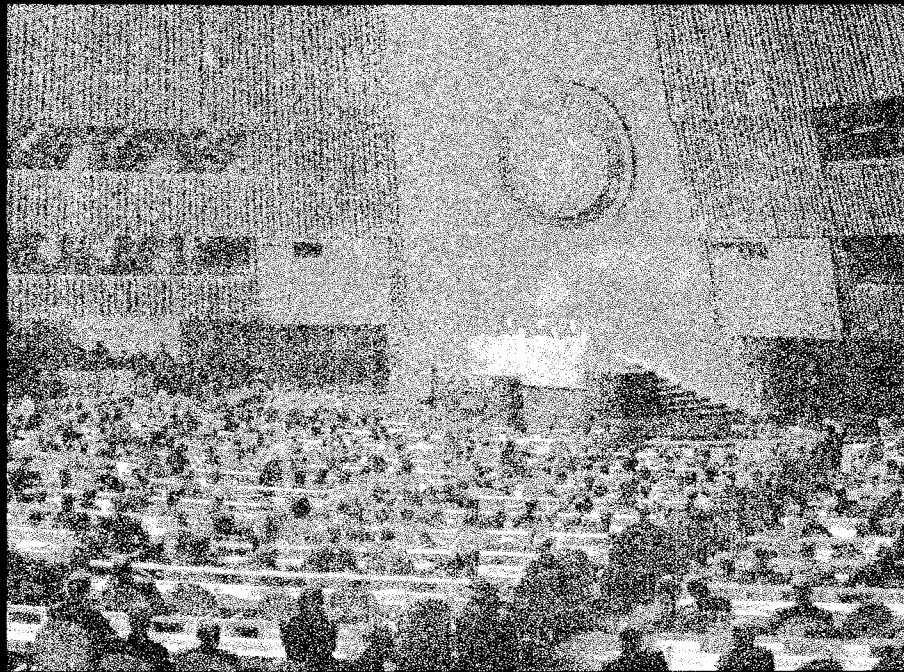
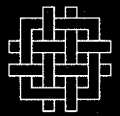


WORLD RESOURCES INSTITUTE



GREENHOUSE WARMING:

Negotiating a
Global Regime

RICHARD ELLIOT BENEDICK
ABRAM CHAYES
DANIEL A. LASHOF

JESSICA T. MATHEWS
WILLIAM A. NITZE
ELLIOT L. RICHARDSON

JAMES K. SEBENIUS
PETER S. THACHER
DAVID A. WIRTH

GREENHOUSE WARMING: Negotiating a Global Regime

Richard Elliot Benedick
Abram Chayes
Daniel A. Lashof

Jessica T. Mathews
William A. Nitze
Elliot L. Richardson

James K. Sebenius
Peter S. Thacher
David A. Wirth

WORLD RESOURCES INSTITUTE

January 1991

Kathleen Courier
Publications Director

Brooks Clapp
Marketing Manager

Hyacinth Billings
Production Manager

United Nations/T. Chen
Cover Photo

Each World Resources Institute Report represents a timely, scientific treatment of a subject of public concern. WRI takes responsibility for choosing the study topics and guaranteeing its authors and researchers freedom of inquiry. It also solicits and responds to the guidance of advisory panels and expert reviewers. Unless otherwise stated, however, all the interpretation and findings set forth in WRI publications are those of the authors.

Copyright © 1991 World Resources Institute. All rights reserved.

ISBN 0-915825-70-8

Library of Congress Catalog Card No. 90-72087

Printed on Recycled Paper

CONTENTS

I. INTRODUCTION AND OVERVIEW	1
<i>Jessica T. Mathews</i>	
II. BUILDING ON THE VIENNA CONVENTION	9
Lessons from “the Ozone Hole”	9
<i>Richard Elliot Benedick</i>	
Beyond Vienna and Montreal—Multilateral Agreements on Greenhouse Gases	13
<i>David A. Wirth and Daniel A. Lashof</i>	
III. THE CLIMATE REGIME: A BROADER VIEW	25
Elements of a Framework Treaty on Climate Change	25
<i>Elliot L. Richardson</i>	
A Proposed Structure for an International Convention on Climate Change	33
<i>William A. Nitze</i>	
IV. FOCUSING ON THE NEAR TERM	37
Alternative Legal and Institutional Approaches to Global Change	37
<i>Peter S. Thacher</i>	
Managing the Transition to a Global Warming Regime or What to Do til the Treaty Comes. . . .	61
<i>Abram Chayes</i>	
V. CRAFTING A WINNING COALITION	69
Negotiating a Regime to Control Global Warming	69
<i>James K. Sebenius</i>	

FOREWORD

In only five years, the status of the global warming issue has progressed from a consensus among scientists that the “greenhouse” threat is real to a consensus among governments that responsive action should be taken. A remarkable transformation of the political landscape has occurred.

The scientists who met five years ago in Villach, Austria, under the auspices of the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP), and the International Council of Scientific Unions (ICSU) concluded that human releases of greenhouse gases could lead in the first half of the next century to “a rise of global mean temperature . . . greater than any in man’s history.” They also took the important step of urging that the global warming issue be moved into the policy arena. “Understanding of the greenhouse question is sufficiently developed,” they concluded, “that scientists and policy-makers should begin an active collaboration to explore the effectiveness of alternative policies and adjustments.”

In a rarity for signers of conference statements, the Villach scientists got their wish. Not only has the greenhouse question moved into the policy arena, but broad agreement on general policies appears to have been forged among governments.

The principal vehicle for this progress has been the Intergovernmental Panel on Climate Change (IPCC), which WMO and UNEP launched in 1988. Working through expert groups on the science of global warming, its likely impacts, and available response strategies, the IPCC has proven to be a creative and effective mechanism.

The consensus on policy as it has emerged is perhaps best reflected in the Ministerial Declaration of the Second World Climate Conference, which was signed by 137 countries in Geneva in November, 1990. The Ministerial Declaration is vague on many points and carefully qualified on others. Moreover, just as there are some scientists whose views differ from those in today’s mainstream, some countries are not yet prepared to accept fully the policy conclusions in the Ministerial Declaration.

Nevertheless, the Ministerial Declaration does provide a point of reference against which to measure how far we have come since Villach. It suggests there is wide agreement among governments on a number of extremely important points:

1). The goal of international action should be to hold greenhouse gases in the atmosphere to a safe level. At Geneva, governments agreed in the

Ministerial Declaration that “the ultimate global objective should be to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with climate.”

2). Achieving such a goal will require a concerted international response initiated without delay despite scientific and other uncertainties.

The Declaration signatories concluded that “a global response . . . must be decided and implemented without further delay based on the best available knowledge” “The potentially serious consequences of climate change,” they added, “give sufficient reasons to begin by adopting response strategies even in the face of significant uncertainties.”

3). The developed countries should lead the way by reducing their emissions of climate-altering greenhouse gases.

The Declaration stresses that “developed countries must take the lead. They must all commit themselves to actions to reduce their major contribution to the global net emissions and enter into and strengthen cooperation with developing countries” It urges “all developed countries to establish targets and/or feasible national programs or strategies which will have significant effects on limiting emissions of greenhouse gases not controlled by the Montreal Protocol.” Recognizing that chlorofluorocarbons (CFCs) and other gases that contribute both to global warming and stratospheric ozone destruction are being regulated under the Montreal Protocol, the Declaration’s signatories called particular attention to excessive fossil fuel use and widespread deforestation as the two areas requiring priority attention to limit emissions.

A subsequent provision urging the development by 1992 of national plans for “achieving reductions in all greenhouse gas emissions” is extensively qualified. It was principally on the issue of setting targets for emission reduction in industrial countries that several countries balked in Geneva. Such opposition, if continued, would be difficult to square with the stated goal of forestalling dangerous changes in the earth’s climate. Scientists working with the IPCC have calculated that immediate reductions of over 60 percent in global emissions of carbon dioxide and certain other greenhouse gases would be required

to stabilize atmospheric concentrations at today’s levels. While not feasible as a policy goal, this estimate does provide a measuring rod. It suggests, for example, that Germany is offering impressive leadership with its recently announced plans to reduce carbon dioxide emissions by 25 percent by 2005.

4). The developing countries will require financial and technological cooperation to participate meaningfully in meeting international climate objectives.

“To enable developing countries to meet incremental costs required to take the necessary measures to address climate change and sea-level rise, consistent with their development needs,” the signatories recommended that “adequate and additional financial resources should be mobilized and best available environmentally sound technologies transferred expeditiously on a fair and most favorable basis.”

5). A global framework convention on climate change should be negotiated without delay.

The Declaration urges that “an effective framework convention on climate change, containing appropriate commitments, . . . be signed in Rio de Janeiro during the United Nations Conference on Environment and Development” in June 1992. The convention should be “framed in such a way as to gain the support of the largest possible number of countries while allowing timely action to be taken,” and it should “contain real commitments by the international community.”

In February 1991, the United States will host the first formal negotiating meeting on this framework convention. International agreement is still to be worked out on the specific nature and content of a convention and on any interim or additional measures that may be desirable. The World Resources Institute (WRI) hopes that *Greenhouse Warming: Negotiating a Global Regime* will be helpful to those who want to consider what type of convention and other international initiatives might best advance the goal of global climate protection. The subject could not be more important.

WRI is very fortunate to be able to present here the thoughts of a remarkable group of contributors

with diverse backgrounds and equally diverse ideas. The contributions from William Nitze, David Wirth and Daniel Lashof, Richard Benedick, and Peter Thacher have appeared previously. Those of Elliot Richardson, Abram Chayes, and James Sebenius are published for the first time here. WRI's Jessica Mathews kicks off the collection with a fine introduction and overview. She also played an important role in conceptualizing the full report. We regret very much that time constraints limited our ability to identify and translate contributions from outside the United States.

The proposals presented by our authors share certain themes, particularly the need for early and effective action, but there are also substantial differences among them. Each proposal has strengths and weaknesses. In considering these options and weighing other issues central to developing an international regime, two considerations are worth keeping in mind. First, the opportunity presented by the U.N. Conference on Environment and Development should not be allowed to slip by. A meaningful international convention of some type should be signed in Rio in 1992. The story of the last few years is that when governments collectively have declared themselves, they have done rather well.

Second, any agreement should contain provisions that build on the single most encouraging thing occurring today in response to global climate risks: the decisions by numerous industrial countries,

including Japan and virtually the whole of Europe, to limit carbon dioxide emissions without waiting on the rest of the world or even their neighbors and trading partners. An industrial country agreement on significant reductions in carbon dioxide and other greenhouse gas emissions should be sought for 1992. At a minimum, provisions should be included that credit rather than penalize nations that proceed on their own or in concert with regional or economic groupings.

This report owes an intellectual debt to the leading experts in international relations, climatology, agriculture, energy, environment, law, industry, and the developing world who serve on WRI's Policy Panel on Responses to the Greenhouse Effect and Global Warming. Over the past two years, the panel has enlightened and informed our work here at WRI.

Essential financial support for WRI's work on the challenge of global warming has been provided by The Ford Foundation, the German Marshall Fund of the United States, The Andrew W. Mellon Foundation, Joyce Mertz-Gilmore Foundation, Public Welfare Foundation, Rockefeller Brothers Fund, and Sasakawa Peace Foundation. To all these institutions, we express our deep appreciation.

James Gustave Speth
President
World Resources Institute

**WORLD RESOURCES INSTITUTE
POLICY PANEL ON
RESPONSES TO
THE GREENHOUSE EFFECT AND GLOBAL CLIMATE CHANGE**

Mr. Richard E. Ayres
Senior Staff Attorney
Natural Resources Defense Council

Ambassador Richard E. Benedick
Senior Fellow
World Wildlife Fund/The Conservation Foundation

Mr. Harold Corbett
Senior Vice President
The Monsanto Company

Dr. John Firor
Director, Advanced Study Program
National Center for Atmospheric Research

Dr. Richard Gardner
Professor of Law and International Organization
Columbia University School of Law

Margaret L. Kripke, MD
Professor & Chairman
Department of Immunology
University of Texas

Mr. C. Payne Lucas
Executive Director
AFRICARE

Dr. Gordon J. MacDonald
Vice President and Chief Scientist
The MITRE Corporation

Dr. Jessica Tuchman Mathews
Vice President
World Resources Institute

Mr. Robert McNamara
Former President, the World Bank

Mr. William G. Miller
President
The American Committee on U.S.-Soviet Relations

Dr. Michael Oppenheimer
Senior Scientist
Environmental Defense Fund

Dr. George Rathjens
Center for International Studies
Massachusetts Institute of Technology

Mr. Roger Sant
Chairman
Applied Energy Services

Dr. Maxine Savitz
Director, Garrett Ceramic Components Division
Garrett Processing Company

Dr. Joseph J. Sisco
Sisco Associates

Mr. James Gustave Speth
President
World Resources Institute

Hon. Robert T. Stafford
Former U.S. Senator

Mr. Stephen Stamas
President, New York Philharmonic

Dr. Robert H. Williams
Center for Energy & Environmental Studies
Princeton University

Dr. George M. Woodwell
Director
Woods Hole Research Center

Mr. Frank Zarb
Chairman
Smith, Barney, Harris, Upham & Co., Inc.

I.

INTRODUCTION AND OVERVIEW

Jessica T. Mathews

The advent of formal negotiations on a regime to control global warming has been breathtakingly swift. All of the formal calls to begin such talks, by the United Nations General Assembly; two summits of the Group of Seven; the Hague, Noordwijk, Bergen and Geneva ministerial declarations; and the preparatory work of the Intergovernmental Panel on Climate Change (IPCC), have been sandwiched into just 24 months. The pressure to have some kind of agreement ready for consideration at the United Nations Conference on Environment and Development in June 1992 guarantees that the pace will not slacken for some time.

These pressures do not mean that agreements will be reached any time soon or that all of the key decisions will be made in the near future. But certain fundamental early choices—for example, on the structure of the negotiations and the type of agreement that is the goal—could profoundly affect the long-term chances of success or failure.

Considering that a greenhouse control regime would be the most ambitious international undertaking of its kind ever attempted, there has been

very little time to mull the lessons of prior international negotiating experience or to imagine innovative approaches that might better fit the unique characteristics of global warming than do earlier models. Indeed, there has not even been enough time for some of the best writing and thinking on this subject to be published.

The conference that will convene in Washington, D.C., in February 1991 may or may not appear in history as having made crucial decisions. But the potential for it to do so is undoubtedly there. In the interest of stimulating the widest possible consideration of the choices that may be faced at that meeting, we have collected here some of the key contributions written by U.S. experts.

This collection brings together the thinking of a remarkable group of individuals, rich in both practical experience and scholarly insight. Several have played leading roles in the international negotiations that are used as guides in thinking about climate change: Peter Thacher in many environmental action plans and UNEP's Regional Seas agreements, Elliot Richardson and James Sebenius in the Law

of the Sea Conference, Abram Chayes in arms control and nuclear proliferation talks, and Richard Benedick in the Vienna convention and Montreal protocol agreements on chlorofluorocarbons (CFCs). Many of them, as well as the other authors—William Nitze, David Wirth, and Daniel Lashof—have been directly involved in international discussions on climate change.

The first two papers in the collection argue that a climate regime will take the form of a general framework convention followed by implementing protocols, following the model of the Vienna convention and its subsequent Montreal protocol. While noting the differences between stratospheric ozone depletion and global warming, Benedick believes that the CFC experience provides a powerful and appropriate guide. Lashof and Wirth simply assume, possibly correctly, that “the model of a convention with ancillary protocols has already been adopted.” Taking an urgent view of the need for immediate reductions in greenhouse gas emissions, they argue that the IPCC has already performed many of the functions of the Vienna convention. Therefore a greenhouse framework agreement should be “considerably more aggressive” than the Vienna model and negotiation of implementing protocols should proceed simultaneously with it. Benedick, urging moderation in the early stages, warns that “a premature insistence on optimal solutions” could delay any agreement.

The following papers gradually shift the focus from the form of specific agreements to the continuing process of which treaties are a part. Both Richardson and Nitze are particularly concerned with how agreements to reduce greenhouse emissions would be turned into achieved reductions. Richardson sees a framework treaty as embodying a general code of obligations, procedures for negotiating subsequent protocols, and, most important, measures to “encourage the voluntary adoption of national commitments, permit the monitoring of compliance with those commitments, and mobilize domestic and international public opinion.” These and other functions would be carried out by a new, or newly strengthened, international agency whose role Richardson spells out in some detail. The combination of *voluntary* national targets with aggressive

international data collection, monitoring, and mobilization of public opinion would amount, Richardson argues, to a “self-reinforcing process . . . [that] could become a formidable substitute for official action—more effective than regulation and far less expensive than its enforcement.”

Like Richardson, Nitze believes that a new international institution will be needed, and he describes its possible structure and roles. He also places considerable emphasis on the importance of international data collection and monitoring and makes national plans the centerpiece of the reduction process. “Only policies formulated at the national level will overcome widespread concern about economic costs and reflect the different circumstances of different countries. The convention should drive this process by requiring each party to prepare and distribute its own national plan” Unlike Richardson, however, he envisions a set of ambitious internationally agreed targets and timetables early in the process.

Though their approaches and arguments seem quite different, the Thacher and Chayes papers share a common premise: that negotiation, ratification, and entry into force of treaties of whatever kind will take a long time and that the early emphasis should therefore be placed on what can be achieved in the meantime. Thacher describes the important role played by various “soft law” mechanisms in a variety of arms control and environmental agreements. Drawing on this experience, his view is that conventional wisdom notwithstanding, a framework treaty should not be the first step. Instead, an action plan should be developed. This would be a political document not requiring ratification, that would set in motion a variety of scientific and technical assistance activities and lay the groundwork for subsequent reduction agreements. To compliment the action plan, he advocates a parallel “fast track” of voluntary emission reductions undertaken unilaterally by industrialized countries.

Chayes’s interest is in the type of “compliance machinery” that might be effective when quantitative reduction limits are eventually agreed to. Like Richardson, he believes that regulatory or coercive methods are unlikely and, indeed, unnecessary.

Based on the experience of the General Agreement on Tariffs and Trade, the U.N. Human Rights Commission, the International Labour Organization, and, particularly, the International Monetary Fund (IMF), he describes a greenhouse regime that would be enforced through a combination of "systematic reporting, consultation, and surveillance, administered by a permanent professional staff." "Reporting, publicity and persuasion," in his view, "create . . . expectations that states do not lightly disappoint."

The task of the 1992 conference, therefore, is to draw up a set of "transitional arrangements" that would lead to a series of voluntary, "customized" national plans. The reporting and consultation procedure would evolve into a gradually stiffening annual negotiation "about what would constitute a satisfactory policy effort" by each nation. Like several of the authors, Chayes assigns considerable importance to the potential role of domestic public opinion and to the activities of nongovernmental organizations in this process. The country-by-country process would soon create a pressure for general rules, but these too, in Chayes's view, could be achieved internationally through nonbinding devices, such as guidelines, published staff decisions, and the use of precedents.

The last paper, by James Sebenius, addresses in greater detail how the negotiating process itself might be designed to maximize the chances of success. He draws on the experience of the Law of the Sea Conference and the Vienna convention/Montreal protocol, arguing that these two international negotiations are not, as most people believe, "pure competing archetypes" but in fact had much in common. He points out, for example, that the failure of the framework/protocol approach in early Law of the Sea conferences led to the eventual adoption of a comprehensive package alternative. He warns that in a greenhouse negotiation, "this pressure is likely to be felt as early as the 'framework' stage, effectively collapsing what is intended as a two-stage process into a single negotiation involving both framework and protocols."

Most treatments of the framework/protocol alternative have concentrated on various ways of slicing the greenhouse problem into manageable parts.

Sebenius looks more closely at the difficulties associated with many separate protocols: "Imagine Libya signing a forestry convention while Nepal agreed to a transportation and automotive protocol." In this key aspect, a greenhouse negotiation is fundamentally different from the Vienna convention model in which only a single protocol was needed. Sebenius also examines the roles ideological and North-South conflicts may play in the negotiations and proposes various devices to disarm or sidestep potential "blocking coalitions." Among them are incremental agreements and ratcheting mechanisms similar in many respects to Chayes's transitional arrangements.

There is much overlap among the full papers not evident in these thumbnail sketches. Indeed, though the perspectives and inclinations of these eight experts are quite different, they converge on many key points to a striking degree. My own views, which follow, draw on these areas of agreement and some additional thoughts with which none of the authors might agree.

It is *de rigeur* to begin any discussion of a climate control regime by pointing out how much more difficult it will be than dealing with stratospheric ozone depletion. Some go so far as to argue that greenhouse warming is so much more difficult that the international agreement to eliminate CFCs cannot even be seen as a hopeful precedent. This is a seriously blinkered view that overlooks many substantial advantages a greenhouse negotiation holds over the CFC control process.

Through the entire period of negotiations, controlling CFC use in order to reduce ozone depletion appeared to offer only one offsetting benefit, namely, slowing greenhouse warming. Only now, after a full phaseout has been agreed to and entered into force, is it becoming evident that many CFC substitutes may be large energy savers, leading to sizable net economic savings. In fact, well into the CFC negotiations, a RAND Corporation analysis concluded that CFC substitutes could not be developed at *any* cost.

The picture on the climate front could not be more different. Most of the biggest steps that could be

taken to slow greenhouse gas emissions promise multiple benefits. Tropical deforestation would remain the most serious environmental problem in the developing world if greenhouse warming did not exist. Improving energy efficiency and reducing energy waste will reduce costly air pollution, ease international dependence on Middle Eastern oil reserves, and, in many cases, cut costs and improve economic efficiency. Slowing population growth is another priority for human and economic reasons quite apart from long-term concerns about climate.

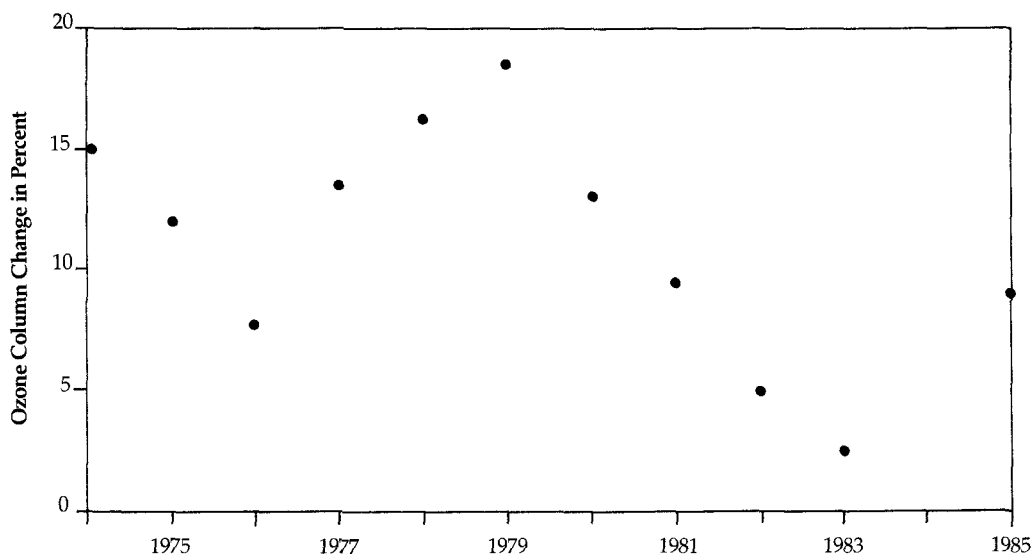
Greenhouse warming is also said to be far more uncertain than ozone loss. Yet as Figure 1 illustrates, at comparable stages of international consideration, ozone depletion was beset by at least comparable scientific uncertainty. Predictions of expected ozone loss fluctuated widely, from almost 20 percent in 1979 to 3 percent in 1983. Greenhouse warming remains a far more complex scientific problem, with a great many unknowns. Present understanding may well prove incorrect in important respects. But through more than 20 years of research, covering

several generations of improvements in general circulation models, scientific predictions about the rate and degree of expected climate change have remained remarkably constant.

Greenhouse negotiations could turn out to be a North-South battleground, but there is also reason to hope that such conflicts could be even less divisive than they were in the CFC negotiations. Chlorofluorocarbon producers and users were and are almost entirely industrialized nations, whereas three of the top five national contributors to global warming today are developing countries. Moreover, unlike ozone depletion, the greatest victims of rapid climate change—and therefore the greatest beneficiaries of a control regime—are almost certain to be developing nations.

In some respects, the number of greenhouse gases and the multiplicity of their sources is an advantage rather than a drawback. Many sources of greenhouse gases also means as many avenues of approach. No one activity or economic sector must

Figure 1. Models of Uncertainty—Various Predictions of Ozone Layer Depletion, 1974–85



Source: Adapted from National Research Council, (1984); World Meteorological Organization, (1986)

bear the brunt of change. Many small percentage changes add up to significant change.

Public opinion should also be a far more potent force than in the CFC case. By and large, people cannot see, feel, or in other ways directly sense the consequences of stratospheric ozone loss. On the other hand, just about everyone has personally experienced some climate catastrophe during his or her lifetime—a hurricane, cyclone, killing cold snap, flood, etc. The costs of climate extremes, as in the 1988 U.S. drought, are all too familiar. Moreover, greenhouse warming appears to threaten the stability and future of the planet and therefore captures public attention in a way that ozone loss does not.

Finally, climate negotiations begin with a far stronger base of steps already taken, commitments to act and joint international research and analysis than was the case for CFCs. All 17 nations of Western Europe (except Malta) have committed themselves to stabilize their carbon dioxide emissions at 1990 levels by the year 2000. Some plan to do much more. Australia, New Zealand, Japan, and Canada have all adopted CO₂ emission control goals. Some countries have small carbon taxes in place. Twenty percent of the greenhouse problem, that due to CFCs, has already been successfully tackled. The IPCC produced a notable degree of scientific and analytic consensus with broad international participation. And many years of work have already gone into designing a comprehensive international global change research plan (the International Geosphere/Biosphere Program [IGBP]) under the auspices of the International Council of Scientific Unions (ICSU). The CFC negotiations, by comparison, began with almost a clean slate.

None of this means that building an international greenhouse control regime will be anything other than a daunting task. It does suggest, however, that conventional wisdom is markedly one-sided, emphasizing the difficulties of greenhouse negotiations while largely ignoring valid grounds for optimism. How might these potential strengths be exploited to achieve actual agreements?

Three aspects of climate change should influence the choice of negotiating mechanism and goal at this

early stage of international cooperation. First is the substantial scientific uncertainty about greenhouse warming and the equal or greater uncertainty regarding the costs of its impacts and of actions to slow the rate of change. The range of uncertainty encompasses the possibility of calamitous outcomes as well as less damaging results than are now generally expected. There is also the fact that global warming is an irreversible phenomenon whose effects cannot be erased in the way that most types of pollution can be cleaned up. In situations of high uncertainty, the usual policy tradeoff is to avoid mistaken actions by waiting for greater scientific certainty even if that means larger cleanup costs later. That approach clearly does not work for an irreversible change. Further, the availability of inexpensive steps to reduce greenhouse gas emissions makes allowing for uncertainty far easier.

Together these characteristics suggest that a greenhouse regime should encourage and facilitate early action both to improve understanding and to reduce long-term risks to the planet by slowing emissions. The regime must be responsive on all fronts (all greenhouse gases from all sources) at all times, because the likelihood of surprise from new research and monitoring is very high. And because of present uncertainties and the scope of the changes that may be necessary over decades, the regime should be designed as a fluid, continuous international process.

Even a self-adjusting treaty like the Vienna convention/Montreal protocol is a relatively static mechanism. Moreover, because many protocols rather than a single one would be involved in a greenhouse regime modeled on that approach, the adjustment process would likely be extraordinarily cumbersome. Treaties are also abrupt. Upon ratification, countries shift from bearing no obligations to bearing all those (and only those) set forth in the agreement. Greenhouse warming is ill-suited to such a process, which is essentially a series of discrete quantum leaps. A better solution would be one that placed some obligations on governments beginning as soon as they formally recognize that greenhouse warming presents a potentially serious global threat—a step most governments have already taken. These obligations should not link non-controversial

but vital actions—such as creating institutional machinery, instituting international data collections and monitoring and providing low-cost technical assistance to developing countries—to emission reduction agreements.

Because it would rely heavily on a continuing process, such a regime would require a professionally staffed agency for implementation and enforcement. Chayes's analogy to the role of the IMF is a powerful one if such a body could be endowed with substantial funds to use as a carrot. Unlike the present IMF, of course, such an agency would have to equally engage developed and developing countries. One of the strongest attributes of such an approach would be its ability, in Chayes's term, to help develop "customized" national emission control plans and to gradually step up or relax the pressure for action as scientific findings warrant and individual countries' political and economic situations allow. For example, the United States and the Soviet Union share many characteristics relevant to slowing or adapting to climate change. Both are large countries with low population densities and many climate zones. Both rely heavily on agriculture and are richly endowed with fossil fuels. Both also have low energy productivity (require large energy use per dollar of GNP) relative to Japan and Western Europe. But there the similarities end abruptly. The United States could dramatically improve its energy efficiency at low or no net cost, and to its substantial benefit, whereas, because of internal political and economic chaos, little progress could be expected of the USSR in the near future. Rather than tie the U.S. goal to what the USSR could achieve or write a more ambitious agreement that many countries must either oppose or violate, an initial greenhouse agreement might state a general global goal while specific emission reduction targets are developed on a country-by-country basis, outside treaty texts.

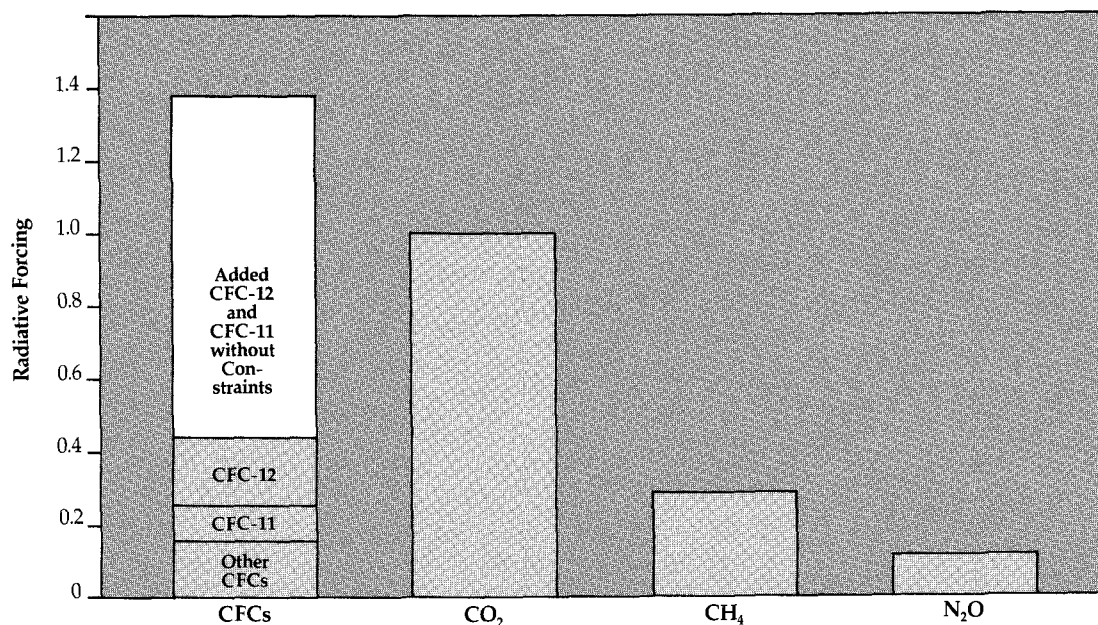
The alternative to voluntary, tailored national plans is to devise a general formula. Too little attention has been paid to how such emission reduction targets might actually be set. Per capita goals reward rapid population growth. Various formulas combining population and gross national product quickly become entangled in debates over what is

fair and how far back the accounts should extend. For example, should the carbon dioxide emissions caused by the deforestation of temperate forests centuries ago be ignored while the consequences of today's deforestation in the tropics are counted? Fixed percentage reductions also have many drawbacks even when coupled to a baseline year that gives credit for steps already taken. It may eventually prove possible or necessary to devise such general emission reduction formulas; however, voluntary national plans, conceived pursuant to a global aim and annually updated in an international context under public scrutiny, may offer greater hope of actual emission reductions in the near term.

Though greenhouse warming requires a mutual commitment by all countries, developing countries' willingness to act is likely to depend on their first seeing evidence of concrete action by the industrialized world. The initial negotiations should nonetheless be global, establishing from the outset that this is a venture that equally affects the interests of all countries. The first emission reductions could and should be made in the countries that have made the greatest contribution to the problem and that have the greatest capacity to act. As Figure 2 illustrates, a few countries can make a big difference. If the United States, Canada, and the Scandinavian countries had not banned CFC use in aerosol cans in the 1970s, chlorofluorocarbons would today be a larger cause of global warming than carbon dioxide!

From the outset, the process should also recognize the importance of public opinion and the force of domestic political pressures both in support of and opposing government action. The recent summit of the Conference on Security and Cooperation in Europe (CSCE) highlighted once again the potency of even general agreements when coupled to a mobilized public opinion. In that case, the Helsinki Accords, which seemed to confirm Communist rule over Eastern Europe, became a powerful tool of its undoing in the hands of domestic Helsinki Watch groups. A greenhouse regime should seek to accommodate and engage positively both industry and nongovernmental groups. Doing so is unlikely to slow down the process of reaching agreements among governments only, and, if successful, it could notably quicken the implementation of international

Figure 2. Current Greenhouse Climate Forcings, (CO₂ equals 1)



Source: Hansen, Lacis, and Prather, "Greenhouse Effect of Chlorofluorocarbons and Other Trace Gases," in *Journal of Geophysical Research*, (Nov. 20, 1989)

agreements at the national level, where changes will actually be made. Because there are only a few rudimentary models of such public-private hybrids among existing international institutions, this is an area where innovation is badly needed.

