attention on problems of monitoring compliance and industry secretiveness about its data' (Benedick, *op. cit.*, in note 22, p. 166).

### 5.3.3 -- A Summary of the Roles of Environmental Pressure Groups

At the beginning of this section, a suggestion is made that environmental pressure groups (EPGs) might be able to accelerate the rate of international regime formation in two key ways. First, their members might be able both to create and to clean channels of communication, and, second, they might also be able to contribute to the technical debate. Indeed, the findings from the study of global atmospheric change reveal that there is at least some truth in these hypotheses. Not only do many governmental negotiators in international society recognise the valuable roles that EPGs play, but at least one even goes so far to suggest that they are the key ingredient in the process of regime formation.[143]

Although this finding would suggest that the presence of EPGs is not only a catalyst in the process, but is rather a precondition, there are other findings that suggest that their identification as a catalyst is, indeed, appropriate. In an analysis specifically related to the issues of global atmospheric change, Peter Usher suggests that even without the presence of campaigning environmental pressure groups, an international regime could nevertheless have been formed to preserve the ozone layer. EPGs were simply another body pushing; they helped to keep the process on track.[144] In support of this, Peter Haas argues that:

> In general, public sentiment and the activities of nongovernmental organizations such as Friends of the Earth had little impact on the adoption of CFC controls. Instead, they tended to merely reinforce government regulations that had already been introduced.[145]

Moreover, a number of officials note that governments were the key players during the formal negotiations on the global warming issue in 1990 and 1991.[146] In this way, they highlight the fact that although EPGs were influential in their ability to accelerate (or, at times, to retard) the rate of regime formation, they were not

---

[143] Interview with Oleg Alex Chistoff, Counsellor, Canadian High Commission, Nairobi, Kenya, 26 July 1991.

[144] He also suggests that if there had not been an ozone crater, then EPGs might have had a more important role to play (interview with Usher, *op. cit.*, in note 48, 1 August 1991).

[145] Haas, *op. cit.*, in note 81, p. 218.

[146] Interview with Mazairac, *op. cit.*, in note 25; interview with Usher, *op. cit.*, in note 48; and interview with Orliange, *op. cit.*, in note 137. Further, although some maintain that EPG participation in the global warming talks is guaranteed by precedence (*op. cit.*, in note 124), Usher nevertheless believes that their right to participate could be quickly withdrawn (interview with Usher, *op. cit.*, in note 48).

central to the process. This revelation also substantiates the assertion that EPGs, although important simulators in the process of regime formation, are not necessarily vital for its success.

### 5.4 -- The Mobilisation of Public Opinion

> A well-informed public is vital in spurring governments to act to protect the environment.
>
> Stanley Clinton Davis
> former European Communities Environment Commissioner[147]

Changes in public opinion can have a considerable effect upon the process of international regime formation on particular issues. This would appear to be especially true in the cases of environmental issues, because individual activities both affect and are affected by the health of the environment. Unlike some other international issues -- for example, traditional forms of military security -- 'control' over the environment issue is not solely in the hands of a elite corps of the state's decision-makers, but is instead in the hands of every member of the general population.[148] Because environmental issues are perceived to have a more direct relationship with the general level of welfare of the individual, public opinion is considered as a factor in the process of international regime formation.[149]

By themselves, however, changes in individuals' views about certain issues might not necessarily be forces for regime formation. Therefore, the proposition put forward in this section is that the extent to which public opinion *is mobilised* might have a bearing upon the rate of international regime formation and thus have the potential to act as a catalytic factor. The rationale is that if public opinion is mobilised, then individuals will be able to use a variety of tools -- economic, political

---

[147] Stanley Clinton Davis, 'Environmental Advance and the European Community', in Angell *et al*, *op. cit.*, in note 66, p. 160.

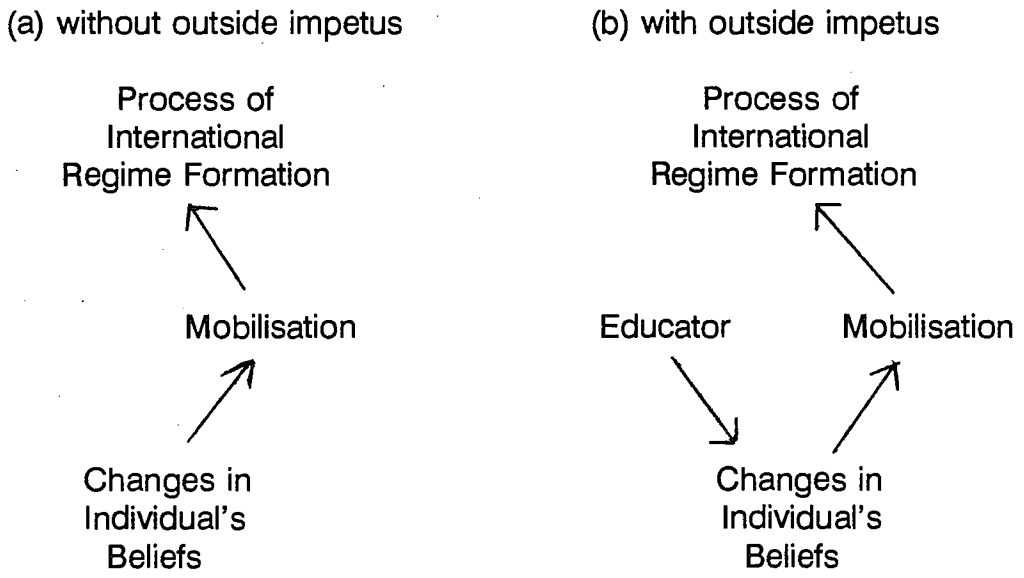
[148] While decisions about the deployment of weapons are in the hands of members of elites, decisions about the use of, for example, CFCs and automobiles, are in the hands of all members of the population (Daniel Deudney, 'The Case Against Linking Environmental Degradation and National Security', *Millennium: Journal of International Studies* (Vol. 19, No. 3, Winter 1990), pp. 464-65).

[149] Dunlap notes that, in particular, 'it has been argued that environmental issues have inherently broad appeal because environmental problems affect virtually everyone' (Riley E. Dunlap, 'Public Opinion in the 1980s: Clear Consensus, Ambiguous Commitment', *Environment* (Vol. 33, No. 8, October 1991), p. 15).

or social -- with which they can exercise leverage and can push actors in international society down the path of regime formation.

This hypothesis, nevertheless, begs the question: if shifts in public opinion occur, what causes them? Two responses are suggested. First, there might be a traditional 'ground-swell' of change in public opinion, which might be spurred by changes in individuals' beliefs in the absence of outside prompting. By suggesting that the origins might be at such a grass-roots level, an imbalance that permeates a great deal of this thesis is (at least partially) redressed. More specifically, much of the focus in this work is upon what can be called 'top-down' processes -- that is, the analysis stresses the actions and initiatives of various elites in international society (for example, scientists, industry chief executive officers, government officials, international civil servants and pressure group leaders). To counter this view, I am suggesting here that not only could the individual matter, but that the 'average individual' could matter, for s/he might accelerate the process of regime formation.[150] Granted, the feelings and associated actions of individuals could eventually spawn groups for implementing collective choice that could become elitist, but, in such instances, it would remain the case that the concern originated at the level of the individual. (See Figure 5.1.)

FIGURE 5.1 -- *The Mobilisation of Public Opinion*




[150] Because of this focus upon the 'individual', one should not be surprised to discover that the inspiration for the inclusion of this factor is the work of the 'individualistic' scholars in international relations. (See Chapter 1.2.3 of this thesis for a discussion of their work.)

Second, shifts in public opinion could also be triggered by specialised groups in international society. Specific groups might act as educators, whose members help to change individuals' beliefs on a particular issue by illuminating certain facts. In this instance, the concern among individuals would not 'spontaneously' arise without the participation of other actors. Once the general population was mobilised, however, public opinion would act as a catalyst for international regime formation in ways similar to those that are outlined above. (See, also, Figure 5.1.) Before we consider our two issues of global atmospheric change in particular, let us first consider the ways in which the mobilisation of public opinion has affected the process of international regime formation on environmental issues more generally.

First, during the 'second environmental revolution' of the late 1980s and early 1990s,[151] there was a general surge of concern for international environmental issues, not only in the developed world, but also in the developing world.[152] From 1990, Arthur Norman notes:

> [W]ithin the last few years the force of public opinion on environmental issues, particularly in the industrialised democracies of the northern hemisphere, has become manifestly stronger, better founded on scientific evidence of real hazards, and more insistent in its demands for action than at any time in the past.[153]

Thus, we should first recognise that there was a feeling that the environment was important and that something needed to be done to preserve it.

As argued above, however, a feeling that one group wants change does not by itself have an impact upon another group, unless the group that desires change is able to influence the other group. Thus, the feeling among members of the public that action should be taken on the environment would only be important if

---

[151] It is generally recognised that the 'first environmental movement' took place during the late 1960s and early 1970s. See, John McCormick, *The Global Environmental Movement: Reclaiming Paradise* (London: Belhaven Press, 1989); and Riley E. Dunlap, 'Public Opinion and Environmental Policy', in Lester (ed.), *op. cit.*, in note 115, pp. 95-101.

[152] A number of polls and survey reflected this concern. See, for example, reports cited in Dunlap, *op. cit.*, in note 149; Nay Htun, 'The Environmental Challenge and the Impact on the Oil Industry', *Energy Policy* (Vol. 18, No. 1, January/February 1990), p. 5; and Jim MacNeill, Pieter Winsemius and Taizo Yakushiji, *Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology* (Oxford: Oxford University Press, 1991), p. 68.

[153] Norman, *op. cit.*, in note 120, p. 183.

they were able to make their sentiments known to the elites -- society's decision-makers -- in a forceful way.[154] Only then would the latter take action, let alone notice. In international society during the late and the early 1990s, that connection between the governed and the governing was indeed made. Norman outlines how the mobilisation of public opinion had an impact at this time:

> There is now wider recognition that this tide of public opinion is still becoming more powerful and it has already demonstrated, in some countries, the ability to influence voting patterns, to halt a great new industry in its tracks, to change agricultural policies and practices and to strangle the markets for products which are known to be contributors to major environmental risks.[155]

By making particular choices, individuals effectively demonstrated their concern for environmental issues at this time. The choices that they made, more specifically, were political,[156] economic[157] and social.[158] With a variety of tools available

---

[154] Friend maintains that government officials 'are too busy to look ahead and can, therefore, only respond to outside stimuli, such as public opinion' (interview with Friend, *op. cit.*, in note 85). In a similar tone, Oppenheimer asserts that governments are 'constrained by the exigencies of the day. In some cases, these are imminent questions of survival.' (Oppenheimer, *op. cit.*, in note 96, p. 343.) Norman, additionally, recognises that:

> No political party and few decision-takers in the business world can believe that they are insulated from the effects of this new pressure for changes which, if implemented, would change much else. Political and business leaders have always relied upon their ability to read, interpret and act upon the signals coming from their market places; few of them would deny that their most costly errors and lost opportunities can be attributed either to poor research and observation, or to false deductions leading to mistakes of concept or timing, which have handed competitive advantage to others. In practice political and business managements have begun to make adjustments to policy and practice -- optimism is justified.

(Norman, *op. cit.*, in note 120, pp. 183-84.)

[155] *Ibid.*, p. 183.

[156] For example, the 15 per cent share of the vote that the Green Party received during the 1989 European elections in the United Kingdom sent shock waves through the ranks of the other, established parties in that country. (See, for example, Michael Ignatieff, 'Why I Voted for the Greens', *The Observer* (London), 25 June 1989.)

[157] The power of 'green consumerism' increased during the latter part of the 1980s. In the United Kingdom, for example, the number of 'green consumers' (that is, those who had selected one product over another for environmental reasons) grew from 19 per cent in 1988 to 50 per cent in 1990 (Frances Cairncross, *Costing the Earth* (London: Business Books, Ltd. in association with The Economist Books, Ltd., 1991), p. 155, Table 17). See, also, the discussion in Chapter 3 of this thesis.

[158] The membership of 'green' organisations grew at a tremendous rate during the late 1980s. In the United Kingdom, for example, membership of the Friends of the Earth increased almost seven-fold to 200,000 between 1985 and 1990. While in the United States, membership of Greenpeace more than quadrupled to 2 million during the same period (Cairncross, *op. cit.*, in note 157, pp. 12-13, Tables 1 and 2).

to them, decision-makers had to take some notice.[159]

As is noted above, however, an observation that public opinion exists begs one to question its origin. Thus, to examine this, let us take a step back for a moment in order to discern whence this interest came. As was suggested in the original hypothesis, we can speculate that some of this concern for environmental issues came from the individual himself or herself, while some of it was encouraged by outside factors.

First, let us consider the linkage between personal action and environmental degradation. The environmental issues (or for that matter, any issues) that will be most prone to involve members of the general public are those that have direct, traceable links between present-day activity and the future level of welfare -- that is, when an individual's mind can make a link between the promulgated threat and the individual's own future well-being.[160] This hypothesis is supported by the history of the politics of dichloro-diphenyl-trichloroethane (DDT). The tangibility of the link between the use of DDT and its presence in birds' eggs, and throughout the food chain more generally, helped to give rise to substantial public pressure in favour of its prohibition.[161] But, more generally, has such an interest arisen spontaneously, or has it required mobilisation by an outside body?

The determining factor in answer to the question has to do with the visual and tangible characteristics of the perceived cause and effect. It is suggested that public attention will be self-mobilised if the particular environmental problem visually impacts the routine activities of individuals. Consider, for example, the case of an

---

[159] Charles Caccia argues that an 'informed public and mobilised public opinion can make a substantial difference in determining the behaviour of governments in response to sustainable development' (Charles Caccia, 'OECD Nations and Sustainable Development', in Angell *et al*, *op. cit.*, in note 66, p. 127). Oppenheimer and Boyle, furthermore, cite a particular example -- namely, the 1989 revolutions in Eastern Europe. This experience, they maintain, suggests that '...environmentalism seems [to be] on the verge of becoming a new organizing principle' (Oppenheimer and Boyle, *op. cit.*, in note 133, p. 193). Additionally, Holdgate highlights the ongoing importance of public opinion on environmental issues: 'It is clear that the future of the world's environment depends on how far collective awareness of our problems is reflected in individual action, and how far this in turn feeds through into collective action by local communities, industries and governments.' (Martin Holdgate, 'Changes in Perception', in Angell *et al*, *op. cit.*, in note 66, p. 94.)

[160] Interview with Brian Herman, Deputy Director, Energy and Environment Division, External Affairs and International Trade Canada, Ottawa, Canada, 2 January 1991; interview with Tim Leah, National Secretariat, 1992 UNCED, Environment Canada, Hull, Canada, 2 January 1991; and interview with Douglas Russell, Director, Climate Change Convention Negotiations, Atmospheric Environment Service, Environment Canada, 2 January 1991.

[161] See, for example, Rachel Carson, *Silent Spring* (Harmondsworth: Penguin, 1965).

annual family picnic. If, one year, the members of a family discover that their favourite picnic spot has become spoilt by pollution, then environmental deterioration will become a concern for them, because it has had an impact upon their traditional ritual.[162] When individuals are mobilised in this way, the general surge of public opinion about the cause of the pollution will increase. In this type of environmental issue, there will be no need of outside forces to prompt mobilisation.[163]

In the absence of such visibility, however, external forces might be needed in order to educate individuals and thereby to trigger change in public opinion on environmental issues. Martin Holdgate identifies the media as one such set of forces, noting that the press and electronic agencies can make people 'increasingly aware of the dependence of human societies on the resources of the planet and the continuing maintenance of the essential processes of the biosphere'.[164] While both formal education and scientific research contributed to this sensitivity, he argues that

> modern environmental awareness has largely been created by journalists, radio commentators and television presenters. It has inevitably been built on 'news stories' which touch the emotions of those they address. The vast majority of individuals alerted by those stories have neither the experience of nor involvement in the subject matter. The stories are commonly made memorable by catchy headlines like 'Black Tide of Death', 'Have We Poisoned the Sea?' or 'The End of the Forests'. Some stories are fair reflections of genuine underlying fact: others exaggerate or trivialise. They have all, however, performed the important task of getting the message across to the literate community that the world is in a mess and that people are responsible.[165]

Media attention upon disasters compelled people to recognise the link that existed between environmental degradation and the health and welfare of the individual. Therefore, public opinion demanded that 'something' be done.[166]

---

[162] Interview with Juan Antonio Mateos, Ambassador and Permanent Representative to UNEP, Embassy of Mexico, Nairobi, Kenya, 31 July 1991.

[163] Dunlap, *op. cit.*, in note 149, p. 14.

[164] Holdgate, *op. cit.*, in note 159, p. 85.

[165] *Ibid.*, p. 86.

[166] Leah goes on to argue that the public is not really 'informed'. Therefore, their sensitivity demands action, but their ignorance precludes them from knowing what action they want (interview with Leah, *op. cit.*, in note 160). Russell puts forth a similar argument (interview with Russell, *op. cit.*, in note 160).

Environmental pressure groups (EPGs) are another possible set of forces that could trigger shifts in public opinion. Findings from a study of environmental issues in general suggest that their members were perceived to be working in the public interest, and thus, when they highlighted the importance of a particular issue, members of the public took notice.[167] Furthermore, Peter Willetts maintains that the 'ability of NGOs to apply pressure is through the mobilization of legitimacy for their cause. Winning support by changing people's perception of the issues is done by presenting arguments and information.'[168] Oppenheimer supports this assertion by contending that only EPGs can, 'through public information, force those issues in a coherent fashion onto the political agenda, and frame the range of responses'.[169] Willetts also suggests that EPGs' leaders are particularly adept at influencing public opinion, because 'they gain skills in presenting their cause to the public and to the media'.[170] In such ways, it could be possible for EPGs to influence public opinion (by presenting their own views on an issue) and even to go so far as to modify or to change prevailing attitudes.[171] Without going beyond speculation about environmental issues in general, let us now turn to the ozone layer depletion to discern, first, the extent to which the mobilisation of public opinion played a catalysing role and to discover, second, what prompted the mobilisation of such public opinion (or, alternatively, discouraged the presence of any public concern).

### 5.4.1 -- The Mobilisation of Public Opinion and Ozone Layer Depletion

A number of scholars note not only the presence of significant levels of public opinion in the politics of the ozone layer depletion issue, but also its effective

---

[167] Burke argues that EPGs' representatives were trusted more than scientists, who in turn were trusted more than government officials, who in turn were trusted more than industry's employees (interview with Burke, *op. cit.*, in note 106). Also, interview with Leah, *op. cit.*, in note 160.

[168] Willetts, *op. cit.*, in note 113, p. 186.

[169] Oppenheimer, *op. cit.*, in note 96, p. 343.

[170] Willetts, *op. cit.*, in note 113, p. 185.

[171] Interview with Herman, *op. cit.*, in note 160. Additionally, a third possible mobiliser of public opinion might be government itself (see, for example, Dunlap, *op. cit.*, in note 151, p. 119).

mobilisation. While examining its impact in Europe,[172] Markus Jachtenfuchs, for example, asserts that: 'It was the pressure of their respective national public opinion which has finally pushed the negotiators to forward-looking behaviour.'[173] In addition, the mobilisation of public sentiment in the United Kingdom, in the form of an economic boycott, contributed to the change in the British government's position.[174] Benedick supports this assertion:

> Stimulated by pressure from British environmental groups, especially national affiliates of Greenpeace and Friends of the Earth, important parliamentary hearings were held in early summer 1988. Both houses of Parliament criticized the government's long-standing position and urged that the United Kingdom press the EC to endorse an 85 percent reduction.[175]

John Gribbin reinforces this general argument by specifically citing the importance of environmental issues for the West German electorate.[176] Oppenheimer and Boyle, in fact, suggest that pressure from the German public acted as the original catalyst in a process that culminated in the Europeans' change of policy during the late 1980s.[177] A report from the Canadian House of Commons, meanwhile, effectively demonstrates that the impact of public opinion on the ozone layer issue was by no means restricted to only one side of the Atlantic Ocean:

> Public pressure has been an effective force in accelerating the removal of CFCs from some products. The two most notable examples are the recent removal of CFCs from most aerosol products, and the substitution of an

---

[172] It should, nevertheless, be noted that public opinion did not have a substantial impact in Europe until much after it did in the United States, for some officials in Europe felt that the Americans were basing their policies on nothing more than emotion and scaremongering (interview with Fiona McConnell, UK Department of the Environment, London, 27 March 1990). Further, articles in the British press during the 1970s had titles like 'Ozone Passion Cooled by the Breath of Sweet Reason' (John Gribbin, *New Scientist* (Vol. 80, 12 October 1978), p. 94.), reflecting the British resolve to preserve sound judgment.

[173] Markus Jachtenfuchs, 'The European Community and the Protection of the Ozone Layer', *Journal of Common Market Studies* (Vol. 28, No. 3, March 1990), p. 275.

[174] *Infra*, in note 187, and accompanying text. A similar boycott was threatened on the European continent: 'Meanwhile, on 14 March [1988], the powerful European Bureau of Consumers' Unions (BEUS) warned it would boycott ozone-depleting spray cans unless firms speeded up plans to modify their products.' ('Supplement 3', *UNEP News* (No. 21, August 1988), p. 3.)

[175] See *ENDS Report 161*, pp. 17-18; and UK House of Lords, 'Seventeenth Report', p. 12. Both sources cited in Benedick, *op. cit.*, in note 22, p. 114, note 17.

[176] He says that: 'The reason [for action on ozone layer depletion] is simply public pressure, in a country [West Germany] where environmental politics matter ...'. (John Gribbin, *The Hole in the Sky* (London: Corgi, 1988), p. 146).

[177] They also note the importance of 'pressure brought by German greens' (Oppenheimer and Boyle, *op. cit.*, in note 133, pp. 48 and 193).