Several of the papers in this collection deal with technology transfer and with financial and other types of assistance to developing countries. Surprisingly, however, the developing world's future energy supply receives little direct attention. Unless developing countries follow a different energy path from that trod by the industrialized world, it is hard to see how needed economic growth and greenhouse gas reductions can both be accommodated. Instead, appropriate alternative energy sources and long-term energy strategies based on huge improvements in energy efficiency are absolutely essential. Because most developing countries do not have large sunk costs in central power stations, electric grids, pipelines, and the like, such a dramatic change

is not as unlikely as it may seem at first glance. Indeed, there is every reason to expect that an energy infrastructure built in the twenty-first century should be able to do better than copy one laid down in the nineteenth.

Developing these new energy sources and strategies will require substantial financial and technical assistance from the industrialized world. However, the new energy technologies cannot depend only on products and fuels that must be imported. As with CFCs, a prime concern of developing countries is whether a substitute product must be bought with scarce foreign exchange or whether it can be produced domestically, even if at greater or equal cost. Therefore a key element in the foundation of a successful greenhouse control regime is the early creation of a sophisticated energy research and development capacity supported by developed countries but located *in* the developing countries. A good model would be the international centers

for agricultural research, a successful jointly managed network of 13 institutions launched in the 1960s and now supported at a cost of about \$200 million per year.

The choices made in the early stages of constructing a greenhouse regime could have far-reaching consequences. Because global warming is different in many crucial respects from any prior effort to manage a shared resource (in this case, planetary

climate) cooperatively, the effort would surely benefit from more thought than these aspects of governance have yet received. No existing model fits perfectly. Instead, it may be possible to draw on aspects of many different negotiations and institutions, complemented by innovation to fill some of the gaps. Though they do not seek to offer complete solutions, the papers collected here illuminate these choices and make a valuable contribution to what will be a long and arduous process.

II.

BUILDING ON THE VIENNA CONVENTION

Lessons from “the Ozone Hole”

Richard Elliot Benedick

On September 16, 1987, a treaty was signed that was unique in the annals of international diplomacy. The “Montreal Protocol on Substances that Deplete the Ozone Layer” mandated significant reductions in the use of chlorofluorocarbons (CFCs) and halons.

At the time of the treaty’s negotiation, these compounds enjoyed rapidly growing use in a wide range of industries, involving billions of dollars of investment worldwide. Scientists suspected, however, that CFCs might cause future damage to a remote gas—the stratospheric ozone layer—that shields life on Earth from potentially disastrous levels of ultraviolet radiation.

Perhaps the most extraordinary aspect of the Montreal Protocol was that it imposed substantial short-term economic costs in order to protect human health and the environment against speculative future dangers—dangers which rested on scientific theories rather than on proven facts. Unlike environmental agreements of the past, it was not a response to harmful events, but rather *preventive* action on a global scale.

The problem of Greenhouse warming, although admittedly more complex, shares some attributes of the threat to the ozone layer. The ozone negotiators confronted dangers that could affect every nation and all life on Earth, over periods far beyond the normal time horizons of politicians. At the time, however, these potential consequences could neither be measured nor predicted with any certitude.

Moreover, entrenched industrial interests claimed that new regulations would cause immense economic dislocations. Technological solutions either were nonexistent or were considered unacceptable by most major governments. The scientific positions taken by some parties were influenced by commercial self-interest, and scientific uncertainty was used by some as an excuse for delaying hard decisions. Many political leaders were long prepared to accept potential future environmental risks rather than to impose the certain short-term costs entailed in limiting products seen as important for modern standards of living.

Does all of this sound as familiar as recent headlines on the international debate over climate

change? There were scoffers of the ozone-depletion hypothesis just as there are skeptics of the prospects for Greenhouse warming. Short-range political and economic concerns are formidable obstacles to international action based upon arcane theories and computer model projections. The Montreal Protocol was not an inevitability; knowledgeable observers had long believed it would be impossible to achieve.

“The Montreal Protocol imposed substantial short-term costs against speculative future dangers.”

Climate change does pose some unique challenges to international cooperation. Because the impacts of Greenhouse warming are so uncertain and distant, there is a possibility of “winners” and “losers” among nations. In addition, efforts to limit the magnitude and rate of temperature rise, and to adapt to the effects of warming, will require perhaps costly changes in energy, industry, agriculture, development, and population policies, as well as in consumer lifestyles. Further, as energy is so essential to the development of such heavily populated, low-income countries as China and India, they will be reluctant to forgo fossil fuels unless economical alternatives are available.

Nevertheless, the international community’s response to the ozone issue suggests several lessons for the new global diplomacy needed for addressing the heat-trap effect:

- Scientists must assume an unaccustomed but critical role in international negotiations. Science became the driving force behind ozone policy. The development of a commonly accepted body of data and analysis and the narrowing of ranges of uncertainty will also be prerequisites to a political solution on Greenhouse gases. In this process, close collaboration among scientists, policymakers, and diplomats will be crucial.
- Governments must nevertheless act while there is still scientific uncertainty, based on a responsible

appraisal of the risks and costs of delaying action. Politicians need to resist a tendency to assign excessive credibility to self-serving economic interests that demand scientific certainty, insisting that dangers are remote and therefore unlikely. By the time the effects of ozone layer depletion and climate change are self-evident, it may be too late to forestall serious harm to human life and draconian costs to society.

- Educating and mobilizing public opinion are essential to generate pressure on often hesitant politicians. The interest of the media in the ozone issue and the use of television and press by U.S. diplomats, environmental groups, and legislators had a major influence on governmental decisions.
- Strong leadership by a major country can be a significant force for mobilizing international consensus. The United States is the largest emitter of both ozone-destroying chemicals and Greenhouse gases. Its influence in achieving the ozone treaty was enormous. The rest of the world expects, and would be responsive to, similar U.S. leadership on the Greenhouse issue.

“The United Nations Environment Programme was indispensable for the Montreal Protocol and can be equally effective for coordinating international negotiations on climate.”

- The catalytic and mediating functions of a multi-lateral institution can be critical when an issue, like ozone and climate, has planetary consequences. The United Nations Environment Programme was indispensable for the Montreal Protocol and can be equally effective for coordinating international negotiations on climate.
- Economic inequalities among countries must be adequately reflected in any international regulatory regime. In the longer run, developing countries, with their huge and growing populations, could undermine efforts both to protect the

ozone layer and to forestall Greenhouse warming. They did not cause these problems, and the rich nations that were responsible must now help them to participate in cooperative efforts without sacrificing their aspirations for improved living standards. It is now essential that ways be explored to transfer needed technology while maintaining intellectual property rights and incentives for private entrepreneurship to undertake research on new technologies.

- A regulatory agreement is most effective when it employs the market mechanism to encourage technological innovation. The ozone protocol set emission targets that initially appeared difficult; however, they effectively signaled the market that research into alternatives would be profitable. Similarly, market incentives—and disincentives—must be devised to stimulate producers and consumers toward investments and actions that reduce Greenhouse-gas emissions.
- The Montreal Protocol broke new ground in the way it was planned and framed. Complicated issues were separated into manageable components; informal fact-finding efforts—workshops, conferences, and consultations—built up gradual consensus and facilitated the formal negotiations. The protocol itself is a dynamic and flexible instrument, designed to be adapted to evolving conditions on the basis of regularly scheduled scientific and technical reassessments. Like the Montreal Protocol, an international accord on climate change should not be a static solution, but rather an ongoing process.
- Finally, pragmatism, combined with firmness, can mean success in complex diplomatic engagement. The United States and other proponents of strong controls did not insist on a perfect solution to the ozone problem. They refrained from extreme positions and exaggerated claims but never relented in their pressure for a meaningful treaty. The basic objective was to get a reasonable agreement in place that could also serve as a framework for future action.

These lessons from the Montreal Protocol can definitely be applied to the current debate over global

climate change. Indeed, the relevance of this experience has not been lost on the international community.

“Such a climate convention need not be a complicated undertaking.”

For example, the Intergovernmental Panel on Climate Change, with its varied participation from public and private sectors and multiple scientific, economic, and policy workshops, is analogous to the fact-gathering phase of the ozone history. Similarly, many governments announced their support last year for a framework agreement on climate change, comparable to the 1985 Vienna Convention on Protecting the Ozone Layer. Such a climate convention need not be a complicated undertaking, and it should be achieved at the earliest possible date. The existence of gaps in scientific and economic knowledge should not become an excuse for postponing the start of negotiations.

Ideally, a framework convention would enable governments to formalize agreement in principle on the dimensions of the climate problem and the scope of possible responses. Governments would undertake general obligations for actions to mitigate and adapt to global warming. They would also agree on coordinated research to develop additional data as guidelines for future measures.

It would be useful to go beyond the Vienna precedent at this stage and try to build into a climate convention some general targets and timetables. However, it would probably be problematical for advocates of stringent Greenhouse-gas controls to attempt to load a convention with overly detailed and still controversial commitments. A premature insistence on optimal solutions could have the unintended effect of bogging down the negotiators and unnecessarily prolonging the entire process. On the other hand, an early convention would in itself set in motion an international momentum toward concrete actions.

The framework convention would provide the legal and logistical structure for the critical next step—corresponding to the Montreal Protocol—which

would entail agreement on specific international regulations. Indeed, work on such protocols might well begin even before the convention itself is completed. Because of the complexity of the climate issue, it would not be realistic to attempt to achieve an ideal solution at a single stroke. Here again, the quest for perfection might only serve to delay action. Instead, the way to success may lie in incremental stages and partial solutions.

Thus, governments could negotiate several separate implementing protocols, each one containing specific measures for dealing with a different aspect of the climate problem. One example could be a treaty mandating greater energy efficiency in the transportation sector, which should be manageable as it need involve only a handful of manufacturing countries. The ozone accord itself exemplifies a partial solution to the climate problem by means of a constituent protocol. A recent National Air and Space Administration study estimated that if CFCs had continued to increase at the growth rates of the 1970s, they would by now exceed carbon dioxide (CO₂) in their Greenhouse impact.

It might be useful to establish standing negotiations under a permanent secretariat, similar to the arrangements for the Geneva disarmament talks. By this means, individual protocols could simultaneously be in the process of development, each at its own pace.

The climate convention and protocols need not be universal in membership—that is an unnecessary

complicating factor. In actuality, the overwhelming proportion of carbon emissions from fossil fuels and deforestation is concentrated in a relatively small number of industrialized and developing nations.

Indeed, the major industrialized countries, which are primarily responsible for the world's current precarious ecological condition, could make a vital contribution by agreeing on pre-emptive actions even before a broader climate treaty is negotiated. North America, the Soviet Union, the European Community, and Japan together account for about 60 percent of carbon emissions from fossil fuels. By not delaying feasible actions to increase energy efficiency and reduce CO₂ emissions, these countries could significantly slow the warming trend. This would buy time for technological innovation that could later be shared with poorer countries—principally China, Brazil, India, and Indonesia—to aid them in assuming their own responsibility.

In conclusion, in the realm of international relations, there will always be resistance to change and there will always be uncertainties—political, economic, scientific, psychological. The ozone negotiations demonstrated that the international community, even in the real world of ambiguity and imperfect knowledge, can be capable of undertaking difficult cooperative actions for the benefit of future generations. The Montreal Protocol may well be a paradigm for international cooperation on the challenge of global warming.

Richard Elliot Benedick, as Deputy Assistant Secretary of State, was the chief U.S. negotiator for the Montreal protocol. He is currently on assignment from the State Department as Senior Fellow, World Wildlife Fund/The Conservation Foundation, Washington, D.C. This article is reprinted from *EPA Journal* (March/April 1990):41–44. It was adapted from *Ozone Diplomacy: New Directions in Safeguarding the Planet* (Washington: The Conservation Foundation and Georgetown University, Institute for the Study of Diplomacy, 1990).

Beyond Vienna and Montreal— Multilateral Agreements on Greenhouse Gases

David A. Wirth and Daniel A. Lashof

Introduction

Besides being the principal culprits implicated in the destruction of stratospheric ozone, chlorofluorocarbons (CFCs) and halons are also of great concern because of their major contribution to “greenhouse” warming. Despite their relatively low concentrations, CFCs and halons are responsible for 15–20% of current contributions to the greenhouse effect, a trend which may result in global average temperature increases of 1.5–4.5°C by the middle of the next century. Per molecule in the atmosphere, these chemicals are up to 20,000 times more potent in absorbing infrared radiation than carbon dioxide (CO₂), another well-known greenhouse gas (GHG).

In contrast to other greenhouse gases—such as CO₂, methane (CH₄), and nitrous oxide (N₂O)—reductions in emissions of CFCs and halons are established through the regulatory structure of the Vienna Convention for the Protection of the Ozone Layer¹ and the Montreal Protocol on Substances that Deplete the Ozone Layer.² Although these instruments help to address the global warming problem in an indirect, incremental manner, they are far from a

comprehensive greenhouse gas regime. Indeed, the Montreal Protocol does not specify that alternatives to the CFCs and halons controlled by the agreement must or even should be greenhouse-friendly.

Major reductions in emissions of all greenhouse gases are necessary to assure the integrity of the biosphere. National commitments by individual countries and concerted action by groups of large emitting nations, such as the Group of Seven (G-7) major industrialized nations, are crucial for achieving progress toward meaningful reductions in greenhouse-gas emissions. Binding multilateral instruments are also needed to attack global warming on a universal scale. New international institutions and decision-making processes may be desirable or even essential.

The desirability of a “framework” or “umbrella” treaty—analogue to the Vienna Convention—with associated ancillary agreements—analogue to the Montreal Protocol—has dominated the discussion of multilateral climate instruments for some time. During the last year, the need for a multilateral convention on climate change has become widely

recognized at the highest political levels and now appears to be universally accepted. The purpose of this article is to examine the implications of the Vienna-Montreal precedent and to stimulate debate on the form and substance of a global greenhouse-gas convention.

The Early Need for Multilateral Greenhouse-gas Controls

“The Earth is one but the world is not.”³ With these words, the World Commission on Environment and Development underscored the principal difficulty of formulating a concerted attack on international environment threats in a world where the primary actors are independent, sovereign, co-equal nation states. Among those perils, few if any rival the greenhouse effect. Without attempting a comprehensive review of the scientific, policy, and legal issues associated with global warming,^{4,5} it is important to highlight the overarching imperatives that an international strategy on this compelling issue must address.

An International Issue

Greenhouse warming, like stratospheric ozone depletion, is a global problem. The most important greenhouse gases—CO₂, CFCs, CH₄, N₂O—remain in the atmosphere for many years after being emitted. As a result, their atmospheric concentrations are essentially the same everywhere. Emissions anywhere on the planet have the same impact on climate, regardless of their geographic origin.

Global warming and ozone depletion share a number of other characteristics with significant policy consequences. In contrast to some other international issues like acid rain, regional solutions, while incrementally helpful, cannot resolve these problems in their entirety. The greenhouse effect and stratospheric ozone depletion are both consequences of current patterns of industrialization. Both threaten long-term, potentially catastrophic harm, whose precise delineation is complicated by a range of uncertainty.

Greenhouse gases are more varied and more widely distributed around the globe. Although CO₂ and methane emissions of fossil-fuel origin are highly concentrated in the industrialized countries which are the dominant CFC consumers, CO₂ releases from deforestation and methane emissions for rice paddies and domestic animals emanate almost entirely from developing countries. For example, the United States, Japan, and the European Economic Community accounted for 70% of global CFC production in 1985. This same configuration of countries accounts for only about 40% of total greenhouse-gas emissions.⁶

No comprehensive solution is possible without the active participation of developing countries, and a GHG agreement must address their special needs. On the one hand, developing countries have caused little of the problem and industrialized countries must bear the bulk of the responsibility. On the other hand, as economic development accelerates, Third World countries may account for the preponderance of greenhouse-gas emissions by the middle of the next century. Moreover, developing countries, with fewer resources to adapt to environmental disturbances, stand to suffer disproportionately from rapid climate change. An international solution that provides incentives for the participation of developing countries while fairly distributing the responsibility for implementing solutions is essential to combatting greenhouse warming.

Winners and Losers

Although the buildup of greenhouse-gas concentrations is globally uniform, the impacts of the resulting climate change will vary from region to region. This has led to the suggestion that there will be “winners” and “losers” from global warming. So long as this incorrect notion persists, there is a serious risk that broad international agreement on environmentally meaningful reductions in GHG emissions will be stymied. The assumption that there will be winners from global warming is often erroneously grounded in a comparison with a future, hypothetical climate regime in equilibrium with carbon dioxide concentrations double their pre-industrial levels. This arbitrary and totally unrealistic scenario was developed only for the convenience of climate

modelers, who needed simple assumptions to carry out their calculations.

The very concept of “winning” implies the existence of a stable warmer climate, which will not occur unless the warming trend is halted. There is no natural end-point to climate disruption from the greenhouse effect. Moreover, no single country will be able to guarantee that the phenomenon is arrested at an optimal point for that country. The only way to ensure that there will be any winners is to guarantee that all countries are winners by reversing the global buildup of greenhouse gases in the atmosphere.

As a consequence of the long atmospheric lifetimes of GHGs, major reductions in emissions from current levels are required. Even after serious reductions in emissions, atmospheric concentrations of GHGs will fall only very slowly. Because of the heat capacity of the oceans, the climatic response would be delayed by decades more. Indeed, temperatures could continue rising for many years even after all anthropogenic emissions were eliminated.⁷ The likelihood of positive feedbacks on emissions caused by the warming itself raises the further frightening possibility that human efforts to reduce emissions could be overwhelmed by natural processes. Once such a crisis has been reached, it will be too late to act.

Policy Implications of Scientific Uncertainties

Informed by what is and is not known about the phenomenon, prudent public policy demands the implementation of measures to avoid the worst risks from global warming. The question of how to react

to scientific uncertainties was an explicit component of negotiations on multilateral instruments to protect stratospheric ozone. Policy discussions concerning global warming, however, have generally not been guided by this crucial principle.

For instance, a widely quoted statement, based on a series of assessments by the National Academy of Sciences and the US Department of Energy, is that the radiative equivalent of doubling the concentration of CO₂ would “most likely” result in a global warming of 1.5–4.5°C. However, when biogeochemical feed back processes are incorporated into climate models, and standard deviations are accounted for, the temperature rise resulting from an initial doubling of CO₂ might increase to more than 6°C, and a warming of as much as 8–10°C cannot be ruled out.⁸

A useful way to think about the policy implications of this scientific uncertainty is to consider the policies needed to limit climate changes to a given level. As an example, consider confining warming commitments to a target of 2.5°C above preindustrial levels by the year 2030. Achieving this goal would result in an average global temperature at or below the maximum global temperature experienced during the last several million years. It is also consistent with the goal of limiting the maximum rate of warming to 0.1°C per decade proposed by the international policy workshops in Villach and Bellagio.⁹

Table 1 shows the current warming commitment and the CO₂ concentration limit that would be required to prevent a global warming of more than 2.5°C for various climate sensitivities to doubling

Table 1. Carbon budget to limit warming to 2.5°C above preindustrial levels.

Climate sensitivity (°C) (2 × CO ₂)	Current warming commitment (°C)	CO ₂ concentration limit (ppm)	Carbon budget (billion tons)
6	3.1	330	—
4.5	2.3	360	30
3.0	1.5	440	340
1.5	0.8	760	1600

CO₂ between 1.5 and 6°C. The current warming commitment is the global temperature increase above preindustrial levels that would occur in equilibrium if greenhouse-gas concentrations were frozen at today's levels. The CO₂ concentration limit is based on the assumption that other greenhouse-gas concentrations can be stabilized at today's level. The last column shows the total amount of CO₂ that could be emitted between now and when CO₂ concentrations are stabilized (for example, the year 2030), assuming that 55% of the emitted CO₂ remains in the atmosphere over this period. This analysis shows that, if the climate system turns out to be quite sensitive to increases in greenhouse-gas concentrations, it may already be impossible to prevent unprecedented climatic change. With even a modest climate sensitivity, aggressive policies to eliminate fossil-fuel dependence would be required.

“With even a modest climate sensitivity, aggressive policies to eliminate fossil-fuel dependence would be required.”

Given this situation, the only prudent policy is to minimize the risks of catastrophic climatic change by reducing CO₂ emissions as necessary to allow atmospheric concentrations of this gas to begin declining at the earliest possible date. It is both necessary and feasible to set a policy course consistent with preventing CO₂ concentrations from exceeding 400 ppm. This could prevent a warming commitment of more than 2.5°C as long as the climate sensitivity to a doubling of CO₂ turns out to be below 3.6°C. If subsequent scientific studies show that the climate system is definitely much less sensitive than this value, then this constraint could be relaxed. A mid-course correction of this sort would have few if any adverse economic consequences, as most if not all of the policies needed to achieve this target will probably prove beneficial in their own right. On the other hand, any delay in establishing policies consistent with the above goal will be extremely costly, both economically and environmentally, if it is subsequently shown that the climate system is at least this sensitive.

Recent Progress toward a Greenhouse-gas Convention

In the past several years, there has been a great deal of international activity on scientific, technical, and policy aspects of the greenhouse issue. Multilateral attention to the causes, consequences, and control of global warming has accelerated dramatically in the past year. As a result, there have been a number of significant international initiatives relevant to the form, content, and timing of multilateral greenhouse gas instruments.

The Intergovernmental Panel on Climate Change (IPCC)

The IPCC is now the principal ongoing multilateral vehicle for scientific and policy treatment of the greenhouse issue. The IPCC was created under the auspices of the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) with a mandate to study the climate change issue and report to the Second World Climate Conference in the fall of 1990. It met for the first time in November 1988. More than 35 countries participate in IPCC activities, which are distributed among three “working groups”: a science working group; a working group studying social and environmental impacts of climate change; and a Response Strategies Working Group (RSWG). The RSWG, beginning with its meeting in Geneva in October 1989, has begun to examine possible elements for inclusion in a framework convention on climate change.

Toronto Conference on the Changing Atmosphere

The Government of Canada in June 1988 sponsored this conference, which was attended by more than 300 individuals from 46 countries, including government officials, scientists, and representatives of industry and environmental organizations. Prominent among the recommendations from the conference were the following:

- the necessity for “a comprehensive global convention as a framework for protocols on the protection of the atmosphere”;

- the establishment of a “World Atmosphere Fund financed in part by a levy on the fossil-fuel consumption of industrialized countries” to facilitate technology transfer to Third World countries; and
- a “reduc[tion in] CO₂ emissions by approximately 20 percent of 1988 levels by the year 2005” as an initial goal.¹⁰

Hague Conference

In March 1989, the Dutch Government convened this conference, which was attended by representatives of 24 countries, including 17 heads of state. The resulting Declaration of the Hague emphasizes the desirability of the “negotiation of the necessary legal instruments to provide an effective and coherent foundation, institutionally and financially,” for a new institutional authority charged with “combating any further global warming of the atmosphere.” The conference recognized the need for this authority to apportion “fair and equitable assistance” to those countries that are asked to bear an “abnormal or special burden, in view . . . of the level of their development and actual responsibility for the deterioration of the atmosphere.”¹¹

UNEP Governing Council

The Governing Council of UNEP, in a decision taken at its biannual meeting in Nairobi in May 1989, requested the heads of UNEP and WMO to “begin preparation for negotiations on a framework convention on climate.” The UNEP Governing Council also instructed that “such negotiations should be initiated as soon as possible immediately after the adoption of the interim report of the [IPCC],” scheduled to occur by the fall of 1990.¹²

G-7 Summit

The governments of many of the world’s largest emitters of CO₂ and other greenhouse gases—Canada, the Federal Republic of Germany, France, Italy, Japan, the United Kingdom, and the United States—were represented at the annual meeting of heads of state of the seven major industrialized nations in Paris in July 1989. The communiqué from this meeting declared the following:

We believe that the conclusion of a framework or umbrella convention on climate change to set out general principles or guidelines is urgently required to mobilize and rationalize the efforts made by the international community. . . . Specific protocols containing concrete commitments could be fitted into the framework as scientific evidence requires and permits.¹³

This commitment was reaffirmed at the next G-7 summit, held in Houston, July 1990.¹⁴

Noordwijk Ministerial Conference on Atmospheric Pollution and Climatic Change

This conference of 68 environment ministers, hosted by the Government of the Netherlands in Noordwijk in November 1989, stressed the necessity for the adoption of a framework convention “as early as 1991 if possible and no later than at the Conference of the United Nations on Environment and Development in 1992.” In addition, the conference endorsed the ambitious goal of reversing deforestation to make forests a net sink for carbon by early in the next century, to be accomplished by “[a] world net forest growth of 12 million hectares a year.”¹⁵

Bergen Ministerial Declaration

This regional meeting, which was attended by representatives of 34 governments from Europe and North America, was an intermediate juncture between the release of the report of the World Commission on Environment and Development and the 1992 UN Conference on Environment and Development. The conference reaffirmed its

full support for the early completion of the work on a framework convention on climate change and the development of protocols dealing with, inter alia, greenhouse gases and forestation, with a view to signing not later than at the 1992 Conference on Environment and Development.¹⁶

This progression of authoritative international declarations represents a remarkably rapid development of consensus on the need for a multilateral

climate convention. While a similar consensus on the substance of such a convention has yet to emerge, the IPCC is charged with explicitly considering both elements to be included in a convention and targets for stabilizing emissions from industrialized countries.

An Environmentally Meaningful Greenhouse-gas Convention

The rapidity and magnitude of environmentally meaningful actions are the ultimate test of any combination of national and international policy responses. In strong contrast to the high-level political consensus on the need for multilateral instruments, there has been remarkably little attention to the environmental goals a greenhouse-gas convention should seek to accomplish.

The Ozone Precedent

Optimism about the prospects for a convention to limit emissions of other GHGs arises from recent progress in negotiating and implementing the Montreal Protocol. It is therefore natural that discussions concerning multilateral instruments on climate have explicitly relied on the structures established in the ozone negotiations. However, there is a serious risk that precedent may be misinterpreted to impede, as opposed to advance, environmentally meaningful actions.

States negotiating under UNEP auspices to reduce threats to the stratospheric ozone layer made an explicit decision to undertake a two-component process. One product of this process was to be a so-called "framework" multilateral convention establishing an institutional basis for cooperation in research, exchange of information, and discussion of substantive policy measures. Ancillary agreements, known as "protocols," containing substantive regulatory measures would be appended to this convention.

The ozone umbrella treaty evolved into the Vienna Convention concluded in March 1985. The allusions to a "framework" convention in the UNEP decision, the G-7 communiqué, and the Noordwijk and Bergen ministerial statements are conscious

references to the instrument. The Vienna Convention itself contains no substantive requirements for specific measures to protect stratospheric ozone. Instead, it embodies only a vague, unenforceable exhortation to protect the stratospheric ozone layer through the implementation of "appropriate measures."

Negotiations on a CFC protocol, which eventually became the Montreal Protocol, proceeded simultaneously with deliberations on the convention itself in early 1985. When negotiations on the CFC protocol broke down, the Convention alone was adopted. Renegotiation of the protocol after a scheduled one-year cooling-off period coincided with an upsurge in public concern about the Antarctic ozone hole, which broke the deadlock and facilitated adoption of the Montreal Protocol in September 1987.

Assuming the IPCC process achieves its stated goals, to a large extent it will have established the framework mechanisms for exchange of information and cooperation in research analogous to those institutionalized by the Vienna Convention. The IPCC process will also have performed another function often ascribed to the Vienna Convention: laying the groundwork for substantive action through preliminary discussions. In addition, the IPCC process serves very much the same function as the one-year cooling-off period that preceded renegotiation of the CFC protocol.

"Because of the IPCC's important work, the need for a strictly procedural framework is considerably lessened."

Accordingly, because of the IPCC's important work, the need for a strictly procedural framework is considerably lessened. Moreover, identifying a framework convention as an interim goal that must precede consideration of environmentally efficacious targets could seriously undercut the considerable momentum already generated on this issue. All these considerations strongly suggest that a greenhouse-gas convention could and should be considerably more aggressive than the Vienna Convention

and that negotiations on protocols should proceed simultaneously with convention negotiations. In particular, there is an urgent necessity for early substantive consideration of environmentally meaningful goals.

“A greenhouse-gas convention could and should be considerably more aggressive than the Vienna Convention and negotiations on protocols should proceed simultaneously with convention negotiations.”

CO₂ Targets Determined by Environmental Necessity

As discussed above, multilateral GHG instruments should establish a global goal of reducing as rapidly as possible emissions of greenhouse gases sufficient to reverse their current buildup in the atmosphere. Given that the model of a convention with ancillary protocols has already been adopted, the convention negotiations would presumably be the earliest opportunity to set global emission levels—at least for CO₂—consistent with the goal. Of all GHGs, carbon dioxide is responsible for the largest portion of the global-warming potential accumulating in the atmosphere. Apart from CFCs and halons, CO₂ is also the greenhouse gas for which emission reduction options are most fully developed.

Consequently, halting the buildup of CO₂ in the atmosphere must be the first priority for multilateral climate instruments. For instance, a recent IPCC science assessment noted that a cut in CO₂ emissions of at least 60% would be required to stabilize atmospheric concentrations of this gas.¹⁷ As discussed above, a stringent but achievable target that lowers the risk of catastrophic climate change is the following: limitation of global emissions to assure that atmospheric concentrations of CO₂ never exceed 400 ppm, with concentrations of CO₂ firmly established on a declining trajectory by the year 2030.

To achieve this goal, global emissions of carbon (as CO₂) from all sources, which now total 6.4 to 8.3

gigatons (Gt) per year, would have to be limited to a total budget of approximately 200 Gt for the 40 years between now and the year 2030. To ensure declining CO₂ concentrations after 2030, the total global emissions rate for CO₂ would have to be no more than 1 to 3 Gt of carbon per year by that time. Interim goals, analogous to the 20% reduction target identified by the 1988 Toronto Conference,¹⁸ could and should also be established in a GHG convention to facilitate smooth, measured, and steady progress toward the ultimate aim.

This target should include both industrial and biotic CO₂ emissions of anthropogenic origin. The climate system does not distinguish between industrial releases and those of biotic origin, which currently account for 10–30% of CO₂ emissions and which result from human activities such as forest clearing and burning. Furthermore, including both industrial and biotic emissions of anthropogenic origin in a larger CO₂ treaty allows for a balancing of obligations, benefits, and other considerations of equity in a broader context.

“A stringent but achievable target is to assure that atmospheric concentrations of CO₂ never exceed 400 ppm.”

An attractive conceptual framework is the apportionment of responsibilities based on national carbon “budgets” calculated according to a specified formula.¹⁹ Two fundamental criteria appear to be the most relevant to the calculation of carbon budgets. The first is national population, probably the single variable most closely connected with a “need” to emit CO₂, particularly as a result of energy consumption. To guarantee the intended environmental results from the treaty and to ensure that budgets remain a stationary figure against which to measure future emissions, population would be calculated as of a base year, such as 1988.

Apportioning CO₂ emissions budgets strictly on the basis of national population, however, is unlikely to be practicable. For instance, reductions to total CO₂ emissions from the United States of approximately

75% would be required merely to bring per capita releases of this gas down to the global average of approximately 1.3 metric tons per person. Although the United States and other disproportionately large emitters must use their best efforts to reduce, even strenuous measures would probably not produce annual cuts in emissions in excess of 5% from a fixed baseline. Consequently, current emissions, or a measure correlated with current emissions such as GNP, should also be a component of the budget calculation.

A formula that accounts for both these factors is probably the most equitable and practical. Although the mix would obviously be subject to debate, an apportionment of 50% of the global budget between 1990 and 2030 based on population and the remaining 50% based on current emissions or GNP appears to achieve both goals simultaneously. The budget concept will assure that countries will receive credit for any emissions reductions they make even before the entry into force of the agreement.

Articulating a global goal in terms of a worldwide carbon budget implies—but does not require—subsequent apportionment of national obligations by means of national carbon budgets. An alternative approach is to frame the overall global endpoint in terms of percentage reductions from a base year. This might—but, again, does not necessarily—imply national obligations framed in terms of percentage reductions from the base year, similar to the strategy adopted in the Montreal Protocol. An appropriate goal would then be an overall reduction in global CO₂ emissions of 20% from 1988 levels by 2005 and 80% from 1988 levels by 2030. Although phrased in different terms, this is equivalent to that set out above as a response to the magnitude of the global warming problem.

Trading Emissions Allocations

Calculating emissions reductions in terms of a comprehensive bundle of greenhouse gases and allowing international trading of emission allowances have recently been advocated.^{20,21} While intellectually attractive on the grounds of economic efficiency, these proposals involve serious practical concerns in their implementation. Insistence on

trading of either sort, particularly in advance of agreement on global CO₂ targets, could become a serious barrier to achieving genuine emission reductions for this chemical.

In principle, it should be possible to agree on the contributions of various GHGs to climate warming, through an analysis of chemical and physical properties such as absorption strength and atmospheric lifetimes.²² Permitting trading among gases, however, would ignore the very real differences among those chemicals from a policy point of view. One unfortunate consequence could be disruption and unnecessary delay in the process of reaching agreement on global goals for those chemicals, such as CO₂, for which control options are readily available.