> HCFC and pentane for CFCs in some cups and packaging materials made from rigid foam. The public can do even more, for example, by choosing non-pressurized dispensers, or products packaged in non-petroleum-based material, or products with substantially reduced packaging. .... Just as consumers have been a driving force for industrial responsibility in the use of CFCs in the past, they can be a potent lobby for future initiatives to ban ozone-depleting substances and to control use of their substitutes. Public involvement is essential. That involvement in turn depends on a well informed public.[178]

Furthermore, Richard Benedick notes the influence of public opinion in the United States:

> [E]ducating and mobilizing public opinion can be a powerful force to generate pressure for action on often hesitant politicians. ... [On the ozone layer depletion issue, a]roused consumers brought about the collapse of the CFC aerosol market.[179]

Oppenheimer, in addition, echoes these sentiments, for he argues that the pressures exerted upon both government and industry accelerated the process of international regime formation by shifting American officials' perception of the issue.[180] Taken together, these comments suggest that the mobilisation of public opinion played an important role in accelerating the process of international regime formation on the ozone layer issue. We can propose, therefore, that in the absence of such public opinion, the process of international regime formation on the ozone layer depletion issue might have taken longer to complete.

To gain a better understanding of the ways in which public opinion contributes to regime formation on this particular issue, however, we should inquire as to its origins. To achieve this end, let us follow in the footsteps of the previous discussion on environmental issues in general, and begin by inquiring whether the ozone layer depletion issue had a demonstrated cause and effect link for the individual.

The answer to this question is 'yes', for it was perceived that an individual act (the use of certain aerosol sprays) would directly bring about harm to the

---

[178] The Standing Committee on Environment, House of Commons, Canada, *Deadly Releases CFCs* (Ottawa: Canadian Government Publishing Center, June 1990), p. 45.

[179] Benedick, *op. cit.*, in note 98, p. 145.

[180] Oppenheimer, *op. cit.*, in note 96, p. 343.

individual (in the form of skin cancer).[181] Because of the relative intangibility of the process of ozone layer depletion, however, this public concern could not have arisen 'spontaneously' without some sort of outside impetus. Let us, therefore, ascertain whether the media or EPGs provided such impetus.

The nature of the ozone layer depletion issue lent itself quite easily to media reporting, particularly after 1985. Stunning, dynamic and colourful pictures on the television evening news were able to demonstrate, both quickly and dramatically, how a hole in the sky was allowing destructive forces to hit the Earth's surface.[182] Similarly, the effects of such penetration -- increased incidence of skin cancer -- could also be displayed in an equally dramatic and alarming manner. Because the media were able to present three simple images -- a spray can, a map of Antarctica with a large crater over it and a person suffering from skin cancer -- to demonstrate cause and effect, they acted as important educators of the general population and thus mobilisers of public opinion.[183] In the United States, in particular, the

> interest of the media in the ozone issue and the collaboration with television and press by diplomats, environmental groups, and legislators had a major influence on governmental decisions and on the international negotiations.[184]

---

[181] Interview with Leah, *op. cit.*, in note 160. Although generally believed to be an uncontestable fact, the link between the recorded increase in rates of skin cancer and the recorded depletion in the ozone layer is not generally accepted. One reason for greater incidence of skin cancer may be changing habits among the populace. This led one researcher to label it 'the "yuppie disease" because it was to be observed more among affluent indoor workers who holiday in the sun' (Professor Mark Elwood of the University of Nottingham, quoted in Tim Radford, 'Ozone Loss Spells End of Sunbathing', *The Guardian* (London), 30 November 1988). Regardless, ozone layer depletion incited a fear among individuals of a tangible and personal harm. Indeed, the fact that President Reagan had two skin cancers removed (in 1985 and 1987) may have had an accelerating influence upon the process of regime formation (Benedick, *op. cit.*, in note 22, p. 67).

[182] The shock discovery of the ozone crater in 1985 was, in this instance, crucial. Further, the similarity with the US Strategic Defense Initiative (the 'Star Wars' programme) -- that is, instead of a nuclear weapon penetrating a 'peace shield', the aggressive weapon is ultraviolet radiation penetrating an 'ozone shield' -- may have helped members of the general public in the United States envisage the issue more easily.

[183] The fact that a film about ozone layer depletion was able to come out of Hollywood serves to reinforce the argument that the issue could be easily represented by the media. (In 1977, a film entitled *Day of the Animals* was produced. A writer for *The Financial Times* describes it as follows: 'An imbalance in the Earth's ozone layer causes animals living at high altitudes to become vicious -- and a mountain trek turns into a nightmare for a group of hikers.' (*The Financial Times* (London), no date given.))

[184] Benedick, *op. cit.*, in note 22, p. 205.

EPGs were also able to make use of the cause-effect link in order to publicise the threats to possible ozone layer depletion by aerosol propellants and other human-made chemicals. In the United States, public campaigns, in part orchestrated by environmental organisations, illuminated the cause-effect link and mobilised public opinion.[185] Although public opinion was not as persuasive in the countries of the European Communities before 1987 (because, at least in part, EPGs were not as active in Europe),[186] the situation changed dramatically after the events of late 1987 and early 1988. Under the charismatic leadership of Jonathan Porritt, Friends of the Earth UK launched a 'CFC-aerosol boycott' in the United Kingdom in 1988. In the absence of any governmental regulation, this campaign did much to inform the general public about the causes and consequences of ozone layer depletion and thereby make it a concern of the British populace.[187]

During the late 1980s and early 1990s, EPGs continued to play an important role in the strengthening of the international regime to protect the ozone layer by mobilising public opinion.[188]

> Environmental organizations [demonstrated] more sophistication than had been the case during the process leading up to Montreal. Both before and during the London meetings [in June 1990], Friends of the Earth International, Greenpeace International, and the Natural Resources Defense Council (NRDC) held press conferences and circulated brochures and briefing sheets to the public, the media, and officials to match the customary public relations output of industry.[189]

By such means, both the media and the EPGs brought the issue to the attention

---

[185] Oppenheimer, *op. cit.*, in note 96, p. 343.

[186] Interview with McConnell, *op. cit.*, in note 172.

[187] Note the different tones of remarks made by the UK Parliamentary Under-Secretary of State for the Environment and the Director of the Friends of the Earth UK at the Ozone Depletion Conference in London in November 1988. The former said that the 'self-regulatory approach' for industry was fully justified on the ozone layer issue. The latter, meanwhile, said that change in industry's attitude had come because of consumer pressure. (Virginia Bottomley, 'Protecting the Ozone Layer -- A Challenge for the World Community' (London, Ozone Depletion Conference, 1988); and Friends of the Earth Press Release, 'Jonathan Porritt Calls for Tougher Measures' (London, 29 November 1988).)

[188] A number of officials recognise the role that EPGs played in this issue (interview with Mazairac, *op. cit.*, in note 25; interview with Shane Cave, Editor, *Our Planet*, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991; and interview with Orliange, *op. cit.*, in note 137).

[189] Benedick, *op. cit.*, in note 22, p. 165.

of the general public and prompted shifts in the course of public opinion.

### 5.4.2 -- The Mobilisation of Public Opinion and Global Warming

Let us now turn our attention to the global warming issue and repeat the same sequence that is executed for both the investigations of environmental issues in general and the ozone layer depletion issue in particular. Therefore, first let us note that public opinion played a catalysing role in the early days of regime formation.[190] As such, decision-makers were forced to consider this popular concern. The study reveals, however, that the driving power of public opinion was not as evident on the global warming issue as it had been at its height on the ozone layer depletion issue. To attempt to explain this difference, let us go on to consider if global warming had a demonstrated 'cause and effect' link for the individual.

The answer to this question must be a tentative 'no', because the global warming issue was, as Atchley notes, more complex, more 'apocalyptic and diffuse' than, in particular, the ozone layer depletion issue.[191] Accordingly, individuals could not mentally link the individual act that enhanced global warming -- for example, driving a car -- to the consequences of a warmer world -- for example, rising sea-levels.[192] Even if the link could be made, the perceived impact of the identified 'harm' upon the individual was not readily apparent. Although the consequences might eventually be personal,[193] the image of a sea that was three or four inches higher did not give rise to any significant level of

---

[190] By 1989, 75 per cent of Americans in one survey felt that the problem posed by the greenhouse effect was 'very serious' or 'somewhat serious' (Cambridge Reports and Cambridge Reports/Research International, cited in Dunlap, *op. cit.*, in note 149, p. 36, Figure 8). See, also, MacNeill *et al, op. cit.*, in note 152, p. 110; and interview with Vincent Cable, Commonwealth Secretariat, London, 8 February 1990.

[191] Interview with John Kristian Atchley, Counselor of Embassy and Permanent Representative to UNEP, American Embassy, Nairobi, Kenya, 15 August 1991.

[192] Dunlap cites survey evidence which suggests that individuals did not believe that they could do anything about mitigating the course of the greenhouse effect (Dunlap, *op. cit.*, in note 149, p. 34).

[193] It is, nevertheless, instructive to recall an observation from the late 1970s: 'Two severe winters and a period of prolonged drought in California have, like the proverbial hangman's noose, had a wonderful concentrating effect on the collective minds of US political administrators.' (David Dickson, 'A Bad Year for Weather, a Good One for Climate', *Nature* (Vol. 273, 11 May 1978), p. 388.)

personal concern among most people.[194] Thus, it is not surprising to find that Holdgate notes that, by 1991, most people 'in the developed countries [had] yet to recognise their own personal involvement in global systems of interdependence'.[195] Although a warm summer, or, more generally, any situation that suggests that there was something 'wrong with the weather' might (either correctly or incorrectly) be attributed to the global warming phenomenon, a visible link to personal well-being was not necessarily evident for a vast majority of the population. Cairncross maintains that the global warming issue was in this way 'disadvantaged', *vis-a-vis* the ozone layer depletion issue: 'One reason for the successful negotiation of the Montreal agreement was the evidence that ozone depletion was dangerous to health. Global warming does not yet enjoy this perverse advantage.'[196]

This hypothesis is further supported by experimental and survey work that suggests that, although people were concerned about climatic change, the complex scientific realities were making it difficult for people to comprehend the phenomenon fully:

> 'Climate change is tricky,' said Baruch Fischoff, professor of social and decision science at Carnegie-Mellon University. 'People have a limited understanding of the scientific processes contributing to it. They may know a fair amount, but the pieces don't fit together.' A ... study by the Public Agenda Foundation found 'tremendous confusion' about the causes of global warming among lay people, said research director Nobel. 'People may think they know. But once you get beneath the surface, their understanding is very fragmentary, very unclear.'[197]

---

[194] In addition, there was the question of 'winners and losers'. Some Canadians and Scandinavians might actually have been attracted by the idea of a warmer world. See the discussion in Chapter 3.2.3 of this thesis.

[195] Holdgate, *op. cit.*, in note 159, p. 89.

[196] Cairncross, *op. cit.*, in note 157, p. 128. Indeed, the perceived cause-effect link among the population of developing countries was even less direct. Hoogendoorn recalls a story to support this: at an international meeting in Nairobi, Maneka Gandhi (Indian Environment Minister at the time) told UNEP Executive-Director Mostafa Tolba of the difficulties she had in making the global warming issue 'real' for the people of her country. One of the difficulties, she explained, was that most of the 800 million citizens of India could not actually picture a sea, let alone a sea-level rise! (Interview with Hoogendoorn, *op. cit.*, in note 24.) Moreover, survey work in the developing world supports this assertion, for one study found that 'global warming is not a priority for them' (Maria Elena Hurtado, 'Lukewarm Response to Controls', *PS (Panoscope)* (No. 24, May 1991), p. 14).

[197] Susan E. Davis, 'Greenhouse Effect: The Human Response', *The Washington Post* (Health Section), 17 April 1990, pp. 9-10. In the developing world, meanwhile, one study found that environmental concerns are 'highly coloured by [peoples'] personal experience. No room here for abstract concerns about the global environment.' (Maria Elena Hurtado, 'The People Speak Out',

This complexity did not allow international public opinion to force the process of regime formation at the pace that it did on the ozone layer issue. This meant that traditional mobilisers of public opinion were not able to act as effectively in the absence of a perceived cause-effect link: for the media, global warming could not easily be adapted to a 'sound bite';[198] for EPGs, meanwhile, their members were not able to organise campaigns on the issue as easily as they had on the ozone layer depletion issue. Taken together, these comments thus suggest that the mobilisation of public opinion made only a relatively minor catalysing contribution to the rate of regime formation on global warming up to the end of 1991.[199]

### 5.5 -- Summary

The purpose of this chapter is to examine the four proposed catalysts for international regime formation. The four catalysts, which, it is suggested, could hasten the time it takes to construct a regime, are: political entrepreneurs, the solidity of the broader international political system, environmental pressure groups and the mobilisation of public opinion. Their identification is legitimated by theoretical support and their importance on the ozone layer depletion and global warming issues is subsequently investigated. In this way, initial ideas about the relative catalytic contribution of each factor on each issue is discerned. There are, however, particular problems associated with this assessment. Although a longitudinal deconstruction allows us to discern if the two variables (catalyst concentration and regime formation) mirror each other over time, they do not, however, allow us to judge whether the relationship was, in fact, causal. The findings should therefore be treated with some caution. Nevertheless, the investigation reveals that the presence of each of these factors was significant -- to varying degrees -- on each of the two issues. Not only did they accelerate the formation of an international regime to preserve the ozone layer, but they also,

---

*PS (Panoscope)* (No. 24, May 1991), p. 8.)

[198] Interview with Atchley, *op. cit.*, in note 191.

[199] This finding concurs with a more general conclusion that Dunlap arrives at with regard to public opinion and environmental policy. He argues that environmental issues, though of concern to members of the public (particular in the United States), do not generate views with particularly strong intensity or salience. He contrasts this with some other issues, like employment or other economic matters, which may have more intense public involvement (Dunlap, *op. cit.*, in note 151, p. 131).

during the politically-early days of the global warming issue, facilitated the building of an international regime on it as well.

## Chapter 6 -- A Summary of the Findings

The findings of this thesis can be best summarised by dividing them into two groupings. On the one hand, there are a number of specific observations that arise from the empirical investigations of the politics of ozone layer depletion and global warming. These are reviewed in the first part of this chapter, where each of the seven factors (the three preconditions and the four catalysts) are examined in turn; the empirical findings are also summarised in Tables 6.1, 6.2 and 6.3. On the other hand, however, a second set of findings is much more general. These findings arise from the application of the theoretical framework to the two issues. They are presented at the end of this chapter.

Before a closer scrutiny of each of the factors is undertaken, it is important to note that not all of the findings related specifically to one of the seven hypothesised factors. First, the findings revealed significant overlap among all of the factors. Indeed, the number of cross-references used in the work indicates that we were right to speculate that the apparent parsimony of the framework would not preclude the discovery of such connections.[1] And second, the findings also showed that there were factors other than the seven hypothesised ones that affected the process of international regime formation, in at least a minor way. The implications of these findings are explored in the Conclusions of this thesis; for now, it is sufficient simply to note them.

The examination in Chapter 2 considered the proposition that a scientific consensus is necessary before an international regime can be built. An analysis of the history of the ozone layer depletion issue revealed that once concerns were raised by scientists about the destruction of stratospheric ozone, the issue attracted the attention of some decision-makers. Agreement regarding the cause of ozone layer depletion among most of the world's foremost atmospheric scientists, however, had to be in place before any substantial action to regulate the implicated chemicals would even be considered. In addition, the ozone layer experience showed that unexpected and dramatic scientific evidence can shake politicians out of their doldrums, for they are eager to be seen to be doing 'something' in the face of a visible problem. Thus, with both mounting theoretical

[1] See Chapter 1 of this thesis, particularly note 147, and accompanying text.

projections and dramatic empirical evidence of ozone layer depletion, the findings revealed that the first proposed precondition was gradually satisfied in the period between 1985 (discovery of the ozone crater above Antarctica) and 1988 (report of the Ozone Trends Panel).

On the global warming issue, meanwhile, certain scientific estimates of the consequences of everyday human activities were dramatic enough to catch the attention of decision-makers during the second half of the 1980s. Governments responded by establishing the Intergovernmental Panel on Climate Change; it met for the first time in 1988. This group's final report, which was presented in 1990, demonstrated that there was a significant degree of scientific consensus about the authenticity of the global warming problem. For this reason, therefore, it is evident that the first proposed precondition was satisfied at this time. The continuing absence of any unqualified proof of enhanced global warming, however, meant that rival explanations of climatic change could still gain attention in the political debate. Thus, the satisfaction of this precondition at the end of 1991 was not as solid as it was on the ozone layer issue.

The study in Chapter 3 considered the proposition that the perceived national costs of policy action among the statespeople of the world's industrialised countries must be tolerable before international regime formation is possible. From the review of the ozone layer depletion experience, an inverse correlation between the threat of proposed regulatory action and the costs of proposed regulatory action was discovered. As the prospects of national legislation increased, industry intensified its efforts to find substitutes for the ozone-depleting chemicals. It was not until these chemicals became commercially available that the possibility of substantial regulation was seriously entertained by the governments of the world's industrialised states. In this way, it is apparent that the second proposed precondition was satisfied in the period between 1986 (when initial indications of co-operation from American industry emerged) and 1988 (when Du Pont, ICI and the other large chemical manufacturers endorsed regulatory action).

A similar relationship between a government's willingness to regulate and its perceived costs was discerned on the global warming issue. However, because of the pervasive nature of the global warming problem, a significant proportion of every country's total economic activity would be affected by policies that restrict greenhouse gas emissions. The investigation revealed that no common set of

perceptions was held by all of the leaders of the world's industrialised states at the end of 1991. While some statespeople (particularly in Germany) felt that the costs of policy action were not unduly large, others (particularly in the United States) believed that such costs were too high to justify any significant change on the course of policy. In this way, it is evident that the second proposed precondition remained unsatisfied at the end of 1991.

In Chapter 4, it was suggested that equity in terms of North-South issues is another precondition for international regime formation. The examination of the ozone layer history revealed that there was a price to pay to obtain the participation of Southern states in any international regime. The developing world's representatives argued that fairness dictated that money and technology must be transferred from the North to the South in order to help their countries industrialise without the use of ozone-depleting chemicals. The investigation demonstrated that this was a major issue of contention, but one that appeared (at the time) to have been adequately resolved in June 1990 (at the Second Meeting of the Parties to the Montreal Protocol in London). An international fund was set up at this time to meet the calls for global equity, which led to the assertion that the third proposed precondition was thus satisfied at this time. Subsequent developments, however, suggested that its status may have become more precarious by the end of 1991.

The review of the history of the other issue of global atmospheric change demonstrated that global equity became an issue in the politics of global warming at a very early stage. By 1991, moreover, it had become one of the most significant parts of the debate for statespeople of both the North and the South. The study revealed, however, that many individuals still held markedly different conceptions at this time concerning how the issue should be addressed. In particular, questions about burden-sharing, transfer size, source of transfers, administration and technology transfer remained contentious. Consequently, the third proposed precondition for international regime formation on global warming had yet to be satisfied by the end of 1991.

TABLE 6.1 -- *The Results of the Investigation into International Regime Formation: The Extent to Which the Preconditions were Satisfied at the End of 1991*

| | Ozone Layer Depletion | Global Warming |
|---|---|---|
| Scientific Consensus | high (satisfied in 1985-88) | medium-high (satisfied in 1990) |
| Tolerable Domestic Economic Costs | high (satisfied in 1986-88) | low-medium (unsatisfied) |
| Global Equity | medium-high (satisfied in 1989-90) | low (unsatisfied) |

Finally, the hypothesised catalysts for international regime formation were examined in Chapter 5. Unlike the proposed preconditions, we were not trying to discover if a threshold had been crossed; instead, we were interested in the extent to which these factors were present. From this, we would then be able to find out if a positive correlation between catalyst concentration and the degree of regime formation was evident.

The findings with regard to the concentration of each catalyst are outlined in two tables below. Table 6.2 presents the extent to which the catalysts *had been*, to the end of 1991, present in the process of regime formation for each issue; while Table 6.3 presents the extent to which the catalysts *were*, at the end of 1991, present in the ongoing process of regime formation (or, more accurately on the ozone layer issue, 'regime maintenance' or 'regime consolidation').

These two tables, though instructive, do not conclusively reveal the impact that each catalyst had at different times in the process of regime formation. Indeed, a longitudinal deconstruction would be necessary in order to determine if the two variables (catalyst concentration and regime formation) are mirroring each other over time. Even if such a relationship were evident, however, it might lead one to make unqualified conclusions: because international regime formation is a gradual *process*, there may be varying lagtimes between the introduction of a catalyst and its impact upon the rate of regime formation. Nonetheless, in the absence of such observations, we can still report that the findings from Chapter 5 showed that the detected catalysts did contribute to international regime formation in the ozone

layer experience, as the framework suggested. Moreover, the detected catalysts on the global warming issue helped both to satisfy the first precondition and to advance the second and third preconditions.

TABLE 6.2 -- *The Results of the Investigation into International Regime Formation: The Extent to Which the Catalysts Affected the Rate of Reaction up to the End of 1991*

| | Ozone Layer Depletion | Global Warming |
|---|---|---|
| Political Entrepreneurs | high | medium |
| Solidity of the Broader International Political System | medium | high |
| Environmental Pressure Groups | low-medium | high |
| Mobilisation of Public Opinion | medium-high | medium |

TABLE 6.3 -- *The Results of the Investigation into International Regime Formation: The Extent to Which the Catalysts Affected the Rate of Reaction at the End of 1991*

| | Ozone Layer Depletion | Global Warming |
|---|---|---|
| Political Entrepreneurs | medium | medium |
| Solidity of the Broader International Political System | high | high |
| Environmental Pressure Groups | high | high |
| Mobilisation of Public Opinion | medium-high | low-medium |

Finally, let us turn to the second type of findings that emerged from this thesis. With regard to the theoretical framework put forward in this thesis, the investigation has allowed us to perform two applications, neither of which has invalidated the original model. When applied to the ozone layer depletion issue, a positive correlation between the gradual satisfaction of the three preconditions and the evolution of an international regime was detected. More substantively, at the end of 1991, the three preconditions were satisfied and an international regime was in place.[2] Despite the fact that a similar positive correlation between precondition satisfaction and regime evolution was noticeable on the global warming issue, the findings suggest that the proposed preconditions on the global warming issue were not satisfied at the end of 1991. As the theoretical hypothesis predicts, an international regime had yet to emerge by this time.[3] In this way, the two issues evolved in manners in which the framework had predicted. Although the limitations of only two applications are self-evident, the findings from this thesis have, nevertheless, not invalidated the original theoretical proposition, but rather, have served to strengthen it. The implications of the use of this framework for the analysis of the politics of global atmospheric change are considered in the Conclusions of this thesis.