The Montreal Protocol limits consumption and production of each of two “baskets” of chemicals consisting of five CFCs and three halons, respectively. The Protocol specifies controls on production and consumption not of each chemical within the basket, but of the basket as a whole, with the contribution of each chemical to calculated levels of production and consumption weighted according to its ozone depleting potential. This formula permits each country to determine for itself the reductions required in consumption and production of each controlled substance, so long as the weighted levels of consumption and production of each basket conform to the Protocol’s requirements.

The analogy between the trading permitted by the Montreal Protocol and the global warming problem, however, is not necessarily a good one. CFCs and halons, which are strictly manmade and not known in nature, all emanate from readily identifiable and controllable sources. By contrast, control options for the various greenhouse gases are at substantially different levels of development. Of non-CFC GHGs, carbon dioxide is the chemical for which the policy options are clearest. By contrast, baseline emissions of methane—the next most important chemical from the point of view of contributions to the global warming problem—are highly uncertain. Although emission reduction techniques are being developed for specific sources, comprehensive targets—either for methane individually or as a component of a GHG bundle—would be very difficult to establish

now or in the near future. Depending on the distribution of initial allocations, trading among gases could create disincentives for early participation by low-CO₂, high methane-emitting developing countries, which may have little leverage in the negotiations. Given the disparate state of development in control options for the GHGs, delays in international progress on those portions of the global warming problem—namely CO₂—that are more susceptible of solution are a likely consequence of premature implementation of this bundling approach.

Trading in emissions allowances among countries, as opposed to among gases, presents different difficulties. The Montreal Protocol permits strictly limited trading in production of the eight controlled CFCs and halons solely for the purpose of “industrial rationalization,” defined by the Protocol as

the transfer of all or a portion of the calculated level of production of one Party to another, for the purpose of achieving economic efficiencies or responding to anticipated shortfalls in supply as a result of plant closures.

With certain exceptions for extremely low-producing countries, the transferred production can never exceed 15% of calculated production in 1986 and must be balanced by a corresponding, documented offset of production forgone by another party.

International trading of emissions allocations for greenhouse gases could provide a mechanism for resource transfers to developing countries, provided that agreement could be reached on an equitable allocation of initial allowances. But while these tradeable offset proposals may have some theoretical appeal, the practical obstacles to successfully implementing such a system are formidable. For example, an institutional structure to administer and oversee the trading system would very likely be necessary. A supervisory mechanism to assure that countries use the proceeds of emission trades for investments consistent with future global emission budgets would also probably be required. In any event, foreign exchange revenues realized for the sale of valuable entitlements to emit greenhouse gases are conceptually distinct from concessional resource transfers,

the purpose of which, as discussed in the following section, is to compensate poorer countries for the costs incurred from choosing environmentally preferable development alternatives.

Resource Transfers

The Montreal Protocol creates a special exemption for developing countries. Provided that the annual CFC consumption of these countries does not exceed 0.3 kilograms per capita, the Protocol entitles them to a ten-year exemption from the agreement’s control measures. After this grace period, the Protocol requires of developing countries the same uniform percentage reductions in total national consumption that are required of all parties. The Montreal Protocol contains explicit provisions for aid to developing countries to underwrite the dissemination of alternative technologies. A special mechanism specifically for this purpose has been created by amendments to the Protocol adopted in June 1990.

Resource transfers to assist poorer countries are likely to be at least as important in GHG agreements as they are in the case of ozone depletion. Technical assistance grants and concessional loans may be necessary for up-front start-up costs associated with forms of assistance largely unfamiliar to development-aid agencies. The dissemination of alternative, environmentally benign options relying on wind, solar, biomass, tidal, and geothermal energy sources may require infusions of new capital. Reforesting and conserving existing forest resources in tropical countries will necessitate additional foreign exchange.

One possibility for financing these resource transfers would be a requirement for countries to contribute to a fund in proportion to their CO₂ emissions. In countries with market-based economies, these contributions could be financed by a tax on fossil-fuel use. Resource transfers should contain conditions to ensure environmental quality and cost-effectiveness as measured by environmental-impact assessment and least-cost energy planning methodologies. To improve the prospects for long-term environmental sustainability, input from the local public in the country concerned should be sought before funds are committed.

Institutional Issues

The international legal system, as currently structured, assumes interactions among co-equal, sovereign states. Those states can create legally binding obligations through treaties—which are in many ways analogous to contracts—but only with the express consent of the states concerned. Sovereign states can also be bound, despite their lack of express assent, through long-standing custom and practice. The creation and identification of these customary international legal obligations, however, can be very slow and subject to considerable dispute. Moreover, customary norms, even if they existed, would be unlikely to be of sufficient specificity adequately to protect the biosphere from the worst effects of global climate change. Accordingly, international solutions to the greenhouse problem are most likely to come, if at all, from a multilateral treaty-making process.

Any country may decline to be bound by a multilateral agreement merely by withholding its consent. Any single reluctant country can eviscerate or thwart an effective agreement, whose obligations that country need not accept in any event. Consequently, effective international solutions to global environmental problems can be held hostage to the national imperatives of virtually every country on earth. The necessity for consensus in multilateral processes can create a built-in inertia, which may very well produce disappointing least-common-denominator results that are not responsive to a particular problem.

“The necessity for consensus can produce disappointing least-common-denominator results.”

Of course, progress can be made within the confines of existing international structures. Nonetheless, the magnitude and urgency of the greenhouse warming threat may well overwhelm the capacity of existing international mechanisms effectively to respond. For this reason, there have recently been calls for non-consensus decision-making procedures and new institutions that would exercise some of the sovereign prerogatives of states. For instance,

the Declaration of the Hague asserts the need for a new international body that would operate pursuant to “such decision-making procedures as may be effective even if, on occasion, unanimous agreement has not been achieved.”²³

The history of the Montreal Protocol demonstrates both the limitations and possibilities of international processes. Although both countries have not indicated their intention to do so, for some time there was considerable concern about the reluctance of India and China to accept the obligations of that agreement. Without their participation, atmospheric chlorine levels would continue to increase, and the likelihood of a return to pre-Antarctic hole atmospheric concentrations in the foreseeable future would be virtually nil.

On the other hand, the process for reassessing the Protocol’s efficacy is a modest step toward international approaches that transcend the confines of the consensus model. Under customary international law, an amendment to a multilateral treaty is binding only on those nations that indicate their affirmative intent to accept those new obligations, ordinarily through ratification of the amendment. The Protocol departs from this rule by specifying expressly that adjustments to the agreement’s reduction schedule, which are binding on all states party to the instrument, may be adopted by a two-thirds majority instead of by consensus.

Conclusion

The most pressing need in preserving the integrity of the climate system is for early, environmentally meaningful reductions in emissions of greenhouse gases on a multilateral basis. There is now an international consensus that a principal component in the mechanism for accomplishing this task will be a so-called “framework” convention, or multilateral treaty. A framework convention should articulate a multilateral GHG control strategy, while simultaneously encouraging unilateral action by the largest emitters and the establishment of specific national commitments.

The process adopted for achieving these goals has major implications for the world’s climate and

environment. As currently envisioned, the IPCC will continue to deliberate until fall 1990. Negotiations on a convention may not end until 1992, if then. Potentially, open-ended negotiations on protocols may begin only after the convention is concluded. Unfortunately, there is a serious risk that this complicated process will become an excuse for delay.

A framework convention should not be viewed as a significant objective in and of itself, but only as an interim step in the implementation of concrete emissions reductions. A convention should include specific targets—at a minimum for CO₂—sufficient to preserve the integrity of the climate system with an adequate margin of error. The convention should expressly provide for resource transfers to developing countries and address the need for new international institutions and decision-making procedures.

“Delays have dangerous ends,”²⁴ wrote Shakespeare. This prudent advice is nowhere more relevant than for global warming. Procrastination today will cost dearly—perhaps not tomorrow, but certainly for the tomorrows of our children.

References

1. *Senate Treaty Doc. No. 9*, 99th Cong., 1st Sess. 1985. Reprinted 1987 in *International Legal Materials* 26, 1516.
2. *Senate Treaty Doc. No. 10*, 100th Cong., 1st Sess. 1987. Reprinted Dec. 14, 1987 in 52 Fed. Reg. 47,515 and in *International Legal Materials* 26, 1550.
3. World Commission on Environment and Development. *Our Common Future* 27. 1987. Report of independent World Commission on Environment and Development, chaired by Dr. Gro Harlem Brundtland, Prime Minister of Norway, prepared at request of UN General Assembly.
4. Wirth, D.A. 1989. Climate Chaos. *Foreign Policy*. Spring, at 3.
5. Natural Resources Defense Council. 1989. *Cooling the Greenhouse: Vital First Steps to Combat Global Warming*. Washington, DC, USA.
6. Lashof, D., and Tirpak, D. 1989. *Policy Options for Stabilizing Global Climate*. Draft report to US Congress of US Environmental Protection Agency.
7. *Id.*
8. Lashof, D. 1989. The Dynamic Greenhouse: Feedback Processes That May Influence Future Concentrations of Atmospheric Trace Gases and Climatic Change. *Climatic Change* 14, 213.
9. World Meteorological Organization and United Nations Environment Programme. 1988. *Development Policies for Responding to Climatic Change*. Report of conferences held at Villach, Austria, Sept. 28–Oct. 2, 1987, and Bellagio, Italy, Nov. 9–13, 1987.
10. The Changing Atmosphere: Implications for Global Security. 1990. Statement from international meeting sponsored by Government of Canada in Toronto, June 27–30, 1988. *Am. U.J. Int'l L. & Pol'y* 5, 515.
11. Declaration of the Hague. 1989. Statement from international meeting sponsored by Government of the Netherlands in the Hague, Mar. 11, 1989. *Intern. Environ. Rep. (BNA)* 12, 215.
12. G.C. Dec. 15/36, 44 U.N. GAOR Supp. (No. 25) at 164, U.N. Doc. A/44/25. 1989. *Environ. Pol. Law* 19, 118.
13. Economic Declaration. 1989. Statement of group of seven major industrialized nations in Paris, July 16, 1989. *Environ. Pol. Law* 19, 183.
14. Houston Economic Declaration. 1990. Statement of group of seven major industrialized nations in Houston, July 11, 1990. *N.Y. Times*, July 12, 1990, at A15, col. 1.
15. Noordwijk Declaration on Atmospheric Pollution and Climatic Change. 1989. Statement of ministerial conference sponsored by Government of the Netherlands in Noordwijk, Nov. 7, 1989. *Environ. Pol. Law* 19, 229.

16. Bergen Ministerial Declaration on Sustainable Development in the ECE Region. 1990. Statement of ministerial conference sponsored by Government of Norway in Bergen, May 16, 1990.
17. Intergovernmental Panel on Climate Change. 1990. *Scientific Assessment of Climate Change*. Report of IPCC Science Working Group.
18. The Changing Atmosphere, note 9 *supra*.
19. Krause, F., Bach, W., and Koomey, J. 1989. *Energy Policy in the Greenhouse*.
20. A "Comprehensive" Approach to Addressing *Potential Global Climate Change*. 1990. Discussion paper prepared by United States Government for IPCC plenary meeting.
21. Grubb, M. 1989. *The Greenhouse Effect: Negotiating Targets*. Publication of Energy and Environment Programme, Royal Institute of International Affairs, London.
22. Lashof, D., and Ahuja, T. 1990. Relative Contributions of Greenhouse Gas Emissions to Global Warming. *Nature* 344, 529.
232. Declaration of the Hague, note 10 *supra*.
24. Shakespeare, W. 1589/90. Henry VI. Part I.

David A. Wirth is Assistant Professor of Law at Washington and Lee University. During the preparation of this article, he was Senior Attorney and Co-director of International Programs at the Natural Resources Defense Council, Washington, D.C. Formerly, he was attorney-adviser specializing in international environmental law at the Office of the Legal Adviser in the U.S. Department of State.

Daniel A. Lashof is Senior Scientist with NRDC. He formerly served as Environmental Scientist with the U.S. Environmental Protection Agency, where he was lead author and editor of *Policy Options for Stabilizing Global Climate*, a report to Congress.

This article is reprinted, by permission from *Ambio* 19:305–310 (1990). The authors would like to thank Dr. John E. Bardach, James A. Losey, Alan S. Miller, and Glenn T. Prickett, who provided valuable insights and advice in its preparation. This work was supported in part by the Rockefeller Foundation's Study Center, Bellagio, Italy, which sponsored research through Mr. Wirth's appointment as a scholar in residence.

III.

THE CLIMATE REGIME: A BROADER VIEW

Elements of a Framework Treaty on Climate Change

Elliot L. Richardson

At the meeting in Nairobi last August of the Preparatory Committee for the 1992 United Nations Conference on Environment and Development, Maurice Strong, the Secretary-General of the conference, identified a number of environmental concerns that could appropriately become the subject of multilateral conventions. Among them were climate change, biodiversity, sustainable development, forestry, and safety in biotechnology. Of them all, the most widely ramified and economically sensitive is climate change. It is also the only one on which the U.N. General Assembly has directed the conference to prepare a framework treaty. Many of the issues that will have to be resolved in developing multilateral arrangements to deal with climate change are also basic to the other subjects of potential conventions. Much of what is said below applies equally to those other subjects.

Dimensions of the Task

The shaping of a framework treaty on climate change will not be easy. The negotiators will have to find ways of overcoming or getting around difficulties more dismaying than those surmounted

by the negotiators of any previous multilateral agreement. The framers of the Law of the Sea (LOS) Convention, the most complex and ambitious multilateral agreement thus far attempted, were able to draw on a highly developed body of customary international law. Their most innovative concepts adapted existing legal regimes to technological change (the exclusive economic zone and the continental margin provisions) and the prospect of a new industry (deep-seabed mining). Implementation of the LOS convention will entail massive economic shifts or sacrifices.

The framers of a multilateral treaty on climate change will not start out with the same advantages. Customary international law on the environment is scanty, and the existing multilateral agreements are narrow in scope. They protect humans, animals, fish, plants, insects, and other forms of life from the harms caused by toxic, radioactive, or disease-causing substances. These harms are widely recognized. Even in the case of the Montreal protocol, the most future oriented of the agreements thus far negotiated, it is generally accepted both that chlorofluorocarbons (CFCs) caused the ozone hole over

the Antarctic and that the destruction of the ozone layer would have serious consequences. Moreover, none of the existing environmental agreements confers on an international institution the power to set binding standards, issue and enforce regulations, or prescribe sanctions. Few provide for dispute settlement.

By contrast, the damage that may eventually result from the accumulation of greenhouse gases cannot be seen or felt; the activities that are believed to be causing it are for the most part unrestricted. But the most striking distinction between climate change and other environmental concerns is that the actuality of global warming is not only distant in time but fraught with uncertainty as to its probable extent and consequences.

The negotiating process is further complicated by the enormous and astonishing variety of the activities that generate greenhouse gases: wood fires, dairy farming, rice growing, power generation, air travel, grass burning, automobile travel, etc., etc., etc. Conducted on a vast scale, these activities are important in one way or another to every human being on Earth. Large economic dislocations are bound to be set in motion by even the most conservative and noncoercive means of reducing the risk of climate change. It is inevitable, therefore, that industrial countries will resist constraints that impair their competitiveness and that developing countries will resist constraints that impair their growth.

By comparison with the limited harms addressed by existing environmental agreements, the devastation that could result from substantial global warming would far exceed the harm caused by any previous human action (except perhaps population growth). Moreover, the accumulation of greenhouse gases is irreversible. Notwithstanding uncertainty, this fact is a powerful reason for taking preventive action now. But if the long-term threat of climate change is enormous, so will be the short-term cost of averting it.

Although some of the actions demanded by a serious effort to curb the buildup of greenhouse gases will be painful, many, including energy conservation, will at the same time yield other benefits.

Climate change aside, we should be taking steps to make more efficient use of the power generated by coal-fired plants. The Gulf crisis has given new urgency to developing new energy sources and phasing out gas-guzzling automobiles. Other useful purposes will be served by checking deforestation and promoting reforestation, recycling more paper, cutting down on packaging material, lowering taxes on conservation land, and using more fuel-efficient stoves. Although largely instigated by health worries, a ban on CFCs will also eliminate a source of greenhouse gases. Meanwhile, the prevention of global warming needs to be seen as part of a broader atmospheric protection effort that includes reducing smog, curbing acid rain, and stopping other toxic emissions.

But the fact that there are many good reasons to protect the atmosphere is no guarantee that enough will be done. Nor is the necessity for a network of multilateral arrangements diminished because it is in every nation's—or most nations'—interest to combat climate change. The results of independent national action are bound to be highly uneven. From the standpoint of impact as well as of equity, there is no alternative to broad-based multilateral cooperation.

“It would not make sense to try to incorporate into a treaty on climate change detailed prescriptive language like that embodied in the LOS convention.”

Approaches to a Treaty

As an original matter, the framework treaty on climate change that the U.N. General Assembly has directed the 1992 conference to prepare could take one of three quite different forms. It could be covered by the charter for a global environmental protection agency with standard-setting, regulatory, and enforcement powers. It could be part of a comprehensive code of generalized obligations to do the right thing by the environment. Or it could offer an array of procedural devices designed to stimulate

action rather than prescribe it. Although the LOS conference pioneered negotiating procedures that will serve the environment no less well than they served the oceans, it would not make sense to try to incorporate into a treaty on climate change detailed prescriptive language like that embodied in the LOS convention. Besides, the LOS negotiations began 20 years ago, and the resulting convention has not yet entered into force. If it is important to prevent climate change, it is important to begin now.

After a slow start, the process of evaluating alternative approaches to the framework treaty is beginning to get under way. The U.N. General Assembly has asked the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to lay the groundwork for the negotiations on a basis taking into account the work of the Intergovernmental Panel on Climate Change. The Preparatory Committee for the 1992 conference, chaired by Ambassador Tommy T.B. Koh, will stay in close touch with the UNEP/WMO process. The conference itself, obviously, is not a suitable forum for a negotiation of this kind. It is essential to hope, therefore, that a consensus in favor of some version or variant of the three possible approaches will be hammered out before the delegates arrive in Rio de Janeiro.

“A global EPA would have no alternative but to deploy a legion of inspectors and enforcers. Rather than increasing compliance, this could well have the opposite effect.”

The first approach would require delegating to a multilateral organization the power to override national environmental policies or practices. Significantly, not even the limited environmental agreements now in effect confer such authority. It is scarcely conceivable, therefore, that a consensus on the composition, decision-making, and regulatory powers of a global environmental protection agency (EPA) can emerge in Brazil. The effort to create such a consensus would in any case be bound to take a

long time. An additional consideration, sufficient in itself to disqualify this approach, is its administrative unwieldiness. The attempt to impose uniform environmental prohibitions, constraints, controls, and standards on 150-odd sovereign states would inevitably provoke resistance and resentment in most of them. To overcome these reactions, the global EPA would have no alternative but to deploy a legion of inspectors and enforcers. This action, rather than increasing compliance, could well have the opposite effect.

The second approach—a comprehensive code of obligations—would avoid these pitfalls. This approach also has some positive attributes. It would, for one thing, be a useful means of building a broad base of international acceptance of some important objectives. Within member states, it would serve as a vehicle for mobilizing domestic support for urgently needed environmental reforms. As a self-contained instrument, however, a comprehensive code of obligations would have serious limitations. Not being declaratory of well-established customary law, it would take a long time to bring state practice into conformity with its precepts. Its necessarily vague and general language would be subject to highly variable interpretations. This same vagueness could also be used to rationalize resistance to higher standards. Standing by itself, a code of obligations lacks a viable means of making something happen.

The third approach comes from the opposite direction. Making things happen is its primary goal. For this purpose, it can draw on an array of devices that includes data collection, technical assistance, monitoring, reporting, and standard-setting. It can also establish procedures for facilitating the adoption of supplementary agreements or protocols. Separately negotiated, these would deal with concrete problems whenever it became propitious to do so. Meanwhile, a permanent organization would operate the procedural machinery.

As previously noted, this approach aims at stimulating action rather than prescribing it. Its weakness is that, until the protocols begin to be adopted, it lacks any substantive content to which its machinery can be hooked up. But there is no reason why

a code of obligations cannot be linked to procedures and no reason why action-oriented mechanisms cannot be used to promote the fulfillment of obligations. The obvious solution is to merge the second and third approaches. The qualities of each can thereby be made to offset the defects of the other.

Essential Elements of a Treaty

To improve the chances of building a consensus around a framework treaty combining substantive and procedural elements, it should be stressed from the outset of the negotiations that its adoption will constitute only the first stage in a continuing process. As time goes on, the gradual addition of supplementary protocols will supply the concreteness and specificity lacking in the general obligations. In due course, either the basic treaty, the protocols, or both can be augmented by provisions for international dispute settlement, private rights of action in domestic courts, and even, perhaps, penalties for violations.

In addition, the framework treaty should contain a provision obligating member states to observe generally accepted international environmental rules, regulations, and standards adopted through the competent international organization. Similar provisions are an important feature of the LOS convention. Standards such as those established by International Maritime Organization conventions or contained in the regulations adopted pursuant to the London Dumping Convention are "generally accepted"; states that are party to the LOS convention are thus obligated to observe these standards even though they are not parties to the conventions from which the standards derive.

To recapitulate, a framework treaty on climate change should contain three essential elements. The first is a statement of goals, principles, and general obligations. If the 1992 conference succeeds in making this statement reasonably comprehensive and comprehensible, the effort to achieve substantive consensus can stop there: because the statement will, in any case, constitute only the first step in the process of elaborating progressively more concrete substantive agreements, its gaps, ambiguities, and inconsistencies will not be fatal; they can be dealt with later when and as the necessary consensus

develops. The second is language establishing the procedures for negotiation and adoption of supplementary protocols. The third is specific provision for a series of auxiliary measures designed to encourage the voluntary adoption of national commitments, permit the monitoring of compliance with those commitments, and mobilize domestic and international public opinion.

"A framework treaty should contain a statement of goals, principles, and general obligations. If the 1992 conference succeeds in making this statement reasonably comprehensive and comprehensible, the effort to achieve substantive consensus can stop there."

To give effect to this framework, the treaty should also entrust to a permanent multilateral body such functions as data collection, laying the groundwork for supplementary protocols, administering the auxiliary measures, providing technical assistance to member states, and monitoring national performance. It should also create a special fund for the support of these activities. If it were decided to make the body a specialized U.N. agency, its charter should provide for funding by financial assessment of member states. It would need, in any case, to have some kind of an executive council whose size, composition, and voting procedures would have to be thrashed out.

It is not obvious what kind of an organization would best fill the bill. Some of us think it should be a beefed-up UNEP. Others believe that an entity patterned on the General Agreement on Tariffs and Trade or the International Monetary Fund would be more suitable. Assuming that the multilateral body has a clearly defined mandate and the powers and resources needed to carry it out, it may not make a crucial difference whether an old agency is given new duties or a new one is brought into existence. For purposes of the discussion to follow, the term "multilateral environmental agency" should be understood as embracing both.

Role of a Multilateral Environmental Agency

Several of the functions that a multilateral environmental agency (MEA) should be directed to perform have already been mentioned. Because the MEA will not have a regulatory role backed up by enforcement powers, it will have to make the most of a number of devices that do not depend on the coercive force of official sanctions. This circumstance need not mean, however, that the MEA is powerless. Recent experience has shown that non-coercive devices like the auxiliary measures touched on above can be effective in promoting the observance of international norms. They already are efficacious in the human rights arena, where nongovernmental organizations that investigate and publicize violations of the Universal Declaration of Human Rights help to mobilize international opprobrium against offending governments. The very process of implementing a framework treaty on climate change will create awareness that governments have no more right to mistreat their environments than their people.

The MEA should have a role in many if not most of the mechanisms called upon to carry out the purposes of the framework treaty. In roughly ascending order of intrusiveness, these mechanisms include the following:

- the definition of targets, which would be set voluntarily on a country-by-country basis,
- the adoption, also country by country, of strategies for reaching these targets,
- periodic progress reports to the MEA,
- monitoring of national performance by international observer teams recruited and trained by the MEA,
- verification of nationally declared greenhouse gas emissions by remote sensing systems,
- publication by the MEA of reports assessing national performance,
- technical assistance to developing countries to enable them to deal with the problems thus identified,

- promulgation by the MEA of recommended standards differentiated, inter alia, by measurable stages of economic development,
- procedures for dispute resolution ranging from conciliation through mediation to binding arbitration, and
- the opportunity to seek injunctive and monetary relief for noncompliance with generally accepted standards in the administrative and civil courts of member states.

The skillful use of these devices would create substantial incentives for member states to improve their environmental performance. Nongovernmental organizations would be watching, exhorting, and pushing. Domestic awareness of the national effort would be heightened by the international attention it attracted. Media coverage would be correspondingly intensified. The attention thereby focused on the government's response would generate pressure to raise its level. It is arguable, indeed, that the self-reinforcing process thus set in motion could become a formidable substitute for official action—more effective than regulation and far less expensive than its enforcement. If this happens, what has generally been called soft law will become progressively harder.

"It is arguable that the self-reinforcing process thus set in motion could become a formidable substitute for official action."

Meanwhile, the multilateral lending institutions still have room to increase their insistence on responsiveness to environmental concerns. It is also essential that they help to compensate developing countries for economic losses caused by their observance of environmental constraints and give them incentives to adopt policies conducive to sustainable growth. One important but inexpensive institutional change that could give major encouragement to sustainability would be the incorporation of resource accounts in all national economic accounts. The developing countries will also require assistance in

obtaining environmental technology and in building national capacities for environmental research and teaching. It is encouraging that the World Bank is prepared to commit substantial resources to the Global Environmental Facility now being developed.

“One change that could give major encouragement to sustainability would be the incorporation of resource accounts in all national economic accounts.”

Coordination of Research

There is a need, finally, for the best possible international coordination of research on the extent, causes, and consequences of climate change. The coordination process should ensure widespread participation by developing countries and embrace the allocation of roles among regions and organizations, the transition between research and operations, the involvement of industry, and the continuing development of environmental indicators.

There is a need as well for the application of science and technology to the development of better alternatives to climate-affecting practices and the design of more efficient regulatory techniques. The present level of coordination among the existing international environmental programs and organizations is not adequate to the purpose of systematically addressing these and other global environmental issues. In the case of climate change, the framework treaty should require the MEA to assemble and disseminate scientific information and to cooperate with the WMO in supporting activities designed to improve the collection and analysis of such information.

Participants

Lance Antrim
Director, Multilateral Negotiations
American Academy of Diplomacy

D. James Baker
President
Joint Oceanographic Institutions, Inc.

Conclusion

Although the atmosphere is the universal sustainer of life on Earth, no such universality can be found in the diverse national interests affected by every proposal to protect this global common. To have a chance of wide acceptance, therefore, a framework treaty on climate change must be capable of adaptation to the varying situations of individual countries. This, indeed, is the rationale for most of the mechanisms enumerated above, starting with the setting of national targets.

Rather than wait for universal consensus, groups of countries with analogous interests and capabilities may wish to pursue agreements among themselves. The framework treaty should be able to accommodate such small-scale agreements. For example, a group of developed nations might agree among themselves both to undertake significant antigreenhouse actions and to couple these initiatives with assistance to developing countries in acquiring the relevant technologies. Such an agreement, linked to the framework treaty, would help to encourage earlier and more positive action than would otherwise occur. In short, the framework treaty should be just that—a framework.

To reemphasize a point made earlier, the negotiation of a framework treaty on climate change must from the outset be understood and accepted as the first step in a continuing process. Negotiations within and among many groups and on many levels will have to go forward long after the framework treaty itself has entered into force. Sustaining this process will require strong leadership, sound strategic judgment, and tactical skill. Never easy to come by, these qualities will be in increasing demand as the world community comes to grips with the pervasive concerns that transcend the capacity of any single nation.

Chester Cooper
Adviser on International Programs
Resources for the Future, Inc.

Michael Deland
Chairman
Council on Environmental Quality

Caroline Isber
The Interparliamentary Conference on the
Global Environment
U.S. Senate

Tommy T.B. Koh
Chairman
Preparatory Committee for the 1992 U.N.
Conference on Environment and Development

Jeffrey Laurenti
United Nations Association of the United States
of America

Bernard Oxman
University of Miami
School of Law

Jessica Tuchman Mathews
Vice President
World Resources Institute

Anna Park
Associate
Milbank, Tweed, Hadley & McCloy

Benjamin Read
President
International Nongovernmental Support Fund for

the 1992 U.N. Conference on Environment and
Development

Elliot L. Richardson
Milbank, Tweed, Hadley & McCloy

Nicholas Robinson
Pace University
School of Law

Jan Schneider
Former Representative of UNEP to the Law of the
Sea Conference

Hugh Scott
Associate General Counsel
The World Bank

James Sebenius
Kennedy School of Government
Harvard University

Peter Thacher
Senior Counselor
World Resources Institute

Russell E. Train
Chairman
World Wildlife Fund/The Conservation Foundation

References

Chayes, Abram, and Antonia H. Chayes. 1990. Adjustment and Compliance Processes in International Regulatory Regimes. New York: Columbia University, 77th American Assembly.

Nitze, William A. 1990. "A Proposed Structure for an International Convention on Climate Change," *Science* 249:607-608. Reprinted here in Part III.

Sand, Peter H. 1990. International Cooperation: The Environmental Experience. New York: Columbia University, 77th American Assembly.

Sebenius, James K. 1990. Negotiating a Regime to Control Global Warming, Harvard University. Printed here in Part V.

Thacher, Peter S. 1990. "Alternative Legal and Institutional Approaches to Global Change," *Colorado Journal of International Environmental Law and Policy* 1(1):101-125. Reprinted here in Part IV.

Mathews, Jessica Tuchman. 1989. "Redefining Security," *Foreign Affairs* (Spring):162-77.

Elliot L. Richardson is a partner in the law firm of Milbank, Tweed, Hadley & McCloy, Washington, D.C. Formerly, he was Special Representative of the President for the Law of the Sea Conference. This paper was initially prepared for a discussion involving the individuals named above. Although this version benefited from that discussion, no attempt was made to determine the extent to which it reflects a consensus among their views. The paper was since strengthened by the helpful suggestions of Lance Antrim, Peter Hakim, Bernard Oxman, Benjamin Read, James Sebenius, and Peter Thacher.

A Proposed Structure for an International Convention on Climate Change

William A. Nitze

Formal negotiations toward an international convention on climate change will begin shortly after completion of the interim report of the Intergovernmental Panel on Climate Change (IPCC); presentation of the report to the Second World Climate Conference will be this fall. The United Nations (UN) and its member governments will be under pressure to have a final text ready for signature at the 1992 UN Conference on Environment and Development, if not before. In a 25 May speech responding to greenhouse warming predictions made by the IPCC science working group, Margaret Thatcher said that Britain would reduce the proposed growth of its CO₂ emissions enough to stabilize them at 1990 levels by 2005 if other countries did their part.

Yet the United States, Japan, and other countries that emit substantial quantities of greenhouse gases continue to resist potentially expensive emission-reduction targets or control measures, citing continuing uncertainties about the extent, timing, and distribution of future climate change and its economic consequences. Similarly, developing countries are unlikely to agree to emissions targets or control measures that they perceive as impeding

their economic development and will almost certainly condition their participation on a commitment by the Organisation for Economic Co-operation and Development (OECD) countries to provide additional development assistance.

When confronted with these political realities, must we settle for a “bare-bones” framework convention similar to the Vienna Convention on Protection of the Ozone Layer, or can we devise a more substantive convention that would stimulate policy changes by the parties without requiring costly emission reduction in the short term? I believe we should take the latter course and pursue a more substantive convention along the lines described below.

A central task for a climate convention will be to provide the international community with a permanent mechanism for coordinating its efforts to deal with climate change. At present, the IPCC is serving this function reasonably well, but it remains an ad hoc working group with no permanent status. The “conference of the parties” to the convention would replace the IPCC and would establish subsidiary

bodies similar to those established by the IPCC. Those bodies would include the following.

1. *A bureau.* The bureau, or group of officers in charge of managing meetings of the parties, would consist of a chair, one or more vice-chairs, and one or more rapporteurs elected for fixed terms of several years.

2. *An executive council.* The executive council would consist of representatives of the parties, including the bureau, which would meet more frequently than the conference of the parties and would oversee implementation of whatever program was approved by the conference.

3. *Permanent committees.* The convention should establish permanent committees on science, environment, and socioeconomic impact, and policy responses similar to IPCC Working Groups I, II, and III.

4. *A strong secretariat.* The breadth and complexity of the climate change issue make it essential that the work carried out under the convention be supported by a strong secretariat of at least 20 professionals, including experts on atmospheric science, economic analysis, financial mechanisms, international law, and public education.

The convention should go beyond organizational structure to establish a process for updating the parties' understanding of the science and potential impacts of climate change and for building consensus on policy responses. It is crucial that the science and impacts committees produce peer-reviewed annual updates of their respective assessments to provide a basis for evolving policy responses.

To support this ongoing assessment process, the convention should explicitly provide for (i) building up the international network of climate monitoring stations as part of the World Climate Program coordinated by the World Meteorological Organization; (ii) international collaboration in developing and funding a space-based monitoring system along the lines of Mission to Planet Earth; (iii) international cooperation in developing and funding the hardware and software for the next several generations of general circulation climate models; and (iv)

maximum participation of developing country scientists and technicians in all these activities.

Whereas an international convention is in many respects a top-down undertaking, a more bottom-up process is preferable for developing policy responses. Only policies formulated at the national level will overcome widespread concern about economic costs and reflect the different circumstances of different countries. The convention should drive this process by requiring each party to prepare and distribute its own national plan for reducing greenhouse gas emissions and for adapting to future change while achieving its development objectives. The convention would contain general guidelines for preparing national plans, including the sectors and general issues to be covered. Each party would be free, however, to determine its own emissions reduction strategy consistent with any overall targets and timetables established by the convention.