---

[2] This assertion is supported by the fact that many states had accepted the obligations outlined in three important international agreements: the 1985 Vienna Convention for the Protection of the Ozone Layer (reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1516-40); the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1541-61); and the 1990 London Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer (reprinted in *International Legal Materials* (Vol. 30, No. 2, March 1991), pp. 539-554).

[3] Formal, international negotiations on a global warming convention began in Washington, DC in February 1991 (under the auspices of the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change). By the end of 1991, however, no significant co-ordinated policy action had been agreed.

## Conclusions

The findings that arise from the investigation in this thesis have a number of implications for the study and the practice of international relations. In this final section, I would like to identify and to develop these implications. By doing so, I hope to contribute to the broader discussion within the field concerning both the possible evolution of international affairs and the theories with which the academic discipline of international relations conducts its investigations. Thus, although this section serves as a conclusion to this thesis, one of its purposes is to support discussion about future policy and research.

Although the first conclusion that I would like to identify is not new, its far-reaching implications warrant its restatement here. This study revealed that despite the fact that every person in the world wanted a particular end, there was no guarantee that it would necessarily be achieved. More specifically, even though a stable atmosphere was desired by all, governments were, over many years, unable to escape sub-optimal outcomes on issues of global atmospheric change. Indeed, a number of substantial difficulties had to be resolved before national governments were finally able to modify their established policies, which were furthering the destruction of the earth's protective ozone layer. Meanwhile, the fact that the difficulties on the global warming issue had not been resolved by the end of 1991 serves to strengthen this finding. In short, the thesis reinforces the belief that the members of international society will not necessarily co-ordinate their actions in order to prevent the destruction of collective goods.

A second conclusion arises from the use of the framework for analysis devised for this thesis. The study revealed that the theoretical foundation of this work has wider application. In Chapter 1, a theoretical model about international regime formation on collective goods issues was proposed and defended; it was subsequently applied against the relevant historical evidence in Chapters 2 through 5. The findings from this exercise have broader implications for international relations.

The model was used twice in this thesis, being applied to the historical evidence of the ozone layer depletion and global warming issues. Because the model was not falsified in either instance, we can claim that it has successfully stood up to some empirical application. This gives the model sufficient weight to

justify an examination of its implications for policy and theory. With regard to policy, the research suggests that if the members of international society want to escape their sub-optimal position on the global warming issue, then they should be working towards a number of goals -- namely, the strengthening of the first precondition (scientific consensus), the satisfaction of the second and third preconditions (tolerable domestic economic costs and global equity) and the maximisation of the concentration of the four catalysts (political entrepreneurs, the solidity of the broader international political system, environmental pressure groups and the mobilisation of public opinion). The theoretical implication, meanwhile, is that the successful utilisation of the model on these two issues invites other scholars to apply it to other international issues that can be modelled as collective goods. Application of this model to a number of other issues would not only advance theoretical knowledge (by either falsifying or further strengthening the proposed model), but could also generate policy recommendations on these other particular issues (by drawing policy-makers' attention to any unsatisfied preconditions and any dilute catalysts).[1]

If we accept the premises of the model, we can move on to consider a number of theoretical conclusions. First, the findings from this thesis suggest that it was correct to utilise a multi-level analysis in this study. In fact, a commitment to any single approach -- be it global, state-centred or individualistic -- would have constrained the analysis, and thereby obstructed our ability to gain the fullest understanding possible. In much of the international relations literature, however, multi-level approaches are not endorsed, let alone used in original research. Despite the fact that some theorists have sometimes made favourable references to multi-level analyses, they nevertheless contend that the scholar must exhibit a

---

[1] It is, of course, recognised that the proposed model can and should be challenged. In particular, it might well benefit from a vigorous examination of alternative preconditions and catalysts. Although some justification is provided for those included in this study, this support is by no means incontestable. Some critics might, for example, judge that one or more of the 'catalysts' is of greater significance than its inclusion in that category would support, and that those factors should therefore be identified as 'preconditions'. Others, meanwhile, might argue that certain factors have been overlooked in this study. Still others might challenge not only the elements included in the model, but also the relationship among them. They may contend that there should not be only two levels (preconditions and catalysts) and suggest that instead there should be more subtle relationships between and amongst the factors. Such criticisms are welcome, for one of the reasons why the model is documented is so that others may challenge it and propose their own ideas. It is hoped that such criticisms will be forthcoming, for ventures of this kind would help to further our understanding of the process of international regime formation.

steadfast commitment to only one level during the analysis of any particular issue.[2] The results of the present investigation, however, imply that this conventional wisdom should be challenged.

Following upon this discussion about levels-of-analysis, findings derived from this thesis also suggest that the decision to identify the state as a focus of attention in international relations is both justifiable and disputable. It is justifiable in the sense that the experience on environmental issues demonstrates that state policy is the primary determinant of the chances for regime formation in international society. An international regime will not be created until states' representatives have reached an explicit agreement about its form and substance. In support of this contention, we can point to the fact that those who wished for particular regimes to be constructed attempted to influence and to sway government officials' beliefs and ideas on environmental issues. These observations thus vindicate the focus upon the state that is employed in this thesis.

What makes the state-centred approach disputable is the finding that states' representatives are predominantly reactive in the international system. In order to explain outcomes, therefore, we must look elsewhere so that the forces that precipitate state action and thus regime formation can be identified. This study suggests a number of possible places to begin our search -- they include scientists, industry representatives, individual political entrepreneurs, environmental pressure groups and the media. It is therefore evident that we should challenge any study that focuses upon the state as the primary *independent* variable, because a wide variety of inputs to state behaviour must be accounted for.

The findings also provide support for a further review of studies that have a unitary, rational state as their primary focus of attention. Let me elucidate by identifying three particular elements. First, the investigation of scientific consensus in Chapter 2 revealed the importance of perceptions and interpretations. Intangible factors of this sort are often overlooked when international relations scholars employ cost-benefit analysis (CBA) in order to explain state behaviour. Indeed, this study has shown that scientific relativism at the level of the individual, organisation and state can contribute to scientific nonconsensus and thereby affect political processes in ways unanticipated by some rational choice theorists.

---

[2] See the discussion in Chapter 1.3 of this thesis.

Second, the study of global equity in Chapter 4 demonstrated that history is an important consideration in the formulation of policy. Actors in international society do not simply take snapshots of the present distribution of costs and benefits on any issue in order to determine a negotiating position. Instead, they look back over history to discern how events have structured the present arrangements. Once again, a traditional CBA, such as is used by some state-centred scholars, does not usually consider such historical, and often non-measurable, factors. Their method of analysis would consequently be unable to make sense of some of the politics of global atmospheric change.

Third, findings from various parts of this investigation reveal that politics at the domestic level can be significant in the formulation of states' foreign policies. On issues of global atmospheric change, a number of different groups made their views known to decision-makers. Although this finding is not particularly new, this investigation has substantiated it. A related finding, however, is not as apparent. The study also found that although decision-makers still use some notion of 'national interest' in order to arrive at their state's foreign policy, the concept is much more complex than suggested by traditional scholars who assume the existence of a unitary, rational state. First, not only did we discover that the interests of each individual state could not be separated from a broader, 'collective interest', but the evidence also demonstrated that considerations of equity, *within* national borders, made it more difficult to determine a specific 'national interest'. The evidence, in Chapter 3 in particular, suggested that different groups within a society can hold different conceptions of what would be most advantageous for their state. Additionally, it was also revealed that the currency with which governments attempt to measure national interest may be changing. Traditionally, 'guns' and 'butter' (*i.e.*, military power and economic output) have been the primary indicators of a state's well-being. Moreover, these variables have been able to be represented by tangible indices (*e.g.*, levels of weaponry and Gross National Product (GNP)). This study, however, suggested that it may not be either appropriate or possible to assess the merits of environmental policy on such criteria. Thus, the discussions about the appropriate indicators with which a country's 'performance' should be measured are given further urgency by the

findings from this thesis.[3] Taken together, therefore, these critiques of unidimensional studies suggest a broader theoretical implication -- namely, that multidimensional approaches may sometimes be needed in the study of international relations.

This paradoxical report of the importance of the state in international relations leaves one to wonder 'who makes regimes?' Together, the various findings from this thesis offer one possible answer. The evidence from the study of the politics of global atmospheric change suggests that states act as 'gate-keepers' between, on the one hand, the desires for an international regime and, on the other hand, the tangible formation of an international regime. States will not initiate demands for regimes, but will nevertheless act as filters, with the result being that only some aspirations are fulfilled. This conclusion therefore suggests that the internal functioning of governmental organisations may indeed be significant determinants of regime formation.[4] Moreover, with an increasingly crowded international environmental agenda, coupled with increasingly scarce resources, not every call will be able to be answered. In this way, the state's ability to determine the success or failure of particular demands may mean that its role is further enhanced in the future.[5]

Moving beyond a specific consideration of the level-of-analysis question, another conclusion emerging from this work is that there appears to have been a change in the most important resources with which actors attempt to influence others in international society. To phrase this in more common international relations terminology, we should recognise that the tools of power are not the same as those traditionally used. This thesis demonstrated that an understanding of power as military might is not particularly significant in relation to the issues of global atmospheric change. Instead, it was shown that money was one of the most significant levers with which one actor was able to influence another. This was evident at all levels -- individual (*e.g.*, green consumerism), inter-state (*e.g.*, trade

---

[3] See the attention drawn to the inadequacies of the present ways in which states calculate their national accounts (Chapter 3, note 8, of this thesis).

[4] One of the classic works in this area is Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston, MA: Little, Brown, and Company, 1971).

[5] Additionally, given the fact that environmental issues now seem to cross a greater number of traditionally-defined issue-areas, the conclusion is given further weight. I return to this point later on in these Conclusions.

balance considerations) and global (*e.g.*, resource transfers). Thus, the need to identify and to recognise the importance of economic power in the process of international regime formation -- a need which has been accepted in the study of some other issue-areas -- is reinforced by this investigation of global atmospheric issues.

This thesis, however, also revealed that power went beyond merely economic considerations. The findings reinforce the view held by some scholars that 'knowledge is power'.[6] Those who were able to discover previously unknown natural relationships or physical changes (and thus environmental problems) were able to determine, to a significant extent, whether or not certain issues spilled over from the scientific agenda to the political agenda. In addition, those who were able to disseminate this new-found knowledge effectively were able to determine, also to a significant extent, the position to be occupied by that issue on the political agenda. Thus, those who could both gain and transmit knowledge exercised significant power in the international system. In this way, the study found that scientists in particular, and leaders of environmental pressure groups and members of the media in general, were able to exercise a new-found amount of power in international politics.

This finding leads us into a closer consideration of the relationship between science and politics. One striking difference between the two issues of global atmospheric change is that the ozone layer debate developed in a serial manner, while the global warming debate progressed in a parallel fashion. In other words, the three preconditions were addressed, to a significant extent, in a sequential way on the ozone layer issue: scientists identified a problem; *then* domestic costs were brought down to a tolerable level; *then* questions of global equity were considered. This sequence parallels our traditional understanding of the way in which societies consider scientific problems: they are first addressed by scientists; *then* considered by politicians, but only at a domestic level initially; *then* examined by politicians with reference to the broader, international system.

The global warming issue, however, unfolded quite differently. The issue became highly political -- both domestically and internationally -- soon after the

---

[6] Ernst B. Haas, *When Knowledge Is Power: Three Models of Change in International Organizations* (Oxford: University of California Press, 1990).

potential consequences of the natural science problem were recognised. Instead of a serial consideration of the preconditions, all three attracted significant political attention simultaneously. This suggests that any traditional distinction between either 'science' and 'politics', or 'domestic issues' and 'international issues', may no longer be valid. Thus, a widespread conclusion about increased global interdependence -- across both states and issue-areas -- is reinforced by new evidence.

The findings of this thesis further demonstrate that significant boundaries have been broken down not only in the policy process, but also in the academic study of ozone layer depletion and global warming. Because every human activity is affected by global atmospheric change, a wide range of social science, applied science and natural science knowledge had to be utilised in order to understand fully the politics of these two issues. Indeed, in this work, ideas about the distribution of costs, capabilities, consciousness, clauses and chlorine were all critical, confirming the need for at least a measure of knowledge in economics, politics, sociology, law and chemistry. At the very least, this suggests that this research appeared to require a multidisciplinary approach.

Terms like 'multidisciplinary' and 'interdisciplinary' have often been advocated with evident enthusiasm in academic discourse. In spite of this, however, there is little agreement about what they mean, let alone about what their full-scale and professional adoption might imply. This assertion is supported by the fact that borders between disciplines appear to be fervently defended in many institutions of higher learning, particularly in the United Kingdom. Even within international relations -- a subject that would seem to be a natural home to interdisciplinary efforts -- much time and energy seems to be spent upon works that set out the parameters of the discipline. Such efforts should not be criticised in their own right, and, indeed, those that seek to define the field of study may simply be responding to broader institutional pressures, not unlike those that are discussed in Chapter 2 of this thesis.[7] Nevertheless, it appears that an important conclusion of this thesis is that research efforts that both draw upon and integrate traditional disciplines may be needed. It remains to be seen if such efforts will be encouraged, or even tolerated, for the present institutional regime would appear

[7] See, in particular, Chapter 2, note 28.

to present significant obstacles to a wholly committed interdisciplinary approach.

Finally, the findings of this thesis point to a new set of problems that may be of increasing significance in international politics. The two issues of global atmospheric change possess characteristics that are unprecedented: they are global in scope and systemic in nature. Let me consider each of these aspects in turn.[8]

First, these is the characteristic of 'global scope'. These issues have a geographical reach that is -- with the possible exception of nuclear war -- unparalleled. Because every person, and thus every state, has the means to exacerbate these atmospheric problems, an effective response to them requires the constructive participation of *every* national government in the world. The two issues therefore extend beyond 'the international' to 'the global'. They cannot be contained to either the local level, the national level or the international level narrowly defined -- that is, two or more, but nevertheless a limited number of states. Instead, all peoples and consequently all states play a role. This in turn means that the marginalisation of particular regions of the world can no longer take place.[9] Foreign policy must now consider the global dimension in addition to the international. The most striking implication of this characteristic to date is that countries of the developing world have been able to attain a greater degree of visibility and thus to a play more significant role in the international politics of global atmospheric change.

Second, there is the quality of 'systemic nature'. Because of the extensive lifetimes of many gases in the atmosphere, these issues become systemic. The most significant repercussion of this is that current human activities are limiting society to only a restricted set of possible futures, no matter what actions humans might take in later years. The consequence for the practice of international relations is that decision-makers may be forced to consider issues, and perhaps to control activities, before the full consequences of society's actions have been demonstrated and perhaps even before full proof of causation is undeniably demonstrated. The requirement to act in this way may conflict with some traditional ideas about foreign policy-making. In the short term, customary conceptualisations

---

[8] Other examples of this type of issue include matters related to health and technology.

[9] This is not meant to suggest that all governments in the world will have significant leverage on these issues, but they will nevertheless have to be accounted for.

of crisis management and brinkmanship may have to be re-evaluated, because the inertial forces that drive the systemic issues are likely to become inexorable. They will curb the ability of humans to intervene, making it much more difficult to reverse decisions. In the longer term, meanwhile, questions of intergenerational equity will have to be considered much more deeply than heretofore. Indeed, not only do traditional policy-making procedures fail to address the past adequately, but evidence exists to suggest that they have difficulty in handling the future as well. Traditional 'discount rates' may not be able to deal with things that are 'unique' and 'irreversible', yet a high proportion of environmental capital has both these properties. In short, systemic issues pose unprecedented, and academically interesting, challenges to conventional policy practices.

Indeed, this opens up a much broader discussion about humans' relationship with their surroundings. The traditional (at least, 'Western') understanding of this relationship is that it had 'long been widely accepted -- and essentially without question -- that humans have supreme authority over the earth and all of its living things, both plant and animal'.[10] This view may be under challenge, however, for the empirical findings from this study suggest that human society has disrupted equilibria in nature: while the system searches for its new equilibrium, humans no longer exercise supreme control over the system.[11] Thus, political agendas and choices may, to some extent, be falling under the control of natural systems. If this is indeed taking place, then there may be profound implications for thinking about human beings' relationships with their surroundings.[12]

---

[10] Arthur H. Westing, 'Constraints on Military Disruption of the Biosphere: An Overview', in Arthur H. Westing (ed.), *Cultural Norms, War and the Environment* (Oxford: Oxford University Press, 1988), p. 6.

[11] See, for example, J.E. Lovelock, *Gaia: A New Look at Life on Earth* (Oxford: Oxford University Press, 1979).

[12] In this way, there may be important implications for our traditional Cartesian interpretation of the relationship between subject and object. Indeed, an interesting parallel with the study of 'Earth Science' is suggested by the comments of one of the world's foremost atmospheric scientists. Michael McElroy, of Harvard University, maintains that, unlike other 'traditional' scientists, earth scientists do not have the luxury of working in the laboratory, where they 'would have hypotheses, ... would do experiments, ... would manipulate the experiment and ... would learn about the processes by the conventional iteration of theory and experiment' (quoted in Cheryl Simon Silver with Ruth S. DeFries, *One Earth One Future: Our Changing Global Environment* (Washington, DC: National Academy Press, 1990), pp. 20-21). Thus, just as applied and natural scientists are considering the need for a 'paradigm shift', social scientists might also be forced to reconsider their traditional worldviews.

This investigation into the politics of global atmospheric change has given rise to a series of conclusions regarding both the study and the practice of international relations. By exploring some of the wider implications, a broader discussion concerning both the possible evolution of international affairs and the study of international relations as an academic discipline has been initiated. In these ways, this thesis has attempted to advance knowledge both about particular issues and about theoretical conceptualising more generally.

## Appendix A.1 -- A Chronology of the Politics of Ozone Layer Depletion

1840

- Ozone is first discovered.

1879-81

- Ozone is first detected in the earth's stratosphere.

1930

- British chemist Sydney Chapman puts forth the first theory of ozone generation and destruction.

1957-58

- The first significant amounts of data on stratospheric ozone are collected during the International Geophysical Year.

1966

- Hampson is the first to argue that hydrogen compounds may be able to alter the ozone balance.

1970

- The first suggestions that nitrogen compounds may be able to destroy stratospheric ozone are proposed by Crutzen and Johnston.

1971

- The United States Congress orders a report on the potential damage to the ozone layer by supersonic transports (SSTs).

1973

- Delegates at a conference in Kyoto, Japan discuss the suggestions that free chlorine in the atmosphere may be able to affect ozone levels in the stratosphere (September).

1974

- The US Department of Transport's Climate Impact Assessment Program publishes its report, arguing that a large fleet of SSTs would have posed significant danger to the ozone layer.
- A paper putting forth the theory that CFCs may destroy significant amounts of stratospheric ozone is published in *Nature* (June).

1975

- The report of the US Task Force on Inadvertent Modification of the Atmosphere finds that the CFC theory is a 'legitimate cause for concern' (June).

1976

- At the fourth Session of the United Nations Environment Programme (UNEP) Governing Council, initial steps are taken to convene an international meeting to consider the CFC-ozone link (March-April).
- The United States National Academy of Sciences (NAS) releases its first report on the ozone layer, predicting most likely depletion to be between 6 and 7.5 per cent (September).
- Together, the US Food and Drug Administration and the US Environmental Protection Agency (EPA) propose a phase-out of CFCs used in non-essential aerosols (October).

1977

- In Washington, DC, the first international meeting to discuss ozone layer depletion is held (March).
- The United States hosts the first intergovernmental meeting in Washington, DC to discuss international regulation of CFCs (April).
- The first meeting of the UNEP-sponsored Co-ordinating Committee on the Ozone Layer is held in Geneva (November).

1978

- CFCs are banned as propellants in non-essential aerosols in the United States (October).
- In Munich, the West German government hosts a second intergovernmental meeting to discuss international regulation of CFCs (December).

1979

- A second NAS report is released in the United States. It estimates eventual ozone layer depletion to be 16.5 per cent (November).

1980

- The European Communities, having reduced aerosol use by 30 per cent, enact a cap on capacity.
- The UNEP Governing Council calls for reductions in the production of CFC-11 and CFC-12 (April).

1981

- The UNEP Governing Council releases a statement which argues for 'the desirability of initiating work aimed at the elaboration of a global framework convention [for the protection of the ozone layer]' (May).
- United States EPA Director nominee Anne Gorsuch testifies at her confirmation hearings that she considers the CFC-ozone theory to be highly controversial (May).

- National Aeronautics and Space Administration (NASA) scientist Donald Heath announces that satellite records show that there has been a loss of some ozone in the stratosphere (August).

1982

- UNEP convenes the first meeting of the *Ad Hoc* Working Group of Legal and Technical Experts for the Preparation of a Global Framework Convention for the Protection of the Ozone Layer in Stockholm (January).
- A third NAS report, which predicts eventual ozone layer depletion to be between 5 and 9 per cent, is released in the United States (March).

1983

- Officials from Norway, Sweden and Finland propose both a worldwide ban on CFCs in aerosols and limitations on all uses of CFCs (April).

1984

- A fourth NAS report is released in the United States. It predicts an eventual level of ozone depletion to be between 2 and 4 per cent (February).

1985

- Members of the Toronto Group continues to promote their proposals for a worldwide ban on CFCs as aerosol propellants (January).
- The Vienna Convention for the Protection of the Ozone Layer is opened for signature (March).
- A paper presenting evidence of significant destruction of the ozone layer over Antarctica is published in *Nature* (May).