"A more bottom-up process is preferable for developing policy responses."

The point is to require each party to make an initial determination of the national measures it is prepared to commit to and then to share that determination with other parties for analysis and discussion. From such analysis and discussion should emerge (i) an initial baseline emissions scenario based on implementation of the national plans, (ii) a more complete inventory of possible policy responses, and (iii) an initial indication of the additional financial and technical resources that might be required to implement the plans, particularly in developing countries.

As national plans are revised and updated, one would hope that various parties could be induced to make their plans more ambitious and effective in response to the information and feedback they receive from other parties and outside sources. Potential opportunities for asymmetrical reductions or emissions trades should become more apparent. The convention should require each party to prepare an initial plan within 1 year of its becoming

subject to the convention and to update that plan every 2 years thereafter.

To obtain the participation of key developing countries such as China, India, and Brazil, the convention will have to contain strong provisions with respect to technology transfer and financial assistance. Despite the popularity of the sustainable development concept, developing country governments still perceive a direct conflict between their goals for economic development and measures to reduce greenhouse gas emissions in their countries. This perception is exaggerated. Developing countries collectively will be investing hundreds of billions of dollars for economic development over the next few decades. If this money is invested in systems that are energy and materials efficient, the environmental impact of a given level of economic development can be substantially reduced. For example, China's ratio of CO₂ emissions to gross national product (GNP) is roughly five times that of Japan.¹ If China were to achieve even 60% of Japanese efficiency and carbon intensity levels in its new energy-producing and energy-consuming infrastructure, it could improve this ratio substantially in a relatively short time. The one major hurdle is obtaining the technical information, management assistance, and capital required to promote more efficient and less polluting supply and use of energy and other natural resources.

A climate convention could make an important contribution to overcoming this hurdle. First, the convention could establish a fund to meet all or part of the hard currency costs of preparing and updating the developing countries' national plans referred to above. The fund would cover the costs of sending public and private sector experts from OECD countries and multilateral institutions to work with counterparts in developing countries in preparing the national plans and more detailed studies of energy, transport, agriculture, and other key sectors. The money required for such a fund might be in the order of a hundred million dollars per year, which could be contributed by the OECD countries proportionate to greenhouse gas emissions. Only developing countries that were parties to the convention could have access to the fund, which should provide a major incentive for developing countries to become parties.

The national plans and sectoral studies would have to identify capital requirements sector-by-sector and possible sources of capital, domestic and foreign. To help meet those requirements, the convention should contain provisions that encourage the private sector to furnish the capital required. The OECD countries would be obligated to arrange for soft loans from multilateral development banks, provide expanded political risk insurance, and even offer credit guarantees for projects meeting certain criteria. The developing countries would be obligated to provide a favorable investment climate for foreign investors making climate-related investments, including effective protection of intellectual property rights and patents, no prohibition on operating control, taxation of profits at a national rate or better, and foreign exchange priority for dividend and capital remittances within certain limits.

"Once this process has begun, we will be able to achieve much greater emissions reductions than we can imagine today."

Finally, we come to the issues of targets and timetables for greenhouse gas emission reduction and their appropriate role. The purpose of short-term targets and timetables is not to set final goals. There is simply too much uncertainty about the science, regional impacts, and socioeconomic consequences of climate change for the United States and other key countries to commit to ambitious short-term emissions reduction goals within the next few years. Rather, the purpose of short-term targets and timetables is to catalyze a process—to induce governments and the private sector to take certain initial steps needed to set the stage for more far-reaching changes later on. Once this process has begun, we will be able to achieve much greater emissions reductions than we can imagine today, irrespective of what is written into international agreements.

The following is a set of targets and timetables for greenhouse gas emissions reductions that might be politically acceptable and yet sufficiently ambitious to begin to bring about results.

1. A short-term stabilization target placing an overall ceiling on the parties' emissions of all greenhouse gases (expressed in equivalent units) at their levels for the year the convention entered into force effective 10 years thereafter.

2. An OECD CO₂ stabilization subtarget that would require each OECD country to hold its emissions at their average level for the year the convention enters into effect and the previous 4 years effective 10 years after the convention enters into effect. The combination of a chlorofluorocarbon phase-out and stabilization of CO₂ emissions from industrialized countries would provide leeway for short-term emissions increases from developing countries.

3. An energy efficiency subtarget, whereby all parties would be obligated to improve the ratio of their carbon emissions to GNP by 2% per year over the same 10-year period. This rate of improvement, which was achieved by Japan and the United States during the 1973 to 1986 period,² would allow individual parties to seek the combination of energy efficiency improvements and reductions in the carbon intensity of their overall fuel mix that best suits their particular circumstances. It would also allow parties with high GNP growth rates correspondingly high emissions.

4. A deforestation subtarget, whereby all parties agree to eliminate net loss of forests by the end of the 10-year period in question. Achieving this goal would help preserve biodiversity and promote other

environmental goals as well as reduce net carbon emissions.

To supplement and reinforce the targets and timetables proposed above, the convention should impose a general obligation on the parties to use the best available technology that is economically achievable to reduce emissions of greenhouse gases. This general obligation is particularly important for greenhouse gases such as methane and nitrous oxide, for which it is difficult to set targets because their sources and sinks are not yet well understood. An annex to the convention could describe specific technologies currently available for reducing emissions and their respective unit costs.

The international community has an unprecedented opportunity to pursue a "no regrets" strategy that will put us on a development path that simultaneously achieves an acceptable degree of economic development and minimizes the possibility of environmental disruption. A properly structured climate convention could be an important step toward grasping this opportunity.

References

1. W.U. Chandler, *Clim. Change* 13, 245 (1988).
2. *The Global Environmental Challenge: Japanese Initiative for Technological Breakthrough*, Report of the Japanese Ministry of International Trade and Industry (March 1990), p. 6.

IV.

FOCUSING ON THE NEAR TERM

Alternative Legal and Institutional Approaches to Global Change

Peter S. Thacher

Introduction

The processes of global change currently under way cannot be dealt with in isolation. Factors linked to environmental quality such as demographic growth, economic interdependence and indebtedness, sociopolitical changes, and others must be managed collectively. In looking at the problems of global change, a central question before us is: How “comprehensive” should a legal regime be in a world of considerable uncertainty in which everything is interrelated with everything else, and what we do may, or may not, have irreversible consequences for future generations? If we think in terms of addressing *all* aspects of global change and involve *all* essential actors, we risk a slow process in which steps now needed to prevent impending problems may be postponed while we wrestle with larger, interrelated issues. On the other hand, if we deal more narrowly with one issue at a time we may miss the interlinkages, grasping symptoms while evading central issues, thereby shifting problems into other sectors rather than coming to grips with them.

Without putting aside the larger dimensions of global change, this article focuses on the problem of global warming to provide a model approach to the larger issues of global change. This reduces the scope of global change to a manageable but representative class of the problems at issue. In doing this, I suggest an approach to stabilize global climate by the end of the next century.¹ However, even within this relatively narrow context of stabilizing the climate, a comprehensive approach is needed to address all heat-trapping gases—not just CO₂—to ensure that *all* human activities generating these gases are managed properly, without causing other problems.²

Care is also needed to avoid starting endless negotiations in an “all-or-nothing” fashion in which our efforts to find the “best” solution may become the enemy of “good” solutions. The risk is that prompt, practical steps available now to reduce the threat of global warming may be delayed until all the answers and implications of the problem are clear.³ Therefore, after outlining a “Comprehensive Action Plan on Climate,” I will suggest a complementary

“fast track” of partial measures to be taken by the United States and other industrialized nations. Under this approach, these states would take *unilateral* steps in the near future to reduce their massive contributions to atmospheric warming, while promoting international negotiations on a comprehensive action plan. The end goal is to reduce greenhouse gas emissions to the level at which natural systems recycle them, thus bringing anthropogenic emissions of heat-trapping gases into equilibrium with natural processes. If work is started soon, both of these endeavors—a comprehensive international plan to reduce the risk of climatic change, complemented by “fast track” unilateral steps by industrialized countries—will be sufficiently developed by the time of the UN Conference on Environment and Development in 1992.

Past Approaches to International Problems

The Lessons of Arms Control

There are a number of parallels between the arms control negotiations of the 1950s and 1960s and steps taken in the 1970s and 1980s to deal with international pollution. These similarities may be helpful as we work in the 1990s to cope with global pollutants, including those that trigger the “greenhouse effect.”

While general and complete disarmament remained elusive in the 1950s and 1960s, significant progress was made during this period in arms control measures. Such measures included the 1959 Antarctic Treaty, the 1963 Partial Test Ban Treaty, the 1967 Outer Space Treaty, the 1967 Treaty for Prohibition of Nuclear Weapons in Latin America, the 1968 Non-Proliferation Treaty, and the 1971 Seabed Denuclearization Treaty.⁴ While we did not succeed in beating swords into plowshares, these treaties showed how to take *preventive* steps to forestall hostile military activities and new weapons systems in large portions of the planet and surrounding space.

Some of these treaties, and the processes that formed them, suggest approaches to cope with global pollutant threats. For example, in 1955 growing

appreciation of the risks of nuclear radiation led governments in the UN General Assembly to set up the UN Scientific Committee on Effects of Atomic Radiation (UNSCEAR), an early example of a mechanism for international assessment of a global problem.⁵ Continuing international expert assessment of risks from nuclear fallout, along with public pressure, moved this issue from sterile debate to negotiations. UNSCEAR thus helped lay the basis for the 1963 Partial Test Ban Treaty, which contributed one of the positive aspects of current global change by reducing radiation doses caused by nuclear weapons tests from about seven percent of natural background radiation in the early 1960s to less than one percent by 1980.⁶ Such a method could be useful in examining global warming, especially in light of the considerable uncertainty and disputes about risks.

“Some of these arms control measures suggest approaches to cope with global pollutant threats.”

In 1971, when I was seconded to serve as Program Director on the secretariat preparing the 1972 United Nations Conference on the Human Environment in Stockholm, Sweden, I interpreted the situation as follows:⁷

The success of states represented at the UN in developing law—in the form of multilateral treaties—in advance of experience holds out the only real hope that man will not have to experience more nuclear warfare before learning how to avoid it. Similarly, now that man has become a significant modifier of his own environment, the successful pre-experience application of States’ responsibility under the Charter for “progressive development of international law and its codification” to the question of arms in space suggests that this planet may not have to experience man-made global pollution on a lethal scale before creating a system of standards, perhaps of law, to protect man from the foreseeable but unregulated effects of the same technology on which his “quality of life” increasingly depends.⁸

Environmental Treaty Development

A key paper presented during preparations for the 1972 Stockholm Conference on the Human Environment highlighted the need to accelerate the processes traditionally used in treaties for establishing international law, and to explore such new approaches as standard-setting and “soft law” routes to govern international behavior.⁹ Its authors cited earlier work at the UN Institute for Training and Research (UNITAR) and the UN Food and Agriculture Organization (FAO) showing the need to increase speed and flexibility for environmental agreements. In particular, a 1969 UNITAR study pointed to a lag of some two to twelve years between signature and effectiveness of international agreements. Similar time lags were present with treaty revisions.¹⁰

“A 1969 study pointed to a lag of some two to twelve years between signature and effectiveness of international agreements.”

The results of these studies were applied during the pre-Stockholm negotiation of the 1973 London Ocean Dumping Convention, and later, when the Mediterranean and other “Regional Seas Action Plans” were developed by the United Nations Environment Programme (UNEP). Most recently, they were used when the 1985 Vienna Convention for the Protection of the Ozone Layer and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer were drafted.¹¹ These agreements all employ procedural devices to increase flexibility and speed updating, such as:

1. “Black” and “grey” annexes to the formal agreement with eased provisions for their revision in light of new assessments.
2. “Framework” conventions with general undertakings interlocked with protocols with specific undertakings and the accompanying proviso that states cannot become members of a framework

convention until they ratify one or more protocols.

3. Explicit commitments to consider scientific assessment results from companion research and monitoring programs on a continuing basis and develop additional protocols as the facts warrant.

A number of other formal international agreements, ranging from those dealing with international trade in endangered species to the control of long-range transboundary pollution, have also shown that the treaty route can be sufficiently expeditious and flexible to help governments come to agreement despite high levels of uncertainty.¹² The key is to employ procedural devices such as those mentioned above that provide a flexible framework that can be revised as information develops and change occurs.

General Principles

Another way to establish an international legal regime without starting with formal treaties has also evolved. It is based on the adoption of statements of “general principles,” often in the form of “Declarations” in the UN General Assembly. International agreement on a declaration of general principles is not binding and—except under unusual conditions—does not constitute international law.¹³ Agreement on such principles can, however, pave the way for formal agreements that achieve binding commitments. They are particularly useful for those states, such as the US, with a tradition of relying on “experience,” rather than logic, as the source of good law.¹⁴

The UN General Assembly adopted several resolutions dealing with outer space and seabeds that set forth agreed statements of principles that led to subsequent negotiations of specific treaties.¹⁵ While the effectiveness of agreed principles cannot be measured as precisely as pollution levels can be, these early actions helped create a world free of weapons systems then on the drawing boards but never deployed; specifically, orbital bombardment systems and “sea-bottom crawlers.” By the time of the Stockholm Conference in 1972, this approach had led to the 1967 Outer Space Treaty and, thanks

to the Maltese initiative, held out the promise of a new treaty on the Law of the Sea.¹⁶

Similarly, twenty-six principles were negotiated on the way to the 1972 Stockholm Conference and were approved in the Stockholm Declaration on the Environment.¹⁷ These principles, and other sets, including the World Conservation Strategy and the World Charter for Nature, have all been endorsed by governments in the UN General Assembly and have thus gained influence and respectability, even if they have not yet acquired the status of international law through common practice or otherwise.¹⁸

Some of these principles, such as Stockholm Principle 21 on “shared natural resources,” have been further studied but not converted into formal undertakings except in part.¹⁹ For example, the segment of Principle 21 exhorting that states have a responsibility to ensure that activities under their control do not damage other states or areas beyond the limits of national jurisdiction, has been further developed. The Working Group of Experts on Development of Environmental Law that met in Montevideo, Uruguay, in 1981, gave this notion top priority in its application to hazardous waste. Within months a set of “Policy Guidelines” had been developed at meetings in Garmisch, West Germany. With further work these became the Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes that were adopted by UNEP’s Governing Council in 1987. After additional refinement at meetings in Caracas, Venezuela, and Geneva, Switzerland, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal was scheduled for March 1989 in Basel, Switzerland. This Convention was approved and opened for signature at Basel on March 22, 1989.

Guidelines and Recommended Practices

The use of “guidelines,” such as the Cairo Guidelines mentioned above, or “recommended practices” that have been drawn up and endorsed by governments at the international level provides yet another route to an international legal regime.²⁰ Although not binding, these generate pressure to modify national practice on environmental matters.

An example of their effectiveness is the widespread use by governments of “Acceptable Daily Intakes” and “Maximum Limits for Pesticide Residues.” These standards are published by the Codex Alimentarius Commission and constitute a record of international assessments of pesticide contamination, thereby providing a rational basis for national regulations and standards.

In sum, a promising array of techniques is already available to facilitate international agreements that can influence national actions causing global change. Many of these have been incorporated in explicitly comprehensive “Action Plans” adopted by governments at the regional level since 1972. To cope with scientific uncertainty about causal relationships, most states have utilized a framework first employed at the 1972 Stockholm Conference that allows digestible pieces to be attacked with some sense of priority and cost-effectiveness.

The Legacy of the Stockholm Framework for Action

The Framework for Action developed at the 1972 Stockholm Conference²¹ identified three components that must be explicitly addressed in any comprehensive environmental Action Plan:

1. assessment activities directed at improving understanding and reducing uncertainty to provide a rational basis for action through
2. management activities involving new policies, practices, and agreements (both formal treaties and political agreements at the international level) that encourage changes in human behavior, backed up by
3. support activities that strengthen financial, institutional and human resources to ensure that *all* key actors—including Third World nations—have the means to contribute to agreed actions and share in the obligations and benefits.²²

The first application of this framework was in UNEP’s 1975 Mediterranean Action Plan for marine and coastal pollution control.²³ This approach has

since been replicated in nine other regional seas and has led to adoption of twenty-three regional seas conventions and protocols involving more than 100 states and fifty international organizations.²⁴ Each of these "Regional Action Plans" called for parallel *assessment* (research and monitoring), *management* (legal agreements and integrated economic planning), and *supporting activities* linked by institutional and financial means.²⁵

"The Action Plan framework has led to adoption of twenty-three regional seas conventions and protocols involving more than 100 states and fifty international organizations."

Today, some fourteen years later, the process of comprehensive planning that started with the approval of the 1975 Mediterranean Action Plan at the Convention for the Protection of the Mediterranean Sea Against Pollution, in Barcelona, Spain, in 1976, continues to move ahead. Mediterranean institutional and financial mechanisms designed to initiate and coordinate region-wide activities are well established. For example, consistent with the assessment function, parties to the Barcelona Convention and to subsequent Protocols collectively finance a trust fund to support expanding networks of more than 100 scientific institutions cooperating on research and monitoring for better understanding of how to deal with such issues as oil spills and protected areas.²⁶ Regional economic planning and development activities attract national support within the region as well as from the World Bank. National institutions in the Mediterranean and other regions are also studying the social and economic consequences of sea-level rise and other aspects of climatic change.²⁷ Thus, the comprehensive fashion through which the Mediterranean Action Plan was employed has proved successful in a number of ways.

Action Plan to Protect Stratospheric Ozone

Based on the experience gained from the Mediterranean Action Plan, a similar comprehensive

approach with corresponding *assessment*, *management*, and *supporting activities* was attempted in the mid-1970s when UNEP and collaborating agencies were drawing up what became the 1977 World Plan of Action on the Ozone Layer.²⁸

In 1976, UNEP's program on Risks to the Ozone Layer called for "an examination, in light of the review of the state of the art, of the need and justification for recommending any national and international controls over the release of man-made chemicals." Given scientific uncertainty about the high-altitude effects of chlorofluorocarbons (CFCs) and industry resistance to any international agreement that might limit their use in the mid-1970s, it was not surprising that attention focused on *assessment* functions that could be improved through international cooperation. *Management* and *support* portions were not given form until later years.

The approved Action Plan to Protect Stratospheric Ozone, therefore, focused on expanding knowledge to resolve vast uncertainties, particularly of upper-atmospheric processes, as well as such rudimentary needs as data on production of CFCs.²⁹ Additionally, the Action Plan encouraged a number of specific investigations that contributed to *management* actions in subsequent years, notably the work of the British scientific team in Halley Bay that, eight years later, was the first to discover the Antarctic ozone hole.³⁰ The Action Plan also called for a new mechanism, the Coordinating Committee on the Ozone Layer (CCOL), as well as publication of a biannual *Bulletin* presenting the results of work under way around the world. These activities have helped to disseminate essential information and create a mechanism by which a problem can be effectively dealt with in light of vast uncertainties.

The gradual improvement of understanding and assessment of risks effectuated by this process led governments by 1980 to agree that "preventive measures are required on a global scale," and to recommend that "production capacity for CFCs F-11 and F-12 should not be increased."³¹ This finding, in turn, induced legal discussions in 1981 that produced the 1985 Vienna Convention for the Protection of the Ozone Layer—the *first* global convention, as UNEP's Executive Director Dr. Mostafa K.

Tolba put it, “to address an issue that for the time being seems far in the future and is of unknown proportions.”³²

The Vienna Convention obliged signatories to cooperate in research and systematic observations in an effort “to better understand and assess the effects of human activities on the ozone layer and the effects on human health and the environment from modification of the ozone layer.” In addition, it required the adoption of appropriate national measures and policies to reduce or prevent activities that might have adverse effects on the ozone layer, and cooperation “in the formulation of agreed measures, procedures and standards for the implementation of this Convention, with a view to the adoption of protocols and annexes.”³³

Unfortunately, however, a draft CFC protocol with more specific undertakings that was to accompany the Vienna Convention was blocked by uncertainty as to what was happening in the stratosphere, and by disagreements between major CFC-producing countries on the amount CFC emissions were to be reduced, as well as on the regulatory means by which to accomplish this. As a result, the opportunity to reduce CFC emissions was delayed until the Montreal Protocol was signed.³⁴ The dramatic discovery of the Antarctic ozone hole in 1985 greatly reduced uncertainties about CFCs’ effects on stratospheric ozone and prompted key governments to sign the Montreal Protocol in September 1987.³⁵

Thus, although the 1977 Action Plan to Protect Stratospheric Ozone failed to contain a *management* section initiating talks toward international agreements, it did set in motion an international program of scientific research and monitoring that laid the basis for the Vienna Convention of 1985, and it contained specific recommendations that led to the discovery of the Antarctic ozone hole phenomenon that, in turn, sped negotiations of the 1987 Montreal Protocol.

Critical Characteristics of Action Plan Success

Looking back on the Action Plans created since the 1972 Stockholm Conference, one finds four critical considerations that should be considered when

drawing up any comprehensive approach to global change:

1. Given a high degree of uncertainty, scientific understanding and institutional capabilities must be sufficient to get the assessment process started. Moreover, there must also be public or political awareness that something needs to be done. Ever since the 1957–1959 International Geophysical Year and especially since the 1972 Stockholm Conference, the scientific community has played an increasing role in defining problems and providing information and policy advice to support diplomatic negotiations on environmental issues.³⁶ More recently, the private sector and nongovernmental groups have also played active, critical roles.³⁷
2. From the outset, *all* parties concerned about the problem should be encouraged to gradually address *all* sources and related human activities through a comprehensive approach.
3. Parallel assessment, management, and support functions should be specified and agreed to, together with the institutional and financial means to get the process started—another dimension of “comprehensiveness.”
4. A dynamic and flexible process should be laid out so that new understanding can support new agreements, and these can be revised as conditions change.

However, the complexity of the problem, combined with scientific uncertainty and international self-interest, complicates our search for solutions. Despite experience with many promising techniques for dealing with issues of global change, new developments add important difficulties as we enter the 1990s.

Dealing with Global Climatic Change

The Problem

Thanks to more insights from scientists, we have as of the late 1980s lost our innocence about the results of our actions. New tools allow us to detect

what could only be imagined before: from atmospheric trace gas concentrations measured in parts per trillion, to periodic planetary vegetation indices. But along with new understanding come new and growing uncertainties, particularly about causal relationships. For example, to what degree is declining food productivity in Africa a result of natural processes or man-made practices?

Furthermore, the slate is not nearly as clean as it used to be. Most experts agree that by the time we are likely to take action to reduce critical emissions, we will already be committed to heat increases in the next century beyond anything experienced in the last 20,000 years. Today's industrial activities and destruction of ecosystems may commit our descendants to changes they may find intolerable, and unforgivable.

The principal greenhouse gas, carbon dioxide, is more disturbing than any other pollutant we have had to cope with since it is not an *incidental* product, like sulfur, that—with good engineering—can be turned off or diverted. CO₂ is a necessary and unavoidable by-product of fossil fuel combustion and therefore a key companion of 20th century well-being. Unfortunately, the greenhouse threat arises largely from actions on which economic development appears to depend. United States prosperity itself is a significant contributor to global warming. While long-term benefits of reducing CO₂ emissions may be hard to quantify because of scientific uncertainty, short-term costs of dealing with the problem are easy to see, and to resist. Without waiting to see how fast the heat rises, it will be more difficult than before to change current activities, to refrain from doing things we now take for granted, and to take steps to head off impacts we have yet to experience.

Unfortunately, global warming is not only a scientific or engineering problem. The greenhouse problem is also interrelated with such difficult issues as international indebtedness and unequal terms of trade. To reduce CO₂ from tropical deforestation—or, put more positively, to convert the biota from a net source to a net sink of CO₂—we must face those issues that tropical developing countries see affecting deforestation, including poor terms of

trade, international indebtedness, and growing poverty in the Third World. These complex relationships are summed up by Norman Myers in the phrase “the Hamburger Connection.”³⁸ This notion was recently related when *Time* magazine described why tropical forests and biodiversity are collapsing:

The main reason is that throughout the tropics, developing nations are struggling to feed their peoples and raise cash to make payments on international debts. Many countries are chopping down their forests for the sake of timber exports. In Central America forests are giving way to cattle ranches, which supply beef to American fast-food chains.³⁹

The Need for a Comprehensive Action Plan

A *comprehensive* approach to coping with pending changes is dictated by our awareness that human activities play a large role in many of the threatening changes under way and therefore should be better managed. The changes in atmospheric constituents that produce harm or risk in such forms as global heating, stratospheric ozone depletion, and acid rain, are all linked to each other. Reducing industrial and automotive exhausts, for instance, alleviates all three problems. The best strategy should reduce greenhouse gas emissions without worsening other problems, such as those posed by current nuclear power practices. It should have other benefits as well; otherwise, political agreement may be difficult to achieve. Fortunately, there are multiple advantages to reducing greenhouse gas emissions, especially for the United States. For example, by increasing energy efficiency, the United States could slow global warming while improving the efficiency with which it produces goods and services. This in turn would strengthen the trade position, reduce local and regional pollutants, and lower dependency on imported petroleum.⁴⁰

But as we consider the issue of climate, we must always keep in mind the larger context of global change; that is, each change in atmospheric constituents is also linked with, and affected by, other *nonatmospheric* changes in which human actions are also critical. Demographic growth rates, for example, may have peaked in the mid-1970s, but

annual increments continue to mount and, as with the greenhouse effect, our future well-being depends on the level at which growth stabilizes.⁴¹ Unparalleled economic growth is accompanied by massive waste, mounting pollutant levels, pressure on marginal lands, declining productivity of natural systems and processes, and eroding biological diversity.

Dealing with various pollution problems has taught us that a "single-issue approach" risks merely transferring problems from one place or type to another. Smokestacks really did get rid of local problems, but at someone else's expense downwind. Landfills move pollutants out of sight and mind, and into critical groundwater systems. There are substitutes for compounds that destroy stratospheric ozone, but their manufacture may involve energy-intensive processes that produce more CO₂. An effective approach must therefore be mindful of trade-offs in other dimensions of global change and be "comprehensive" in the sense of taking all side effects into account and being alert to the danger of overlooking what economists refer to as "externalities."

"An effective approach must be 'comprehensive' in the sense of taking all side effects into account and being alert to the danger of overlooking what economists refer to as 'externalities.'"

Furthermore, a comprehensive approach is inherently crucial to the greenhouse issue because of the need to include *all* potential actors. It is obvious that no government or group of governments can alone cope with global warming. Carbon dioxide, the principal greenhouse gas, comes primarily from the industrialized countries. The same is true for virtually all of the CFCs, which are far more efficient than is CO₂ at trapping heat. Thus, the burden of reducing heat-trapping pollutants today falls largely on these countries, but perhaps one-quarter or more of today's extra atmospheric CO₂ comes from biotic sources. These sources are located primarily in tropical, Third World countries. Additionally, Third World energy demands are very modest in comparison to

developed countries', but if these demands keep pace with expanding populations, their contributions of CO₂ may reach fifty percent of the total in the next century. Furthermore, their emissions of methane and nitrous oxide may increase their contributions to global heat-trapping even faster. Clearly, states in all parts of the world are, or soon will be, significant contributors to global warming and, therefore, no state or region should be left out of a comprehensive approach to climatic change.

What is needed is an agreed plan of cooperative action to stabilize the global climate insofar as human contributions to heating are concerned. This requires that anthropogenic emissions be reduced to the levels natural systems can handle, so they do not build up in the atmosphere and trap heat, and that ways be found to increase rates at which CO₂ and other greenhouse gases can be "locked-up" in natural cycles, such as by reforestation. Any such plan should be phased so as to encourage agreements governing key human activities that contribute to each of the major greenhouse gases on the basis of the best knowledge that science can provide. This calls for continuous research and monitoring and information exchange to be built into the plan, along with flexibility in setting targets—whether for atmospheric levels of particular gases, or slowing their rates of increase, or for emissions, country by country. To collectively improve understanding, as well as to ensure that data are gathered that help measure progress, or lack thereof, close links will be needed between agreements to stabilize greenhouse gas levels and an expanded scientific research and monitoring program. Different types of data are needed for better understanding and for measuring performance, and verification measures may be necessary to ensure compliance with agreed undertakings.

Paradoxically, the more we become aware of the complexity and interrelationships of global change, the greater the uncertainty becomes. Now we realize change itself is changing; the *spatial* scale of human impacts is expanding from local to regional to global, and the *temporal* scale is changing, too. For example, we now know CFCs will continue to catalyze ozone depletion for about a century after they are released.

Rapid change triggered by human actions puts a premium on understanding what is changing and the likely impacts of change, and on taking effective steps at an early stage to deal with this change despite considerable uncertainty or dispute about likely effects. The large degree of uncertainty surrounding the greenhouse issue means that any comprehensive plan must encourage expeditious scientific research and provide for the incorporation of results into actions to reduce threats. In short, active participation by the scientific community is very important. New, nonstate actors must therefore be involved in drawing up any comprehensive plan to deal with the problem.

The Prospect of a Comprehensive Action Plan

Any plan to reduce man-made emissions of heat-trapping gases must be comprehensive in the sense that all sources must be addressed and no nation can be ignored. At present the United States alone produces about one-quarter of all global CO₂ and one-third of the CFCs. Collectively, the member states of the Organisation for Economic Co-operation and Development (OECD) and the Council for Mutual Economic Cooperation (CMEA) contribute about two-thirds of CO₂ emissions.⁴² This presents a special responsibility, and opportunity, for the “superpowers” to start the process of drawing up a comprehensive, global plan that progressively reduces important greenhouse gas emissions. High-level East-West collaboration could smooth the way and enlist North-South cooperation in time to have a plan—or an outline of its contents—ready for consideration at the UN General Assembly late in 1990, following the Second World Climate Conference.⁴³ Further refinement and first review of progress could begin at the 1992 UN Conference on Environment and Development, twenty years after Stockholm.⁴⁴

Groundwork: The Maltese Resolution

By unanimously adopting the Maltese Resolution on “Protection of global climate for present and future generations of mankind” in December 1988, the UN General Assembly laid the basis for such a comprehensive plan.⁴⁵ In it, the nations of the world expressed their concern that “human activities could

change global climate patterns[,] threatening present and future generations with potentially severe economic and social consequences.” Thus, “climate change is a common concern of mankind” and should be “confronted within a global framework so as to take into account the vital interests of all mankind.”⁴⁶

“High-level East-West collaboration could smooth the way and enlist North-South cooperation.”

The Resolution endorsed work in the World Climate Programme already under way by the World Meteorological Organization (WMO), the International Council of Scientific Unions (ICSU), and UNEP.⁴⁷ The Assembly, by the Resolution, also requested the heads of WMO and UNEP to

utiliz[e] the Intergovernmental Panel on Climate Change (IPCC), immediately to initiate action leading . . . to a comprehensive review and recommendations with respect to:

- a. the state of knowledge of the science of climate and climatic change;
- b. programs and studies on the social and economic impact of climate change, including global warming;
- c. possible response strategies to delay, limit or mitigate the impact of adverse climate change;
- d. the identification and possible strengthening of relevant existing international legal instruments having a bearing on climate;
- e. elements for inclusion in a possible future international convention on climate.⁴⁸

The likely direction of this work was suggested by UNEP’s Executive Director Dr. Tolba. He challenged the panel to produce conclusions by mid-1990 that

would justify actions by governments to limit and cope with climate change and possibly start

negotiations over a global framework convention on the subject—a convention that would define the problem, chart the course of action and set priorities of such action. The specific actions themselves could be negotiated in separate protocols within the framework of the convention.

Obstacles to a Comprehensive Action Plan

A negotiated framework convention, or a comprehensive action plan addressing all key issues related to climatic change, even if only in a preliminary way, will be difficult to accomplish by 1990, or even 1992. Given the clear and heavy costs involved if CO₂ emissions are to be significantly reduced, there is bound to be resistance that will take advantage of the inherent difficulties of a comprehensive approach. The questions will again arise: Is a comprehensive approach conducive to preventive action when everything is related to everything else, especially when uncertainty is high? Might comprehensiveness help special interest groups tie progress to the pace of the slowest marcher? How can we agree in principle to favor less carbon-intensive fuel mixes without tackling unemployment problems in carbon-intensive industries, including coal-mining? Can we agree on a higher priority for reforestation without first addressing international timber trade prices? Can a truly comprehensive approach be developed to protect climate stability in the face of so many uncertainties, or are we condemned to taking no action, except unending research, because *nothing* should be done until *all* the answers are clear?

“There has never been a global plan in which virtually all states are involved.”

Another difficulty is the need to involve all principal actors, whether contributors or victims. There has never been a *global* plan in which virtually *all* states are involved. In addition to resisting pressures to give a stronger voice to nonstate entities—such as the scientific community, corporations, and other nongovernmental organizations—the representatives of some states may be expected to resist

involving so many states in the process. Some may call for an alternative approach dominated by industrialized countries. Such an approach was undertaken with the recent treaty on Antarctic minerals by which a limited number of states intend to set up a regime to apply at such time as Antarctic resources are of commercial interest.⁴⁹

In the final analysis, since every state contributes greenhouse gases, and the ratios are shifting with demographic growth in the developing countries, an inclusive approach should be favored. However, this raises difficult questions of equity and burden-sharing. While similar issues were resolved in the Montreal Protocol, CFCs are far simpler to cope with than CO₂ and the other gases of concern here.

“The precise means to secure representation for generations yet unborn do not exist.”