1986

- A NASA-UNEP report finds evidence of reduced levels of stratospheric ozone (January).
- The First Part of the Workshop on the Control of CFCs -- part of a series of informal workshops designed to advance the drafting of a Protocol -- is held in Rome (May).
- CFC manufacturers suggest that safe substitutes for the chemicals might be possible, if the price were high enough (June).
- Thirteen US scientists depart for Antarctica on the National Ozone Expedition. Although they discover significant destruction of stratospheric ozone, their findings do not resolve the debate about causation (August).
- The Second Part of the Workshop on the Control of CFCs is held in Leesburg, VA (September).
- The Alliance (an industry group) announces that it will support limits on CFC production (September).

- The first session of the *Ad Hoc* Working Group of Legal and Technical Experts for the Elaboration of a Protocol on the Control of CFCs to the Vienna Convention for the Protection of the Ozone Layer is convened in Geneva (December).

1987

- The second session of the working group that is developing a draft Protocol takes place in Vienna (February).
- A UNEP meeting of scientists -- convened to discuss models of ozone depletion -- takes place in Wurzburg, West Germany (April).
- The third session of the working group that is developing a draft Protocol is held in Geneva (April).
- The US shifts its negotiating position, and endorses the Europeans' idea of restricting end-uses (April).
- Informal Consultations toward the Elaboration of a Protocol on the Control of CFCs to the Vienna Convention for the Protection of the Ozone Layer are held in Brussels (June).
- After much discussion and debate, the Montreal Protocol on Substances that Deplete the Ozone Layer is opened for signature (September).
- Members of the Airborne Antarctic Ozone Experiment conclude that chlorine chemicals are the primary cause of ozone depletion in Antarctica (October).

1988

- A trade fair, at which many new CFC substitutes are displayed, is held in Washington, DC (January).
- Members of the Ozone Trends Panel not only formalise the results of their Antarctic trip, but also announce that they have discovered ozone losses over the northern hemisphere (March).
- Du Pont announces that it will cease manufacture of CFCs as substitutes become available (March).
- Delegates to the Toronto Conference on The Changing Atmosphere call upon all countries to ratify the Montreal Protocol and to revise it in 1990 'to ensure nearly complete elimination of the emissions of fully halogenated CFCs by the year 2000' (June).
- The Vienna Convention enters into force (September).
- Scientists meeting in The Hague confirm the Ozone Trends Panel findings of ozone losses in the Northern Hemisphere (October).
- The Ozone Depletion Conference is held in London (November).

1989

- The Montreal Protocol enters into force (January).

- European countries and the United Sates agree to faster CFC reductions, but developing countries oppose the new timetable, citing the prohibitive costs of substitutes. They call for a fairer arrangement (March).
- The 'Saving the Ozone Layer' Conference is held in London (March).
- The First Meeting of Parties to the Montreal Protocol takes place in Helsinki (May).
- Working groups are formed to consider revisions to the Montreal Protocol (August). They continue to meet through the second half of 1989 and the first half of 1990.
- UNEP publishes a *Synthesis Report*, incorporating results of scientific, environmental, economic and technical assessments (November).

1990

- The Second Meeting of the Parties to the Montreal Protocol is held in London, at which substantial amendments to the original terms of the Protocol are agreed (June).
- The Multilateral Ozone Fund is established. Located in Montreal, its primary purpose is to provide assistance to countries of the developing world so that they can reduce their use of ozone-depleting chemicals (September).

1991

- The Third Meeting of the Parties to the Montreal Protocol is held in Nairobi (June).
- The World Meteorological Organisation (WMO) and UNEP release a report which suggests that destruction of the ozone layer has advanced far more rapidly than predicted (October).

## Appendix A.2 -- A Chronology of the Politics of Global Warming

1273

- The first air pollution law to deal with the deleterious effects of fossil fuel combustion is passed in London.

1661

- John Evelyn writes about the harmful effects caused by coal burning.

1827

- Baron Jean-Baptiste-Joseph Fourier sets out the analogy between the behaviour of heat in the atmosphere and its behaviour in a greenhouse.

1863-65

- John Tysdall builds upon the theories originally put forward by Fourier.

1896

- Svante Arrhenius puts forth the theory that rising concentrations of atmospheric, carbon dioxide would lead to global warming.

1938

- G.D. Callendar, a British meteorologist, tries to persuade an audience at the Royal Society in London that the global warming that had occurred since the 1880s was the result of increasing carbon dioxide levels in the atmosphere. His ideas attract little support.

1957

- An atmospheric carbon dioxide measuring station is established at Mauna Loa observatory in Hawaii as part of the International Geophysical Year.
- A paper suggesting that the oceans had not absorbed as much carbon dioxide as previously assumed is published in *Tellus*.

1965

- The US White House initiates a study into the burning of fossil fuels and its relations to the steadily rising atmospheric concentrations of carbon dioxide.

1970

- 'The Study of Critical Environmental Problems', a symposium to investigate such issues, is held at MIT in Cambridge, MA (July).

1971

- The first international meeting of scientists to discuss long-term climate change is held in Wijk, Sweden (August).

1972

- The United Nations Conference on the Human Environment is held in Stockholm, Sweden (June).

1975

- A WMO-sponsored 'International Symposium on Long-Term Climate Fluctuations' takes place in Norwich, England (August).
- One of the first major governmental studies to investigate the causes and consequences of climate change is published by the NAS in the United States. It highlights the need to improve the science on the global warming issue.

1977

- Another report is prepared by the US NAS, and, like its predecessor, it calls for further investigations. Nevertheless, it also warns that the implications of projected climate change 'warrant prompt action' (July).

1979

- The First World Climate Conference is convened in Geneva by the WMO (February).
- At its Eighth World Meteorological Congress, the World Climate Programme (WCP) is created by the WMO.

1980

- As part of the WCP, an international conference to address climate change is held in Villach, Austria (November).

1982

- An NAS report in the US reinforces the emerging consensus that a doubling of carbon dioxide concentrations in the atmosphere would cause a global warming of between 1.5°C and 4.5°C..

1983

- Reports in the United States by the NAS and the EPA draw different conclusions from seemingly similar findings.

1985

- Participants in the International Conference on the Assessment of the Role of Carbon Dioxide and Other Greenhouse Gases in Climate Variations and Associated Impacts (held in Villach, Austria) agree that global warming could occur (October).

1987

- A workshop to investigate further the question of global warming is held in Villach, Austria (September-October).

- The previous month's Villach meeting is followed-up by another gathering in Bellagio, Italy. Together, the findings from these two conferences not only highlight the problem, but also put forward proposals for policies (November).
- WMO and UNEP agree to establish an intergovernmental mechanism to assess the scientific data and to formulate response strategies for climate change (June).
- The World Commission on Environment Report publishes its report, entitled *Our Common Future* (commonly referred to as the 'Brundtland Report').

1988

- In testimony to the US Senate Energy Committee, NASA's James Hansen asserts that he is 99 per cent certain that the warming of the 1980s is not a chance event, but is, instead, causally linked to global warming (June).
- A conference on 'The Changing Atmosphere: Implications for Global Security' is held in Toronto (June). Its delegates conclude that humanity is 'conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war' (June).
- The first meeting of the Intergovernmental Panel on Climate Change (IPCC) is held in Geneva (November).
- A United Nations General Assembly resolution charges the WMO and the UNEP to initiate a comprehensive review and to make recommendations on possible responses to mitigate the impact of adverse climate change, as well as on elements for inclusion in a possible future international convention on climate (December).

1989

- 'Protection of the Atmosphere: International Meeting of Legal and Policy Experts' is held in Ottawa, Canada (February).
- 'Summit Meeting on the Protection of the Atmosphere' takes place in The Hague. Delegates call for the formation of new global institutions to meet the challenges of global atmospheric change (March).
- The UNEP Governing Council requests that the heads of UNEP and WMO 'begin preparation for negotiations on a framework convention on climate' (May).
- At their annual meeting, leaders of the seven richest nations (G7) note the significance of the global warming issue (July).
- 'The Langkawi Declaration on the Environment' is released by the Commonwealth Heads of Government in Kuala Lumpur, Malaysia (October).
- A 'Ministerial Conference on Atmospheric Pollution and Climatic Change' takes place in Noordwijk, the Netherlands (November).
- The Dutch government, by introducing plans to stabilise carbon dioxide emissions at the 1989/1990 level by the year 2000, becomes the first to set a target on the global warming issue.

1990

- 'The White House Conference on Science and Economics Research Related to Global Change' is held in Washington (April).
- The first reports of the IPCC's three working groups are released (May).
- A meeting of the United Nations Economic Commission on Europe, called as a follow-up to the report of the World Commission on Environment and Development, is held in Bergen, Norway (May).
- The West German government commits the country to a 25 per cent reduction in carbon dioxide emissions from 1987 levels by the year 2005 (June).
- G7 leaders consider a new fund for global warming, but American resistance prevents any agreement (July).
- The IPCC reports are finalised in Sundsvall, Sweden (August).
- The Second World Climate Conference is held in Geneva (November).
- With its resolution on the 'protection of global climate for present and future generations of mankind', the United Nations General Assembly takes primary responsibility for the climate change issue (December).

1991

- The first meeting of the Intergovernmental Negotiating Committee on a Framework Convention on Climate Change (INC) is held in Washington, DC (February).
- Meetings of the INC continue in Geneva (June), Nairobi (September) and Geneva once again (December).
- Leaders of over 40 developing countries issue the 'Beijing Declaration', in which they reinforce their demands for resource transfers on the global warming issue (June).

# Appendix A.3 -- Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

The Parties to this Protocol,

Being Parties to the Vienna Convention for the Protection of the Ozone Layer,

Mindful of their obligation under that Convention to take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer,

Recognizing that world-wide emissions of certain substances can significantly deplete and otherwise modify the ozone layer in a manner that is likely to result in adverse effects on human health and the environment,

Conscious of the potential climatic effects of emissions of these substances,

Aware that measures taken to protect the ozone layer from depletion should be based on relevant scientific knowledge, taking into account technical and economic considerations,

Determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge, taking into account technical and economic considerations,

Acknowledging that special provision is required to meet the needs of developing countries for these substances,

Noting the precautionary measures for controlling emissions of certain chlorofluorocarbons that have already been taken at national and regional levels,

Considering the importance of promoting international co-operation in the research and development of science and technology relating to the control and reduction of emissions of substances that deplete the ozone layer, bearing in mind in particular the needs of developing countries,

HAVE AGREED AS FOLLOWS:

## ARTICLE 1: DEFINITIONS

For the purposes of this Protocol:

1. "Convention" means the Vienna Convention for the Protection of the Ozone Layer, adopted on 22 March 1985.

2. "Parties" means, unless the text otherwise indicates, Parties to this Protocol.

3. "Secretariat" means the secretariat of the Convention.

4. "Controlled substance" means a substance listed in Annex A to this Protocol, whether existing alone or in a mixture. It excludes, however, any such substance or mixture which is in a manufactured product other than a container used for the transportation or storage of the substance listed.

5. "Production" means the amount of controlled substances produced minus the amount destroyed by technologies to be approved by the Parties.

6. "Consumption" means production plus imports minus exports of controlled substances.

7. "Calculated levels" of production, imports, exports and consumption means levels determined in accordance with Article 3.

8. "Industrial rationalization" means 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 closures.

/...

## ARTICLE 2: CONTROL MEASURES

1. Each Party shall ensure that for the twelve-month period commencing on the first day of the seventh month following the date of the entry into force of this Protocol, and in each twelve-month period thereafter, its calculated level of consumption of the controlled substances in Group I of Annex A does not exceed its calculated level of consumption in 1986. By the end of the same period, each Party producing one or more of these substances shall ensure that its calculated level of production of the substances does not exceed its calculated level of production in 1986, except that such level may have increased by no more than ten per cent based on the 1986 level. Such increase shall be permitted only so as to satisfy the basic domestic needs of the Parties operating under Article 5 and for the purposes of industrial rationalization between Parties.

2. Each Party shall ensure that for the twelve-month period commencing on the first day of the thirty-seventh month following the date of the entry into force of this Protocol, and in each twelve month period thereafter, its calculated level of consumption of the controlled substances listed in Group II of Annex A does not exceed its calculated level of consumption in 1986. Each Party producing one or more of these substances shall ensure that its calculated level of production of the substances does not exceed its calculated level of production in 1986, except that such level may have increased by no more than ten per cent based on the 1986 level. Such increase shall be permitted only so as to satisfy the basic domestic needs of the Parties operating under Article 5 and for the purposes of industrial rationalization between Parties. The mechanisms for implementing these measures shall be decided by the Parties at their first meeting following the first scientific review.

3. Each Party shall ensure that for the period 1 July 1993 to 30 June 1994 and in each twelve-month period thereafter, its calculated level of consumption of the controlled substances in Group I of Annex A does not exceed, annually, eighty per cent of its calculated level of consumption in 1986. Each Party producing one or more of these substances shall, for the same periods, ensure that its calculated level of production of the substances does not exceed, annually, eighty per cent of its calculated level of production in 1986. However, in order to satisfy the basic domestic needs of the Parties operating under Article 5 and for the purposes of industrial rationalization between Parties, its calculated level of production may exceed that limit by up to ten per cent of its calculated level of production in 1986.

4. Each Party shall ensure that for the period 1 July 1998 to 30 June 1999, and in each twelve-month period thereafter, its calculated level of consumption of the controlled substances in Group I of Annex A does not exceed, annually, fifty per cent of its calculated level of consumption in 1986. Each Party producing one or more of these substances shall, for the same periods, ensure that its calculated level of production of the substances does not exceed, annually, fifty per cent of its calculated level of production in 1986. However, in order to satisfy the basic domestic needs of the Parties operating under Article 5 and for the purposes of industrial rationalization between Parties, its calculated level of production may exceed that limit by up to fifteen per cent of its calculated level of production in 1986. This paragraph will apply unless the Parties decide otherwise at a meeting by a two-thirds majority of Parties present and voting, representing at least two-thirds of the total calculated level of consumption of these substances of the Parties. This decision shall be considered and made in the light of the assessments referred to in Article 6.

/...

5. Any Party whose calculated level of production in 1986 of the controlled substances in Group I of Annex A was less than twenty-five kilotonnes may, for the purposes of industrial rationalization, transfer to or receive from any other Party, production in excess of the limits set out in paragraphs 1, 3 and 4 provided that the total combined calculated levels of production of the Parties concerned does not exceed the production limits set out in this Article. Any transfer of such production shall be notified to the secretariat, no later than the time of the transfer.

6. Any Party not operating under Article 5, that has facilities for the production of controlled substances under construction, or contracted for, prior to 16 September 1987, and provided for in national legislation prior to 1 January 1987, may add the production from such facilities to its 1986 production of such substances for the purposes of determining its calculated level of production for 1986, provided that such facilities are completed by 31 December 1990 and that such production does not raise that Party's annual calculated level of consumption of the controlled substances above 0.5 kilograms per capita.

7. Any transfer of production pursuant to paragraph 5 or any addition of production pursuant to paragraph 6 shall be notified to the secretariat, no later than the time of the transfer or addition.

8. (a) Any Parties which are Members States of a regional economic integration organization as defined in Article 1 (6) of the Convention may agree that they shall jointly fulfil their obligations respecting consumption under this Article provided that their total combined calculated level of consumption does not exceed the levels required by this Article.

(b) The Parties to any such agreement shall inform the secretariat of the terms of the agreement before the date of the reduction in consumption with which the agreement is concerned.

(c) Such agreement will become operative only if all Member States of the regional economic integration organization and the organization concerned are Parties to the Protocol and have notified the secretariat of their manner of implementation.

9. (a) Based on the assessments made pursuant to Article 6, the Parties may decide whether:

(i) Adjustments to the ozone depleting potentials specified in Annex A should be made and, if so, what the adjustments should be; and

(ii) Further adjustments and reductions of production or consumption of the controlled substances from 1986 levels should be undertaken and, if so, what the scope, amount and timing of any such adjustments and reductions should be;

(b) Proposals for such adjustments shall be communicated to the Parties by the secretariat at least six months before the meeting of the Parties at which they are proposed for adoption;

/...

(c) In taking such decisions, the Parties shall make every effort to reach agreement by consensus. If all efforts at consensus have been exhausted, and no agreement reached, such decisions shall, as a last resort, be adopted by a two-thirds majority vote of the Parties present and voting representing at least fifty per cent of the total consumption of the controlled substances of the Parties;

(d) The decisions, which shall be binding on all Parties, shall forthwith be communicated to the Parties by the Depositary. Unless otherwise provided in the decisions, they shall enter into force on the expiry of six months from the date of the circulation of the communication by the Depositary.

10. (a) Based on the assessments made pursuant to Article 6 of this Protocol and in accordance with the procedure set out in Article 9 of the Convention, the Parties may decide:

(i) Whether any substances, and if so which, should be added to or removed from any annex to this Protocol; and

(ii) The mechanism, scope and timing of the control measures that should apply to those substances;

(b) Any such decision shall become effective, provided that it has been accepted by a two-thirds majority vote of the Parties present and voting.

11. Nothwithstanding the provisions contained in this Article, Parties may take more stringent measures than those required by this Article.

ARTICLE 3: CALCULATION OF CONTROL LEVELS

For the purposes of Articles 2 and 5, each Party shall, for each Group of substances in Annex A, determine its calculated levels of:

(a) Production by:

(i) Multiplying its annual production of each controlled substance by the ozone depleting potential specified in respect of it in Annex A; and

(ii) Adding together, for each such Group, the resulting figures;

(b) Imports and exports, respectively, by following, mutatis mutandis, the procedure set out in subparagraph (a); and

(c) Consumption by adding together its calculated levels of production and imports and subtracting its calculated level of exports as determined in accordance with subparagraphs (a) and (b). However, beginning on 1 January 1993, any export of controlled substances to non-Parties shall not be subtracted in calculating the consumption level of the exporting Party.

ARTICLE 4: CONTROL OF TRADE WITH NON-PARTIES

1. Within one year of the entry into force of this Protocol, each Party shall ban the import of controlled substances from any State not party to this Protocol.

/...

2. Beginning on 1 January 1993, no Party operating under paragraph 1 of Article 5 may export any controlled substances to any State not party to this Protocol.

3. Within three years of the date of the entry into force of this Protocol, the Parties shall, following the procedures in Article 10 of the Convention, elaborate in an annex a list of products containing controlled substances. Parties that have not objected to the annex in accordance with those procedures shall ban, within one year of the annex having become effective, the import of those products from any State not party to this Protocol.

4. Within five years of the entry into force of this Protocol, the Parties shall determine the feasibility of banning or restricting, from States not party to this Protocol, the import of products produced with, but not containing, controlled substances. If determined feasible, the Parties shall, following the procedures in Article 10 of the Convention, elaborate in an annex a list of such products. Parties that have not objected to it in accordance with those procedures shall ban or restrict, within one year of the annex having become effective, the import of those products from any State not party to this Protocol.

5. Each Party shall discourage the export, to any State not party to this Protocol, of technology for producing and for utilizing controlled substances.

6. Each Party shall refrain from providing new subsidies, aid, credits, guarantees or insurance programmes for the export to States not party to this Protocol of products, equipment, plants or technology that would facilitate the production of controlled substances.

7. Paragraphs 5 and 6 shall not apply to products, equipment, plants or technology that improve the containment, recovery, recycling or destruction of controlled substances, promote the development of alternative substances, or otherwise contribute to the reduction of emissions of controlled substances.

8. Nothwithstanding the provisions of this Article, imports referred to in paragraphs 1, 3 and 4 may be permitted from any State not party to this Protocol if that State is determined, by a meeting of the Parties, to be in full compliance with Article 2 and this Article, and has submitted data to that effect as specified in Article 7.

## ARTICLE 5: SPECIAL SITUATION OF DEVELOPING COUNTRIES

1. Any Party that is a developing country and whose annual calculated level of consumption of the controlled substances is less than 0.3 kilograms per capita on the date of the entry into force of the Protocol for it, or any time thereafter within ten years of the date of entry into force of the Protocol shall, in order to meet its basic domestic needs, be entitled to delay its compliance with the control measures set out in paragraphs 1 to 4 of Article 2 by ten years after that specified in those paragraphs. However, such Party shall not exceed an annual calculated level of consumption of 0.3 kilograms per capita. Any such Party shall be entitled to use either the average of its annual calculated level of consumption for the period 1995 to 1997 inclusive or a calculated level of consumption of 0.3 kilograms per capita, whichever is the lower, as the basis for its compliance with the control measures.

/...

2. The Parties undertake to facilitate access to environmentally safe alternative substances and technology for Parties that are developing countries and assist them to make expeditious use of such alternatives.

3. The Parties undertake to facilitate bilaterally or multilaterally the provision of subsidies, aid, credits, guarantees or insurance programmes to Parties that are developing countries for the use of alternative technology and for substitute products.

## ARTICLE 6: ASSESSMENT AND REVIEW OF CONTROL MEASURES

Beginning in 1990, and at least every four years thereafter, the Parties shall assess the control measures provided for in Article 2 on the basis of available scientfific, environmental, technical and economic information. At least one year before each assessment, the Parties shall convene appropriate panels of experts qualified in the fields mentioned and determine the composition and terms of reference of any such panels. Within one year of being convened, the panels will report their conclusions, through the secretariat, to the Parties.

## ARTICLE 7: REPORTING OF DATA

1. Each Party shall provide to the secretariat, within three months of becoming a Party, statistical data on its production, imports and exports of each of the controlled substances for the year 1986, or the best possible estimates of such data where actual data are not available.

2. Each Party shall provide statistical data to the secretariat on its annual production (with separate data on amounts destroyed by technologies to be approved by the Parties), imports, and exports to Parties and non-Parties, respectively, of such substances for the year during which it becomes a Party and for each year thereafter. It shall forward the data no later than nine months after the end of the year to which the data relate.

## ARTICLE 8: NON-COMPLIANCE

The Parties, at their first meeting, shall consider and approve procedures and institutional mechanisms for determining non-compliance with the provisions of this Protocol and for treatment of Parties found to be in non-compliance.

## ARTICLE 9: RESEARCH, DEVELOPMENT, PUBLIC AWARENESS AND EXCHANGE OF INFORMATION

1. The Parties shall co-operate, consistent with their national laws, regulations and practices and taking into account in particular the needs of developing countries, in promoting, directly or through competent international bodies, research, development and exchange of information on:

(a) Best technologies for improving the containment, recovery, recycling or destruction of controlled substances or otherwise reducing their emissions;

/...