There are also the questions of who represents impacted areas *beyond* national jurisdiction, such as the High Seas and Antarctica, and who represents future generations whose options are being foreclosed by current activities.⁵⁰ The precise means to secure representation for generations yet unborn do not exist. Good ideas to this end have been suggested, but they have not yet received the study they deserve.⁵¹ Perhaps the idea of an ombudsman for both extranational areas and future generations should be studied in the course of drawing up the plan. We must be cautious, however, to insure that such ideas are not misused to retard the planning process.

Clearly, a 1990 “Comprehensive Action Plan to Stabilize Global Climate” cannot purport to answer all the questions, and it would be a mistake to try. Its chief function would be to initiate a durable process without degenerating into a loose collection of single-issue approaches. The realistic goal should be to stabilize global climate as soon as possible (probably not much sooner than the end of the next century). This would mean agreeing on ceiling levels for each of the greenhouse gases and identifying steps that must be taken so that, once stable, these

levels remain constant insofar as human contributions are concerned.

Reaching this goal requires improving our understanding of sources and pathways of these gases, and identifying those key human activities that significantly increase atmospheric heat-trapping. In light of the many disproportionate contributions of CO₂ from such sectors as energy, transportation, and industry, and the different communities affected, it may also be necessary to set target emission reductions by sectors, as well as by country or region, as was done in the Montreal Protocol.⁵² The plan should set specific target figures to facilitate monitoring of performance (and national compliance) by the turn of the century. It should also provide the means to keep governments and other key actors informed by drawing on various networks of institutions so that agreed-upon assessment, management, and support activities can be carried out at appropriate levels.

These notions regarding monitoring and assessment are already on the agenda. The UN General Assembly resolution on the 1992 Conference on Environment and Development calls for “early warning to the world community on serious environmental threats within the framework of Earthwatch.”⁵³ Similar objectives are also sought by the Eastern European sponsors of a Resolution on “International cooperation in the monitoring, assessment and anticipation of environmental threats.”⁵⁴ This background, coupled with additional hard thought and international cooperation, makes the prospect of a “Comprehensive Action Plan to Stabilize Global Climate” appear to be promising.

Suggested Contents of a Comprehensive Action Plan on Climate

A comprehensive action plan on climate that addresses assessment, management, and support activities, including institutional and financial means, might contain the following elements:

Assessment

Clearly, much of the emphasis of the plan will fall on *research* and monitoring activities to improve

understanding and identify strategic actions that will reduce emissions and achieve target levels for atmospheric greenhouse gases. Preparations for the Second World Climate Conference in 1990 could include setting research and monitoring priorities for atmospheric and associated sciences. Given the difficulty of persuading decision-makers to take costly action in the face of uncertain benefits, we need to improve the reliability of models and increase specific information as to the impacts of atmospheric heating in such fields as agriculture, where demographic growth is bound to increase strains on an already unreliable world food system. Related work is already under way in WMO’s World Climate Program as well as in the International Geosphere-Biosphere Program (IGBP), the global research program of the 1990s. IGBP was launched by the International Council of Scientific Unions (ICSU) to develop the scientific understanding needed to anticipate future changes in the Earth system and provide a foundation for decisionmakers.

A critical component of *assessment* activities is the need to stimulate research and development of technologies for energy efficiency and conservation. These activities must be coupled with the means to encourage their transfer and adaptation in developing countries, if they are to contribute to the slowing of CO₂ buildup. Obviously, the private sector has an important role to play here.

Management

Management action included in the plan should involve new policies, practices, and agreements that are incremental, easy to present to informed, nonexpert audiences, and capable of attracting institutional, public, and political support.

One early step to the development of such policies would be to set up a drafting group to draw up the “new charter to guide state behavior in the transition to sustainable development” called for in the report of the World Commission on Environment and Development (WCED, or the Brundtland Commission). The Brundtland Commission recommended that a universal “Declaration” along these lines be drafted and adopted by the General Assembly and subsequently negotiated into a convention.

Suggested principles are referred to in the closing chapter and first annex of the Commission's report, *Our Common Future*.⁵⁵ Such principles as could be agreed upon in 1990 would provide a basis for negotiations toward future "framework" conventions, including one on climatic change.

A number of more concrete actions could also be undertaken by 1990. For instance, the Montreal Protocol could be strengthened to reduce CFCs even further than the present fifty percent target. Even though the Protocol is concerned with protecting stratospheric ozone, the treaty mechanism also provides a convenient basis on which to reduce heating contributions from CFCs, far more powerful greenhouse gases than CO₂. In addition, the Protocol has provisions for adjusting the production and consumption figures for controlled CFCs and for adding new compounds to the list of controlled substances.

To cut CO₂ emissions, the plan could call for negotiation of one or two framework conventions in the early 1990s accompanied by appropriate protocols dealing with particular gases of concern. Some of the elements of a possible "Framework Convention on Climate Change" or "Framework Convention to Protect the Atmosphere" are already in hand: the global Vienna Treaty and the Montreal Protocol on Stratospheric Ozone; the 1979 Convention on Long-Range Transboundary Air Pollution (the only multilateral agreement to control air pollution); the 1985 Helsinki Protocol on Reduction of Sulphur Emissions or Their Transboundary Fluxes by at Least Thirty Percent (the first multilateral acceptance of a specific numerical environmental goal); and the 1988 Sofia Protocol Concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes (which reduces a precursor of acid disposition and tropospheric ozone and thus contributes to multiple local, regional, and global objectives). Admittedly, the existence of these agreements raises the question of whether an effort focused on climatic change or protecting the atmosphere would make more progress than strengthening the many efforts currently under way. In my view, the seriousness of the global warming threat probably dictates an effort focused on the global issue that would establish a comprehensive regime.

Another *management* approach could be to negotiate an "International Framework Convention to Reduce World Energy Intensity," possibly with sectoral protocols that set specific efficiency targets. For example, 2025 might be set as the target year for reaching efficiency levels already practiced by some countries in terms of energy use per unit of economic output. Particular attention should be paid to enhancing efficiency in electric power production, industry, transport, and building.⁵⁶ Preparations for these negotiations could be started now in the OECD, the CMEA, the Economic Commission for Europe (ECE), and the World Energy Conference. In such forums, those who can contribute the most—the industrialized nations—should declare their intention to share the benefits of their experience with the Third World in such fields as "smokeless" technology and biofuels, and to incorporate it into their aid programs.⁵⁷

Support

Other forms of support actions to be embodied in a "Comprehensive Action Plan to Stabilize Global Climate" would consist of technical and other forms of assistance to strengthen human and institutional capabilities to enable developing countries to carry out national assessment and management activities that contribute to the plan.⁵⁸ Ultimately, new funds will be needed to help developing countries employ technologies to reduce greenhouse gas emissions that may be more costly than conventional technologies. The means to provide these funds should be incorporated in the plan from the outset if broad participation is the goal.

While *support* activities are intended to encourage active participation by all states, as a practical matter, their chief purpose is to improve national capabilities, especially in developing countries, relevant to the agreed goals and program. In general terms, whether by nonbinding principles, international standards, norms, codes of conduct, or treaty, the effectiveness of any international agreement rests on national practices. The aim should therefore be to encourage national practices that reduce the buildup of CO₂ and other heat-trapping gases.

This highlights the special relationship of the Third World to global heating, an issue that cuts many

different ways. The United States and other First as well as Second World states have been the principal sources of CO₂ and CFCs. Third World developing countries are the principal victims of the greenhouse problem because of their greater dependence on natural resources affected by climate, their lack of infrastructure, or their special vulnerability.⁵⁹ However, Third World energy demands are mounting and will have to be met one way or another. Choices made today will aid in determining the energy patterns and fuel mixes used by a doubled world population, with the greatest population increase in developing countries. The Third World's current twenty percent of CO₂ from fossil fuel combustion could climb to over fifty percent in the next century. Because the Third World's role in the greenhouse problem is enlarging, and because present conditions of indebtedness make it particularly dependent on development assistance for future economic growth, the role of the "Development Community" in tackling greenhouse issues—especially that of the World Bank and United Nations Development Programme (UNDP), as well as bilateral aid programs—should be strengthened. In particular, a new emphasis by the World Bank and other development agencies on meeting growing energy needs by improving efficiency should replace their traditional reliance on flooding valleys and mining coal seams to increase supply. These agencies should also give higher priority to helping Third World governments arrest massive deforestation and encourage reforestation, especially on degraded lands, thus furthering development without boosting CO₂ levels.

As part of the *support* function, institutional and financial support mechanisms must be designed to ensure that the plan is capable of making a difference. The Brundtland Commission articulated the need to enlist broader participation at all levels in tackling the problems of environment and development. Recent growth of influence by business and national and international nongovernmental organizations, especially scientific organizations, suggests there is plenty of room for innovation.

Nevertheless, while governments may appear to be less important in the 1990s than in the 1960s, they are still in charge. Recent statements by the

leaders of the United Kingdom, the Soviet Union, and the United States are very encouraging in this regard. Perhaps the United States will resume its proper role of leadership in the UN system.⁶⁰ High-level governmental leadership is a critical first step to any effective international approach to climatic issues, especially if nonstate actors, such as the scientific community and the private sector, are to be enlisted in a common effort. Thereafter, governments must be involved at a high level and informed of progress so they can reach appropriate, collective decisions to keep the process moving.

"While governments may appear to be less important in the 1990s than in the 1960s, they are still in charge."

To strengthen and raise the level of intergovernmental involvement in the search for common security, the President of the World Federation of United Nations Associations (WFUNA) has proposed that the UN Trusteeship Council be "revitalized, given a new mission and a new mandate as the forum within which the nations of the world exercise their trusteeship for the integrity of the planetary systems on which our security and survival depends, as well as for the global commons."⁶¹ Although such a proposal might require a revision of the UN Charter that set up the Trusteeship Council, this and other ideas to provide a high-level forum should be considered.

New ideas for generating new sources of funding should also be explored. For instance, the World Resources Institute (WRI) has already launched a project on International Conservation Funding to carry out the WCED recommendation that significant consideration be given to the idea of developing a special international banking program. The objective of such a program would be to strengthen the resource base for development through investments in conservation activities and other national strategies.

Despite this call for action, the sums of money required in a comprehensive approach to global climate are probably far more than what WCED had

in mind. This problem was recognized in the Statement adopted at the conclusion of the June 1989 Conference on the Changing Atmosphere: Implications for Global Security in Toronto. It called for "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 Protection of the Atmosphere."⁶² A separate proposal was also made for a trust fund that would provide incentives to enable developing countries to sustain their tropical forest resources, while still allowing them to develop.

Regardless of what institutional mechanism is chosen, governments will retain ultimate authority over any international climatic program, and their ability to guide it will depend largely on the information they use to reach decisions. Although there will always be the need for national initiatives, research, and monitoring programs, any international program ultimately rests on information produced by international cooperation, with broad participation and consensus among experts.

To this end, the President of WFUNA, Maurice Strong, called on the United Nations to:

make a unique and indispensable contribution to achievement of global security . . . by mastering the new tools and techniques of gathering, processing, analyzing and disseminating information which technology now makes possible. By becoming the principal source of credible and timely information on the issues which bear on global security, the UN can provide an important impetus to the political will to deal with these issues as well as one of the most effective tools for managing them.⁶³

I also believe the time has come to look anew at existing proposals for international programs to harness satellite monitoring of planetary resources and processes and to apply new techniques of data analysis to sustainable development.⁶⁴ A convenient starting point for this endeavor would be the 1992 International Space Year, during which new muscle could be given to the UNEP Earthwatch program. This program now embraces the Global

Environmental Monitoring System (GEMS), the Global Resource Information Database (GRID), and other UNEP activities.

With the help of cooperating agencies, UNEP is well placed to assemble the two kinds of information that governments need to carry out an effective global Action Plan: data on physical and other changes under way and their likely impacts; and the information governments need in order to employ the resources of various international institutions and to manage the UN system more effectively. In addition to its Earthwatch activities, UNEP has assembled the System-Wide Medium-Term Environment Program and other joint planning exercises that can help governments make better use of the far-flung UN system of programs and agencies.⁶⁵ Unfortunately, UNEP cannot preserve its current programs, much less live up to its full potential, without stronger support and funding by governments.

The Need for a Complementary "Fast Track"

Even a "Comprehensive Action Plan to Stabilize Global Climate," as modest as the above is clearly not likely to be ready for agreement until 1992 at the earliest. Thereafter, it will take at least several years before concrete actions are taken to reduce critical emissions. Each year of delay increases the global heating commitment, and, coupled with missed opportunities for action in the current decade, a comprehensive action plan in the 1990s may not be soon enough or strong enough. The challenge was summed up by UNEP's Executive Director Dr. Tolba, at the signing of the 1985 Vienna Convention for the Protection of the Ozone Layer: "[T]he essence of the anticipatory response so many environmental issues call for [is] to deal with the threat of the problem before we have to deal with the problem itself."⁶⁶

For example, it has been almost ten years since a WMO study group concluded there was little doubt that rising concentrations of CO₂ in the atmosphere cause global warming. That same year, the US Climate Research Board concluded that "if CO₂ continues to increase, [there is] no reason to doubt that climate changes will result and no reason to believe

that these changes will be negligible. . . . A wait and see policy may mean waiting until it is too late.”⁶⁷ After examining the socio-economic effects of increased CO₂, the Board emphasized that uncertainties in predicting the effects will continue even while intensive research generates more knowledge. They recommended that the main energy-consuming nations “keep open a number of options for energy and not become committed to an extended period of unrestricted fossil-fuel use. . . [to] ensure that options for adaption and prevention remain open.”⁶⁸

Given this urgency, the development of a comprehensive action plan in coming years should be accompanied by specific “fast track” actions that slow the rate at which greenhouse gases are accumulating. These measures should be taken unilaterally by the United States and other industrialized states in the near future, while they simultaneously promote international negotiations on a comprehensive action plan. These prompt actions will slow the accumulation rate of greenhouse gases and demonstrate in good faith that the states most responsible are taking action.⁶⁹ However, these actions should not be taken merely because the major powers have contributed the bulk of the problem, but because it is in their interest, and every state’s interest, that prompt, significant reductions now be made. Just as in the 1960s, when these same states acted to reduce global nuclear fallout and signed agreements to prevent the deployment of new weapons systems, these states alone have the power to take specific steps that can make a significant difference in the rate of planetary heating.

There are already signs of movement in the right direction insofar as *assessment* activities are concerned. Most recently, there is the formation by the US and Soviet Academies of Science of a joint Committee on Global Ecology Concerns. The Committee will investigate threats to the planet’s “ecological security” and present policy recommendations to their governments and international organizations.⁷⁰

More importantly, even before 1990, a number of fast track *management* actions can also be initiated that would contribute to the early stabilization of critical greenhouse gases. Moreover, by

demonstrating industrial countries’ willingness to act, these actions would help lay a basis for an effective, globally supported, comprehensive plan.

Within the context of possible fast track measures, there are a number of actions to slow the accumulation of principal greenhouse gases that are particularly appropriate for the United States to initiate. Three general actions seem pertinent.⁷¹ First, the United States should take the lead in fortifying the Montreal Protocol to take account of current knowledge of climatic change, enlisting the private sector to do this. The power of the private sector was demonstrated by DuPont, the world’s largest producer of CFCs, when it supported the need to tighten the Montreal Protocol by calling for a complete phaseout of CFC production rather than a fifty percent reduction. A March 24, 1988, letter from DuPont’s Chairman of the Board to the Chairmen of the United States Senate and House Committees on Hazardous Wastes announced that because of recent research findings, their goal would be “an orderly transition to the total phaseout of fully halogenated CFC production.” DuPont credited UNEP’s ongoing negotiation process as “the most successful effort by far toward protection of stratospheric ozone” and urged it be supported. “Through the assessment provisions of the Montreal Protocol we believe effective global actions can be taken as necessary.” It also stated that DuPont is “encouraging user industries, policymakers and suppliers worldwide to join us in pursuit of this goal.”

Second, the United States could reduce the rate of heating in ways that achieve other goals, such as greater trade competitiveness through improved energy efficiency and reduction of urban smog and acid rain. For example, as much as nine percent of worldwide CO₂ released—one-third of the US share—comes from US electric utilities. Studies suggest these utilities can benefit from improved energy efficiency because it is often cheaper to *avoid* adding a kilowatt of new capacity than to build one.⁷² To do this, utilities can turn to various “end-use” efficiency techniques, as well as to new combustion technology.

Lastly, the United States can also help slow tropical deforestation (which contributes twenty to

twenty-five percent of total CO₂) by pressing for changes at the World Bank, the UNDP, FAO, and the US/AID program. In addition, it can press for policies in favor of forest protection, conservation of biological diversity, better watershed management, and spreading the practice of agroforestry in ways that also contribute to sustainable development. These projects can both reduce CO₂ release, and—by stimulating vegetation growth—expand the planet's "carbon sink," thereby reducing CO₂ levels.

Looking Ahead

Despite the difficulties of managing under uncertainty, the longer a start on a comprehensive action plan is delayed, the greater the costs. This is not only because of long lead times and reduced options, but also because of mounting difficulties in dealing with other global change issues in an "interrelated" world. The pressures of these complex interrelationships are already destructive for a growing portion of humankind in areas characterized by poverty and collapse of governance; this is not limited to the Third World.

Ever since Stockholm, poverty has been recognized as a root cause of environmental degradation. Today we understand that poverty and environmental degradation are also related to international commodity prices, indebtedness, and other economic issues on the world agenda that are likely to come to a head at international meetings in 1990.⁷³ Recognition that global problems require international cooperation has already led to a resurgence of interest in "multilateralism"; witness changing US attitudes about the roles of international institutions on stratospheric ozone and greenhouse issues. Of course, *global institutions cannot handle all aspects of global problems, and a "supergovernment" is not nearly as useful or achievable as better local government.* But there is no substitute for international cooperation and the wise use of existing international organizations to help governments cope with global change.

Yet, unless the United States and other major powers take unilateral actions to reduce their own CO₂ emissions, no "comprehensive" approach is likely to be agreed upon that can deal with climatic

change or other dimensions of global change. Even with the best of international goodwill, projected levels of human suffering from lack of food, water, shelter, and jobs will demand priority attention by more and more states. Without interfering in any way with the development of a comprehensive approach, many critical, intervening steps can be taken unilaterally by the United States or cooperatively working in restricted forums such as OECD and ECE. Such a setting for action may feel more "comfortable" for the industrialized states than does the United Nations with its larger membership.

"Unless the United States and other major powers take unilateral actions, no 'comprehensive' approach is likely to be agreed upon."

Firm commitments of financial support for actions agreed upon for such an undertaking can and should be recorded at the 1992 UN Conference on Environment and Development, even if a formal convention is not yet ready for signing. Ironically, a "Comprehensive Action Plan to Stabilize Global Climate" can succeed in the 1990s only if it is modest and does not purport to resolve *all* issues. Otherwise, persistent uncertainty may stall it indefinitely. Nevertheless, the need is for a dynamic process in which management actions are linked to research activities such as the International Geosphere-Biosphere Program that will be getting under way in the 1990s.

The focus of this paper on stabilizing the greenhouse effect, itself a complex and far-reaching problem, underscores the difficulty of launching a comprehensive action plan to tackle all aspects of global change. We lack a full understanding even of the "hard science" aspects of global change, not to mention the causal links with human activities. But if we succeed in the next thirty years in stabilizing atmospheric heat so as to keep the temperature tolerable late in the next century, the human race will be better prepared to face a host of other global change issues. Experience gained in dealing with atmospheric issues will help us to cope with the

larger challenge of switching over to a “sustainable development” path in which we exploit natural resources and systems without destroying them—living off our natural income instead of eating up capital.

Concern with climatic change must not blind us to other aspects of global change. As Professor Edward O. Wilson of Harvard University asserts:

The worst thing that can happen during the 1980s is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired within a few generations. The one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by destruction of natural habitats. This is the folly that our descendants are least likely to forgive us.⁷⁴

But first we must succeed with stabilizing the climate. If we do not, the rest may not matter.

References and Notes

1. The emphasis in this paper on *preventive* steps to slow and reduce atmospheric heating should not distract us from taking adaptive steps now to prepare for higher temperatures to which we are already committed. For example, sea-level rise may be a threat for much of the world's population living in coastal areas, and better coastal management should be practiced now.
2. For example, switching over to nuclear energy now will sharply reduce CO₂ emissions, but nuclear energy poses other significant dangers.
3. The way in which we have dealt with acid rain is an example of this problem.
4. Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, T.I.A.S. No. 4780, 402 U.N.T.S. 71, reprinted in 19 I.L.M. 860 (1980); Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, Aug. 5, 1963, 480 U.N.T.S. 43 [hereinafter Partial Test Ban Treaty]; Outer Space Treaty, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205; Treaty for Prohibition of Nuclear Weapons in Latin America, Apr. 2, 1967, 634 U.N.T.S. 281; Treaty on the Non-Proliferation of Nuclear Weapons, Jan 7, 1968, 729 U.N.T.S. 161; Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea Bed and the Ocean Floor and in the Subsoil Thereof, Nov. 2, 1971, reprinted in 10 I.L.M. 145 (1971).
5. UNSCEAR was recently commended by the UN General Assembly for its thirty-three-year contribution “to wider knowledge and understanding of the levels, effects and risks of atomic radiation and for fulfilling its original mandate with scientific authority and independence of judgment.” G.A. Res. 43/55, 1 U.N. GAOR Supp. (No. 49) at 135, U.N. Doc. A/43/49 (1988).
6. The Partial Test Ban Treaty, *supra* note 3, was signed by more than 100 states, including all major powers except China and France. It prohibited the testing of nuclear weapons in the atmosphere, in outer space, and under water. For statistical information, see RADIATION: DOSES, EFFECTS, RISKS 43, 50 (Tables 4.1 and 4.7), U.N. Doc. UNEP(02)/R2, U.N. Sales No. E.86.III.D.4 (1985).
7. The 1972 UN Conference on the Human Environment was, essentially, the first comprehensive attempt to respond to global environmental degradation. Over 130 nations met in Stockholm, Sweden, beginning June 5, 1972. The basic goal was to harmonize development and environmental objectives. The Conference, and preparations for it, succeeded in stimulating environmental thought and action throughout the world, and paved the way for future international environmental activity. See Stockholm Declaration on the Human Environment, June 16, 1972, U.N. Doc. A/CONF.48/14 & Corr. 1 (1973), reprinted in 11 I.L.M. 1416 (1972) [hereinafter Stockholm Declaration].
8. Thacher, *Arms Control and Outer Space in the United Nations*, INTERNATIONAL COOPERATION IN

OUTER SPACE, A SYMPOSIUM, Library of Congress, Doc. No. 92-57 (1971).

9. "Standard-setting" involves developing international standards or procedures for conducting activities that pose significant risks to the world environment. "Soft laws" are instruments that are not mandatory or binding but formulate international environmental values and principles, thereby establishing a foundation for the creation of international "hard laws" (e.g., treaties). *See generally* Contini & Sand, *Methods to Expedite Environment Protection: International Ecostandards*, 66 AM. J. INT'L L. 37 (1972).
10. *See id.* at 39, n. 12 (citing UNITAR study, Wider Acceptance of Multilateral Treaties). *See also* Serwer, *International Cooperation for Pollution Control*, UNITAR Research Rep. No. 9, *reprinted in* LAW, INSTITUTIONS, AND THE GLOBAL ENVIRONMENT 178-236 (J.L. Hargrove ed. 1972) (reflecting Serwer's inputs into the Stockholm preparatory process).
11. Fifty-five countries negotiated the Montreal Protocol in September 1987. Among other things, the Protocol calls for a 50 percent reduction in the consumption of CFCs by 1999, and a 20 percent reduction by 1994. Montreal Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, *reprinted in* 26 I.L.M. 1550 (1987) [hereinafter Montreal Protocol]. The Vienna Convention was the convention under which the Montreal Protocol was negotiated. Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, *reprinted in* 26 I.L.M. 1516 (1987) [hereinafter Vienna Convention].
12. These are the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973, REGISTER OF INTERNATIONAL TREATIES AND OTHER AGREEMENTS IN THE FIELD OF THE ENVIRONMENT, U.N. Doc. UNEP/GC.15/Inf.2 at 117 (1989) [hereinafter UN REGISTER]; the Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, T.I.A.S. (No. 10541), *reprinted in* 18 I.L.M. 1442 (1979); the 1985 Helsinki Protocol to the Convention on the Reduction of Sulphur Emissions or Their Transboundary Fluxes by at Least 30 Percent, *id.* at 179; and the 1988 Sophia Protocol Concerning the Control of Emission of Nitrogen Oxides or Their Transboundary Fluxes. *See generally id.* (provides a list of 140 conventions and protocols signed since 1972).
13. A possible exception arose during UN General Assembly consideration of the Draft Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space in December 1963, when the representatives of the US and USSR stated that if this text were adopted without dissent, their governments would consider that the principles in the operative part of the declaration "reflected international law as accepted by the members of the United Nations" and, accordingly, would abide by them. In this they were joined by others, notably the UK and Canada. The Declaration was adopted unanimously by the Assembly on Dec. 13, 1963. 1 U.N. GAOR Supp. (No. 15) at 15, U.N. Doc. 1962 (XVIII) (1964).
14. In my view, the adoption of nonbinding general principles offers a way around Anglo-Saxon rejection of theory in favor of practice when it becomes necessary to act on logic, *without* the test of experience. It is difficult to use law to reduce the threat of nuclear war, or of climatic heating, if we are limited to Justice Holmes's dictum: "The life of the law is not logic but experience." O. HOLMES, THE COMMON LAW 1 (1896).
15. The 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, Dec. 13, 1963, and the 1970 Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Beyond the Limits of National Jurisdiction, Dec. 17, 1970, were adopted unanimously by the UN General Assembly. *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, INTERNATIONAL COOPERATION IN OUTER SPACE, A SYMPOSIUM 653 (1971). *See also* Declaration of Principles Governing the Sea-Bed and Ocean Floor, and the Subsoil Thereof, Beyond the Limits of National Jurisdiction, G.A. Res. 2749,

- 1 U.N. GAOR Supp. (No. 28) at 122, U.N. Doc. A/8028 (1970) [hereinafter 1970 Declaration].
16. The 1967 Maltese Proposal that the seabeds be declared “the common heritage of mankind” led to the 1970 Declaration, *supra* note 15, by the UN General Assembly and the convening of the Third Law of the Sea Conference in 1973. See Draft Ocean and Space Treaty: Working Paper Submitted by Malta (1967), New Directions in the Law of the Sea (R. Churchill, K. Simmonds & J. Welch eds. 1973). In 1982, the United Nations Convention on the Law of the Sea (UNCLOS) was adopted in Montego Bay, Jamaica. Its objective is to set up a comprehensive new legal regime for the sea and oceans, and to establish environmental standards and enforcement provisions that deal with pollution of the marine environment. This Convention is not yet in force, but many of its provisions are viewed as rising to the level of customary international law. The United States has not signed the Convention, but the vast majority of States have. United Nations Convention on the Law of the Sea, Oct. 21, 1982, U.N. Doc. A/CONF.62/122(1981), reprinted in 21 I.L.M. 1261 (1982) (*opened for signature*, Dec. 10, 1982).
 17. The Stockholm principles were updated ten years later in the Nairobi Declaration of Principles of 1982. See G.A. Res. 36/192, 1 U.N. GAOR Supp. (No. 51) at 124, U.N. Doc. A/36/51 (1983). Also endorsed in the Stockholm Action Plan were 21 “General Principles for Assessment and Control of Marine Pollution.” These principles were intended to be guiding concepts for future conferences, including the then-pending UN Conference on the Law of the Sea. Stockholm Declaration, *supra* note 7.
 18. Some would suggest these principles were approaching the status of “general principles of law recognized by civilized nations”—one of four factors to be applied by the International Court of Justice. Statute of the International Court of Justice, art. 38, 59 Stat. 1055, T.S. 993, 3 Bevens 1179 (1947).
 19. Stockholm Principle 21 states that countries have “the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.” In 1979 the UN General Assembly requested all states to use a set of 15 principles developed by UNEP working groups for the “Conservation and Harmonious Utilization of Natural Resources Shared by Two or More States” as guidelines in the formulation of bilateral or multilateral conventions. G.A. Res. 33/87, 1 U.N. GAOR Supp. (No. 45) at 87, U.N. Doc. A/33/45 (1979).
 20. See, e.g., the 1981 Geneva Guidelines on Off-Shore Mining, and the 1985 Montreal Guidelines for the Protection of the Marine Environment against Pollution from Land-Based Sources, which states and international organizations are encouraged to take into account when developing bilateral, regional, and, as appropriate, global agreements in these fields. UN REGISTER, *supra* note 12, at 130.
 21. The actual Action Plan that governments approved at Stockholm, and subsequently in the General Assembly, is a listing of the numbered recommendations that had been dealt with sectorally, by subject area, and redistributed according to function into the three components: the global environmental assessment program (Earthwatch); environmental management activities; and supporting measures. The Framework for Environmental Action, on which this was based, is described in Stockholm Declaration, *supra* note 7, at 6.
 22. The evaluation report of the American Society of International Law (ASIL) drew on a similar analytical framework involving five functions corresponding to “assessment” (problem identification, monitoring and evaluation, data-gathering and information collection, risk estimation and impact assessment, and information exchange and dissemination); and three functions relevant to “management” (normative pronouncements, standard-setting and rule-making, and supervision of norms, standards,

- and rules). None, however, explicitly addressed "support" functions per se. See ENVIRONMENTAL PROTECTION: THE INTERNATIONAL DIMENSION (D. Day & H. Jacobson eds. 1983), especially Boxer, *The Mediterranean Sea* in *id.*
23. UNEP's proposed "comprehensive" approach to pollution control as part of a wider commitment to management of the marine and coastal environment was adopted by the states bordering the Mediterranean, except Albania, in Barcelona in February 1975. For an early evaluation of this action plan, see Boxer, *supra* note 22.
 24. For the single most complete publication on this collection, see generally P. SANDS, MARINE ENVIRONMENTAL LAW (1988).
 25. For a review of the early development of this action, and the importance of "process," see Thacher, *The Mediterranean Action Plan*, 6 AMBIO 308 (1977).
 26. Convention for the Protection of the Mediterranean Sea Against Pollution, and Protocols, Feb. 16, 1976, *reprinted in* 15 I.L.M. 290 (1976).
 27. For an example relevant to greenhouse issues, see *Implications of Climatic Changes in the Wider Caribbean Region*, U.N. Doc. UNEP(OCA/CAR WG.1/Inf.3 (based on an expert meeting under UNEP's Caribbean Environment Program in Mexico City, Sept. 7-9, 1988). Another meeting, in Split, Yugoslavia, in October 1988 brought together coordinators of teams working on this topic from the Caribbean, Mediterranean, Southeast Pacific, South Pacific, East Asian Seas, and South Asian Sea regions.
 28. Addressing UNEP's first Governing Council meeting, Maurice Strong cited "the carbon dioxide content of the atmosphere, the ozone content of the stratosphere, and the health of the oceans" as possible "outer limits" that, if exceeded, "may endanger the continuance of human life on this planet." Statement by Maurice Strong, Executive Director UNEP to UNEP's first Governing Council, June 1973, Nairobi, Kenya. "Risks to the ozone layer" was an approved budget item by 1975 under which a UNEP strategy was submitted to a World Meteorological Organization (WMO) working group in 1976. A US proposal to the Governing Council that year opened the door to the March 1977 UNEP Meeting of Experts that adopted the World Plan of Action on the Ozone Layer. For papers and results of that meeting, see THE OZONE LAYER (A. Biswas ed. 1979).
 29. OECD's Environment Committee was then collecting data on CFC production and use in Western industrialized countries while UNEP sought similar data from non-OECD countries; at the time this was a key gap in knowledge and an obstacle to risk assessment.
 30. The 1977 Action Plan urged that the total-ozone station at Halley Bay be reactivated to provide a backup to the Amundsen-Scott station at the South Pole. G.A. Res. 33/87, 1 U.N. GAOR Supp. (No. 45) at 6, U.N. Doc. A/33/45 (1979).
 31. UNEP G.C. Decision 8/7, U.N. Doc. UNEP/GC. 8/10, at 135 (1980).
 32. The Vienna Convention entered into force Sept. 22, 1988. As of Nov. 9, 1988, a total of thirty-five states, as well as the EEC, were contracting parties. As of November 10, 1988, a total of forty-five countries as well as EEC had signed the Montreal Protocol, while sixteen had either ratified, acceded to, or accepted it. Vienna Convention, *supra* note 11.
 33. *Id.*
 34. Many excellent papers have been written on the negotiating process at Vienna and Montreal. For the first and best overview written by an insider, see SAND, PROTECTING THE OZONE LAYER: THE VIENNA CONVENTION IS ADOPTED, 27 ENV'T 18 (1985).
 35. For an early, authoritative look at this process, see R. Benedick, CONSERVATION FOUNDATION LETTER (Nov. 1987).
 36. For an early example of scientific involvement in the field of environment, see S. KUWABARA, THE

LEGAL REGIME OF THE PROTECTION OF THE MEDITERRANEAN AGAINST POLLUTION FROM LAND-BASED SOURCES (1984).