(b) Possible alternatives to controlled substances, to products containing such substances, and to products manufactured with them; and

(c) Costs and benefits of relevant control strategies.

2. The Parties, individually, jointly or through competent international bodies, shall co-operate in promoting public awareness of the environmental effects of the emissions of controlled substances and other substances that deplete the ozone layer.

3. Within two years of the entry into force of this Protocol and every two years thereafter, each Party shall submit to the secretariat a summary of the activities it has conducted pursuant to this Article.

## ARTICLE 10: TECHNICAL ASSISTANCE

1. The Parties shall in the context of the provisions of Article 4 of the Convention, and taking into account in particular the needs of developing countries, co-operate in promoting technical assistance to facilitate participation in and implementation of this Protocol.

2. Any Party of Signatory to this Protocol may submit a request to the secretariat for technical assistance for the purposes of implementing or participating in the Protocol.

3. The Parties, at their first meeting, shall begin deliberations on the means of fulfilling the obligations set out in Article 9, and paragraphs 1 and 2 of this Article, including the preparation of workplans. Such workplans shall pay special attention to the needs and circumstances of the developing countries. States and regional economic integration organizations not party to the Protocol should be encouraged to participate in activities specified in such workplans.

## ARTICLE 11: MEETINGS OF THE PARTIES

1. The Parties shall hold meetings at regular intervals. The secretariat shall convene the first meeting of the Parties not later than one year after the date of the entry into force of this Protocol and in conjunction with a meeting of the Conference of the Parties to the Convention, if a meeting of the latter is scheduled within that period.

2. Subsequent ordinary meetings of the parties shall be held, unless the Parties otherwise decide, in conjunction with meetings of the Conference of the Parties to the Convention. Extraordinary meetings of the Parties shall be held at such other times as may be deemed necessary by a meeting of the Parties, or at the written request of any Party, provided that, within six months of such a request being communicated to them by the secretariat, it is supported by at least one third of the Parties.

3. The Parties, at their first meeting, shall:

(a) Adopt by consensus rules of procedure for their meetings;

(b) Adopt by consensus the financial rules referred to in paragraph 2 of Article 13;

(c) Establish the panels and determine the terms of reference referred to in Article 6;

(d) Consider and approve the procedures and institutional mechanisms specified in Article 8; and

(e) Begin preparation of workplans pursuant to paragraph 3 of Article 10.

4. The functions of the meetings of the Parties shall be to:

(a) Review the implementation of this Protocol;

(b) Decide on any adjustments or reductions referred to in paragraph 9 of Article 2;

(c) Decide on any addition to, insertion in or removal from any annex of substances and on related control measures in accordance with paragraph 10 of Article 2;

(d) Establish, where necessary, guidelines or procedures for reporting of information as provided for in Article 7 and paragraph 3 of Article 9;

(e) Review requests for technical assistance submitted pursuant to paragraph 2 of Article 10;

(f) Review reports prepared by the secretariat pursuant to subparagraph (c) of Article 12;

(g) Assess, in accordance with Article 6, the control measures provided for in Article 2;

(h) Consider and adopt, as required, proposals for amendment of this Protocol or any annex and for any new annex;

(i) Consider and adopt the budget for implementing this Protocol; and

(j) Consider and undertake any additional action that may be required for the achievement of the purposes of this Protocol.

5. The United Nations, its specialized agencies and the International Atomic Energy Agency, as well as any State not party to this Protocol, may be represented at meetings of the Parties as observers. Any body or agency, whether national or international, governmental or non-governmental, qualified in fields relating to the protection of the ozone layer which has informed the secretariat of its wish to be represented at a meeting of the Parties as an observer may be admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure adopted by the Parties.

ARTICLE 12: SECRETARIAT

For the purposes of this Protocol, the secretariat shall:

(a) Arrange for and service meetings of the Parties as provided for in Article 11;

/...

(b) Receive and make available, upon request by a Party, data provided pursuant to Article 7;

(c) Prepare and distribute regularly to the Parties reports based on information received pursuant to Articles 7 and 9;

(d) Notify the Parties of any request for technical assistance received pursuant to Article 10 so as to facilitate the provision of such assistance;

(e) Encourage non-Parties to attend the meetings of the Parties as observers and to act in accordance with the provisions of this Protocol;

(f) Provide, as appropriate, the information and requests referred to in subparagraphs (c) and (d) to such non-party observers; and

(g) Perform such other functions for the achievement of the purposes of this Protocol as may be assigned to it by the Parties.

ARTICLE 13: FINANCIAL PROVISIONS

1. The funds required for the operation of this Protocol, including those for the functioning of the secretariat related to this Protocol, shall be charged exclusively against contributions from the Parties.

2. The Parties, at their first meeting, shall adopt by consensus financial rules for the operation of this Protocol.

ARTICLE 14: RELATIONSHIP OF THIS PROTOCOL TO THE CONVENTION

Except as otherwise provided in this Protocol, the provisions of the Convention relating to its protocols shall apply to this Protocol.

ARTICLE 15: SIGNATURE

This Protocol shall be open for signature by States and by regional economic integration organizations in Montreal on 16 September 1987, in Ottawa from 17 September 1987 to 16 January 1988, and at United Nations Headquarters in New York from 17 January 1988 to 15 September 1988.

ARTICLE 16: ENTRY INTO FORCE

1. This Protocol shall enter into force on 1 January 1989, provided that at least eleven instruments of ratification, acceptance, approval of the Protocol or accession thereto have been deposited by States or regional economic integration organizations representing at least two-thirds of 1986 estimated global consumption of the controlled substances, and the provisions of paragraph 1 of Article 17 of the Convention have been fulfilled. In the event that these conditions have not been fulfilled by that date, the Protocol shall enter into force on the ninetieth day following the date on which the conditions have been fulfilled.

/...

2. For the purposes of paragraph 1, any such instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by member States of such organization.

3. After the entry into force of this Protocol, any State or regional economic integration organization shall become a Party to it on the ninetieth day following the date of deposit of its instrument of ratification, acceptance, approval or accession.

ARTICLE 17: PARTIES JOINING AFTER ENTRY INTO FORCE

Subject to Article 5, any State or regional economic integration organization which becomes a Party to this Protocol after the date of its entry into force, shall fulfil forthwith the sum of the obligations under Article 2, as well as under Article 4, that apply at that date to the States and regional economic integration organizations that became Parties on the date the Protocol entered into force.

ARTICLE 18: RESERVATIONS

No reservations may be made to this Protocol.

ARTICLE 19: WITHDRAWAL

For the purposes of this Protocol, the provisions of Article 19 of the Convention relating to withdrawal shall apply, except with respect to Parties referred to in paragraph 1 of Article 5. Any such Party may withdraw from this Protocol by giving written notification to the Depositary at any time after four years from assuming the obligations specified in paragraphs 1 to 4 of Article 2. Any such withdrawal shall take effect upon expiry of one year after the date of its receipt by the Depositary, or on such later date as may be specified in the notification of the withdrawal.

ARTICLE 20: AUTHENTIC TEXTS

The original of this Protocol, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF THE UNDERSIGNED, BEING DULY AUTHORIZED TO THAT EFFECT, HAVE SIGNED THIS PROTOCOL.

DONE AT MONTREAL THIS SIXTEENTH DAY OF SEPTEMBER, ONE THOUSAND NINE HUNDRED AND EIGHTY SEVEN.

/...

## Annex A

CONTROLLED SUBSTANCES

| Group | Substance | Ozone Depleting Potential*/ |
|---|---|---|
| Group I | | |
| $CFCl_3$ | (CFC-11) | 1.0 |
| $CF_2Cl_2$ | (CFC-12) | 1.0 |
| $C_2F_3Cl_3$ | (CFC-113) | 0.8 |
| $C_2F_4Cl_2$ | (CFC-114) | 1.0 |
| $C_2F_5Cl$ | (CFC-115) | 0.6 |
| Group II | | |
| $CF_2BrCl$ | (halon-1211) | 3.0 |
| $CF_3Br$ | (halon-1301) | 10.0 |
| $C_2F_4Br_2$ | (halon-2402) | (to be determined) |

*/ These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically.

---

## Appendix A.4 -- Final Statement of the Second World Climate Conference (Geneva, 1990)

7 November 1990

# SECOND WORLD CLIMATE CONFERENCE FINAL CONFERENCE STATEMENT

## SUMMARY

1. Climate issues reach far beyond atmospheric and oceanic sciences, affecting every aspect of life on this planet. The issues are increasingly pivotal in determining future environmental and economic well-being. Variations of climate have profound effects on natural and managed systems, the economies of nations and the well-being of people everywhere. A clear scientific consensus has emerged on estimates of the range of global warming which can be expected during the 21st century. If the increase of greenhouse gas concentrations is not limited, the predicted climate change would place stresses on natural and social systems unprecedented in the past 10,000 years.

2. At the First World Climate Conference in 1979, nations were urged "to foresee and to prevent potential man-made changes in climate that might be adverse to the well-being of humanity". The Second World Climate Conference concludes that, notwithstanding scientific and economic uncertainties, nations should now take steps towards reducing sources and increasing sinks of greenhouse gases through national and regional actions, and negotiation of a global convention on climate change and related legal instruments. The long-term goal should be to halt the build-up of greenhouse gases at a level that minimizes risks to society and natural ecosystems. The remaining uncertainties must not be the basis for deferring societal responses to these risks. Many of the actions that would reduce risk are also desirable on other grounds.

3. A major international observational and research effort will be essential to strengthen the knowledge-base on climate processes and human interactions, and to provide the basis for operational climate monitoring and prediction.

# PART I

# MAIN CONCLUSIONS AND RECOMMENDATIONS

## A. Greenhouse Gases and Climate Change

1. Emissions resulting from human activities are substantially increasing atmospheric concentrations of the greenhouse gases. These increases will enhance the natural greenhouse effect, resulting on average in an additional warming of the Earth's surface. The Conference agreed that this and other scientific conclusions set out by the IPCC reflect the international consensus of scientific understanding of climate change. Without actions to reduce emissions, global warming is predicted to reach 2 to 5 degrees C over the next century, a rate of change unprecedented in the past 10,000 years. The warming is expected to be accompanied by a sea level rise of 65 cm ± 35 cm by the end of the next century. There remain uncertainties in predictions, particularly in regard to the timing, magnitude and regional patterns of climate change.

2. Climate change and sea level rise would seriously threaten low-lying islands and coastal zones. Water resources, agriculture and agricultural trade, especially in arid and semi-arid regions, forests, and fisheries are especially vulnerable to climate change. Climate change may compound existing serious problems of the global mismatch between resources, population and consumption. In many cases the impacts will be felt most severely in regions already under stress, mainly in developing countries.

3. Global warming induced by increased greenhouse gas concentrations is delayed by the oceans; hence, much of the change is still to come. Inertia in the climate system due to the influence of the oceans, the biosphere and the long residence times of some greenhouse gases means that climate changes that occur may persist for centuries.

4. Natural sources and sinks of greenhouse gases are sensitive to a change in climate. Although many of the response or feedback processes are poorly understood, it appears likely that, as climate warms, these feedbacks will lead to an overall increase rather than a decrease in greenhouse gas concentrations.

5. The historical growth in emissions has been a direct consequence of the increase of human population, rising incomes, the related exploitation of fossil fuels by industrialized societies and the expansion of agriculture. Under "Business-as-Usual" assumptions*, it is projected that emissions will continue to grow in the future as a consequence of a projected doubling of energy consumption in the first half of the 21st century and an expected doubling of population by the latter half. As a result, the effect of human-induced greenhouse gas concentrations on the earth's radiation balance would by 2025 correspond to a doubling of carbon dioxide unless remedial actions are taken.

6. Over the last decade, emissions of carbon dioxide ($CO_2$) contributed 55% of the increased radiative forcing produced by greenhouse gases from human activities. The CFCs contributed about 24% of the past decade's changes, and methane 15%, with the balance due to other greenhouse gases. With controls on CFCs under the Montreal Protocol, the relative importance of $CO_2$ emissions will increase, provided the substitutes for CFCs have minimal

---

* "Business-as-Usual" assumes that few or no steps are taken to limit greenhouse gas emissions. Energy use and clearing of tropical forests continue and fossil fuels, in particular coal, remain the world's primary energy source. The Montreal Protocol comes into effect but without strengthening and with less than 100 percent compliance.

greenhouse warming potential. Some 75% of total $CO_2$ emissions have come from the industrialized countries.

7. The above emissions can be expected to change the planet's atmosphere and climate, and a clear scientific consensus has been reached on the range of changes to be expected. Although this range is large, it is prudent to exercise, as a precautionary measure, actions to manage the risk of undesirable climate change. In order to stabilize atmospheric carbon dioxide concentrations by the middle of the 21st century at about 50% above pre-industrial concentrations, a continuous world-wide reduction of net carbon dioxide emissions by 1 to 2% per year starting now would be required. The Intergovernmental Panel on Climate change (IPCC) also considered three other emissions scenarios, which would not lead to stabilization of $CO_2$ concentrations in the 21st century. A 15 to 20% reduction in methane emissions would stabilize atmospheric concentrations of that gas.

8. This Conference concludes that technically feasible and cost-effective opportunities exist to reduce $CO_2$ emissions in all countries. Such opportunities for emissions reductions are sufficient to allow many industrialized countries to stabilize $CO_2$ emissions from the energy sector and to reduce these emissions by at least 20 percent by 2005. The measures include increasing the efficiency of energy use and employing alternative fuels and energy sources. As additional measures to achieve further cost-effective reductions are identified and implemented, even greater decreases in emissions would be achieved in the following decades. In addition, reversing the current net losses in forests would increase storage of carbon. The economic and social costs and benefits of such measures should be urgently examined by all nations. An internationally coordinated assessment should be undertaken through the IPCC.

9. Countries are urged to take immediate actions to control the risks of climate change with initial emphasis on actions that would be economically and socially beneficial for other reasons as well. Nations should launch negotiations on a convention on climate change and related legal instruments without delay and with the aim of signing such a convention in 1992.

## B. Use of Climate Information in Assisting Sustainable Social and Economic Development

Climate data, analyses, and eventually climate predictions, can contribute substantially to enhancing the efficiency and security of economic and developmental activities in environmentally sustainable ways. These benefits are particularly important in food and wood production, water management, transportation, energy planning and production (including assessment of potential resources of biomass, hydropower, solar and wind energy), urban planning and design, human health and safety, combatting of drought and land degradation, and tourism. This requires both data on the climate system, and its effective application. Data acquisition, collection, management and analysis must be more vigorously supported in all countries and special assistance provided to developing countries through international cooperation. Transfer of techniques for applying climate information should be accelerated through more widespread use of software (e.g. CLICOM) for readily available personal computers and other means. Further development of methods for predicting short-term variations in climate and the environmental and social impacts should be vigorously pursued. These advances would provide enormous economic and other welfare benefits in coping with droughts, prolonged rain, and periods of severe hot and cold weather. Such predictions will require major steps forward in ocean-atmosphere-biosphere observing systems. Much greater efforts are also needed to increase involvement in these fields by developing countries, especially through increased education and training.

## C. Priorities for Enhanced Research and Observational Systems

1. A consensus exists among scientists as summarized in the Report of Working Group I of the IPCC that climate change will occur due to increasing greenhouse gases. However, there is substantial scientific uncertainty in the details of projections of future climate change. Projections of future regional climate and climate impacts are much less certain than those on a global scale. These uncertainties can only be narrowed through research addressing the following priority areas:

- clouds and the hydrological cycle
- greenhouse gases and the global carbon and biogeochemical cycles
- oceans: physical, chemical and biological aspects; and exchanges with the atmosphere
- paleo-climatic studies
- polar ice sheets and sea ice
- terrestrial ecosystems.

2. These subjects are being addressed by national programmes, the World Climate Research Programme and the International Geosphere-Biosphere Programme and other related international programmes. Increased national support and substantially increased funding of these programmes is required if progress on the necessary time scale is to be made in reducing the uncertainties.

3. Present observational systems for monitoring the climate system are inadequate for operational and research purposes. They are deteriorating in both industrialized and developing regions. Of special concern is the inadequacy of observation systems in large parts of the southern hemisphere.

4. High priority must be placed on the provision and international exchange of high-quality, long-term data for climate-related studies. Data should be available at no more than the cost of reproduction and distribution. A full and open exchange of global and other data sets needed for climate-related studies is required.

5. There is an urgent need to create a *Global Climate Observing System* (GCOS) built upon the World Weather Watch Global Observing System and the Integrated Global Ocean Service System and including both space-based and surface-based observing components. GCOS should also include the data communications and other infrastructure necessary to support operational climate forecasting.

6. GCOS should be designed to meet the needs for:
   (a) climate system monitoring, climate change detection and response monitoring, especially in terrestrial ecosystems
   (b) data for application to national economic development
   (c) research towards improved understanding, modelling and prediction of the climate system.

7. Such a GCOS would be based upon:
   (1) an improved World Weather Watch Programme
   (2) the establishment of a global ocean observing system (GOOS) of physical, chemical and biological measurements
   (3) the maintenance and enhancement of monitoring programmes of other key components of the climate system, such as the distribution of important atmospheric constituents (including the Global Atmosphere Watch), changes in terrestrial ecosystems, clouds and the hydrological cycle, the earth's radiation budget, ice sheets, and precipitation over the oceans.

8. The further development and implementation of the GCOS concept should be pursued, with urgency, by scientists, governments and international organizations.

9. The impacts of climate variability on human socio-economic systems have provided major constraints to development. Climate change may compound these constraints. In semi-arid regions of Africa, drought episodes have been directly responsible for major human disasters. Research undertaken during the first decade of the WCP and through other international and national programmes has improved drought early warning systems, including FAO's Global Early Warning System, and increased the reliability of climate impact analyses. But much more remains to be done. Intensified efforts are required to refine further our ability to predict short-term climate variability, anticipate climate impacts, and identify rational strategies to mitigate or prevent adverse effects. The threat of climate change brings new challenges to the future well-being of people. This requires greater efforts to understand impacts of climate change. Mitigation and adaptation strategies are also essential. Immediate steps to be taken include:

(a) national and regional analyses of the impacts of climate variability and change on society, and study of the range of response and adaptation options available
(b) closer co-operation and communication among natural and social scientists, to ensure that climate considerations are accounted for in development planning
(c) significant increases in resources to carry out impact/adaptation studies.

10. Improvements in energy efficiency and non-fossil fuel energy technologies are of paramount importance, not only to reduce greenhouse gas emissions but to move to more sustainable development pathways. Such advances will require research and development, as well as technology transfer and co-development.

11. A specific initiative would create a network of regional, interdisciplinary research centres, located primarily in developing countries, and focussing on all of the natural science, engineering and social science disciplines required to support fully integrated studies of global change and its impacts and policy responses. The centres would conduct research and training on all aspects of global change and study the interaction of regional and global policies.

## D. Public Information

People need better information on the crucial role climate plays in development and the additional risks posed by climate change. Governments, intergovernmental and non-governmental organizations should give more emphasis to providing accurate public information on climate issues. The public information and education and training component in the WCP and IGBP must also be expanded.

# PART II

# SPECIFIC ISSUES

## 1. Water

1.1 Among the most important impacts of climate change will be its effects on the hydrological cycle and water management systems, and through these, on socio-economic systems. Increases in incidence of extremes, such as floods and droughts, would cause increased frequency and severity of disasters.

1.2 The design of many costly structures to store and convey water, from large dams to small drainage facilities, is based on analyses of past records of climatic and hydrological parameters. Some of these structures are designed to last 50 to 100 years or even longer. Records of past climate and hydrological conditions may no longer be a reliable guide to the future. The design and management of both structural and non-structural water resource systems should allow for the possible effects of climate change.

1.3 Data systems and research must be strengthened to predict water resources impacts, detect hydrological changes, and improve hydrological parameterization in global climate models.

1.4 Existing and novel technologies, for more efficient use of water for irrigation, should be made available to developing countries in semi-arid zones.

## 2. Agriculture and Food

2.1 Important uncertainties remain regarding the prediction of the magnitude and nature of potential impacts of changing climate and higher $CO_2$ levels on global food security. The potential impact on food production in developing countries, with more than half the world's population, could be more uncertain than recent reviews suggest.

2.2 High priority should therefore be given to research on the direct effects of rising $CO_2$ concentrations on food and fibre crop productivity and equal priority should be given to research on agricultural emissions so as to determine agriculture's present and potential role as a source of and sink for greenhouse gases, and to clarify the costs and possible trade-offs arising from limitation measures.

2.3 New or strengthened institutional mechanisms are required to upgrade natural resource inventories, research strategies and extension services to raise agricultural productivity and minimize emissions. These mechanisms should include collaborative programmes between FAO and international and national agencies with stress on interdisciplinary activities on food security and related topics.

## 3. Oceans, Fisheries and Coastal Zones

3.1 The earth's climate including shorter-term variations is influenced by the coupled atmosphere - ocean system. Coastal zones and their associated high biological productivity, including fisheries, are especially affected. Thus, an improved data base of oceanic parameters is considered indispensable for operational climate forecasting. It is recommended that a global ocean observing and data management system be developed for improving predictions of climate change. Research on the oceans will provide quantification of important feedback loops in climate processes. Observation and research on the El Niño - Southern Oscillation phenomena, on upwelling areas and on biological productivity of the open sea are also important.

3.2 Coastal zones, which are the source of most of the global fish catch, are especially susceptible to effects of global warming and sea level rise. Predicting the impact of changes

would be of enormous benefit to the increasing number of people living in coastal areas. Thus, it is also recommended that a programme of coastal zone research and monitoring be established to identify the effects of climate change on the coast and coastal ecosystems, and to assess the vulnerability of various natural and managed ecosystems such as coral reefs, mangroves and coastal aquaculture.

3.3 Action should be taken now to develop coastal zone adaptation strategies and policies.

## 4. Energy

4.1 In order to stabilize atmospheric concentrations of greenhouse gases while allowing for growth in emissions from developing countries, industrialized countries must implement reductions even greater than those required, on average, for the globe as a whole. However, even where very large technical and economic opportunities have been identified for reducing energy-related greenhouse gas emissions, and even where there are significant and multiple benefits associated with these measures, implementation is being slowed and sometimes prevented by a host of barriers. These barriers exist at all levels — at the level of consumers, energy equipment manufacturers and suppliers, industries, utilities, and governments. Overcoming the barriers obstructing least-cost approaches to meeting energy demands will require responses from all parts of society — individual consumers, industry, governments, and non-governmental organizations.

4.2 Developing countries also have an important role in limiting climate change. Maintaining development as a principal objective, energy and development paths can be chosen that have the additional benefit of minimizing radiative forcing.

## 5. Land Use and Urban Planning

Population growth, increasing urbanization, and competing demands for finite areas of arable land will produce increasingly severe problems of food supply, energy production, and water resources. Climate changes may exacerbate these problems in some regions. Prudent planning will require baseline analyses of land use, quality and quantity of water resources, and the assessment of vulnerability of urbanized societies to environmental change. In particular, improved adaptation of urban areas to local climatic regimes needs to be achieved by more appropriate layouts and building densities, and improved building construction through modifications to building and planning regulations. Because conurbations make a major contribution to energy-related greenhouse gas emissions, the design and efficiency of all aspects of urban systems should be enhanced.

## 6. Health and Human Dimensions

6.1 The direct impact of climate change on people, their health and cultural heritage, could be severe. There is likely to be increased health inequity between peoples of developing and developed countries. Climatic change could result in increasing numbers of environmental refugees with associated increases of ill-health, disease and death among them.

6.2 Global warming is likely to shift the range of favourable conditions for certain pests and diseases, causing additional stresses on people, particularly those of the semi-arid tropics. It must be appreciated however that serious problems may arise in all parts of the world.

6.3 Research into how human behaviour contributes to and responds to climate change must have increased emphasis. Public awareness and education programmes are particularly essential in this regard.

## 7. Environment and Development

7.1 Climate change, superimposed on population pressures, excessive consumption, and other stresses on the environment imperils the sustainability of socio-economic development

throughout the world. In addition, slowing climate change will give countries more time to enhance their prospects for sustainable development. The developed countries need to reduce emissions and assist the developing countries to adopt new, clean technologies.

7.2 Climate change has such important implications for the sustainability of development that policy responses, including measures to reduce greenhouse gases, measures to reduce deforestation, and the commitment of financial and other resources, are justified for that reason alone. Economic policies, such as subsidies and trade restraints, can distort markets so they harm the environment and contribute to global warming and sea level rise. There is an imperative need for development policies that not only reduce global warming trends but also increase economic and social resilience.

## 8. Forests

While increasing forest cover can contribute to the slowing of global climate change, this is not the major cure for the problem.

Five priority actions are recommended:

(1) Assessing national opportunities to increase forest carbon storage commensurate with national resource development policies, developing an approach by 1992 and completing assessment by 1995

(2) Managing the world's forests to optimize biomass and resultant carbon storage in addition to the maintenance of sustainable yields of forest products, biological diversity, water quality and the many other values that forests provide

(3) Accelerating research to assess the added contribution that forests can make to atmospheric $CO_2$ reduction and the impacts of climate change on the world's forests

(4) Designing and implementing international monitoring systems to determine conditions and changes in forest ecosystems in response to anticipated climate changes

(5) Supporting the development of an international instrument on conservation and development of the world's forests linked with climate and biodiversity conventions.

# PART III

# ORGANIZATIONAL AND POLICY ISSUES FOR INTERNATIONAL ACTIVITIES

## 1. The Future Structure of the WCP

1.1 The WCP should be broadened and closely coordinated with related programmes of other agencies in response to increased emphasis on the prediction of climate and its impacts.

1.2 The World Climate Data Programme, renamed the World Climate System Monitoring Programme, should be redefined to take into account new objectives.

1.3 Greater emphasis in the strengthened WCP (WCP-2) should be given to adaptation, mitigation and education, with adaptation and mitigation activities closely linked to the Impact Studies Programme (WCIP).

1.4 The World Climate Applications Programme should be renamed the World Climate Applications and Services Programme (WCASP) to reflect the need for intensifying efforts to provide climatological services to a wide variety of users. There should be strong interaction between WCIP and WCASP.

1.5 The organizational framework for international scientific research is in place, constituted by the WCRP, emphasizing the physical aspects, and the IGBP, covering bio-geochemical aspects.

1.6 Governments should establish national committees for the WCP to mobilize support for national activities and to coordinate efforts. The UN agencies and ICSU should work towards ensuring regular contact and exchange of information with national committees.

1.7 The mechanism established for overall coordination of the WCP, involving meetings of the chairs of steering bodies for the various components, should be actively supported by WMO, the other UN bodies concerned and ICSU. Annual meetings of Executive Heads should consider their recommendations.

1.8 Restructuring and strengthening of the WCP will also be necessary to support new activities, such as the development of the proposed GCOS. The Conference recommended that a proposal for the new structure of WCP be formulated by the organizations involved, taking into account the above comments, and presented to the Eleventh World Meteorological Congress, May 1991, and at appropriate meetings of other participating organizations.

## 2. Special Needs of the Developing Countries

2.1 As stated in the IPCC report, industrialized and developing countries have a common but differentiated responsibility for dealing with the problems of climate change. The problem is largely the consequence of past patterns of economic growth in the industrial countries. However, in future the much needed economic growth in the developing countries could play an important role in determining the rate of climate change.

2.2 Developing countries are being asked to participate in the alleviation of the legacy of environmental damage from prior industrialization. If they are to avoid the potentially disastrous course followed by industrialized countries in the past, they need to adopt modern technologies early in the process of development, particularly in regard to energy efficiency. They also must be full partners in the global scientific and technical effort that will be required. It is clear that developing countries must not go through the evolutionary process of previous industrialization but rather, must "leapfrog" ahead directly from a status of under-development through to efficient, environmentally benign, technologies.

2.3 Although developing countries have collaborated in providing data, and participated to a degree in meetings and research, they have benefited to a lesser extent from the analyses developed from their contributions, and even less so from the applications derived therefrom.

2.4 Therefore, a massive and sustained flow of scientific and technological expertise towards the development of the intellectual resources, technical and institutional capacity of the developing countries is a necessary complement to the efforts of those countries.

2.5 Developing countries should be assisted to build up their capabilities

- to monitor, assess and apply climate information
- to prepare inventories of greenhouse gases emissions and future emissions projections
- to identify impacts of potential global warming
- to prepare cost estimates and priorities for response strategies to adapt and mitigate problems posed by climate change
- to participate in the World Climate Programme.

2.6 The mechanisms of the transfer of technology and provision of technical assistance and co-operation to developing countries should take into account considerations such as the need for preferential and assured access, intellectual property rights, the environmental soundness of such technology and the financial implications.

2.7 Taking note that industry plays a significant role in the development and transfer

of science and technology, efforts by industry to promote further the development and transfer of environmentally sound technologies should be encouraged, and policies to encourage such efforts should be formulated.

2.8 Additional financial resources will have to be channelled to developing countries for those activities which contribute both to limiting greenhouse gas emissions and/or adapting to any adverse effects of climate change, and promoting economic development. Areas for co-operation and assistance could include the efficient use of energy, land use planning, forest management, soil and water conservations, strengthening of observational systems and scientific and technological capabilities.

## 3. Co-operation in International Research

3.1 The existing and planned research projects of the WCRP and the IGBP address the highest priority scientific issues related to the understanding and prediction of climate variability and change.

3.2 These programmes should be implemented completely and rigorously. It is particularly important that adequate funding, including long-term funding commitments, be provided.

3.3 In view of the progress made in climate research, it is now timely to proceed to the detailed design of an operational global climate observing system (Section C, paras. 5 - 8), together with the data communications and other infrastructure needed to support operational climate forecasting. Governments should enter into early discussions aimed at international cooperation in operational climate forecasting.

## 4. Co-ordinated International Activities and Policy Development

4.1 The Conference endorsed the three streams of international activity:

a. Global measurement and research efforts through the WCP, IGBP, and other related international programmes
b. Assessment functions of a continuing IPCC to support negotiation of and provide technical input to a Convention
c. Development of a Convention on Climate Change.

It is essential that all parties to a Convention and related legal instruments should, as part of their obligations, be required to participate fully in the free exchange and flow of information necessary for technical input to the convention. Such a convention should include a technical annex to provide for:

- International co-operation in research, systematic observation and exchange of related information
- Adjustments based on up-dates of scientific knowledge
- Strengthening national scientific and environmental capabilities of developing countries.

4.2 The development of policy regarding climate change requires on the part of policy makers an understanding of the underlying science and a weighing of the scientific uncertainties associated with the prediction of climate change and its likely impacts. An important aspect of future work is therefore a continued dialogue between scientists and policy makers.

4.3 The UN Conference on Environment and Development (Brazil 1992) provides a valuable opportunity to relate the above three themes to the other environment/development issues and objectives being examined by the Conference. It is therefore essential that the three streams should interact effectively with UNCED.

4.4 It is proposed that the sponsoring agencies for the SWCC consider the possibility of holding a Third World Climate Conference at an appropriate time about the year 2000.

## Appendix A.5 -- Sources

### A.5.1 -- Interviews

Yusuf Ahmad, Senior Advisor to the Executive-Director, United Nations Environment Programme, Nairobi, Kenya, 14 August 1991.

John Kristian Atchley, Counselor of Embassy and Permanent Representative to UNEP, American Embassy, Nairobi, Kenya, 15 August 1991.

George Barnett, Senior Product Manager, responsible for HFC134a, Imperial Chemicals Limited Plc, Runcorn, England, 4 April 1991.

Mona Bjorklund, Environmental Management, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991.

Daniel Blank, Division of Global Change, Environmental Protection Agency, Washington, DC, USA, 19 April 1990.

Amedeo Buonajuti, Chief, Follow-up and Evaluation Section, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991.

Tom Burke, Director, Green Alliance, London, England, 4 June 1990.

G. Victor Buxton, Executive Director, National Secretariat, 1992 UNCED, Environment Canada, Hull, Canada, 2 and 3 January 1991.

Vincent Cable, Commonwealth Secretariat, London, England, 8 February 1990.

Shane Cave, Editor, *Our Planet*, Information and Public Affairs, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991.

Oleg Alex Chistoff, Counsellor, Canadian High Commission, Nairobi, Kenya, 26 July 1991.

Uttam Dabholkar, Chief, Development Planning and Co-operation Unit, United Nations Environment Programme, Nairobi, Kenya, 30 July 1991.

A. Davis, Department of the Environment, London, England, 4 April 1991.

David Doniger, Natural Resources Defense Council, Washington, DC, USA, 19 April 1990.

M. J. Flux, Group Environment Advisor, Imperial Chemicals Limited Plc, London, England, 1 March 1990.

John D. Friend, First Secretary, High Commission of the United Kingdom, Nairobi, Kenya, 25 July 1991.

Michael Grubb, Royal Institute of International Affairs, London, England, 23 March 1990.

M.D. Gwynne, Director, Global Environment Monitoring System Programme Activity Centre, United Nations Environment Programme, Nairobi, Kenya, 13 August 1991.

Scott Hajost, Environmental Defense Fund, Washington, DC, USA, 20 April 1990.

Brian Herman, Deputy Director, Energy and Environment Division, External Affairs and International Trade Canada, Ottawa, Canada, 2 January 1991.

W-K. Hoogendoorn, Deputy Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 16 July 1991.

Karen Jorgensen, Special Assistant to the Executive Director for Programme Matters, United Nations Environment Programme, Nairobi, Kenya, 23 July 1991.

Serge Langdau, Environment Canada, Hull, Canada, 14 December 1990.

David S. Lazarus, Co-ordinator, Programme Communications, Information and Public Affairs, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991.

Tim Leah, National Secretariat, 1992 UNCED, Environment Canada, Hull, Canada, 2 January 1991.

Francis Lee, Department of State, Division of Global Change, Washington, DC, USA, 20 April 1990.

William Mansfield III, Deputy Executive Director, United Nations Environment Programme, Nairobi, Kenya, 13 August 1991.

Juan Antonio Mateos, Ambassador and Permanent Representative to UNEP, Embassy of Mexico, Nairobi, Kenya, 31 July 1991.

L.P.J. Mazairac, Ambassador and Permanent Representative to UNEP, Embassy of the Kingdom of the Netherlands, Nairobi, Kenya, 2 August 1991.

Fiona McConnell, Department of the Environment, London, England, 27 March 1990.

Richard Mott, Environmental Law Institute, Washington, DC, USA, 20 April 1990.

Philippe Orliange, Representant Permanent Adjoint de la France, Aupres de l'Office des Nations-Unies a Nairobi, Ambassade de France au Kenya, Nairobi, Kenya, 15 July 1991.

Gwyn Prickett, Natural Resources Defence Council, Washington, DC, USA, 18 April 1990.

Mikko Pyhala, Chief, Clearing-House Unit, United Nations Environment Programme, Nairobi, Kenya, 30 July 1991.

Kathryn Ranscombe, Public Relations Manager, British Aerosol Manufacturers' Association, London, England, 27 March 1991.

Iwona Rummel-Bulska, Chief, Environmental Law Unit, United Nations Environment Programme, Nairobi, Kenya, 1 August 1991.

Douglas Russell, Director, Climate Change Convention Negotiations, Atmospheric Environment Service, Environment Canada, Ottawa, Canada, 2 January 1991.

Vicente Sanchez, Ambassador and Permanent Representative to UNEP, Embassy of Chile, Nairobi, Kenya, 2 August 1991.

A. Sharmar, Ozone Secretariat, United Nations Environment Programme, Nairobi, Kenya, 24 July 1991.

Peter Thacher, World Resources Institute, Washington, DC, USA, 19 April 1990.

Jack Titsworth, Counsellor (Development), Canadian High Commission, Nairobi, Kenya, 26 July 1991.

Peter Usher, Atmospheric Co-ordinator, Global Environment Monitoring System Programme Activity Centre, United Nations Environment Programme, Nairobi, Kenya, 23, 24, 29 and 30 July, and 1 August 1991.

Scott Vaughan, Speechwriter to the Executive Director, United Nations Environment Programme, Nairobi, Kenya, 13 August 1991.

Pamela Wexler, Center for Global Change, University of Maryland, College Park, MD, USA, 18 April 1990.

### A.5.2 -- Scientific Papers

Svante Arrhenius, 'On the Influence of Carbonic Acid in the Air Upon the Temperature on the Ground', *Philosophical Magazine* (Vol. 41, April 1896), pp. 237-76.

G.D. Callendar, 'The Artificial Production of Carbon Dioxide and Its Influence on Temperature', *Quarterly Journal of the Royal Meteorological Society* (Vol. 64, 1938), pp. 223-40

Sydney Chapman, 'The Theory of Upper Atmosphere Ozone', *Memoirs of the Royal Meteorological Society* (Vol. 3, No. 26, 1930), pp. 103-25.

J.C. Farman *et al*, 'Large Losses of Total Ozone in Antarctica Reveal Seasonal $CLO_x/NO_x$ Interaction', *Nature* (Vol. 315, 16 May 1985), pp. 207-10.

Jean-Baptiste Fourier, 'Les Temperatures du Globe Terrestre et des Espaces Planetaires', *Memoires de L'Academe Royal des Sciences de L'Institut de France* (Vol. 7, 1824), pp. 569-604.

Mario J. Molina and F.S. Rowland, 'Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom-catalysed Destruction of Ozone', *Nature* (Vol. 249, 28 June 1974), pp. 810-12.

R. Revelle and H. E. Suess, 'Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric $CO_2$ During the Past Decades', *Tellus* (Vol. 9, 1957), pp. 18-27.

H.I. Schiff (ed.), Special Issue of *Canadian Journal of Chemistry* on 'Aeronomy of the Stratosphere and Mesosphere' (Vol. 52, No. 8, Part 2, 15 April 1974), pp. 1381-1634.

J. Tyndall, 'On Radiation Through the Earth's Atmosphere', *Philosophical Magazine* (Vol. 4, 1863), pp. 200-07.

### A.5.3 -- Conference Reports and Declarations

'The Beijing Ministerial Declaration (Letter dated 1 July 1991 from the Charge d'affaires a.i. of the Permanent Mission of China to the United Nations addressed to the Secretary-General)' (UN/A/46/293, 9 July 1991).

World Meteorological Organisation and others, *Second World Climate Conference: Conference Statement and Ministerial Declaration* (Geneva, Switzerland: 29 October - 7 November 1990).

'Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer' (London: 27-29 June 1990), reprinted in *International Legal Materials* (Vol. 30, No. 2, March 1991), pp. 539-554.

'Bergen Conference (Ministerial Declaration on Sustainable Development)' (Bergen, Norway: 14-16 May 1990), reprinted in *Environmental Policy and Law* (Vol. 20, No. 3, 1990), pp. 100-07.

'The World Conference on Preparing for Climate Change' (Cairo, Egypt: 17-21 December 1989), reprinted in *Environmental Policy and Law* (Vol. 20, Nos. 1/2, 1990), pp. 59-60.

'Ministerial Conference on Atmospheric Pollution and Climatic Change', *Conference Statement* (Noordwijk, The Netherlands: 6-7 November 1989).

'Commonwealth Heads of Government Langkawi Declaration on Environment' (Langkawi, Malaysia: 18-24 October 1989), reprinted in *Commonwealth Law Bulletin* (Vol. 15, No. 4, October 1989), pp. 1545-51.

'Helsinki Declaration on the Protection of the Ozone Layer' (Helsinki, Finland: 2' May 1989), reprinted in *Environmental Policy and Law* (Vol. 19, Nos. 3/4, 1989), p. 137.

'Summit Meeting on the Protection of the Atmosphere, Declaration of the Hague' (The Hague: The Netherlands: 11 March 1989), reprinted in *Environmental Policy and Law* (Vol. 19, No. 2, 1989), p. 78.

'Saving the Ozone Layer', *Conference Communique* (London: 5-7 March 1989), reprinted in Pearce Wright, 'Banning CFCs in Only Remedy', *The Times* (London), 8 March 1989, p. 6.

'Protection of the Atmosphere: International Meeting of Legal and Policy Experts', *Conference Statement* (Ottawa, Canada: 20-22 February 1989).

'Global Warming and Climate Change: Perspectives from Developing Countries', *Conference Statement* (New Delhi: February 1989).

World Meteorological Organisation, 'The Changing Atmosphere: Implications for Global Security', *Conference Proceedings* (Toronto, June 1988) (Geneva: WMO, No. 710).

World Climate Programme (Impact Studies), *Developing Policies for Responding to Climate Change* (A Summary of the Discussions and Recommendations of the Workshops Held in Villach (28 September - 2 October 1987) and Bellagio (9 -13 November 1987) under the auspices of the Beijer Institute, Stockholm) (Geneva: WMO/TD, No. 225, April 1988).

'Montreal Protocol on Substances that Deplete the Ozone Layer', reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1541-61.

World Meteorological Organisation, *The International Conference on the Assessment of the Role of Carbon Dioxide and Other Greenhouse Gases in Climate Variations and Associated Impacts, Villach, Austria, 9-15 October 1985* (Geneva: WMO, No. 661).

'Vienna Convention for the Protection of the Ozone Layer', reprinted in *International Legal Materials* (Vol. 26, 1989), pp. 1516-40.

Wilfrid Bach *et al*, *Carbon Dioxide: Current Views and Developments in Energy/Climate Research, 2nd Course of the International School of Climatology, Eftore Majorana Centre for Scientific Culture, Erice, Italy, July 16-26, 1982* (Lancaster: D. Reidel Publishing Company, 1983).

Wilfrid Bach, Jurgen Pankrath and William Kellogg (eds.), *Man's Impact on Climate: Proceedings of an International Conference held in Berlin, June 14-16, 1978* (Oxford: Elsevier Scientific Publishing Company, 1979).

World Meteorological Organisation, *Proceedings of the World Climate Conference: A Conference on Experts on Climate and Mankind, Geneva, 12-23 February 1979* (Geneva: WMO, No. 537, 1979).

'World Plan of Action' (Washington, DC: March 1977), reprinted in Asit K. Biswas (ed.), *The Ozone Layer* (Oxford: Pergamon Press, 1979), pp. 377-81.

World Meteorological Organisation, *Proceedings of the WMO/IAMAP Symposium on Long-term Climatic Fluctuations: Norwich 18-23 August 1975* (Geneva: WMO, No. 42, 1975).

'United Nations Conference on the Human Environment: Final Documents' (Stockholm, Sweden: 5-16 June 1972), reprinted in *International Legal Materials* (Vol. 11, No. 6, November 1972), pp. 1416-69.

*Inadvertent Climate Modification: Report of the Study of Man's Impact on Climate* (London: The MIT Press, 1971).

*Man's Impact on the Global Environment: Report of the Study of Critical Environmental Problems* (London: MIT Press, 1970).

United Nations Educational, Scientific and Cultural Organisation and World Meteorological Organisation, *Changes of Climate: Proceedings of the Rome Symposium Organized by UNESCO and WMO* (Paris: UNESCO -- Arid Zone Research Series XX, 1963).

### A.5.4 -- Reports of Governmental and Intergovernmental Organisations

Intergovernmental Panel on Climate Change (J.T. Houghton, G.J. Jenkins and J.J. Ephraums (eds.)), *Climate Change: The IPCC Scientific Assessment* (Cambridge: Cambridge University Press for WMO and UNEP, 1990).

Intergovernmental Panel on Climate Change (W.J.McG. Tegart, G.W. Seldon and D.C. Griffiths (eds.)), *Climate Change: The IPCC Impacts Assessment* (Canberra: Australian Government Publishing Service for WMO and UNEP, 1990).

Intergovernmental Panel on Climate Change, *Climate Change: The IPCC Response Strategies* (Geneva: WMO and UNEP, 1990).

International Energy Agency, *Energy Efficiency and the Environment* (Paris: OECD, 1991).

International Energy Agency, *Greenhouse Gas Emissions: The Energy Dimension* (Paris: OECD, 1991).

Latin American and Caribbean Commission on Development and Environment, *Our Own Agenda* (Washington, DC: Inter-American Development Bank, and New York: United Nations Development Programme, 1990).