37. Despite governmental resistance, UNEP brought the International Chamber of Commerce and various associations of chemical manufacturers, as well as ICSU/SCOPE, into the 1977 Action Plan to Protect Stratospheric Ozone. Not only did they play supporting roles throughout the assessment process—with memberships in the CCOL—but when, a decade later, the time came for management action, some chemical corporations strongly supported governments negotiating the Montreal Protocol.
38. For an early description of how consumerist lifestyles of the affluent temperate zones contribute to the destruction of forests in the tropics, see N. MYERS, *THE PRIMARY SOURCE: TROPICAL FORESTS AND OUR FUTURE* (1984).
39. Linden, *The Death of Birth*, TIME, Jan. 2, 1989, at 34.
40. See J. MACKENZIE, *BREATHING EASIER: TAKING ACTION ON CLIMATE CHANGE, AIR POLLUTION, AND ENERGY INSECURITY* (World Resources Inst. ed. 1989).
41. The planet is passing through a period of dramatic growth and fundamental change. Our human world of 5 billion must make room in a finite environment for another human world. The population could stabilize at between 8 billion and 14 billion sometime next century, according to UN projections. More than 90 percent of the increase will occur in the poorest countries, and 90 percent of that growth in already bursting cities. Economic activity has multiplied to create a \$13 trillion world economy, and this could grow five- or tenfold in the coming half-century. Industrial production has grown more than fiftyfold over the past century, four-fifths of this growth since 1950.
42. Member states of the OECD include Australia, Austria, Belgium, Canada, Denmark, France, the Federal Republic of Germany, Finland, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. The Socialist Republic of Yugoslavia takes part in certain work of the OECD. CMEA is a council formed of Soviet bloc countries.
43. An opportunity for this collaboration now lies in the Intergovernmental Panel on Climate Change (IPCC) that was set up by the governing bodies of UNEP and the WMO last year. The first meeting of the IPCC was convened in Geneva in Nov. 1988, and a work plan has been adopted with three working groups on scientific assessment, impacts, and policy response. Work began in London, Moscow, and Washington, D.C. in early 1989.
44. G.A. Resolution 43/196 calls for a UN Conference on Environment and Development in 1992, with scope and objectives to be recommended after governmental views have been ascertained. G.A. Res. 43/196, 1 U.N. GAOR Supp. (No. 49) at 147, 148, U.N. Doc. A/43/49 (1988). The General Assembly is expected to reach a final decision on this at its session in the fall of 1989.
45. G.A. Res. 43/53, 1 U.N. GAOR Supp. (No. 49) at 133, U.N. Doc. A/43/49 (1988).
46. *Id.*
47. The WMO organized the World Climate Programme in 1978 to gather data about the climate and to monitor it.
48. *Supra* note 45.
49. Conference Statement, *The Convention on the Regulation of Antarctic Mineral Resource Activities*, Wellington, New Zealand, 1988. UN REGISTER, *supra* note 12, at 248.
50. For a review of how future generations have been recognized in the Stockholm Principles and

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, *OUR COMMON FUTURE* 4 (1987) [hereinafter *OUR COMMON FUTURE*].

- subsequent treaties, see Thacher, *Serving Future Generations*, in *THE FUTURE OF THE INTERNATIONAL LAW OF THE ENVIRONMENT* 451 (R. Dupuy ed. 1985).
51. See E.B. Weiss, *The Planetary Trust: Conservation and Intergenerational Equity*, 11 *ECOLOGY* L.Q. 495 (1984).
52. Montreal Protocol, *supra* note 11.
53. Earthwatch is the environmental assessment branch of UNEP.
54. Draft Resolution L.25/Rev. 2, cosponsored by Czechoslovakia and the Ukraine, calls for a consolidated report in time for the 1992 Conference on Environment and Development on the means to alert the international community against imminent environmental dangers, drawing on the work of UNEP's Earthwatch. U.N. Doc. L.25/Rev. 2 (1988). On December 20, 1988, the UN General Assembly decided to defer consideration of this to its Fall 1989 session. One year later, December 22, 1989, the UN General Assembly adopted the Resolution without a vote. 1 U.N. GAOR (Supp. No. 56), U.N. Doc. 441228 (1989).
55. For the full text of the principles, see *LEGAL PRINCIPLES FOR ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT* (Dordrecht ed., forthcoming, Martinus Nijhoff Publishers, the Netherlands). See generally *OUR COMMON FUTURE*, *supra* note 41.
56. For a similar proposal, see *AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY, ENERGY EFFICIENCY: A NEW AGENDA* (1988). The Toronto Conference suggested as targets for 2005 a 10 percent energy efficiency and 10 percent energy supply improvement. *Conference Statement, The Changing Atmosphere: Implications for Global Security*, Toronto, Ontario, Canada (June 27-30, 1988) [hereinafter *Conference Statement on the Changing Atmosphere*]. For a listing of countries in terms of energy intensity and consumption by economic sector, see *WORLD RESOURCES 1988-1989*, at 120 (1989) (Table 7.3).
57. Another body with limited membership that played an active role in the early 1970s was NATO's Committee on the Challenges of a Modern Society (CCMS). The Moscow-based CMEA was approached by UNEP during this period, but was limited by its member governments to minor roles outside their territory. Under current conditions, one may hope CMEA will enjoy greater autonomy and flexibility and become more effective, along the lines of OECD.
58. This kind of support is commonly thought of in terms of the developing countries, but as was experienced in the Mediterranean and the European Monitoring and Evaluation Program (EMEP), even "developed" countries need help to improve data quality, comparability, and information exchange. In any case, intercalibration exercises conducted by international organizations have been found to be more productive and durable than those left to national institutions.
59. For instance, for both economic and physical reasons, Bangladesh is more vulnerable to sea-level rise impacts than is New Orleans.
60. Many international programs related to global change were proposed by the United States during a period when it saw its national interests being advanced by cooperative, international programs. These included, among many others, the World Weather Watch, the Global Atmospheric Research Program, the International Decade of Ocean Exploration, and the International Geosphere-Biosphere Programme, as well as UNEP and its voluntary fund.
61. Statement by WFUNA President Maurice F. Strong at Halifax, Nova Scotia (June 5, 1988) (Strong was Secretary-General of the 1972 Stockholm Conference and UNEP's first Executive Director).
62. *Conference Statement on the Changing Atmosphere*, *supra* note 56.
63. *Supra* note 61.
64. For a recent review, see J. Elkington and J. Shopley, *The Shrinking Planet: US Information*

- Technology and Sustainable Development (World Resources Inst. Paper, No. 3, 1988).
65. In its December 1988 resolution on climate, the UN General Assembly singled out all activities in support of the World Climate Programme and “elaborated in the system-wide medium-term environment program for the period 1990–1995” to be accorded high priority by all parts of the UN system. G.A. Res. 43/55, *supra* note 5.
66. Statement by Dr. Tolba, Executive Director of United Nations Environment Programme, at the signing of the 1985 Vienna Convention.
67. See NATIONAL ACADEMY OF SCIENCES STUDY, CO₂ AND CLIMATE: A SCIENTIFIC ASSESSMENT (1979). The Working Group on Atmospheric CO₂ of WMO’s Commission for Atmospheric Sciences met in Boulder, Colorado, November 1–7, 1979.
68. 11th Annual Report of the Council on Environmental Quality (1980).
69. A comparable “fast track” approach was first employed during preparations for the 1972 Stockholm Conference on the Human Environment when, under what were then termed “Level III activities,” the London Ocean Dumping Convention was negotiated at meetings in 1971 and 1972 in London, Ottawa, and Reyjavik. At Stockholm, governments called on the UK to convene a conference to adopt the Convention before the end of 1972. The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter was signed on December 29, 1972, in London and entered into effect in 1975. See Stockholm Declaration, *supra* note 7.
70. N.Y. Times, Dec. 14, 1988, at 6, col. 1 (late city final ed.).
71. See generally I. MINTZER, A MATTER OF DEGREES: THE POTENTIAL FOR CONTROLLING THE GREENHOUSE EFFECT (1987). See also MACKENZIE, *supra* note 40; CONSERVATION FOUNDATION LETTER, *supra* note 35.
72. See Mintzer, *Weathering the Storms in a Warming World*, PUB POER (Dec. 1988). See also WORLD RESOURCES 1988–1989, *supra* note 56, at 122 (comparing the results of conservation incentives in California and Texas).
73. In December 1988 the UN General Assembly decided to call for a Special Session on “revitalization of economic growth and development in the developing countries” early in 1990, with terms of reference yet to be decided. G.A. Res. 43/443, 1 U.N. GAOR Supp. (No. 49) at 316-317, U.N. Doc. No. A/43/49 (1988). The strategy for the Development Decade of the 1990s must also be set in 1990.
74. E. Wilson, HARV. MAG. (Jan.–Feb. 1980), quoted in P. EHRLICH & A. EHRLICH, EXTINCTION 1 (1981).

Peter S. Thacher is Senior Counselor, World Resources Institute, Washington, D.C. Formerly, he was Deputy Executive Director of the United Nations Environment Programme and Assistant Secretary-General of the United Nations. This article is reprinted, by permission, from *Colorado Journal of International Environmental Law and Policy* 1(1):101–126 (1990). It was adapted from a paper and remarks presented at the Doman Colloquium on Global Change and International Law: The “Greenhouse Effect,” University of Colorado School of Law, Boulder, Feb. 1–2, 1989.

Managing the Transition to a Global Warming Regime or What to Do til the Treaty Comes

Abram Chayes

No matter how the current debate on international action to curb global warming is resolved, it will be years, perhaps decades, before agreed limitations on greenhouse gas emissions are legally in effect.

At present, planning for international action on global warming calls for a "framework agreement" containing a general undertaking to cooperate in the control of greenhouse gas emissions, to be concluded at or before the 1992 U.N. Conference on Environment and Development in Brazil. More specific limitations would await the emergence of scientific and political consensus and would be embodied in supplementary agreements, or "protocols," subject to separate ratification. The model is the successful experience with the Vienna Convention for the Protection of the Ozone Layer, a "framework agreement" signed in 1985, which was quickly followed by the Montreal protocol in 1987, mandating 50 percent cuts in chlorofluorocarbon (CFC) usage from a 1986 base by 1998, and revised at London in 1990 to call for complete elimination of CFCs by 2000. The U.N. General Assembly, the Intergovernmental Panel on Climate Change (IPCC),

and the Economic Declaration from the Houston summit in July 1990 all endorse the same procedure for greenhouse gases.

Skolnikoff has argued that in pursuing this approach, the international community is making a virtue of necessity.¹ In this view, the absence of scientific consensus on global warming issues, together with the high near-term direct costs of steps to limit greenhouse gas emissions, means that powerful affected interests will be able to thwart agreement on substantive action. Enough constituencies would generate enough pressure to forestall U.S. adherence to any treaty containing quantitative emissions limits.

Other observers believe that the high political visibility and influence of the environmental movement in the United States and elsewhere, combined with the momentum building to the 1992 conference, will produce agreement on specific quantitative limitations for greenhouse gas emissions by 1992. Even so, such a treaty will undoubtedly provide for a phase-in period as well as exceptions for disadvantaged countries. The latest revision of the Montreal

protocol contemplates 10 years for eliminating CFC production, with an additional 10-year grace period for developing countries.

Thus, whether the 1992 conference adopts a "framework agreement" to be followed by specific protocols or a quantitative emission limit after a phase-in period, an interim of long duration will pass before quantitative obligations are fully in force. This period should not be wasted. By the time scientific certainty is achieved, many of the adverse consequences of global warming may well be irreversible. It is important, therefore, to get a start on reducing emissions even before agreed quantitative limits are operative. Moreover, machinery to secure compliance with such a regime will not spring into existence full-blown. Waiting until the agreed limits come into force before beginning to put in place the implementation machinery will add additional years to the period before the limits become effective.

"An interim of long duration will pass before quantitative obligations are fully in force. This period should not be wasted."

Despite environmentalist demands for an agreement "with teeth," it is unlikely that a global warming treaty will deploy serious coercive sanctions. Likewise, the indications to date are that the developed countries will not provide large financial incentives for limiting emissions, at least not initially. Compliance machinery will have to be modeled on that used in other international regimes—the General Agreement on Tariffs and Trade (GATT), the International Monetary Fund (IMF), the U.N. Human Rights Commission, and the International Labour Organisation, among others. These organizations rely primarily on systematic reporting, consultation, and surveillance, administered by a permanent professional staff. The record of compliance in these regimes falls well below 100 per cent. They vary in professionalism and effectiveness. Nevertheless, the evidence is that processes of reporting, publicity, and persuasion can significantly influence state behavior. They operate to create and intensify a community of expectations that states do not lightly disappoint.

"Compliance machinery will have to be modeled on that used in GATT, the IMF, the UN Human Rights Commission, and the ILO, among others."

Thus it may be that the most important and practical task of the 1992 conference is to design and initiate a transition to a regime of agreed limitations on greenhouse gas emissions, if that should become necessary, by adapting the body of experience gained in other international regulatory activities to the requirements of such a regime. The transitional arrangements would have two principal objectives:

1. initial steps to reduce emissions and to begin the necessary economic, social, and cultural adjustments that will be required in a system of quantitative limitations and
2. planning and gearing up the international institutional base for an effective compliance process that commands the confidence of the parties.

* * * * *

No existing international institutional machinery has the capability of securing compliance with treaty limitations on greenhouse gas emissions. The principal U.N. entity in the field is the United Nations Environment Programme (UNEP), headquartered in Nairobi. In addition to its other duties, it provides "secretariat services" under 14 environmental agreements, including the ozone convention, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, the Mediterranean Action Plan, and the Convention on International Trade in Endangered Species.

UNEP has provided invaluable leadership for international environmental cooperation and was the catalyst for the Vienna convention and other important initiatives. But it is not a U.N. "agency." Its total annual budget is \$30 million provided by voluntary contributions of member states (although members of each treaty organization make voluntary

contributions of additional funds to defray some of the secretariat services). UNEP has no supervisory powers, no authority to interpret the agreements, no mechanism for settling disputes that may arise under them. Its function is limited essentially to the provision of administrative and housekeeping services, and even these duties stretch its resources to the limit.

Nor do the recent environmental treaties themselves supply much in the way of institutional sinew. Characteristically, the only decision-making body is a plenary conference of the parties meeting for a week or so once or twice a year. The structure of the conferences and the state of the agenda are such that they can deal only with the most urgent policy issues. Questions of implementation are neglected. The Montreal protocol dealing with reductions in CFC production provides that at their first meeting, the parties "shall consider and approve procedures and institutional mechanisms for determining non-compliance . . . and for treatment of Parties found to be in non-compliance" (Article 8). But the conference has yet to address this task.

* * * * *

"A transitional arrangement could draw on the early history of the IMF."

A transitional arrangement for greenhouse gas emissions could draw on the analogy of the early history of the IMF. The fund agreement, concluded in 1945, contemplated a system of convertible currencies. Article VIII prohibited exchange controls limiting convertibility of currency for current international payments except with the approval of the fund. Although it seemed important to get the treaty regime up and running promptly, war-ravaged states were understandably unwilling to accept this limitation. The solution was to provide for a "postwar transitional period" in which members, simply by notifying the fund of their intention to do so, could "maintain" restrictions otherwise forbidden by the agreement (Article XIV). A member taking advantage of Article XIV was obligated to report its exchange restrictions to the fund and, after a five-year grace

period, to consult annually with the fund about further retention of any such restrictions.

In addition to the United States, only the unlikely quartet of El Salvador, Guatemala, Mexico, and Panama accepted the convertibility obligations in full from the beginning. All the other members availed themselves of the Article XIV "opt-out" provision. Most European states continued in the "postwar transitional period" until the end of the 1950s. Japan, in 1964, was the last of the major industrial states to accept the convertibility obligations. Most developing countries still remain under Article XIV, and in recognition of this fact, the 1974 amendments to the fund agreement changed the title of the article from "Transitional Period" to "Transitional Arrangements."

"The requirement of providing annual justification for maintaining the restrictions has generated continuous pressure to reduce or eliminate them."

A "transitional period" that extends indefinitely may be thought to show the futility of the whole effort to impose international standards. But the requirement of providing annual justification for maintaining the restrictions has in fact generated continuous pressure to reduce or eliminate them. The establishment of the European Payments Union in 1950, an early result of this pressure, was the first major step on the way back to full convertibility for Western Europe. Relying on earlier decisions as precedents, the consultation process gave rise to a one-way ratchet rule, under which once an Article XIV country eliminated a particular restriction, it was not free to restore it without the approval of the fund. The overall level of exchange restrictions maintained under the authority of Article XIV has steadily declined, and today many members still nominally under transitional arrangements have eliminated most or all of their exchange controls on current transfers.

In sum, reporting and consultation under transitional arrangements gave the fund a foot in the

door, an opportunity to promote the basic substantive objectives of the IMF. Furthermore, these processes provided the prototype for the fund's procedures for ensuring compliance with conditions imposed on members' drawings and stand-by arrangements and for surveillance of exchange-rate practices.

* * * * *

A transitional arrangement established under a framework agreement on greenhouse gases could be built around a similar reporting and consultation procedure. It would operate in substantially the same way whether the basic treaty takes the form of a "framework agreement" to be followed by specific protocols or of quantitative limits to take effect after a phase-in period. In either case, the parties would be required to submit a detailed report annually (a) on their emissions of specified greenhouse gases and (b) on the policies and programs they were carrying out in fulfillment of their obligations under the treaty. A country report would include specific emissions targets and commitments with respect to contemplated administrative or legislative actions. The activities that contribute to global warming vary drastically from one country to the next. Likewise, a wide range of responses may be appropriate. Thus an important advantage of the procedure is that through the country reports each party to the agreement could develop and submit for review a customized package of responses, tailor-made to its own circumstances.

If the basic treaty provided for a phase-in period to a quantitative limitation, the report would explain how the policies and programs indicated were reasonably adapted to meet the ceiling in the period provided. Under the "framework agreement" approach, because there would be no international consensus on specific ceilings, the reporting country would not be expected to show efforts to achieve any particular quantitative reduction. But it would be required to explain why the actions it was pursuing and the voluntary targets it established were sufficient, under all the circumstances, to satisfy the general undertaking to cooperate in reducing emissions.

A staff of international experts would be established to analyze the reports and conduct the consultations. It would be small at the outset, expanding

as it gained experience and expertise and as the substantive obligations of the regime intensified. It could be organized as a free-standing entity. But it would be better to attach it to UNEP. Strengthening that organization has already been accepted as an important objective of the 1992 conference.

The experts would first subject the report to intensive review to test its representations as to emissions levels against other available information and to appraise whether the constellation of policies represented a good-faith effort to comply with the treaty obligation, given the political and economic context in the country involved. It would seek to identify additional efforts when the costs might be justified on the basis of near-term benefits, such as gains in energy efficiency or the reduction of urban pollution.

Thereafter, members of the staff would meet with representatives of the country concerned to carry out a detailed review of the staff analysis. This consultation process should not be adversarial or confrontative; its purpose should not be to detect "violations." The focus would be on whether the country's overall effort was consistent with its capacities. A major element would be technical advice and assistance to the parties in identifying, designing, and implementing measures to limit emissions, including voluntary emissions targets where appropriate.

Because the reporting and consultation procedure is not a legal "enforcement" process for detecting and correcting "violations" of the treaty, it would tend to become, to a considerable extent, a negotiation about what would constitute a satisfactory policy effort. This evolution has been the experience of other international regimes such as the GATT, IMF, and even arms control. Often the consultation would result in agreement between the staff experts and the reporting country on a set of targets and measures. These agreements would be embodied in a final staff report. In the absence of agreement, the staff would be free to include its views as to deficiencies in the reporting country's programs.

Subsequent consultations would tend to focus on the extent to which the country had fulfilled its

agreements or corrected the deficiencies. They would explore the reasons for any shortfalls and consider amendments or supplementary measures that might be justified by changes in the technical or economic setting. Repeated consultations would therefore tend to refine and elaborate the reporting country's agreed targets and policy commitments.

* * * * *

Of course, the parallel between the IMF and the global warming problem is not exact. The most important difference is that the fund disposes of resources, and members that may have need of these resources have a large incentive to remain in its good graces. The fund is considerably more successful in imposing austerity measures on such supplicants than in affecting interest rates or budgetary deficits in, say, the United States.

"The consultation reports would become an important part of the context in which international financial institutions make their loan decisions."

On the other hand, although massive funding seems unlikely, at least in the near term, the international effort on global warming would not be totally without material incentives. In the CFC case, an international fund of \$240 million is to be made available for easing the transition of developing countries to substitute technologies. It seems more than likely that at least some such funding will be provided for reduction of greenhouse gases. Access to these monies could be conditioned on a favorable outcome of the annual consultation. Moreover, international financial institutions like the World Bank and the regional development banks are already putting increasing emphasis on the environmental considerations in evaluating loan applications. The consultation reports would become an important part of the context in which these institutions make their loan decisions. Foreign assistance programs of individual countries would also be likely to take account of the consultation reports.

As against the richer countries, the international global warming staff would have one instrument that the IMF has denied itself—publicity. Because of the sensitivity of markets to information about monetary policies, the fund has pursued a policy of almost obsessive confidentiality.

Staff reports on consultations under an agreement on greenhouse gas emissions, however, should be made public as a matter of course. Unlike classical international legal obligations, an environmental agreement is designed not just to regulate the international behavior of member states but also to affect their domestic policies. Changes in *domestic* policies are accomplished through domestic politics, popular or bureaucratic. Implementation of international ceilings therefore requires the activation of the domestic political processes of the member states.

Developments in the field of international human rights illustrate the efficacy of reporting and publicity, not just by precipitating condemnation by "world public opinion" but by mobilizing effective domestic political action, even against totalitarian governments. On the domestic plane, environmental impact assessments mandated by the National Environmental Policy Act (NEPA) have provided the basis for political action against unsound projects. The reports of the international staff on global warming consultations could play a similar role. Environmental organizations, both national and international, are increasingly well positioned to use the consultation reports to secure action by domestic administrators and lawmakers.

* * * * *

The transitional reporting and consultation process would not only begin to prepare the treaty parties to accept stringent limitations on emissions, should that become necessary, but will strengthen the international capacity to secure compliance with such limits in a number of ways:

1. *A start on the collection of detailed statistical series on global emissions.* It is of utmost importance to begin assembling a reliable and generally accepted data base on greenhouse gas emissions. Although objections to on-site inspection have

moderated in recent arms control negotiations, it still seems unlikely that schemes for continuous, comprehensive physical monitoring of emissions by international agencies will soon be realized. In the beginning, at least, the accumulation of data will have to rely on national reporting, subject to rigorous analysis and critique by outside agencies, public and private. The consultation process would make a start on this task.

Again there is a model in the IMF experience. The fund agreement contains a list of financial data on which each member is obligated to report regularly to the fund. On the basis of these reports, the fund, from the outset, has published a detailed compilation of "International Financial Statistics." It now appears monthly and has become an invaluable source of international economic and financial information, not only for the operations of the fund but for national governments and private parties.

Obviously, self-reported data cannot automatically be accepted as reliable. Indeed, the IMF agreement takes into consideration "the varying ability of members to furnish information" and requires only that it be provided "in as detailed and accurate a manner as is practicable." Nevertheless, as with other extended statistical series, errors, inconsistencies, and misreportings will tend to be discovered as successive reports are analyzed in the light of other available data. The expert staff could have recourse to the organized international scientific community, which already devotes a good deal of energy to collecting and analyzing emissions statistics and could provide an important check on reported figures. Moreover, here again, as in the human rights area, an array of sophisticated and activist nongovernmental organizations stand ready to provide conflicting evidence and critical evaluations of self-serving national reports.

2. *Technical assistance to national environmental agencies.* Sir Joseph Gold, present at the creation of the IMF and its long-time legal adviser, maintains that a major benefit of the Article XIV "transitional period" has been to provide technical assistance to fledgling ministries of finance in a way that was acceptable to sensitive developing country sovereigns. In the environmental field as well, capacity

for formulating and implementing policy at the national level is often inadequate, especially in the developing countries. Even the industrialized countries could use help on such matters as the evaluation of scientific data, relevant cost-benefit analysis, and the range and comparative efficacy of market and regulatory approaches. Indeed, it is only since the Stockholm conference in 1972 that governments began to establish specialized agencies for the environment. The consultation process would be a vehicle for training and educating civil servants and sensitizing officials to policy problems and opportunities.

3. *The introduction of more concrete and quantitative performance criteria as they become politically and empirically validated.* The transitional process would proceed on a case-by-case basis, treating each country on its own terms. But a tendency toward general norms and rules would inevitably arise in response to demands for equal treatment. This tension is likely to be resolved by a variety of "nonbinding" devices—policy pronouncements, guidelines, published staff decisions, use of precedents. These will provide a framework for the negotiation between the international staff and the reporting country described above. In this way, consultation procedures during the transition could compensate for some of the deficit in international decision-making capacity noted above. Moreover, as data on the scientific impact or the costs and benefits of particular activities emerge, they could be assimilated into this normative process.

Though at odds with the traditional theoretical notion that international law is based exclusively on the consent of the parties, such modes of modifying the content of substantive international obligations are commonplace. For example, the IMF's authority to impose constraints on domestic economic policies of would-be borrowers, although included expressly in the amended agreement, was developed wholly by decisions of the executive directors and policy statements of the managing director interpreting very general provisions of the original agreement.

4. *Development of a technically competent and credible international monitoring and compliance*

capability. In the world of international affairs, the word for the past two decades has been “no new organizations.” But like other such self-denying ordinances, this too will have to change. In the end, the international effort to deal with global warming cannot succeed without a much stronger institutional base than is now available.

“The effort to deal with global warming cannot succeed without a much stronger institutional base.”

Competence and credibility in international bureaucracies are not inevitably unattainable, as evidenced by the performance of the IMF secretariat. Over the past several years, the major financial contributors to international organizations have established an increasing measure of control over personnel and budgetary matters. It should not be beyond their capacity to ensure a lean and efficient organization. The gradual build-up of an effective compliance institution would be one of the chief

benefits of a transitional reporting and consultative regime.

* * * * *

The questions of the potential scale and impact of the global warming phenomenon and what, if anything, should be done about it continue to be hotly debated by scientists and policymakers. These questions are not likely to be definitively resolved for some time. The central dilemma is that by then it may be too late to mount an effective response. In such circumstances, the sensible policy course, at both the national and international levels, is to identify low-cost measures that will provide some insurance against a worst-case outcome. The design and implementation of an international transitional process that will have some impact on emissions rates, although building institutional capability in case more drastic action is needed, may not sound dramatic. But it should be near the top of any list of such measures.

Reference

1. Skolnikoff, E.B. 1990. “The Policy Gridlock on Global Warming.” *Foreign Policy* (Summer):77.

V.

CRAFTING A WINNING COALITION

Negotiating a Regime to Control Global Warming

James K. Sebenius

International negotiations to address global warming will dot the diplomatic landscape for some time. In December 1988, the U.N. General Assembly unanimously passed a special resolution calling for the adoption of a “framework convention” on climate change (1989a). In line with this charge, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) set up the Intergovernmental Panel on Climate Change (IPCC) to undertake a comprehensive review of the area and to make recommendations; meanwhile, the nations of the European Community (E.C.) and the European Free Trade Association, along with Japan, Australia, and Canada, have adopted greenhouse gas stabilization or reduction targets.¹ The declaration of the 1990 Houston G-7 Summit endorsed expeditious framework negotiations following the conclusion of the next phase of the IPCC process; actual climate negotiations were set to begin in early 1991.

Climate change negotiators will inevitably debate the IPCC’s careful inputs on science, impacts, and responses; indeed, delegates will confront literally reams of analysis on these subjects produced in

many quarters.² Lively controversies will continue to surround the genuinely uncertain nature, timing, magnitude, and distribution of global warming and its effects. Arguments will drag out over the most appropriate policy choices from “wait-and-see” to immediate action, from centralized to decentralized measures, from incremental to comprehensive responses, from regulatory limits and timetables to marketable quotas and tradable emission permits, and so on. Proposed institutional responses will range from upgrading UNEP to the creation of an “Environmental Security Council” or an ongoing forum like the General Agreement on Tariffs and Trade, able continually to assess new evidence and adapt existing agreements.

This paper will *not* seek to evaluate or contribute to these important debates in substance but, rather, will seek to develop a negotiation-analytic perspective on the area.³ For purposes of this analysis, it will uncritically maintain that the prospect of a serious climate problem exists. Further, the analysis will refer to a number of proposed policy and institutional responses to the greenhouse problem while only lightly appraising their broader advantages and

drawbacks. These underlying substantive and policy questions will enter the analysis primarily insofar as they affect the likely outcomes of pending and potential negotiations.

“The fundamental negotiating task is to craft and sustain a meaningful ‘winning’ coalition.”

At present, there is no international regime in place with respect to global climate change.⁴ The impending negotiations can be understood as shaping a new “institutional bargain” in this issue area (Young, 1989:351). To an advocate of a new greenhouse control regime, the *fundamental negotiating task* is to craft and sustain a meaningful “winning” coalition of countries backing such a regime. Two centrally necessary, though not sufficient, conditions for this fundamental task are: (1) that each member of the coalition see enough gain in the regime relative to the alternatives to adhere and (2) that potential and actual “blocking” coalitions of interests opposed to the regime be prevented from forming and from being acceptably accommodated or otherwise neutralized.⁵

The analysis of this paper is organized around key questions whose answers will influence whether and how these two necessary conditions might (or might not) be met. For example, should the negotiations proceed from a general framework agreement in a *step-by-step fashion*, or should a *more comprehensive “package”* approach be employed? How does an aspiration for decision-making by consensus interact with this choice? What are the likely bases around which blocking coalitions are likely to form (e.g., scientific disagreement? economic self-interest? ideological conflict? opportunism?)? What are the main approaches for dealing with such blocking coalitions? What are some of the negotiating implications of different kinds of agreements (e.g., informal versus formal, relatively fixed or with provisions permitting major or minor modification)? What are the advantages and disadvantages of negotiating a small-scale agreement among a few key countries versus an agreement with virtually universal participation? To make progress on these questions, we

can usefully begin with conventional wisdom on the best approach to climate negotiations.

A “Framework-Protocol” Approach: The Conventional Wisdom and Its Origins

The widely accepted goal for climate change negotiations is for a general “framework convention,” perhaps together with one or more “protocols” on specific subjects, to be negotiated after the IPCC’s working groups have reported and following the November 1990 Second World Climate Conference in Geneva. Many observers expect a framework convention to be completed by not later than 1992, when the wide-ranging U.N. Conference on Environment and Development is scheduled to be held in Brazil.⁶ As will be shown below, unlike the contentious *substantive* issues for negotiation, the current “general-framework-convention-followed-by-specific-protocols” approach to addressing climate change has practically assumed the status of conventional wisdom.

In part, this step-by-step framework-protocol approach is a reaction against the seemingly endless years of negotiating the detailed and comprehensive Law of the Sea (LOS) Treaty that was ultimately rejected by the United States and opposed by other key powers.⁷ In part, the present approach to climate negotiations seeks to build on the perceived success of an analogous process that led to the widely accepted 1985 Vienna framework convention and 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which was revised and strengthened in June 1990 in London (Browne, 1990). Though a large number of other international negotiations have influenced the dominant course of climate change negotiations and contain useful insights, both the LOS and the ozone negotiations concerned global resources (like the atmosphere), embody valuable lessons in themselves, and serve as especially salient examples for many informed observers.⁸

“Lessons” from the LOS Conference

Considerable thinking on climate change negotiations derives in large measure from unhappy aspects of the vast and extended negotiations over

the LOS. The Third United Nations Conference on the Law of the Sea, launched by the General Assembly in 1970, led in 1982 to a comprehensive treaty signed by 159 states (and other authorized parties) that will enter into force once the sixtieth instrument of ratification is deposited. The LOS agreement is vast, codifying or advancing legal rules on the full extent of ocean uses. Though the total number of LOS ratifications now exceeds 40, the United States (along with Israel, Turkey, and Venezuela) voted against the treaty; though signatories, important opponents of ratification also include the United Kingdom and the Federal Republic of Germany.⁹

On the positive side, against the predictions of many knowledgeable observers, a broadly acceptable LOS convention—a “constitution for the oceans”—did result from this mammoth effort despite technical complexity, uncertainty, and ideological division. It is quite possible that something quite like the present convention would have been far more ratifiable by the United States if completed during the Nixon, Ford, or Carter administration. The nine-year formal negotiation process and the resulting LOS treaty have reduced much of the ocean conflict that was burgeoning at the outset of the negotiations. Claims of extended territorial jurisdiction into the ocean—one of the prime U.S. motivations for the LOS convention—have largely moderated, and hot conflicts such as the “cod war” between Britain and Iceland (that involved not only naval gunfire exchanges but Iceland’s threat to evict a National Atlantic Treaty Organization base) have diminished. Rights to fish, hydrocarbons, deep-seabed minerals (the “common heritage of mankind”) and other resources have been clarified; agreements were reached on rules for protection of the marine environment along with the conduct of marine scientific research. The conference itself made a number of innovations, from negotiations by a “single text” process, to novel roles for conference officers, to unique structure and voting systems for an international seabed authority. Given these factors—and the fact that the atmosphere, like the oceans, is a “global” resource—there have been calls from some quarters, notably at the 1988 Toronto Conference on the Changing Atmosphere, for a loosely analogous, comprehensive “Law of the Atmosphere” to address global warming (Zaelke and Cameron, 1990).

By contrast, many view the LOS as precisely the *wrong* way to negotiate a convention. As British U.N. Ambassador, Sir Crispin Tickell, noted, “There are many . . . who would like to look forward to a Law of the Atmosphere on the same lines as the Law of the Sea. To them I counsel caution” (1988). More bluntly, UNEP Executive Director Mostafa Tolba declared, “With an eye toward the frustrations and difficulties in the elaboration of the Law of the Sea, I don’t want to see UNEP take on a ‘Mission Impossible’ ” (1989:307). The process was conducted at a level of detail that arguably should have been unthinkable in a treaty framework; moreover, 20 years after its inception, the result has yet to enter into force. In the views of many U.S. skeptics, the result of this unwieldy process, especially with respect to deep-seabed resources, was unworkable, a dangerous precedent, and counter to western interests. In this view, if there is a lesson from the LOS, especially with respect to the possibility of a comprehensive “Law of the Atmosphere,” it is simple and resounding: “Don’t!”