Organisation for Economic Co-operation and Development, *Environmental Data Compendium* (Paris: OECD, 1991).

Organisation for Economic Co-operation and Development, *Fluorocarbons: An Assessment of Worldwide Production, Use and Environmental Issues (First Interim Report)* (Paris: OECD, 1976).

United Kingdom Department of the Environment, Central Directorate on Environmental Protection, *Chlorofluorocarbons and their Effect on Stratospheric Ozone (Second Report)* (London: HMSO, Pollution Paper No. 15, 1979).

United Kingdom Department of the Environment, Central Unit on Environmental Pollution, *Chlorofluorocarbons and their Effect on Stratospheric Ozone* (London: HMSO, Pollution Paper, No. 5, 1976).

United Kingdom House of Commons Environment Committee, Various Reports (London: HMSO, various years).

United Kingdom Stratospheric Ozone Review Group, *Stratospheric Ozone* (London: HMSO, 1987, 1988 and 1990).

United Nations Environment Programme, Documents from: 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; the Bureau of the Montreal Protocol; the First, Second and Third Meetings of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer; the First and Second Meetings of the Parties to the Vienna Convention for the Protection of the Ozone Layer; and the Open-Ended Working Group of the Parties to the Montreal Protocol (Nairobi: UNEP, various dates).

United Nations General Assembly Resolution, 'Protection of Global Climate for Present and Future Generations of Mankind' (A/RES/46/169, 19 December 1991).

United Nations General Assembly Resolution, 'Protection of Global Climate for Present and Future Generations of Mankind' (A/RES/45/212, 21 December 1990).

United Nations General Assembly Resolution, 'International Co-operation in the Field of the Environment' (A/RES/44/229, 22 December 1989).

United Nations General Assembly Resolution, 'Protection of Global Climate for Present and Future Generations of Mankind' (A/RES/44/207, 22 December 1989).

United Nations General Assembly Resolution, 'Possible Adverse Effects of Sea-Level Rise on Islands and Coastal Areas, Particularly Low-lying Coastal Areas' (A/RES/44/206, 22 December 1989).

United Nations General Assembly Resolution, 'Protection of Global Climate for Present and Future Generations of Mankind' (A/RES/43/53, 6 December 1988).

United Nations General Assembly Resolution, 'Environmental Perspective to the Year 2000 and Beyond' (A/RES/42/186, 11 December 1987).

United Nations General Assembly Resolution, 'International Co-operation in the Field of the Environment' (A/RES/42/184, 11 December 1987).

United Nations General Assembly Resolution, 'Protection of the Ozone Layer' (A/RES/42/182, 11 December 1987).

United Nations General Assembly Resolution, 'United Nations Conference on the Human Environment' (2994(XXVII), 15 December 1972).

United States Climate Impact Assessment Program, *Report of Findings. The Effects of Stratospheric Pollution by Aircraft* (Washington, DC: US Department of Transport, DOT-TST-75-50, 1974).

United States Climate Impact Committee, *Environmental Impact of Stratospheric Flight: Biological and Climate Effects of Aircraft Emissions in the Stratosphere* (Washington, DC: National Academy of Sciences, 1975).

United States Committee on Impacts of Stratospheric Change, *Halocarbons: Environmental Effects of Chlorofluoromethane Release* (Washington, DC: National Academy of Sciences, 1976).

United States Committee on Science, Engineering, and Public Policy, *Policy Implications of Greenhouse Warming -- Synthesis Panel* (Washington, DC: National Academy Press for the National Academy of Sciences, National Academy of Engineering and the National Institute of Medicine, 1991).

United States Council on Environmental Quality, Federal Council for Science and Technology, *Fluorocarbons and the Environment: Report of Federal Task Force on Inadvertent Modification of the Stratosphere (IMOS)* (Washington, DC, June 1975).

United States Environmental Protection Agency (Daniel A. Lashof and Dennis A. Tirpak), *Policy Options for Stabilizing Global Climate: Report to Congress, Main Report* (Washington, DC: EPA, Office of Policy, Planning and Evaluation, December 1990).

United States Environmental Protection Agency, *Assessing the Risks of Trace Gases That Can Modify the Stratosphere*, Volume 1: Executive Summary (Washington, DC: EPA, December 1987).

United States Environmental Protection Agency, *Regulatory Impact Analysis: Protection of Stratospheric Ozone*, 3 Volumes (Washington, DC: EPA, 1987).

United States Environmental Protection Agency (J.G. Titus (ed.)), *Effects of Changes in Stratospheric Ozone and Global Climate, Volume 1* (Washington, DC: EPA, 1986).

United States Environmental Protection Agency (Stephen Seidel and Dale Keyes), *Can We Delay a Greenhouse Warming?: The Effectiveness and Feasibility of Options to Slow a Build-Up of Carbon Dioxide in the Atmosphere* (Washington, DC: Office of Policy and Resources Management, EPA, September 1983).

United States National Academy of Sciences, *Changing Climate: Report of the Carbon Dioxide Assessment Committee* (Washington, DC: National Academy Press, 1983).

United States National Academy of Sciences, *Carbon Dioxide and Climate: A Second Assessment* (Washington, DC: National Academy Press, 1982).

United States National Academy of Sciences, *Carbon Dioxide and Climate: A Scientific Assessment* (Washington, DC: National Academy of Sciences, Climate Research Board, 1979).

United States National Aeronautics and Space Administration, *Chlorofluoromethanes and the Stratosphere* (Greenbelt, MD: NASA Reference Publication 1010, 1977).

United States National Research Council, Committee on Atmospheric Sciences, *Weather and Climate Modification: Problems and Progress* (Washington, DC: National Academy of Science, 1973).

United States Panel on Stratospheric Chemistry and Transport, *Stratospheric Ozone Depletion by Halocarbons: Chemistry and Transport* (Washington, DC: National Academy of Sciences, 1979).

United States President's Science Advisory Committee, *Restoring the Quality of Our Environment: Report of the Environmental Pollution Panel* (Washington, DC: The White House, 1965).

World Meteorological Organisation, *Scientific Assessment of Stratospheric Ozone* (Geneva: WMO and UNEP, various years).

World Meteorological Organisation, *Atmospheric Ozone 1985* (Geneva: WMO, Global Ozone Research and Monitoring Project -- Report No. 16, 1986).

### A.5.5 -- Secondary Sources: Theoretical

Vinod K. Aggarwal, *Liberal Protectionism: The International Politics of Organized Textile Trade* (London: University of California Press, 1985).

Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston, MA: Little, Brown, and Company, 1971).

Samir Amin, Giovanni Arrighi, Andre Gunder Frank and Immanuel Wallerstein, *Dynamics of Global Crisis* (Basingstoke: Macmillan, 1982).

Robert Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984).

Vernon Bogdanor (ed.), *Science and Politics: The Herbert Spencer Lectures 1982* (Oxford: Clarendon Press, 1984)

Harvey Brooks and Chester L. Cooper (eds.), *Science for Public Policy* (Oxford: Pergamon Press, 1987).

Hedley Bull, *The Anarchical Society: A Study of Order in World Politics* (Basingstoke: Macmillan, 1977).

Robert W. Cox, 'Gramsci, Hegemony and International Relations: An Essay in Method', *Millennium: Journal of International Studies* (Vol. 12, No. 2, Summer 1983), pp. 162-75.

Karl W. Deutsch, *The Nerves of Government: Models of Political Communication and Control* (New York: The Free Press, 1966).

Roger Fisher, *Improving Compliance with International Law* (Charlottesville, VA: University of Virginia Press, 1981).

Norman Frohlich, Joe A. Oppenheimer and Oran R. Young, *Political Leadership and Collective Goods* (Princeton, NJ: Princeton University Press, 1971).

Johan Galtung, 'A Structural Theory of Imperialism', *Journal of Peace Research* (Vol. 8, No. 2, 1971), pp. 81-117.

Robert Gilpin, *War and Change in World Politics* (Cambridge: Cambridge University Press, 1981).

Joshua S. Goldstein and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics* (London: University of Chicago Press, 1990).

Joseph M. Grieco, *Cooperation Among Nations: Europe, America, and Non-Tariff Barriers to Trade* (London: Cornell University Press, 1990).

A.J.R. Groom and Paul Taylor, *Frameworks for International Co-operation* (London: Pinter Publishers, 1990).

Isabelle Grunberg, 'Exploring the "Myth" of Hegemonic Stability', *International Organization* (Vol. 44, No. 4, Autumn 1990), pp. 431-77.

Ernst B. Haas, *When Knowledge Is Power: Three Models of Change in International Organizations* (Oxford: University of California Press, 1990).

Ernst B. Haas, 'On Systems and International Regimes', *World Politics* (Vol. 27, No. 2, January 1975), pp. 147-74.

Ernst B. Haas, Mary Pat Williams and Don Babai, *Scientists and World Order: The Uses of Technical Knowledge in International Organizations* (London: University of California Press, 1977).

Peter M. Haas, 'Introduction: Epistemic Communities and International Policy Coordination', *International Organization* (Vol. 46, No. 1, Winter 1992), pp. 1-35.

Stephan Haggard and Beth A. Simmons, 'Theories of International Regimes', *International Organization* (Vol. 41, No. 3, Summer 1987), pp. 491-517.

Garrett Hardin, 'The Tragedy of the Commons', *Science* (Vol. 162, 13 December 1968), pp. 1243-48.

Garrett Hardin and John Baden (eds.), *Managing the Commons* (San Francisco, CA: W.H. Freeman and Company, 1977).

Russell Hardin, *Collective Action* (Baltimore, MD: Johns Hopkins University Press, 1982).

Robert Jervis, 'Realism, Game Theory and Cooperation', *World Politics* (Vol. 40, No. 3, April 1988), pp. 317-49.

Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976).

Christer Jonsson, *International Aviation and the Politics of Regime Change* (London: Frances Pinter, 1987).

Robert O. Keohane, *International Institutions and State Power: Essays in International Relations Theory* (London: Westview Press, 1989).

Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, NJ: Princeton University Press, 1984).

Robert O. Keohane and Joseph S. Nye, *Power and Interdependence: World Politics in Transition*, Second Edition (Boston, MA: Little, Brown, and Company, 1989).

Robert O. Keohane and Joseph S. Nye, 'Transgovernmental Relations and International Organizations', *World Politics*, (Vol. 27, No. 1, 1974), pp. 39-62.

Robert O. Keohane and Joseph S. Nye, Jr. (eds.), *Transnational Relations and World Politics* (Cambridge, MA: Harvard University Press, 1972).

Charles P. Kindleberger, 'International Public Goods Without International Government', *The American Economic Review* (Vol. 76, No. 1, March 1986), pp. 1-13.

Charles Kindleberger, 'Systems of International Economic Order', in David Calleo (ed.), *Money and the Coming World Order* (New York: New York University Press, 1976).

Charles Kindleberger, *The World in Depression* (Los Angeles, CA: University of California Press, 1973).

Stephen D. Krasner (ed.), *International Regimes* (Ithaca, NY: Cornell University Press, 1984).

Stephen D. Krasner, 'State Power and the Structure of International Trade', World Politics (Vol. 28, No. 3, April 1976), pp. 317-47.

Friedrich Kratochwil, 'The Force of Prescriptions', *International Organization* (Vol. 38, No. 4, Autumn 1984), pp. 685-708.

Friedrich Kratochwil and John Gerard Ruggie, 'International Organization: A State of the Art on an Art of the State', *International Organization* (Vol. 40, No. 4, Autumn 1986), pp. 753-75.

Margot Light and A.J.R. Groom (eds.), *International Relations: A Handbook of Current Theory* (London: Frances Pinter, 1985).

Bonnie J. McCay and James M. Acheson (eds.), *The Question of the Commons: The Culture and Ecology of Communal Resources* (Tuscon, AZ: The University of Arizona Press, 1987).

Edward L. Morse, 'Managing International Commons', *Journal of International Affairs* (Vol. 31, No. 1, Spring/Summer 1977), pp. 1-21.

William R. Nelson (ed.), *The Politics of Science: Readings in Science, Technology, and Government* (London: Oxford University Press, 1968).

Michael Nicholson, *Formal Theories in International Relations* (Cambridge: Cambridge University Press, 1989).

Michael Nicholson, 'The Edwards' Report and the International Relations Profession', *Review of International Studies* (Vol. 14, No. 2, April 1988), pp. 149-52.

Mancur Olson, 'Increasing the Incentives for International Cooperation', *International Organization* (Vol. 25, No. 4, Autumn 1971), pp. 866-874.

Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965).

Mancur Olson Jr. and Richard Zeckhauser, 'An Economic Theory of Alliances', *Review of Economics and Statistics* (Vol. 48, No. 3, August 1966), pp. 266-79.

Kenneth A. Oye (ed.), *Cooperation Under Anarchy* (Princeton, NJ: Princeton University Press, 1986).

David Pearce, *Cost-Benefit Analysis*, Second Edition (Basingstoke: Macmillan, 1983).

Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge & Kegan Paul, 1963).

Volker Rittberger and Michael Zurn, 'Regime Theory: Findings from the Study of "East-West Regimes"', *Cooperation and Conflict* (Vol. 26, No. 4, 1991), pp. 165-83.

James Rosenau, 'Before Cooperation: Hegemons, Regimes, and Habit-Driven Actors in World Politics', *International Organization* (Vol. 40, No. 4, Autumn 1986), pp. 849-94.

John Gerard Ruggie, 'International Responses to Technology: Concepts and Trends', *International Organization* (Vol. 29, No. 3, Summer 1975), pp. 557-83.

John G. Ruggie, 'Collective Goods and Future International Collaboration', *The American Political Science Review* (Vol. 66, No. 3, September 1972), pp. 874-893.

B.M. Russett and J. Sullivan, 'Collective Goods and International Organizations', *International Organization* (Vol. 25, Autumn 1971), pp. 845-865.

J. David Singer, 'The Level-of-Analysis Problem in International Relations', *World Politics* (Vol. 14, No. 1, October 1961), pp. 77-92.

Duncan Snidal, 'The Game Theory of International Politics', *World Politics* (Vol. 38, No. 1, October 1985), pp. 25-57.

Duncan Snidal, 'The Limits of Hegemonic Stability Theory', *International Organization* (Vol. 39, No. 4, Autumn 1985), pp. 579-614.

Duncan Snidal, 'Public Goods, Property Rights and Political Organization', *International Studies Quarterly* (Vol. 23, No. 4, December 1979), pp. 532-66.

Arthur A. Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (London: Cornell University Press, 1990).

Susan Strange, 'The Persistent Myth of Lost Hegemony', *International Organization* (Vol. 41, No. 4, Autumn 1987), pp. 551-74.

Paul Taylor and A.J.R. Groom (eds.), *International Organisation: A Conceptual Approach* (London: Frances Pinter Ltd., 1978).

Wallace J. Thies, 'Alliances and Collective Goods: A Reappraisal', *Journal of Conflict Resolution* (Vol. 31, No. 2, January 1987), pp. 298-332.

Richard H. Ullman, 'Redefining Security', *International Security* (Vol. 8, No. 1, Summer 1983), pp. 129-153.

Kenneth N. Waltz, *Theory of International Politics* (London: Addison-Wesley Publishing Company, 1979).

Kenneth N. Waltz, *Man, the State and War: A Theoretical Analysis* (New York: Columbia University Press, 1954).

Alexander Wendt, 'Bridging the Theory/Meta-theory Gap in International Relations', *Review of International Studies* (Vol. 17, No. 4, October 1991), pp. 383-92.

Peter Willetts (ed.), *Pressure Groups in the Global System: The Transnational Relations of Issue-Orientated Non-Governmental Organizations* (London: Frances Pinter, 1982).

Oran R. Young, 'Political Leadership and Regime Formation: On the Development of Institutions in International Society', *International Organization* (Vol. 45, No. 3, Summer 1991), pp. 281-308.

Oran R. Young, *Compliance and Public Authority: A Theory with International Applications* (London: Johns Hopkins University Press, 1979).

### A.5.6 -- Secondary Sources: Theoretical/Environmental and Environmental

Dean Edwin Abrahamson (ed.), *The Challenge of Global Warming* (Washington, DC: Island Press, 1989).

Anil Agarwal and Sunita Narain, *Global Warming in an Unequal World* (New Delhi: The Centre for Science and Technology, 1990).

The Alliance for Responsible CFC Policy, *The Montreal Protocol: A Briefing Booklet* (Rosslyn, VA: The Alliance for Responsible CFC Policy, December 1987).

Kym Anderson and Richard Blackhurst (eds.), *The Greening of World Trade Issues* (London: Harvester Wheatsheaf, 1992).

Steinar Andresen and Willy Ostreng (eds.), *International Resource Management: The Role of Science and Politics* (London: Belhaven, 1989).

David J.R. Angell, Justyn D. Colmer and Matthew L.N. Wilkinson (eds.), *Sustaining Earth: Response to the Environmental Threats* (Basingstoke: Macmillan, 1990).

Erik Arrhenius and Thomas W. Waltz, *The Greenhouse Effect: Implications for Economic Development* (Washington, DC: The World Bank, Discussion Paper No. 78, 1990).

Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (London: Harvard University Press, 1991).

Asit K. Biswas (ed.), *The Ozone Layer* (Oxford: Pergamon Press, 1979).

B. Bolin, B. Doos, J. Jager and R. A. Warrick, *The Greenhouse Effect, Climatic Change, and Ecosystems (SCOPE 29)* (Chichester: Wiley, 1986).

Stewart Boyle and John Ardill, *The Greenhouse Effect: A Practical Guide to the World's Changing Climate* (Sevenoaks: New English Library, 1989).

Neville Brown, 'Climate, Ecology and International Security', *Survival* (November/December 1989), pp. 519-532.

Seyom Brown *et al*, *Regimes for the Ocean, Outer Space, and Weather* (Washington, DC: The Brookings Institution, 1977).

Seyom Brown and Larry L. Fabian, 'Toward Mutual Accountability in the Non-Terrestrial Realms', *International Organization* (Vol. 29, No. 3, Summer 1975), pp. 877-892.

Jutta Brunnee, *Acid Rain and Ozone Layer Depletion: International Law and Regulation* (New York: Transnational Publishers, 1988).

T. Bunge, 'International Agreements', in *Responsibility Means Doing Without -- How to Rescue the Ozone Layer* (Berlin: The Federal Environment Agency, 1989), pp. 165-81.

G. Victor Buxton, 'International and Canadian Progress on Implementing the Montreal Protocol', presented at the Air and Waste Management Association Meeting (Annaheim, CA, 26-30 June 1989).

G. Victor Buxton, 'The Montreal Protocol on Substances that Deplete the Ozone Layer', paper presented at the 81st Annual Meeting of the Air Pollution Control Association, Dallas, TX, 19-24 June 1988.

Frances Cairncross, *Costing the Earth* (London: Business Books, Ltd. in association with The Economist Books, Ltd., 1991).

Lynton Keith Caldwell, *International Environmental Policy: Emergence and Dimensions*, Second Edition (London: Duke University Press, 1990).

Canada, The Standing Committee on Environment, House of Commons, *Out of Balance: The Risks of Irreversible Climate Change* (Ottawa: Canadian Government Publishing Center, March 1991).

Canada, The Standing Committee on Environment, House of Commons, *No Time To Lose: The Challenge of Global Warming* (Ottawa: Canadian Government Publishing Center, October 1990).

Canada, The Standing Committee on Environment, House of Commons, *Deadly Releases: CFCs* (Ottawa: Canadian Government Publishing Center, June 1990).

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', *Virginia Journal of International Law* (Vol. 29, 1989), pp. 211-248.

John E. Carroll (ed.), *International Environmental Diplomacy: The Management and Resolution of Transfrontier Environmental Problems* (Cambridge: Cambridge University Press, 1988).

Rachel Carson, *Silent Spring* (Harmondsworth: Penguin, 1965).

Channel 4 Television, *The Greenhouse Conspiracy: An Edited Transcript* (London: Channel 4 Television, 1990).

Robert S. Chen and Martin L. Parry (eds.), *Climate Impacts and Public Policy* (Laxenburg: International Institute for Applied Systems Analysis, 1988).

Robin Clarke and Lloyd Timberlake, *Stockholm Plus Ten: Promises, Promises?* (London: Earthscan for the International Institute for Environment and Development, 1982).

H.S.D. Cole *et al*, *Thinking About the Future: A Critique of The Limits to Growth Model* (London: Chatto & Windus, 1973).

Christine B. Davidson, 'The Montreal Protocol: The First Step Toward Protecting the Global Ozone Layer', *New York University Journal of International Law and Politics* (Vol. 20, 1988), pp. 793-823.

Ingrid Detter de Lupis, 'The Human Environment: Stockholm and its Follow Up', in Paul Taylor and A.J.R. Groom (eds.), *Global Issues in the UN Framework* (Basingstoke: Macmillan, 1989), pp. 205-25.

Diane M. Doolittle, 'Underestimating Ozone Depletion: The Meandering Road to the Montreal Protocol and Beyond', *Ecology Law Quarterly* (Vol. 16, No. 2, 1989), pp. 407-441.

Rudiger Dornbusch and James M. Poterba (eds.), *Global Warming: Economic Policy Responses* (London: The MIT Press, 1991).

Lydia Dotto, *Thinking the Unthinkable: Civilization and Rapid Climate Change* (Waterloo, ON: Wilfrid Laurier Press, 1988).

Lydia Dotto and Harold Schiff, *The Ozone War* (Garden City, NY: Doubleday & Company, 1978).

Anthony Downs, 'Up and Down with Ecology -- the "Issue-Attention Cycle"', *The Public Interest* (No. 28, Summer 1972), pp. 38-50.

John F. Dunn, *Responses to Global Warming and Pollution* (London: HMSO, February 1990).

Joshua M. Epstein and Raj Gupta, *Controlling the Greenhouse Effect: Five Global Regimes Compared* (Washington, DC: The Brookings Institute, 1990).

David Everest, *The Greenhouse Effect: Issues for Policy Makers* (London: Royal Institute of International Affairs, 1988).

Richard A. Falk, *This Endangered Planet: Prospects and Proposals for Human Survival* (New York: Random House, 1971).

A.A. Fernandez-Bremauntz, *An Assessment of the Relative Importance of Scientific, Technological, Economic and Political Issues in the Protection of the Stratospheric Ozone Layer* (London: Imperial College, Centre for Environmental Technology, MSc Thesis, September 1989).

Jack Fitzgerald, 'The Intergovernmental Panel on Climate Change: Taking the First Steps Towards a Global Response', *Southern Illinois Law Journal* (Vol. 14, Winter 1990), pp. 231-55.

Christopher Flavin, *Slowing Global Warming: A Worldwide Strategy* (Washington, DC: Worldwatch Paper No. 91, 1989).

Cees Flinterman, Barbara Kwiatkowska and Johan G. Lammers (eds.), *Transboundary Air Pollution: International Legal Aspects of the Co-operation of States* (Dordrecht: Martinus Nijhoff Publishers, 1986).

Friends of the Earth, *Funding Change: Developing Countries and the Montreal Protocol* (London: Friends of the Earth, June 1990).

Friends of the Earth, *The Heat Trap: The Threat Posed by Rising Levels of Greenhouse Gases* (London: Friends of the Earth, September 1989).

Thomas Gehring, 'International Environmental Regimes: Dynamic Sectoral Legal Systems', *Yearbook of International Environmental Law* (Vol. 1, 1990), pp. 35-56.

German Bundestag (ed.), *Protecting the Earth's Atmosphere: An International Challenge* (Bonn: German Bundestag, 1989).

C. Boyden Gray and David B. Rivkin Jr., 'A "No Regrets" Environmental Policy', *Foreign Policy* (No. 83, Summer 1991), pp. 47-65.

John Gribbin, *The Hole in the Sky: Man's Threat to the Ozone Layer* (London: Corgi Books, 1988).

John Gribbin, *Climate and Mankind* (London: Earthscan, 1979).

Michael Grubb, *Energy Policies and the Greenhouse Effect. Volume One: Policy Appraisal* (London: Royal Institute of International Affairs, 1990).

Michael Grubb, *The Greenhouse Effect: Negotiating Targets* (London: Royal Institute of International Affairs, 1989).

Michael Grubb and Nicola Steen (eds.), *Pledge and Review Processes: Possible Components of a Climate Convention* (London: Royal Institute of International Affairs, 1991).

Peter M. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', *International Organization* (Vol. 46, No. 1, Winter 1992), pp. 187-224.

Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990).

Robert W. Hahn and Albert M. McGartland, 'The Political Economy of Instrument Choice: An Examination of the U.S. Role in Implementing the Montreal Protocol', *Northwestern University Law Review* (Vol. 83, No, 3, Spring 1989), pp. 592-611.

Nigel Haigh, *EEC Environmental Policy and Britain*, Second Revised Edition (Harlow: Longman, 1989).

Khristine Hall, Nina Kogan and Jonathan Plaut, 'A Business Approach to Global Climate Change', *International Environmental Affairs* (Vol. 2, No. 4, Fall 1990), pp. 298-302.

Fen Osler Hampson, 'Climate Change: Building International Coalitions of the Like-Minded', *International Journal* (Vol. 45, No. 1, Winter 1989-90), pp. 36-74.

Dieter Helm (ed.), *Economic Policy Towards the Environment* (Oxford: Blackwell, 1991).

Henry Hengeveld, *Understanding Atmospheric Change: A Survey of the Background Science and Implications of Climate Change and Ozone Depletion* (Ottawa: Ministry of Supply and Services, March 1991).

Peter Hoeller and Markku Wallin, *Energy Prices, Taxes and Carbon Dioxide Emissions* (Paris: OECD, Economics and Statistic Department Working Paper No. 106, 1991)

Peter Hoeller, Andrew Dean and Jon Nicolaisen, *A Survey of Studies of the Costs of Reducing Greenhouse Gas Emissions* (Paris: OECD Working Paper No. 89, December 1990).

Thomas F. Homer-Dixon, 'On the Threshold: Environmental Changes as Causes of Acute Conflict', *International Security* (Vol. 16, No. 2, Fall 1991), pp. 76-116.

ICF Incorporated, *An Analysis of the Economic Effects of Regulatory and Non-Regulatory Events Related to the Abandonment of Chlorofluorocarbons as Aerosol Propellants in the United States from 1970 to 1980, with a Discussion of Applicability of the Analysis to Other Nations* (Washington, DC: Aerosol Working Paper Series, Paper 1, October 1984).

Mark F. Imber, 'Environmental Security: A Task for the UN System', *Review of International Studies* (Vol. 17, No. 2, April 1991), pp. 201-12.

Markus Jachtenfuchs, 'The European Community and the Protection of the Ozone Layer', *Journal of Common Market Studies* (Vol. 28, No.3, March 1990), pp. 261-77.

Jyrki Kakonen (ed.), *Perspectives on Environmental Conflict and International Politics* (London: Pinter, 1992).

H-J Karpe, D. Otten and S.C. Trinidade (eds.), *Climate and Development: Climatic Change and Variability and the Resulting Social, Economic and Technological Implications* (London: Springer-Verlag, 1990).

William W. Kellogg, 'Mankind's Impact on Climate: The Evolution of Awareness', *Climatic Change* (Vol. 10, 1987), pp. 113-36.

John Warren Kindt and Samuel Pyeatt Menefee, 'The Vexing Problem of Ozone Depletion in International Environmental Law and Policy', *Texas International Law Journal* (Vol. 24, No. 2, Spring 1989), pp. 261-93.

Winfried Lang, Hanspeter Neuhold and Karl Zemanek (eds.), *Environmental Protection and International Law* (London: Graham and Trotman Limited, 1991).

Geoffrey Lean, *Action on Ozone* (Nairobi: UNEP, 1989).

Jeremy Leggett (ed.), *Global Warming: The Greenpeace Report* (Oxford: Oxford University Press, 1990).

Philippe Le Prestre, 'Toward Progress in International Environmental Cooperation', *Environmental Awareness* (Vol. 12, No. 4, October-December 1989), pp. 143-47.

James P. Lester (ed.), *Environmental Politics and Policy: Theories and Evidence* (London: Duke University Press, 1989).

James P. Lodge, *The Smoake of London: Two Prophecies* (Elmsford, NY: Maxwell Reprint Co., 1969).

J.E. Lovelock, *Gaia: A New Look at Life on Earth* (Oxford: Oxford University Press, 1979).

Francesca Lyman with others, *The Greenhouse Trap* (Boston, MA: Beacon Press, 1990).

Jim MacNeill, 'The Greening of International Relations', *International Journal* (Vol. 45, No. 1, Winter 1989-90), pp. 1-35.

Jim MacNeill, Pieter Winsemius and Taizo Yakushiji, *Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology* (Oxford: Oxford University Press, 1991).

Alan S. Manne and Richard G. Richels, 'Global $CO_2$ Emission Reductions -- the Impacts of Rising Energy Costs', *The Energy Journal* (Vol. 12, No. 1, 1991), pp. 87-107.

Alan S. Manne and Richard G. Richels, '$CO_2$ Emissions Limits: An Economic Analysis for the U.S.A.', *The Energy Journal* (Vol. 11, No. 2, 1990).

Jessica Tuchman Mathews (ed.), *Preserving the Global Environment: The Challenge of Shared Leadership* (London: W.W. Norton & Company, 1991).

Jessica Tuchman Mathews, 'Redefining Security', *Foreign Affairs* (Vol. 68, No. 2, Spring 1989), pp. 162-77.

Jessica Tuchman Mathews *et al*, *Greenhouse Warming: Negotiating a Global Regime* (Washington, DC: World Resources Institute, 1991).

Fiona McConnell, 'Book Reviews', *International Environmental Affairs* (Vol. 3, No. 4, Fall 1991), pp. 318-20.

John McCormick, *The Global Environmental Movement: Reclaiming Paradise* (London: Belhaven Press, 1989).

McKinsey and Company, *Protecting the Global Atmosphere: Funding Mechanisms. Interim Report to Steering Committee for Ministerial Conference of Atmospheric Pollution and Climate Change (Noordwijk, The Netherlands, November 1989)*, 27 June 1989.

Donella H. Meadows, Dennis L. Meadows, Jorgen Randers and William W. Behrens III, *The Limits to Growth* (New York: Universe Books, 1972).

Alan S. Miller, 'Policy Responses to Global Warming' *Southern Illinois Law Journal* (Vol. 14, Winter 1990), pp. 187-230.

Alan S. Miller and Irving M. Mintzer, *The Sky Is the Limit: Strategies for Protecting the Ozone Layer* (Washington, DC: World Resources Institute, Research Report No. 3, November 1986).

Terrell J. Minger (ed.), *Greenhouse Glasnost: The Crisis of Global Warming* (New York: The Ecco Press, 1990),

Irving M. Mintzer, *A Matter of Degrees: The Potential for Controlling the Greenhouse Effect* (Washington, DC: World Resources Institute, Research Report No. 5, April 1987).

Irving Mintzer, 'Cooling Down a Warming World: Chlorofluorocarbons, the Greenhouse Effect, and the Montreal Protocol', *International Environmental Affairs* (Vol. 1, No. 1, 1989), pp. 12-25.

P.M. Mische, 'Ecological Security and the Need to Reconceptualize Sovereignty', *Alternatives* (Vol. 14, 1989), pp. 389-427.

William R. Moomaw, 'Scientific and International Policy Responses to Global Climate Change', *The Fletcher Forum of World Affairs* (Vol. 14, No. 2, Summer 1990), pp. 249-61.

William R. Moomaw, 'Assessing the Greenhouse Challenge', *Southern Illinois Law Journal* (Vol. 14, Winter 1990), pp. 169-86.

Peter M. Morrisette, 'The Evolution of Policy Responses to Stratospheric Ozone Depletion', *Natural Resources Journal* (Vol. 29, No. 3, Summer 1989), pp. 793-820.

Peter M. Morrisette, Joel Darmstadter, Andrew J. Plantingu and Michael A. Toman, *Lessons From Other International Agreements for a Global $CO_2$ Accord* (Washington, DC: Resources for the Future, October 1990).

Norman Moss, *The Politics of Global Warming* (London: London Defence Studies No. 9, Brassey's for the Centre for Defence Studies, December 1991).

Norman Myers, 'Environment and Security', *Foreign Policy* (No. 74, 1989), pp. 23-41.

Ved P. Nanda, 'Global Warming and International Environmental Law -- A Preliminary Inquiry', *Harvard International Law Journal* (Vol. 30, No. 2, Spring 1989), pp. 375-92.

Ved P. Nanda (ed.), *World Climate Change: The Role of International Law and Institutions* (Boulder, CO: Westview Press, 1983).

William A. Nitze, *The Greenhouse Effect: Formulating a Convention* (London: Royal Institute of International Affairs, 1990).

William Nordhaus, 'To Slow or Not to Slow: The Economics of the Greenhouse Effect', *The Economic Journal* (Vol. 101, No. 407, July 1991), pp. 920-37.

Kenneth Nowotny, 'The Greenhouse Effect and Energy Policy', *Journal of Economic Issues* (Vol. 23, No. 4, December 1989), pp. 1075-84.

Michael Oppenheimer and Robert Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (London: I.B. Tauris & Co., Ltd., 1990).

Organisation for Economic Co-operation and Development, *Responding to Climate Change: Selected Economic Issues* (Paris: OECD, 1991).

Organisation for Economic Co-operation and Development, *Climate Change: Evaluating the Socio-Economic Impacts* (Paris: OECD, 1991).

Gail Osherenko and Oran R. Young, *The Age of the Arctic: Hot Conflicts and Cold Realities* (Cambridge: Cambridge University Press, 1989).

David Pearce (ed.), *Blueprint 2: Greening the World Economy* (London: Earthscan, 1991).

David Pearce, Anil Markandya and Edward B. Barbier, *Blueprint for a Green Economy* (London: Earthscan, 1989).

Fred Pearce, *Turning up the Heat: Our Perilous Future in the Global Greenhouse* (London: The Bodley Head, 1989).

M.J. Peterson, *Managing the Frozen South: The Creation and Evolution of the Antarctic Treaty System* (London: University of California Press, 1988).

Dennis Pirages, *The New Context for International Relations: Global Ecopolitics* (North Scituate, MA: Duxbury Press, 1978).

Gareth Porter and Janet Welsh Brown, *Global Environmental Politics* (Oxford: Westview Press, 1991).

Gwyn Prins, 'Politics and the Environment', *International Affairs* (Vol. 66, No. 4, October 1990), pp. 711-30.

David Reed, *The Global Environmental Facility: Sharing Responsibility for the Biosphere* (Multilateral Development Bank Program, WWF-International, 1991).

Michael Renner, *National Security: The Economic and Environmental Dimensions* (Washington, DC: Worldwatch Paper No. 89, May 1989).

Sharon L. Roan, *Ozone Crisis: The 15 Year Evolution of a Sudden Global Emergency* (Chichester: John Wiley & Sons, Inc., 1989).

Walter A. Rosenbaum, *Environmental Politics and Policy*, Second Edition (Washington, DC: CQ Press, 1991).

Ian H. Rowlands, 'Environmental Issues in World Politics', in N.J. Rengger and John Baylis (eds.), *Dilemmas of World Politics: International Issues in a Changing World* (Oxford: Oxford University Press, 1992), pp. 287-309.

Ian H. Rowlands, 'Ozone Layer Depletion and Global Warming: New Sources for Environmental Disputes', *Peace and Change* (Vol. 16, No. 3, July 1991), pp. 260-84.

Ian Rowlands, 'The Security Challenges of Global Environmental Change', *The Washington Quarterly* (Vol. 14, No. 1, Winter 1991), pp. 99-114.

Ian H. Rowlands and Malory Greene (eds.), *Global Environmental Change and International Relations* (Basingstoke: Macmillan, 1992)

John Gerrard Ruggie and Ernst B. Haas, 'Environmental and Resource Interdependencies: Reorganizing for the Evolution of International Regimes', in *Commission on the Organization of the Government for the Conduct of Foreign Policy*, Volume 1, Appendices (June 1975), pp. 218-230.

David Runnalls, *United Nations Conference on Environment and Development: Institutional and Financial Options for Sustainable Development* (Ottawa: United Nations Association in Canada, Briefing Paper No. 30, July 1991).

Barry Sadler and Brian Hull, *In Business for Tomorrow: The Transition to Sustainable Development* (Ottawa: Government of Canada, 1990).

Sunneva Saetevik, *Environmental Cooperation Between the North Sea States: Success or Failure?* (London: Belhaven Press, 1988).

Peter H. Sand, *Lessons Learned in Global Environmental Governance* (Washington, DC: World Resources Institute, June 1990).

Oscar Schachter, *Sharing the World's Resources* (New York: Columbia University Press, 1977).

Karen Schmidt, 'How Industrial Countries are Responding to Global Climate Change', *International Environmental Affairs* (Vol. 3, No. 4, Fall 1991), pp. 292-317.

Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco, CA: Sierra Club Books, 1989).

James K. Sebenius, 'Designing Negotiations Toward a New Regime: The Case of Global Warming', *International Security* (Vol. 15, No. 4, Spring 1991), pp. 110-48.

Cynthia Pollock Shea, *Protecting Life on Earth: Steps to Save the Ozone Layer* (Washington, DC: Worldwatch Paper No. 87, December 1988).

Cheryl Simon Silver with Ruth S. DeFries, *One Earth One Future: Our Changing Global Environment* (Washington, DC: National Academy Press, 1990).

S. Fred Singer (ed.), *Global Climate Change: Human and Natural Influences* (New York: Paragon House, 1989).

Eugene B. Skolnikoff, 'The Policy Gridlock on Global Warming', *Foreign Policy* (No. 79, Summer 1990), pp. 77-93.

Margaret E. Somerset, 'An Attempt to Stop the Sky from Falling: The Montreal Protocol to Protect Against Atmospheric Ozone Reduction', *Syracuse Journal of International Law and Commerce* (Vol. 15, No. 3, Spring 1989), pp. 391-429.

Marvin S. Soroos, *Beyond Sovereignty: The Challenge of Global Policy* (Columbia, SC: University of South Carolina Press, 1986).

Allan L. Springer, *The International Law of Pollution: Protecting the Global Environment in a World of Sovereign States* (London: Quorum Books, 1983).

Harold Sprout and Margaret Sprout, *Toward a Politics of the Planet Earth* (London: D. Van Nostrand Co., 1971).

Ulrich Steger, 'The Greening of the Board Room: How European Companies are Dealing with Environmental Issues', *mimeo.* (also published in *Business and Society Review* (1990)).

Peter Stone, *Did We Save the Earth at Stockholm?* (London: Earth Island Ltd., 1973).

E.T. Sundquist and W.S. Broecker (eds.), *The Carbon Cycle and Atmospheric $CO_2$: Natural Variations, Archean to Present* (Washington, DC: American Geophysical Union, 1985).

Caroline Thomas, *The Environment in International Relations* (London: Royal Institute of International Affairs, 1992).

Peter Thompson (ed.), *Global Warming: The Debate* (Chichester: John Wiley & Sons, 1991).

Crispin Tickell, *Climatic Change and World Affairs* (New York: Pergamon Press, 1977).

Mostafa Kamal Tolba, *Sustainable Development: Constraints and Opportunities* (London: Butterworths, 1987).

Touche Ross Management Consultants for the UK Department of Trade and Industry and Overseas Development Administration, *Global Climate Change: The Role of Technology Transfer* (London: Touche Ross, February 1991).

James T.B. Tripp, 'The UNEP Montreal Protocol: Industrialized and Developing Countries Sharing the Responsibility for Protecting the Stratospheric Ozone Layer', *New York University Journal of International Law and Politics* (Vol. 20, 1988), pp. 733-52.

United Nations Environment Programme, *Annual Review* (Nairobi: UNEP, various years).

United Nations Environment Programme, *Annual Report of the Executive Directory* (Nairobi: UNEP, various years).

Peter Usher, 'Science and Public Policy', presented at a conference on 'The Global Business Outlook for CFC Alternatives', London, 12-13 March 1991.

Peter Usher, 'Climate Change and the Developing World', *Southern Illinois University Law Journal* (Vol. 14, 1990), pp. 257-64.

Kenneth J. Vandevelde, 'International Regulation of Fluorocarbons', *The Harvard Environmental Law Review* (Vol. 2, 1977), pp. 474-489.

Norman J. Vig and Michael E. Kraft (eds.), *Environmental Policy in the 1980s: Reagan's New Agenda* (Washington, DC: CQ Press, 1984).

Volker von Prittwitz, 'Several Approaches to the Analysis of International Environmental Policy', in Nordal Akerman (ed.), *Maintaining a Satisfactory Environment* (Oxford: Westview Press, 1990), pp. 1-33.

Barbara Ward and Rene Dubos, *Only One Earth* (Harmondsworth: Penguin, 1972).

R.A. Warrick, E.M. Barrow and T.M.L. Wigley, *The Greenhouse Effect and its Implications for the European Community* (Luxembourg: Commission of the European Communities, 1990).

Arthur H. Westing (ed.), *Cultural Norms, War and the Environment* (Oxford: Oxford University Press, 1988).

Arthur H. Westing (ed.), *Global Resources and International Conflict* (Oxford: Oxford University Press, 1986).

Per Magnus Wijkman, 'Managing the Global Commons', *International Organization* (Vol. 36, No. 3, Summer 1982), pp. 511-536.

David A. Wirth, 'Climate Chaos', *Foreign Policy* (No. 74, Spring 1989), pp. 3-22.

World Bank, *Funding for the Global Environment* (Washington, DC: The World Bank, Discussion Paper, February 1990).

World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987).

World Resources Institute, *World Resources 1990-91* (Oxford: Oxford University Press, 1990).

Oran R. Young, 'The Politics of International Regime Formation: Managing Natural Resources and the Environment', *International Organization* (Vol. 43, No. 3, Summer 1989), pp. 349-75.

Oran R. Young, *International Cooperation: Building Regimes for Natural Resources and the Environment* (Ithaca. NY: Cornell University Press, 1989).

Oran R. Young, '"Arctic Waters": The Politics of Regime Formation', *Ocean Development and International Law* (Vol. 18, No. 1, 1987), pp. 101-14.

Oran R. Young, *Resource Regimes* (London: University of California Press, 1982).

### A.5.7 -- Specialist Periodicals

*Ambio*
*Brundtland Bulletin*
(published by the Centre for Our Common Future, Geneva)
*Bulletin of the Atomic Scientists*
*Chemical and Engineering News*
*Climate Alert*
(published by the Climate Institute, Washington, DC)
*Delta*
(published by the Canadian Global Change Program, Ottawa, Canada)
*Earth Matters*
*EarthQuest*
(published by the Office for Interdisciplinary Earth Studies, Boulder, CO)
*Ecoforum*
(published by the Environment Liaison Centre International, Nairobi, Kenya)
*The Ecologist*
*Energy Policy*
*Environment*
*Environmental Policy and Law*
*EPA Journal*
*International Legal Materials*
*Issues in Science and Technology*
*National Secretariat UNCED'92 Newsletter*
(published by Environment Canada, Ottawa, Canada)
*Nature*
*Network Newsletter*
(published by the National Center for Atmospheric Research, Boulder, CO)
*Network '92*
(published by the Centre for Our Common Future, Geneva)
*New Scientist*
*Options*
(published by the International Institute for Applied Systems Analysis, Laxenburg, Austria)
*Our Planet*
(published by the United Nations Environment Programme, Nairobi, Kenya)
*Resources*
(published by Resources for the Future, Washington, DC)
*Science*

*Scientific American*
*SCOPE Newsletter*
(published by the International Council of Scientific Unions, Paris)
*UNEP News*
*UNEP Report to Governments*
*WMO Bulletin*

### A.5.8 -- Newspapers

*The Economist*
*The Financial Times* (London)
*The Globe and Mail* (Toronto)
*The Guardian* (London)
*The Independent* (London)
*The Independent on Sunday* (London)
*The International Herald Tribune*
*The New York Times*
*The Observer* (London)
*The Sunday Correspondent* (London)
*The Sunday Times* (London)
*The Times* (London)
*The Washington Post*