“Lessons” from the Ozone Negotiations

By contrast to the LOS experience, negotiations to protect the ozone layer appear to be a more promising model for climate change negotiations.¹⁰ In 1974, two scientists published a theory suggesting that the ozone layer was being depleted by the release of chlorofluorocarbons (CFCs) into the atmosphere. If the theory were true, serious damage would be caused to life on Earth. (Incidentally, apart from their effects on the ozone layer, CFCs are a potent greenhouse gas.) In 1977, UNEP and other U.N. agencies drew up an “Action Plan to Protect Stratospheric Ozone,” which strengthened international efforts at research, monitoring, and assessment; this plan drew on the experience of UNEP’s 1975 Mediterranean Action Plan (approved in the Barcelona Framework Convention and its protocols). In 1978, the United States banned “nonessential” uses of CFCs, such as aerosol propellants. Although the United States encouraged other countries to follow suit, only Canada and the four Nordic countries did so.

The United States and other like-minded countries subsequently sought an international agreement on

the issue. Under the auspices of UNEP, a working group was established in May 1981 to try to come up with a global agreement, a “framework convention,” to protect the ozone layer. After seven rounds of negotiations, the compromise Vienna Convention for the Protection of the Ozone Layer was signed in March 1985 by 20 countries and the European Community (EC). The convention created a framework for international cooperation on research, monitoring, and exchange of information and provides procedures for developing specific control measures as needed. In December 1986, the Vienna convention signatories began to deliberate on possible CFC control measures. Less than a year later, 24 countries signed the Montreal Protocol on Substances that Deplete the Ozone Layer. This protocol calls for the consumption of most CFCs to be frozen at 1986 levels by 1990 and to be reduced from this level by 20 percent by 1994 and by 50 percent by 1999.¹¹

The protocol took effect on January 1, 1989. By mid-1990, more than 60 countries had ratified the protocol or announced their dates of ratification. This list included key developed countries, including the United States, the Soviet Union, Japan, and the E.C. countries. However, relatively few developing countries (LDCs) had ratified the Montreal protocol; holdouts included potentially major CFC producers such as India, China, and Brazil.¹² In a June 1990 London meeting, following some North-South pyrotechnics, 93 nations—including some vocal LDC holdouts such as India—signed a much strengthened CFC convention that would virtually ban CFC production and use by the year 2000. The new agreement also promised substantial financial and technical assistance to the developing world.

In direct contrast to the blunt U.S. rejection of the LOS treaty, President Reagan described the 1987 Montreal accord as “the result of an extraordinary process . . . of international diplomacy . . . a monumental achievement” (Benedick, 1990). In assessing the relevance of this approach for climate change negotiations, U.S. Ambassador Richard Benedick—along with others such as Britain’s Sir Crispin Tickell and UNEP head, Mostafa Tolba—after noting that the complexity of climate issues makes it “impossible

to deal with everything at once,” recommended disaggregating the problem and following a step-by-step framework-protocol process modeled after the CFC experience.¹³ At a late 1989 meeting of the policy responses panel of the IPCC, there was virtually full support for this approach. The General Assembly approved it by resolution, and at the July 1990 summit in Houston, the seven heads of the major industrial countries declared their unanimous backing for “the negotiation of a framework convention on climate change . . . [that] should be completed by 1992.” Further, “work on appropriate implementing protocols should be undertaken as expeditiously as possible and should consider all sources and sinks” (*New York Times*, 1990b). In short, the framework-protocol approach can be considered today’s conventional wisdom.

“The LOS and Vienna/Montreal processes should not be thought of as pure competing archetypes.”

Though the present analysis will often refer to the LOS and Vienna/Montreal processes, they should not be thought of as pure competing archetypes, such as “step-by-step versus comprehensive.” Instead, each approach bundles several important negotiating characteristics from which designers of a climate change bargain might selectively draw. Key features of the Vienna-Montreal process—which is widely seen as a model for climate negotiations—included *formal negotiation* of a *general framework* followed by (*separate*) *specific protocols*, aspirations for *universal participation* and *decision-making by consensus*, an *agreement subject to significant modification without reratification*. The LOS process was also *formal*, was *universally inclusive with respect to both issues and participants*, and *virtually required consensus on a comprehensive “package deal.”*

To analyze these and other possible features of climate change negotiations, however, it is useful briefly to compare its underlying substantive issues with those behind the sea law and ozone talks. With respect to climate change, structure and process can hardly be analyzed independent of substance.

Climate Change Negotiations Will Be Far More Difficult than Those over CFCs or the Law of the Sea

Negotiating and sustaining serious substantive actions to mitigate greenhouse gas emissions will be *far* more difficult than either the LOS or the Montreal protocol. Though the Vienna-Montreal model is often seen as the model for climate change negotiations, the number of significant CFC-producing countries was small. The economic costs required institutional changes, and affected industries were relatively limited. Those firms that expected to be able to produce CFC substitutes could benefit compared with their competitors and thus could even gain from the treaty. Few of these conditions apply to limits on carbon and other greenhouse emissions.

A Convention of Limitation versus a Convention of Expansion

Indeed, several factors suggest that negotiating a broad-scale convention on the apparent cause of global warming would be much more difficult even than the Law of the Sea. Much of the LOS accord granted or legitimated a series of previously tenuous new claims to resources by many states. For example, the United States solidified its claim to the rich resources contained in more than *2.2 million square miles of ocean space* off its coastlines. And “mankind” in general, with special provisions for developing countries, worked out a mechanism to share in any eventual benefits of completely “new” and physically vast resources of the deep seabed. Devising an LOS “convention of expansion” involved the relatively easy problem of how to divide an expanding pie.¹⁴ By contrast, climate change negotiations will likely focus on working out convention(s) of limitation, shared sacrifice, and painful transfers and compensation—requiring curtailments in energy use, more expensive LDC development paths, changes in agricultural patterns, cessation of currently profitable deforestation, and other such activities. *To the extent that climate change negotiations are perceived as allocating sacrifices, they will be fundamentally more difficult than the happier LOS problem of allocating “new” resources.* Of course, to the extent that the participants focus on the joint gains relative to feared climate disaster, the process

will be so much the easier. And some groups that will directly benefit—such as vendors of renewable, cleaner, more efficient energy and the technologies that make such energy use possible—may join environmental advocates as vocal proponents of a greenhouse control regime.

A True Global Commons with Damaging Incentives

Though the atmosphere is widely and correctly understood to be a global “commons,” such status is analytically distinct from what many people see as a similarity to deep-seabed resources—which the General Assembly unanimously declared to be the “common heritage of mankind.” This declaration concerned collective property rights to manganese nodules. By contrast, the global atmosphere is *true* commons in that any greenhouse gas emissions from a single country eventually mix and adversely affect the entire world.¹⁵ True commons resources contain economic disincentives for individual initiatives to curb emissions (Hardin, 1968). These disincentives result from the fact that the full costs of efforts to mitigate harmful emissions by one state can be borne fully by that state—while the benefits of such actions are diffused throughout the global community. Moreover, any benefits of actions taken now that would slow the present rate of growth of greenhouse gases would be felt only decades hence, by the inhabitants of a *future* world. Thus, facing the full costs of abatement today but enjoying only a fraction of any future benefits, individual entities have powerful incentives to continue emitting. As such, strong political and economic forces can lead states and private parties to postpone any action absent a broad international agreement. Moreover, such an agreement can be frustrated by the inherent “commons” characteristic of the climate problem that allows those who do nothing to “free ride” any costly actions others might take to mitigate the problem.

A More Distant Threat

Though global climate change threatens sea level rise, crop pattern alterations, increased variability and severity of weather conditions, and a host of other consequences, most of these harms are subject

to considerable scientific uncertainty as to their timing, magnitude, and distribution across countries and regions. Indeed, some observers even claim to see future winners as well as losers from global warming (e.g., milder winters in Massachusetts and Siberia, expanded areas of cropland in currently cold climates)—a stance that could greatly complicate negotiations over costly mitigation measures. By contrast, LOS negotiators faced a range of pressing problems as well as future concerns. President Johnson warned about an imminent “race to grab and hold the lands under the high seas”; other observers made dire predictions of the “biggest smash and grab” of (ocean) territory since the great powers carved up Africa at the end of the nineteenth century. Seaward territorial claims had proliferated, conflicts over fishing rights had frequently turned violent, ownership of oil under continental shelves was disputed, legal duties and liability provisions were muddled around ocean environmental disasters such as the breakup of the *Amoco Cadiz*, and a range of other problems proliferated. As Henry Kissinger apocalyptically warned, “The current [LOS] negotiation may thus be the world’s last chance. . . . The breakdown of the current negotiation . . . will lead to unrestrained military and commercial rivalry and mounting political turmoil” (1975). In short, the LOS negotiators faced urgent as well as future problems. Further, in addressing these ocean problems, LOS delegates could build on centuries of legal development, with a relatively small part of their task requiring entirely new legal regimes.¹⁶ By contrast, climate change negotiators mainly face a distant, uncertain threat requiring entirely new rules—making their task correspondingly more difficult.

Curbing Greenhouse Emissions Could Affect a Much Wider Range of Human Activities

Far more than the LOS or CFCs, new rules to deal with the greenhouse effect could greatly alter a range of crucial national activities for a large number of countries, virtually guaranteeing that negotiating meaningful results will be time consuming.¹⁷ In conventional scenarios, slightly less than one-half the expected warming from emissions during the 1980s comes from energy-related activities (coal, petroleum, natural gas), with nonenergy industrial activities

(mainly CFCs) delivering about one-quarter (less, depending on the effects of the Montreal protocol), and land use activities (deforestation, rice cultivation, fertilization, etc.) causing the rest. About 55 percent of the expected contribution to warming from emissions during this period is due to carbon dioxide, with CFCs (24 percent), methane (15 percent), and nitrous oxides (6 percent) delivering the rest. About one-half the expected warming will reflect population growth and the other half will reflect growth in per capita demand. About 40 percent of the expected warming now comes from activities in the developing countries, a figure that may rise to 60 percent by the end of the next century. (These proportions are reversed, of course, for the developed world.) Thus both economic growth for the industrial countries and economic development in the Third World will be at stake as possible responses to global warming are fashioned.

This examination of the present and future causes of the greenhouse effect reveals the manifold causes and range of policies that could make some difference in the amount or rate of expected warming. No approach narrowly focused on carbon dioxide, for example, or fossil fuels or conservation or deforestation can fully solve the problem. More important, this look at the vast scope of the greenhouse problem underscores just how deeply its causes are embedded in the central aspects of the world’s economic and social activity: across transportation, industrial, agricultural, and forestry practices; from the developed to the developing world; and in the very growth of populations and economies. As Massachusetts Institute of Technology’s (MIT) Eugene Skolnikoff soberly observed, a “major characteristic of the [greenhouse] issue is the interaction of two vast and complex systems, the planet’s ecosystem and the human socioeconomic system. . . . The fact that climate change involves the interplay of large human and physical systems has several consequences. The most obvious are that the time horizon of policy intervention must be very long and that changes in either of the fundamental systems cannot be achieved quickly, even if there were an agreed will to do so” (1990:82).

It is fairly widely assumed that greenhouse negotiators will seek to hammer out an overall or country-

by-country schedule of emission reductions, such as the 20 percent carbon dioxide cut by the year 2005 that was discussed by 68 countries in the November 1989 Ministerial Conference on Atmospheric Pollution and Climate Change held in Noordwijk, the Netherlands (Noordwijk Declaration, 1989). Yet any simple targets will face overwhelming complexities. In part, as Michael Grubb of the Royal Institute of International Affairs has cogently argued, this fact derives from the great variation in the energy economies of different nations. Some countries, such as Japan, having already taken substantial steps toward high energy efficiency, would find further percentage reductions difficult; so would France, which relies heavily on nuclear power (which does not emit greenhouse gases). More generally, carbon emissions per unit of gross national product vary internationally by a factor of more than 10. Sizable international differences in population, level of development, fuel mix, amount and kind of energy reserves (from high-carbon coal, to low-carbon natural gas, to no-carbon hydro) as well as industrial and transportation patterns add up to a powerful case for the complexity and difficulty of negotiated country targets. In short, seeking equal absolute or percentage reductions (à la Montreal), or efficiency targets, or similar benchmarks will entail inequities and frustrations. Grubb concludes that the notion of “all the countries of the world sitting around a table and agreeing on who should reduce by how much. . . like the Montreal Protocol writ large” is an “illusion best dispersed before it leads us irretrievably down a blind alley” (1989).

Many environmental advocates expect quick negotiations and decisive, sustained actions given the high level of public concern about the greenhouse issue. The more than 20 industrial countries that unilaterally or in groups (such as the E.C.) had committed by late 1990 to greenhouse gas stabilization or reduction targets encourages this optimistic view. Yet powerful economic and political actors will face potential restrictions and will seek to delay, avoid, and shift abatement costs. Even more than the 12-year LOS process, climate change negotiations could seriously impinge on a range of vital activities. The much simpler negotiation process leading to the 1987 Montreal protocol to limit CFCs took more than five years from the start of negotiations and more

than 10 years from the announcement of UNEP's 1977 Action Plan to Protect the Ozone Layer. Similarly, the 12-nation European Community Large Combustion Plant Directive to limit acid rain took five years of negotiations, often twice-weekly, among a relatively homogeneous group to agree on targets (Grubb, 1989:14). Thus, like trade or arms control talks, the climate change negotiation process will take considerable time (though a number of measures, discussed below, could streamline the process). If the Vienna-Montreal process was a 100-meter race and the LOS talks a marathon, full climate negotiations would be a decathlon.

“If the Vienna-Montreal process was a 100-meter race and the LOS talks a marathon, full climate negotiations would be a decathlon.”

Recall that, to an advocate of a new greenhouse control regime, the *fundamental negotiating task* is to craft and sustain a meaningful “winning” coalition of countries backing such a regime. Further, two necessary conditions for this task are: (1) that each member of the coalition sees enough gain in the regime relative to the alternatives to adhere and (2) that potential and actual “blocking” coalitions of interests opposed to the regime be prevented from forming and from being acceptably accommodated or otherwise neutralized. A number of process questions bearing on these conditions were raised above for the LOS and Montreal cases. Having now developed a clearer understanding of the substantive challenges to greenhouse negotiation, the first of the necessary conditions may be addressed.

Ensuring Sufficient Joint Gains without Overwhelming Complexity: Single-issue Protocols versus Comprehensive Packages

In the fact of these substantive challenges, a successful accord on climate change calls for a process designed to achieve relatively expeditious results—unlike the LOS—that can be sustained over time and modified as appropriate. Many factors contributed

to the lengthy LOS process, but four procedural cornerstones virtually guaranteed its duration and could easily do the same if adopted for global warming negotiations. These included: (1) virtually *universal participation* combined with (2) a powerful set of rules and understandings aimed at taking *all decisions by consensus* (if at all possible), (3) a *comprehensive agenda*, plus (4) the agreement to seek a single convention that would constitute a “*package deal*” (Koh and Jayakumar, 1985; Evensen, 1986). The rationale for each of these components was understandable, but, in the extreme, a universally inclusive process with respect to both issues and participants, together with requirements of consensus on an overall package deal would be time consuming—holding the ultimate results hostage to the most reluctant party on the most difficult issue. In practice, the LOS conference was less constrained by absolute versions of these procedural choices, but the powerful bias toward a snail’s pace was real.

Reacting against the broad agenda-package-deal-LOS approach, climate change negotiators are mostly aiming for a framework convention to be followed by specific protocols. In line with the Vienna convention-Montreal protocol experience, this goal would retain the aims of universality and consensus but drop comprehensivity and the goal of a package deal—in favor of single, separable protocols on limited subjects. *This step-by-step framework-protocol alternative has attractive negotiating features, but it is worth recalling that the failure of precisely this approach—negotiation of separate “miniconventions,” analogous to protocols—in earlier LOS conferences (in 1958 and 1960) indirectly led back to the comprehensive package approach of the 1973 LOS conference.*

By 1958, for the first U.N. LOS conference, the International Law Commission had suggested a negotiating structure with four separate conventions concerning different issues such as the breadth of the territorial sea and the extent of the continental margin. With respect to the comprehensive agenda of the 1973 LOS conference, President Tommy Koh observed: “A disadvantage of adopting several conventions is that states will choose to adhere only to those which seem advantageous and not to others, leaving the door open to disagreement and

confrontations. The rationale for this [comprehensive] approach was to avoid the situation that resulted from the 1958 conference which concluded four [separate] conventions” (Koh and Jayakumar, 1985:41). And as International Court of Justice member Jens Evensen noted, “The four Geneva Conventions of 29 April 1958 had clearly demonstrated the weaknesses of the piecemeal approach to the Law of the Sea. Countries naturally enough adhered to the one or the other of the 1958 conventions that they deemed advantageous to them and then failed to adhere to the rest” (Evensen, 1986:485).

Such an uneven pattern might also result from a framework-protocol structure on climate change. Imagine Libya signing a forestry convention while Nepal agreed to a transportation and automotive protocol. For individual countries or groups of similar ones, a single issue often represents either a clear gain or a clear loss. As with the early LOS conferences (with independent miniconventions), countries sign the gainers and shun the losers. In a climate context, for example, China may resist a specific fossil fuel protocol that would place restrictions on the development of its extensive coal resources. Such single-issue protocols may prove nonnegotiable unless they can be combined with agreements on other issues that offset the losses (or at least seem to distribute them fairly). A package deal may offer the possibility of “trading” across issues for joint gain—thus breaking impasses resulting from treating issues separately.

For example, following the 1958 and 1960 LOS experiences, two *separate* negotiations were attempted; until linked, each proved fruitless. With deep-seabed resources the “common heritage of mankind,” the “Seabeds Committee” undertook a negotiation over the regime for seabed mining. Developing countries wanted this convention to offer meaningful participation in deep-seabed mining and sharing of its benefits. Yet the developed countries whose companies potentially had the technology, the capital, and the managerial capacity ultimately to mine the seabed saw no reason to be forthcoming, and these negotiations went nowhere. At about the same time, strenuous efforts by the United States, the Soviet Union, and other maritime powers—that were greatly concerned about increasing numbers of

claims by coastal, straits, island, and archipelagic states to territory in the oceans—sought to organize a set of negotiations that would lead to a halt in such “creeping jurisdiction.” In effect, the maritime powers were asking coastal states, without compensation, to cease a valuable activity (claiming additional ocean territory). Not surprisingly, these discussions over limits on seaward territorial expansion in the ocean yielded scant results.

Seen as separate “protocols,” these two issues taken independently were not susceptible to agreement. Yet—together with concerns over the living resources and outer continental shelf hydrocarbons—it was ultimately the linkage of these two issues, navigation and nodules, in a bargaining sense that came to be at the heart of the comprehensive LOS conference negotiations.¹⁸ Though intriguing twists and turns of logic and politics, both domestic and international, led to a comprehensive treaty, the words of Evan Luard summarize the result: “Every country, and every group of countries, had a different and sometimes conflicting range of interest within ocean space: either on the surface of the sea, on the bottom, or both. . . . Only if these varying interests were balanced would a solution be possible. And only if the manifold issues were considered together in a single, mammoth negotiation, so that a concession on one point would be balanced by a concession on another, were the conflicting interests likely to be reconciled” (1977:152–53).

“Despite the current conventional wisdom one should expect great pressure toward combining issues that might initially be conceived as separate (protocols) for purposes of negotiation.”

With respect to climate change negotiations, it is easy to imagine that separate protocols calling on different groups to undertake painful and costly measures will similarly be rejected unless they can be packaged in ways that offer sufficient joint gains to all. Because any action on climate change will largely involve shared and parallel sacrifice, it is

probably only by linking issues such as technological assistance and various forms of compensation, financial or in kind, that many countries will be induced into joining. As such, despite the current conventional wisdom about negotiating a framework followed by independent protocols, *one should expect great pressure toward combining issues that might initially be conceived as separate (protocols) for purposes of negotiation. This pressure is likely to be felt as early as the “framework” stage, effectively collapsing what is intended as a two-stage process into a single negotiation involving both framework and protocols.*

Given this analysis, a central problem in greenhouse “negotiation design” would seem to be finding a constructive path between the Scylla of a comprehensive package agenda that risks LOS-like complexity and the Charybdis of independent single-issue protocols (that may lack sufficient joint gain and risk selective adherence).¹⁹ At best, this course can be roughly charted, given informed assessments of the interests and perceptions of the major players; yet designing the conference absent this consideration risks either great delay or non-negotiability. Rather than trying to predict the appropriate linkages, the conference should be designed in such a way as to facilitate them as they become evident and necessary. Though it might appear to be a substantive “waffle” that does not clearly endorse either a step-by-step or comprehensive approach, *an appropriate criterion is to find a middle ground between the LOS and Montreal experiences. In short, by the structure and procedures of a conference, organizers should seek to permit issues to be creatively linked into packages that promise sufficient joint gain to be attractive to a large number of parties—yet that are not so broadly comprehensive as to risk excessive complexity and delay.*

It is generally preferable to deal with issues on their separate substantive merits as much as possible, yet be alert to potential linkages to break impasses.²⁰ This point suggests a conference design with independent working-negotiating groups with a higher-level body seeking to integrate across the groups and facilitate valuable but limited “trades.” One way to create mutually beneficial but manageable “packages” of protocols early in the process

would be to include in the framework convention an agreed requirement to accede to the first one or two specified protocols (or three of four)—in which case those protocols could be negotiated concurrently with the framework convention.²¹

Yet issues should be linked with caution. It can be extraordinarily difficult to “unpack” them once they have been combined for bargaining purposes. For example, the United States was generally in favor of the navigational portions of the LOS treaty but had obvious problems with the concessions demanded on a seabed regime. It exerted strenuous efforts at unlinking or separating these topics into “manageable packages,” but to no avail. The “package deal” was too strong in the minds of many delegates, and ultimately the LOS convention contained both elements.

This analysis of the likely pressures toward combining issues in negotiation is related but not necessarily identical to the normal economic (efficiency) argument for control regimes that apply across as many activities as possible. By considering greenhouse sources as a whole, comprehensive regimes may enable the *overall* lowest-cost abatement choices to be realized. A major tradeoff, however, involved in negotiating more comprehensive schemes—whether for purposes of realizing joint gains, breaking impasses, or enhancing economic efficiency—is with the prospect of greatly increased complexity and delay. To choose appropriately, the negotiating problem should be examined from a different perspective, that of potential blocking coalitions, to which the analysis now turns.

The Bases of “Blocking Coalitions” in Global Warming Negotiations: Science, Interest, Ideology, and Opportunism

A natural way to think about concluding a treaty on global warming is to imagine creating a supportive coalition of countries that see enough joint gains in the new regime that it can be sustained over time. Yet it is also useful in this instance to turn this approach on its head and inquire about the often-underestimated capacity of opposing interests or potential “blocking coalitions” to prevent agreement on or implementation of an otherwise desirable

treaty. With respect to climate change negotiations, as various restrictions (e.g., on energy use, industrial processes, agricultural or forestry practices) are seriously contemplated, the danger of blocking coalitions increases. As presently contemplated, a “framework” convention on climate change would be negotiated first—setting forth an agreed definition of the problem, possible reduction targets, joint research, monitoring, and coordination—to be followed by specific “protocols” detailing restrictions to be placed on various sectors. *In such an approach, the choice of which specific protocols to pursue singly, in combination, or in sequence (e.g., transportation, energy, tropical forestry, etc.) will heavily determine which interests will arise to oppose action; in choosing one’s issues, one chooses one’s opponents.* As will be elaborated below, this “choice of potential opponents” should be a conscious and strategically sophisticated decision. A few examples illustrate the varied bases of potential blocking coalitions.

Blocking Coalitions Based on Economic Interest and Ideology: The Cautionary LOS Experience

It is perhaps sobering to recall how the LOS treaty’s burdens on seabed mining—for all intents and purposes a nonexistent industry segment—engendered tenacious and ultimately effective opposition, for pragmatic and ideological reasons.²² Major maritime establishments, especially in the Soviet Union and the United States, were powerfully motivated in the 1960s by the desire to stop so-called “jurisdictional creep,” or the tendency for territorial claims to expand and cast an ever-widening net of restrictions on submarine, ship, and aircraft mobility in what had traditionally been the high seas. Developing countries in South America, along with those bordering essential straits (such as Gibraltar, Malacca, Singapore, and Bab el Mandeb) had asserted many such claims during the 1950s and 1960s and could have continued this expansionist territorial trend. As a result, heretofore routine maritime activities could increasingly have been curtailed, could have required politically costly confrontations, or could have led to endlessly renegotiable accommodations with coastal or straits states (like base-rights negotiations). Thus the developing world influenced something of high value to the maritime powers.

Emboldened by this genuine maritime interdependence, many developing countries effectively pressed for a seabed regime modeled on the precepts of the New International Economic Order (NIEO), including significant wealth redistribution, greater LDC participation in the world economy, and greater Third World control over global institutions and resources. Real LDC leverage meant that the maritime powers could not costlessly reject NIEO demands and just walk away.²³ This perceived vulnerability to LDC coastal state power kept the United States and other maritime powers at the LOS bargaining table for years, but ideological disagreements ultimately spurred the treaty's rejection.

“Industry opposed the LOS treaty because of its ideological cast. Many of these issues are very similar to those beginning to animate climate change negotiations.”

In the early days of the LOS process, industry members supported a universal treaty as the only feasible means of ensuring them the needed 20–30 years of secure tenure over ocean minesites roughly the area of Switzerland. Private miners had envisioned a kind of international claims registry to arbitrate disputes among rival claimants, perhaps with minimal taxation powers. Yet as the seabed regime took on more of an NIEO-like character, industry opposition grew. The most effective vehicle the industry found to oppose the treaty was less its economic self-interest than the ideological cast of the emerging regime. Elements included the declaration that seabed resources were the “common heritage of mankind” (seeming collectivist), seabed production controls (OPEC-like cartelization), mandatory technology transfer (seeming to ride roughshod over intellectual property rights), financial requirements (that functioned as globally levied taxes), new voting schemes (more like the U.N. General Assembly), and the creation of international mining enterprises (worse even than state-owned enterprises). (A number of these issues are similar to those now beginning to animate climate change negotiations.)

Richard Darman, once the vice chairman of the U.S. LOS delegation and subsequently a senior policy advisor in the Reagan White House, contended in an influential *Foreign Affairs* article, “The most important issues at stake in the deep seabed negotiations, however, are not merely questions of manganese nodule mining. What is fundamentally at stake is a set of precedents with respect to systems of governance.” In particular, he distinguished between the “precedential elements of the *seabed regime* (as distinguished from *seabed mining*)” (1978). To an administration that judged the direction of multilateral institutions in general and the United Nations in particular to be inimical to U.S. principles, the LOS treaty was an abomination—and a chance to make a far wider statement.²⁴ Seabed mining was only a small part of the LOS treaty, but the blocking coalition of seabed miners and policy skeptics that it engendered (in the United States) was ultimately successful, prevailing over the defense and environmental interests that were the strongest supporters of the LOS convention.²⁵

Some Implications for Climate Negotiations

This history highlights a largely overlooked danger with which advocates of global climate change negotiations should be concerned. Like the LOS, long-term success is impossible without the cooperation of the developing world. Greenhouse gases in the atmosphere are now mainly due to developed nations. However, with projected population and economic growth in the developing world, the source of the greenhouse problem will rapidly shift over time, especially if India and China choose their least-cost development paths that rely on their vast coal resources. China, for example, now plans to expand its coal consumption fivefold by the year 2020, a result that would add nearly 50 percent to current worldwide carbon emissions (Grubb, 1990:75). *Anti-global warming steps agreed and taken by the developed world alone could be heavily offset over time by inaction in the developing countries; by the year 2050, projected warming without developing country cooperation would be 40 percent higher than with it* (U.S. Environmental Protection Agency, 1989:40–43).

Thus the developed world cannot solve the climate problem in the long run without the cooperation of

the LDCs.²⁶ So too for CFCs. Developing country concerns played a significant role in the Vienna-Montreal process. Many LDCs concurred with the Vienna framework convention with its hortatory language about their concerns but were disappointed with the final Montreal result that contained only general undertakings on funding and ozone-friendly technology to the developing world. India, China, and Brazil—all potentially significant future CFC producers—did not sign the Montreal protocol. They were especially irritated by the recent Bush administration decision—ultimately reversed after a firestorm of international environmental protest—against contributing to a fund intended to assist LDCs in this area. Only after substantial and far more specific undertakings were made in London during the June 1990 meetings did key LDC representatives agree to urge their governments to sign a strengthened protocol.

Especially given current levels of distrust—not to mention the steep energy requirements of vital development—a threat by key developing nations *not* to cooperate with an emerging climate regime—even if ultimately mutually destructive and even if its effects might be more severe in the developing world—could have a clear rationale and a measure of credibility. After all, the bulk of political concern over global warming is concentrated in the developed world, which unambiguously caused most of the existing problem. Further, southern inaction on this issue could offset many northern actions.

No wonder that, in the words of a recent discussion of climate change and overall Third World concerns, “The problems presented by climate change also present opportunities to reexamine and correct many of the underlying problems of development that have led to the current dilemma . . . including trade issues, debt, technology transfer, technical assistance, and financial assistance” (Stone, 1990). To southern diplomats with this view, the climate change issue may be a potent bargaining lever with application well beyond the climate context. According to another observer, “This group sees environment as the same kind of issue in the 1990s that energy was in the 1970s. They hope that the developed countries’ high interest in the environment can be used to wring

concessions on economic and development issues from the North” (Stanley, 1990:8).

The underlying ideological template, present in both the LOS and Montreal negotiations, is that of the NIEO. It is quite possible that either or both the UNEP framework-protocol process and 1992 conference could end up mainly focused on generalized North-South concerns expressed in well-worn NIEO terms. The risk, to be assessed in more detail later, is that attempted use of real southern leverage on behalf of NIEO precepts might meet northern intransigence based on antipathy to the underlying ideology. Any progress on climate issues *per se* could be blocked as a result.

Blocking Coalitions Based on Science and Interest: The CFC Negotiations

A further perspective can be found in another look at the negotiations leading to the 1987 Montreal protocol. Though the framework-protocol agreements for ozone protection indeed represent important international coordinating steps, they contain a cautionary tale as well on the issue of potential blocking coalitions. Despite periodically intense public concerns dating from supersonic transport and aerosols, the actions of a relatively small number of industry players—DuPont and Allied in the United States, ICI and others in Europe, along with policy skeptics in the major countries—were able to delay action on an ozone convention for a number of years.²⁷ For an understanding of why, it is critical to focus on “internal” (domestic) considerations along with what is happening in the “external” (international) negotiating forum.

It is both instructive and sobering to see how this industry opposition was overcome by 1987. In part, it was a matter of science. Though predictions of individual scientists varied greatly, consensus estimates of the extent, likelihood, and danger of ozone depletion had declined from the early 1980s until the (surprise) discovery of the “ozone hole” in 1985; thus industry opposition to regulation statements during this period had a scientific basis. However, DuPont was publicly committed by statements of company officials to the Congress to the effect that, if scientific evidence conclusively showed adverse

health effects, it would no longer produce CFCs; this commitment was a key factor in its “conversion.” But two other special dynamics may have been at work in overcoming DuPont’s effective blocking actions.

First, though it put the work on hold for a time in the early 1980s, DuPont had been intensively engaged in the search for CFC substitutes and appeared to be well ahead of its global competitors in this regard. Thus international regulation that would strictly limit the amount of CFCs that could be produced and consumed would both permit the price of the allowed production to be raised and place DuPont in a favorable competitive position within the industry, if its research were in the lead. Second, as public concern culminated in tremendous concern about the ozone hole over the Antarctic, prospects grew substantially for U.S. legislation that would have *unilaterally* restricted CFC production and use in the United States. From DuPont’s point of view, though no regulation would have been the preferred alternative, international rules that constrained the entire global industry were far preferable to a U.S. law that singled out domestic companies (Haas, 1990).

Thus the unusual confluence of several distinct factors—scientific evidence coupled with prior public statements by the company, competitive dynamics within the industry driven by CFC substitutes, and the unusual effect of a threat of domestic legislation—were sufficient to turn DuPont around and open a split in global industry ranks. Further actions were also required in Europe before the opposition of industry groups there could be overcome.

Extent of Likely Blocking Coalitions in Antigreenhouse Negotiations

These tortuous tales are relevant to climate change negotiations because they raise a warning of how potent treaty opponents may be—on scientific, economic, ideological, and/or opportunistic bases. As such, the subjects for negotiation should be carefully chosen with an eye toward the potential blocking coalitions that will be energized by international action. After all, the LOS treaty was scuttled in the United States and in other important

industrial nations by the economic and ideological concerns of an industry segment (seabed mining) that did not even exist. With respect to the ozone process, the 1990 *Economic Report of the President* estimates the U.S. costs of compliance with the Montreal accord at \$2.7 billion—one measure, since reduced, of the costs motivating skeptical policymakers and corporate opponents of the treaty (U.S. Council of Economic Advisors, 1990). Despite public concern over the ozone layer, the Montreal treaty was effectively delayed for several years by these groups until the scientific consensus shifted.

Now \$2.7 billion is certainly a high cost, but the same report cites the costs of an antigreenhouse 20 percent carbon dioxide cut at between *\$800 billion and \$3.6 trillion*.²⁸ If these figures are even remotely accurate, they suggest that those concerned by large-scale greenhouse control (e.g., policy skeptics, coal and oil companies, automakers, etc.) would have an economic motivation for opposition—regardless of the level of environmental benefits—literally hundreds of times stronger than that of the CFC industry. The recent protracted battle over the Clean Air Act, with annual costs in the “mere” \$25–35 billion range, gives another sobering point of comparison. Yet the powerful coalitions that will arise to resist major greenhouse action are now mostly asleep. Look, for example, to Canada, a country in the rhetorical vanguard of greenhouse concern. If serious actions are proposed, however, will the Canada that pumps oil, cuts forests, and builds cars really just go along? And are those Brazilians who profit from burning rain forests today really going to buy arguments about future world benefits?

The experience of seabed miners and the LOS treaty together with that of the Montreal protocol confirms the power of potentially blocking actors. A brief comparison of the cost of compliance with the ozone convention suggests just how small it is by comparison with those that might be involved in significant action to mitigate global warming. Costs of that magnitude would entail correspondingly strong opposing interests. A taste of this kind of blocking coalition was experienced at the Noordwijk Ministerial Conference in November 1989, whose resolution favoring a specific carbon dioxide cut was

blocked by the United States, the United Kingdom, the Soviet Union, and Japan.²⁹ Blocking coalitions are just as likely to arise in “southern” countries whose development could be impeded by antigreenhouse measures as in developed countries whose industries and consumers could face heavy cost burdens. Likewise, the imperative for Eastern Europe to grow to consolidate its political gains will weigh against major greenhouse action.

The Bases of Blocking Coalitions: Science, Interest, Ideology, and Opportunism

If climate woes strike with force, they will likely entail widespread harm. Yet the immediate costs of each preventive measure would mainly fall on a specific group. As to providing uncertain future benefits for all, such smaller groups will not want to pay the full tab now, and they can be expected to mobilize to block action. These considerations suggest that those concerned with organizing effective international action to combat global warming should carefully anticipate, prevent, and prepare to deal with the potential blocking coalitions that may arise. Such coalitions will likely be composed not only of traditional nation-states but also of domestic interest groups and transnational alliances.

“Potential blocking coalitions will likely be composed not only of nation-states but also of domestic interest groups and transnational alliances.”

Though economic reasons are most often cited as the basis for opposition to greenhouse action, that is too narrow a view; scientific disagreement, ideological clash, and opportunistic use of apparent bargaining leverage are also likely to play roles.³⁰ In principle, each type of blocking coalition might be dealt with according to its basis; in practice, the bases are likely to be intertwined. The seabed mining industry appealed to economic interest and ideology in opposing the LOS treaty; science and self-interest played complementary roles in delaying a CFC accord. Ideological clash and opportunism may well combine in global climate talks. Opposition for

one set of reasons will often masquerade behind another, perhaps a more politically palatable one. Thus actions to deal with blocking coalitions should be analyzed from multiple perspectives.

Generic Approaches to Dealing with Blocking Coalitions

Evidently, the conduct and diffusion of further research on global warming carry the promise, though not the certainty, of reducing the scientific basis for opposing greenhouse control regimes. For obvious reasons ranging far beyond its effects on potential blocking coalitions, such research should be supported—even though its findings will contain uncertain elements and inconsistencies and may well end up supporting inaction.

Beyond converting opponents by irresistible science, a number of generic approaches exist for dealing with potential blockers. An appealing option is to prevent their formation in the first place by procedural and/or substantive choice. As the earlier discussion on issue linkage for joint gain suggested, issues can be added as “side payments” to induce previously blocking parties into an agreement. Beyond these approaches, economic, ideological, and opportunistic opponents may sometimes be won over by appeal to shared interests, by at least partially meeting their separate interests, by providing “selective incentives,” by showing them how a new control regime would really be in their interest, or by inventing new options that sidestep their objections. Classic tactics include isolating and overwhelming them by political pressure, dividing and conquering them, lulling them, and so on. It is to a number of such specific suggestions that the analysis now moves.

Dealing with Potential Blocking Coalitions I: Prevention

Evidently, the choice of protocols and the negotiating relationship that is envisioned among them are of central importance; after all, with the choice of a protocol comes a set of opponents (as well as supporters). Protocols have been suggested, seemingly without much explicit analysis of their implications for negotiating success, on a virtually endless

number of potential subjects (e.g., targets for reducing national greenhouse gas or carbon emissions, credits for providing carbon “sinks,” automotive transportation, industrial energy use, tropical forestry, agricultural practices, sea-level rise, technology transfer, international funds to aid LDCs, population growth, a carbon tax, tradable emission permits, methane, etc.).

Though it is beyond the scope of this paper to develop and justify a specific agenda for this process, at least three criteria should guide the choice of protocols: (maximizing) substantive desirability, (minimizing) the likely opposing interests that will be stimulated, and (maximizing) the potential of the chosen issue to contribute joint gains to a broad-based group of adherent countries. Following substantive value, a prime consideration in the choice of protocols should be a clear-eyed view of the likely opposition. Is a proposed target concentrated or diffuse? Politically influential in key countries or not? Are the necessary changes inexpensive or costly?

Sequential Approaches to Minimize the Risk of Energizing and Unifying Disparate Interests into a Large Blocking Coalition

A good way to guarantee an endless negotiating impasse would be to handle all the above-mentioned protocols in a comprehensive “Law of the Atmosphere” package to be agreed by consensus. A comprehensive climate change convention might well energize and unify a large set of otherwise separate opposing interests.

An unlikely but illustrative U.S. domestic parallel involving the creation of an unusual and potent blocking coalition may be found in Michael Pertschuk’s stewardship of the formerly sleepy Federal Trade Commission (FTC) in the late 1970s.³¹ The FTC had recently launched a number of rule-making efforts directly affecting a range of small business interests in the United States, from funeral homes to used-car dealers, to optometrists, and others. Further, the FTC decided to take on the issue of children’s TV advertising, which not only threatened major media advertising revenues but also smacked of First Amendment restrictions. In effect, having energized and unified an enormous coalition of

large and small business and media companies—many of whom had been bitter rivals before—the FTC engendered a hail of protest, had its budget and authority slashed, and was even shut down for a while. In part, Pertschuk’s legacy was a far more unified and politically effective business community.

“Perhaps it would be best to pick ‘easy’ subjects first—protocols directed at greenhouse contributors that are politically weak, morally suspect, and concentrated in highly ‘green’ countries.”

By analogy, comprehensive antighreenhouse efforts that affect a number of potentially powerful interests run serious risks of energizing and unifying otherwise independent, blocking forces. A protocol that, for example, targeted oil companies, coal-mining interests, or automobile manufacturing firms as well as various agricultural concerns—let alone the full range of human activities that result in greenhouse gases—would almost certainly take a long time to negotiate and might never surmount the solid wall of opposition it could raise. Instead, to avoid creating a potent unified opposing coalition, it may be wise to proceed *sequentially* with protocols. Perhaps it would be best to pick “easy” subjects first—protocols directed at greenhouse contributors that are politically weak, morally suspect, and concentrated in highly “green” countries—to generate momentum, with strategically chosen later protocols building on early successes.

In this connection, one of the more promising greenhouse control regimes involves allocating a number of “tradable emission permits” such that the overall level of greenhouse gas emissions could be limited. Beyond the initial allocation, the ultimate distribution of the permits would not have to be negotiated or bureaucratically determined because these permits could be bought and sold. In theory at least, they would end up in the hands of those entities that could reduce emissions most efficiently (Grubb, 1989). An ongoing question with respect to

such a tradable permits regime is whether it should cover only carbon dioxide emissions or should extend to other greenhouse gases such as methane and nitrous oxides (in order that the *overall* least-cost control actions be chosen). A full answer to this question depends on issues such as source identifiability, monitorability, and negotiating complexity. Yet from the standpoint of blocking coalitions, it is clear that seeking to negotiate a more comprehensive regime would also risk unifying a much wider set of disparate opposing interests. Analogous reasoning applies to other proposed antigreenhouse regimes such as outright emission limits and various forms of "carbon taxes."

A "Baseline Protocol"

In the best of circumstances, a framework-protocol process on climate change, whether "stand alone" or embedded in the larger 1992 conference, is bound to take considerable time before any major substantive agreements are hammered out. Meanwhile, valuable time may be lost as countries wait until the international process concludes before taking actions to mitigate greenhouse problems. Some domestic opponents of action will cynically argue for delay; others will merely regard it as a prudent bargaining technique to hold off any unilateral action until an international accord is reached.

"A 'baseline year' agreement, perhaps negotiated as a protocol, could help to neutralize a major argument of domestic opponents."

One approach to this problem would be the early negotiation of a protocol specifying a baseline date after which antigreenhouse measures taken by individual countries would be credited against the requirements of a later international agreement (Moomaw, 1990). With such an agreed date in place, states could promptly undertake unilateral or small group initiatives to reduce greenhouse emissions in the confidence that these measures would "count" toward the reductions required by an ultimate regime.³² Such a "baseline year" agreement, perhaps

negotiated as a protocol, could help to neutralize a major argument of domestic opponents of antigreenhouse measures who hold that action absent overall international agreement is either unwarranted or foolish.

Given the likely time required for an overall agreement embracing substantive antigreenhouse measures, a preliminary "baseline" protocol of this sort should prove far easier to negotiate quickly (perhaps to be announced as part of the 1992 conference results). Incidentally, such a baseline protocol need only assure states that their actions subsequent to the agreed baseline year would count; the question of the status of actions taken *prior* to the agreed date could be left for future negotiation.

International Actions Short of Agreed Emissions Limits or Specific Greenhouse Control Regimes

Instead of immediately seeking a traditional, treaty-based control regime, other approaches can partly sidestep and prevent the problems of blocking coalitions as well as some of the time lags and sovereign difficulties characteristic of formal treaty negotiation, ratification, and implementation.³³ For example, former UNEP Deputy Executive Director, Peter Thacher, has argued against the conventional wisdom of waiting for a negotiated framework convention as a "first step" to be followed by specific protocols. Instead, in line with the Mediterranean and ozone action plans, he suggests that as many countries as are now willing should first agree on a greenhouse "action plan" that contains no formal obligations but that offers the willing sponsors a vehicle within which to commence valuable research, monitoring, and assessment programs promptly as well as to offer developing countries needed assistance to participate in technical and negotiating forums. Such voluntary actions would support and may well speed up the conventional framework-protocol negotiation (1990). Arguably, enough countries and environmental organizations are already supportive enough of such actions that they should not have to wait for the conclusion of a framework convention.

There are a number of other such "soft law" options—so-called to distinguish them from "hard"

treaty law—that function by joint declarations and resolutions (Sand, 1990). Given the potential of global communications technologies and the efforts of concerned governments and interested nongovernmental organizations, these actions can help to spur “informal” control regimes, in part by building on and influencing domestic opinion (Grubb, 1989). In turn, stronger informal regimes may come to be embodied in more potent formal instruments that could earlier have been blocked by opposing coalitions.

A slightly “harder” option has been suggested by Abram Chayes by analogy to launching the International Monetary Fund (1990). By creating a post-war “transition” period during which treaty members could simply “maintain” various forbidden restrictions until they voluntarily relinquished them, the institutional apparatus could be developed, professional staffs and reporting practices established, and generally, momentum built toward the result that was ultimately widely accepted. Applied to the greenhouse case, this arrangement would permit further collection of detailed statistical series on global emissions, facilitate technical assistance to environmental agencies (especially in the developing world), permit the development and empirical validation of more specific performance criteria, and help develop a technically competent and credible monitoring and compliance capability.

In brief, there are several approaches to preventing potential blocking coalitions from acting. The choice and sequence of climate protocols will largely determine the interests, singly or in combination, that arise in opposition; as such, great care should be exercised in the choice. “Baseline” protocols and “transition arrangements” may be useful devices to avoid potent blocking coalitions. International actions short of agreed emission limits or specific control measures may spur information regimes that later become strengthened and formalized in treaties.

Dealing with Potential Blocking Coalitions II: Incremental Agreements and “Ratchets”

Some potential protocols, such as those setting up carbon tax systems, do not single out particular industries or countries for the brunt of regulation,

but they could apply across a broad range of greenhouse gas-emitting activities. One possible negotiating implication is interesting: if initially set at a low enough level—for example, to collect resources for an international environmental fund—their relatively diffuse impact *may* not trigger the same concentrated opposition that more targeted protocols could arouse. Later, with the structure in place, the levels might be ratcheted up, if the state of the science merits it and broad-based support exists for such a move. In virtually any case, getting the structure in place along with a ratchet mechanism for changing the standards seems preferable to holding out for a more stringent regime at the outset.

Indeed, a review of the history of the ozone negotiations suggests the potential value of the advice to proceed step by step rather than to seek a comprehensive accord like the LOS treaty. When an agreement to set CFC limits proved unreachable in 1985, the United States and others pressed for the Vienna “framework” convention that collectively legitimated the problem, set in motion joint efforts at monitoring, coordination, and data exchange, and envisioned the later negotiation of more specific “protocols.”³⁴ (This approach is analogous to the “softer” options discussed above.) In 1987, after scientific consensus on the problem had solidified and industry opposition was largely neutralized, the Montreal protocol embodied an agreement to cut CFC production and use by 50 percent by the year 2000. Many environmental activists harshly criticized these agreed targets as inadequate. Yet negotiators at the time felt both that the 50 percent cut was the maximum that could then be negotiated and that to press for more would have resulted in deadlock.

More important, as part of the institutional arrangements set up by the Montreal protocol, were provisions that facilitated a review of the agreed limits in the face of new evidence (or, effectively, with shifts in public opinion). In effect, these provisions functioned as a “ratchet,” whereby the 50 percent cut served as a base and later findings such as the direct link between CFCs and the “ozone hole” stimulated treaty parties to tighten up the limits. This model of settling for relatively modest restrictions on which early agreement can be reached,

together with arrangements that facilitate reconsideration, may well be emulated in the climate context. As UNEP's Mostafa Tolba recently put it, "By aiming in 1987 for what we could get the nations to sign . . . we acquired a flexible instrument for action. If we had reached too far at Montreal, we would almost certainly have come away empty-handed . . . [The] protocol that seemed modest to some . . . is proving to be quite a radical instrument" (1989:305). This assessment was borne out by the 1990 London negotiations that converted a 50 percent reduction into a virtual CFC ban (Browne, 1990).

Yet there is a danger to partial agreements as exemplified by the 1963 Partial Test Ban Treaty. A number of observers have criticized these accords as stopping too soon and bleeding off the intense public pressure for change—when, arguably, a *comprehensive* test ban treaty was then attainable with intensified negotiating efforts. By addressing the concerns about Strontium-90 from atmospheric testing in the food chain (mothers' milk in particular), this argument goes, the broader dangers of nuclear testing were not addressed and a more valuable opportunity squandered. Rather than acting as a stepping stone to a larger accord, the Partial Test Ban Treaty became a stopping place.

"The Gramm-Rudman antideficit law eerily resembles a climate 'framework' convention in that it contains targets and timetables but leaves specific agreement on cuts and tax increases for later."

One might also draw the analogy to the Gramm-Rudman antideficit law, which eerily resembles a climate "framework" convention in that it contains targets and timetables but leaves specific agreement on cuts and tax increases for later. As such, this law served for years as an expedient political "solution"—at a time of intense public deficit concern—allowing executive and legislative officials to declare the problem "solved" and return to budgetary chicanery. It is quite possible that the large number of unilaterally adopted greenhouse gas control

targets or a weak framework convention that was politically touted as the "solution" to global warming would have an analogous effect.

It is well, therefore, to be mindful of the two different risks associated with the passage of time. To sea-law advocates, dragging out the LOS negotiations in search of a comprehensive accord paved the way for a new administration with a contrary view. By contrast, settling too quickly on partial, expedient measures may reduce the pressure for more genuinely effective accords.

With respect to climate change negotiations, in particular, it is quite likely that public concern will be cyclic, in part as a result of natural climate variability as well as unrelated environmental events (such as medical waste on beaches and the *Exxon Valdez*). Arguably, a naturally occurring period of climate calm, including milder summers and normal rainfall, will lead to reduced public concern and pressure for action. Moreover, scientific understanding will change over time. These prospects argue for more limited agreements with analogs to the ratchet mechanism in the Montreal protocol—if and as more stringent action appears warranted. Such agreements could constitute a "rolling process of intermediate or self-adjusting agreements that respond quickly to growing scientific understanding" (Mathews, 1989). And an even more fundamentally adaptive institution might be envisioned, better matching the rapidly changing science and politics of this issue area. Yet the overall point seems clear: the hazards of blocking coalitions, as discussed above with respect to the U.S. rejection of the LOS treaty and the experience of the ozone negotiations, likewise suggest that—if attainable—it is better to settle for an earlier, more modest treaty with provisions to expedite reviews of the specifics than the uncertain prospect of a more sweeping instrument down the road.

Dealing with Blocking Coalitions III: Reducing the Risk of a North-South Impasse

As discussed above, there is an acute risk that a larger North-South agenda—some of it only loosely related to climate change and much of it highly

contentious—will occupy center stage in greenhouse negotiations. General Assembly debates and early sessions of the Preparatory Commission for the 1992 Conference on Environment and Development have already been characterized by LDC demands for technology transfer and large resource commitments from the industrial world. It is clear that finance and technology, for example, are legitimate interests, but the extent to which developed countries will be forthcoming on them in the context of climate change negotiations is far less clear—especially given ideological reservations about what could be seen as resurgent demands for a “discredited” NIEO. Moreover, despite the keen concern in many nations about climate change, the greenhouse problem is speculative, contested, far in the future, and costly to address now merely on its own terms—absent additional resources to mitigate generalized problems of developing countries. The uncertain prospect of global warming may not be a strong enough hook on which to hang a larger North-South agenda.

It is possible to argue that the force of the ideological opposition to the LOS treaty in the United States was an artifact of a particularly fevered time in U.S. politics that has now passed and that such reactions will not affect the climate issue. Yet this notion would likely be a misinterpretation. As Michael Dukakis found out to his dismay in the 1988 presidential campaign with his appeal to “competence,” ideological forces are often underrated in the United States. In an era when population policy, abortion, social issues, and the proper role of public authority are hotly contested, climate change negotiations may well engender powerful blocking coalitions based on these ideological considerations. For example, while issues of efficiency and mission surrounded the continuing U.S. attacks on the United Nations Educational, Scientific and Cultural Organization, a sizable ideological component animates this U.S. policy. And with the crumbling of socialist ideology in Eastern Europe and the Soviet Union, many Europeans as well are less receptive to formerly attractive NIEO precepts. Thus, if the language negotiated as part of a climate change convention invokes images such as central command, heavy-handed international bureaucracy, forcible technology transfer, blame-casting ideological

declarations, guilt-based wealth transfers, and the like, the results of any such negotiation run substantial risk of being overturned. Indeed northern, especially U.S. opponents of a climate change convention may well base their negative stand on the actual or supposed adverse ideological cast of the regime.

“In an age of media driven politics, climate negotiators should be careful of energizing opponents by a strategy that appears to make major ideological concessions in return for pragmatic fine print.”

The LOS experience is again instructive. Close analysis of the contentious technology transfer provisions of the LOS treaty, for example, suggests that it would be almost impossible to invoke them and that the international community could obtain this technology by other nonforcible means. The production limits that were negotiated were on the basis of technically complex formulas that generally ensured they would pose no real constraint. And the financial terms of contracts, if anything, are more flexible and efficient at risk-sharing than most mining contracts negotiated for land-based contracts or oil leases.³⁵ Considerable U.S. negotiating effort was expended in obtaining these substantive outcomes. Indeed, it is possible to interpret the U.S. negotiating strategy over time as a detailed effort to generate a system that, though burdensome, was commercially workable—but that “gave” the ideological declarations to the developing world and cloaked the substantive provisions in quite visible trappings of the NIEO. Yet an approach that in effect placed a relatively pragmatic system behind a Third World facade proved decisive in energizing opposing ideological coalitions. Indeed, in an age of media-driven politics, climate negotiators should be careful of energizing opponents by a strategy that appears to make major ideological concessions in return for pragmatic fine print.

Like the LOS, therefore, real mutual interdependence means that climate-change talks have the

ingredients for an inescapable long-term North-South engagement: southern insistence on NIEO-like measures met with U.S.-led northern resistance. Southern dissatisfaction with the Montreal protocol and its aftermath only heightens this prospect. Unlike the LOS, given that southern commitment to the NIEO per se has moderated considerably since the 1970s, the risk of an ideologically driven impasse are probably manageable with some conscious effort. As will be discussed below, creative steps are essential to meet legitimate LDC interests while reducing the risk that such an engagement results in endless delay and damaging ideological confrontation—with no action to address the greenhouse problem. Beyond exhortations to reasonableness and shared interest, a number of specific measures could help avoid recreating a sterile North-South clash in the context of climate negotiations—either on a stand-alone basis or in the setting of the 1992 Conference on Environment and Development.

Informal Workshops

A number of well-publicized regional workshops in advance of the negotiations—presented by regional scientists and policy figures that focused on possible local impacts—could help spread the conviction that global warming is a common threat from a shared problem.³⁶ Joint developing-developed country research and study should likewise be encouraged, perhaps building on the work of the IPCC.

During the negotiations themselves, similar informal educational events could be helpful. One extraordinary element of the LOS experience that has been detailed by many outside observers consisted of the influence of a computer model of deep-ocean mining developed at MIT. Largely as a result of its sponsorship, process, and other credibility-enhancing elements, the MIT model came to be widely accepted in the face of the great uncertainty felt by the delegates about the engineering and economic aspects of deep-seabed mining. A significant point in the negotiations occurred during a Saturday morning workshop—held outside U.N. premises under the auspices of Quaker and Methodist NGOs—in which developed and developing country

delegates were able to meet and query extensively the MIT team that had built the model. Indeed, the delegates over time came to make frequent use of the model for learning, mutual education, and invention of new options—and even as a political excuse to move from frozen positions (Sebenius, 1981).

Similarly, a series of informal off-the-record workshops in which diplomats and politically active participants in the negotiation gathered aided the Montreal protocol process. These events greatly increased mutual understanding, improved relationships, and pointed in the direction of a successful treaty (Benedick, 1989). Despite its potential abuse by advocates, therefore, outside scientific information—when it can be seen to be objective and is accessible to the participants—can help move a complex negotiation, even one that is highly politicized and ideologically controversial, in the direction of mutual cooperation. (Of course, improved science may instead clarify winners and losers, thus polarizing the issue.)

Noninflammatory Conference Structure

Conference leadership could avoid structuring the issues and working groups in a way that makes latent North-South clashes more salient. For example, assigning preparation of negotiating drafts to groups with mixed memberships could help; this system might avoid the well-worn reflexive position-taking characteristic of many existing U.N. groups. Likewise, designating protocols or negotiating groups as solely dealing with, say, technology transfer, carries a higher risk of polarization than considering such issues together with others.

Advisory Groups and Cross-cutting Coalitions

Given the actual and feared adverse impacts of measures under discussion, conference leadership would be wise to make extensive use of broadly constituted advisory groups composed of business and other interests to understand concerns, anticipate emerging problems, correct misapprehensions, and communicate about the issues and evolving negotiating responses. Not only could the two-way communication be useful in such settings,

but cross-cutting coalitions might form. For example, industries that could gain from substantial antigreenhouse action in the developing world (by, for example, supplying essential technology for energy efficiency) might make common cause with key LDCs and green advocacy organizations in arguing the case for more developed country assistance for this purpose.

Mutually Beneficial Linkages

Although the LOS experience was cited above as suggesting mutually beneficial “manageable packages” of protocols under a framework climate convention, there is no reason why the same logic could not be cautiously extended to other environmental issues in the context of the Environment and Development Conference. For example, desertification and soil erosion issues may be more pressing to key developing countries than greenhouse questions. Many developed countries that are unwilling to make what could be characterized as “bribes” to induce developing country participation may be genuinely concerned about and more willing to be forthcoming in these regional issues in the context of a larger agreement that promised global climate benefits. Similarly, more expansive versions of so-called “debt-for-nature” swaps may be explored.

One of the most potent long-term steps that could be taken by developing countries to combat global warming (as well as a host of other environmental issues) would be significantly stepped-up population control programs.³⁷ Unlike, say, energy use restrictions, this course of action has the virtue of helping rather than hindering economic development objectives. For cash-strapped LDCs, relatively modest developed country aid in this dimension could considerably enhance domestic population control efforts. (Unfortunately, population issues are not now on the agendas of either the follow-on IPCC process or the 1992 Environment and Development Conference.)

A New Ideological “Template”

Until recently, many international negotiations were doomed to sterility by the clash between East and West. With this ideological conflict receding into

the past, new creative solutions are becoming possible in areas from trade to human rights and to arms control. Another staple of global negotiations—from the United Nations Conference on Trade and Development to debt and codes of conduct for transnational corporations—has been the North-South conflict, though it has moderated in the years between the LOS and Montreal talks.³⁸ As argued above, it is indeed possible, however, for climate change negotiations to become yet another venue for a similarly unproductive contest between an updated version of the NIEO and various northern principles of economics and governance. The previous suggestions in this section have all involved various means of sidestepping or downplaying this ideological conflict, for example, by using procedural devices that emphasize the underlying common problems or by finding offsetting “side payments.”

“A new ‘ideological template’ need not shoehorn countries with vastly different climate interests into catchall categories such as ‘north’ and ‘south.’”

Another possible approach to avoiding rigid ideological deadlock would be the joint development of a new “ideological template” within which the climate question could be negotiated. At a minimum, a new such conception need not shoehorn countries with vastly different climate interests—from coal-rich developing countries such as China and India, to sub-Saharan Africa, to the Second World of Central Europe, and to Norway and the United States—into catchall categories such as “North” and “South.” The most promising candidates to date are the principles of “sustainable development”—insisting on development that meets the needs of the present without compromising the ability of future generations to meet their own needs—articulated by the Brundtland Commission in *Our Common Future* (World Commission on Environment and Development, 1987). Though in need of clearer definition, these widely discussed principles call for tight links between environment and development, for institutions that integrate environmental and economic decision-making, for international cooperation on

global issues, and for major efforts toward more sustainable paths of population, energy, and resources. Whether such principles can come to have the acceptance, weight, and specific implications needed to affect climate negotiations remains to be seen, but they are a promising possibility.

Dealing with Blocking Coalitions IV: A Small-scale (Expanding) Agreement

Notwithstanding the previous suggestions for successful negotiations, the complexities of a universal process, either in a stand-alone framework-protocol context or as part of a larger conference, may threaten endless delay or impasse. In such cases, an alternative possibility will likely become more salient.³⁹ Suppose that a small group of countries, probably certain industrialized states—with potent domestic interests in antigreenhouse measures—were to negotiate among themselves a reduction regime, which could take various forms—including timetables and targets, either voluntary or mandated. Presumably the “core” group of any such smaller-scale negotiation would include major contributors to the greenhouse problem in which there was substantial and urgent domestic sentiment for action. A natural starting “core” would be the 12 nations of the E.C., the 6 member states of the European Free Trade Association, Japan, Australia, and Canada—all of which by late 1990 had adopted greenhouse gas stabilization or reduction targets. At present, the Organisation for Economic Cooperation and Development (OECD) countries account for approximately 45 percent of carbon emissions; with the addition of the Soviet Union and Eastern Europe, the total would rise to 71 percent (Manne and Richels, 1990:15).

Agreement within such a group would likely prove far easier to achieve than a global accord as a function of the smaller number of states involved as well as their greater economic and political homogeneity. Existing institutions (such as the U.N. Economic Commission for Europe or the OECD) might facilitate the process. And though there would clearly be substantial negotiating difficulties involved, this smaller-scale process could avoid a protracted, inconclusive North-South clash that might characterize a larger forum.

To be effective in the longer term, of course, a smaller-scale agreement would have to be expanded later to include key developing countries such as China, India, Brazil, Indonesia, and Mexico (as well as additional developed nations, especially in Eastern Europe). In this sense, an agreement explicitly designed for an increasing number of adherents has strong parallels to agreements that “ratchet” to become increasingly stringent. The design of the smaller negotiation could anticipate and facilitate such an expansion in several ways.

First, the smaller agreement should seek to follow the negotiation of a widely accepted framework convention on climate, such that the general problem is legitimated and accepted to the largest extent possible.

Second, it should be cast not so much as an *alternative* to the global process over protocols but as a complement to it—in which those nations that have evidently caused the present greenhouse gas problem so far are those that are taking early actions to mitigate emissions. This approach would give the smaller group that had agreed to cuts a *higher moral standing* in soliciting later reductions from others.

Third, the smaller-scale group should structure its accord with the explicit expectation of collectively negotiating incentives, likely tailored to special circumstances, for key developing nations to join the accord. For example, the smaller group might agree to tax its members on their carbon emissions. All or part of those tax proceeds could be used to gain the acquiescence of key countries to antigreenhouse measures. Rather than attempt ad hoc negotiations by its members with such other countries, the smaller group could create an entity that itself would carry out these negotiations.

Such negotiations between the smaller treaty group and, say, China, could set a schedule of emission targets and offer China significant incentives to reach them. Or it could address a range of China’s special concerns—environmental and other—in return for less climate-damaging development (e.g., assistance with greater exploration for Chinese natural gas reserves, Chinese agreement to use CFC

substitutes in refrigeration and to undertake more greenhouse-friendly coal development, perhaps by the transfer of more efficient electrical generating equipment). Most important, the character of such “customized” small group-Chinese negotiations—as well as with others such as India and Brazil—should be more conducive to environmentally desirable results than would generalized North-South clashes in a full-scale U.N. conference.

Fourth, as the group of adherents to the smaller convention grew in size, it might choose, in addition to such incentives, to impose a tax on products imported into their member countries from nonadherents, perhaps based on the direct or indirect carbon content of those products. The carrot (of providing individually tailored negotiated incentives for nonadherents to join) and the stick (of raising such a “carbon fence” around the antigreenhouse group) might together lead to a much larger number of countries jointly taking measures to prevent climate change. Evidently, a price to be faced, deliberated, and accepted by the smaller group would be a substantial number of free-riding countries. With a large enough group of adherents, however, the smaller group could still be preferable to no agreement at all.

Ironically, though a number of developing countries have joined the Montreal protocol, it is quite possible to interpret this experience after the fact as strongly analogous to the smaller-scale convention just discussed. Though carried out in the context of a widely accepted framework (the Vienna convention), the relatively small number of key CFC-producing countries ultimately acceded to the CFC reductions in the Montreal protocol. However, important LDCs (India, China, and Brazil) did not go along until 1990. India, for example, demanded \$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 (Stone, 1990). In 1990, a number of developed nations agreed to provide such assistance up to \$240 million. This offer proved sufficiently attractive to representatives of states such as India and China that they indicated willingness to join. Yet, crucially, as a result of the “smaller-scale” Montreal protocol, extremely significant ozone-protection measures are now under way—even

before the full resolution of important issues concerning financial aid and technology transfer to the developing world.⁴⁰

“The provisions in the Montreal Protocol for LDC financial and technical assistance did not contain specific commitments. LDC activists will likely press for far more specificity in a climate conference.”

It is important to note that the provisions in the Montreal protocol for LDC financial and technical assistance, though generally in favor of such actions, did not contain specific commitments. Taking this frustrating experience as a lesson, LDC activists (e.g., India, Brazil, China) will likely press for far more specificity in a larger climate conference, possibly at the framework stage. Clearly, these questions must be addressed; equally clearly, requiring their resolution before any climate action is undertaken could be a recipe for considerable delay. The experience of Montreal as a de facto “smaller-scale” convention may give rise to a more explicit minitreaty in a larger climate context.

Conclusions

For purposes of analysis, this paper has uncritically maintained that the prospect of a serious climate problem exists and has only lightly examined the broader advantages and drawbacks of various proposed policy and institutional responses. Crucial as they are to a full treatment of the issues, these underlying substantive and policy questions enter the analysis primarily insofar as they affect the likely outcomes of pending and potential negotiations. To an advocate of a new greenhouse control regime, the fundamental negotiating task is to craft and sustain a meaningful “winning” coalition of countries backing such a regime. Two centrally necessary conditions for this fundamental task are: (1) that each member of the coalition see enough gain in the regime relative to the alternatives to adhere and (2) that potential and actual “blocking” coalitions of

interests opposed to the regime be prevented from forming and from being acceptably accommodated or otherwise neutralized. The analysis of this paper has been organized around key questions whose answers will influence whether and how these two necessary conditions might (or might not) be met.

Environmental diplomats have largely taken negative lessons from the LOS and positive ones from the CFC accords in envisioning a framework-protocol process for global warming. A deeper analysis is essential. Gaining significant action to curb greenhouse emissions will be a *far* more difficult task than dealing with either ocean resources or the ozone layer. Despite the apparent appeal of the step-by-step framework-protocol approach, a review of the evolution of the LOS process from separate miniconventions into a comprehensive treaty illustrates the powerful forces that will likely operate on a climate change negotiation to combine protocols and to collapse what is seen as a many-stage process into a more unified effort. The trick will be to find smaller, more manageable packages that embody enough mutual gains to attract key players. The generally overlooked power of the coalitions that will arise to block greenhouse action—for reasons of science, interest, ideology, and/or opportunism—must be taken into account in designing an effective negotiating process. Preventing and overcoming these forces could be aided by a sophisticated choice and sequence of protocols as well as by innovative devices such as “ratchet” mechanisms, negotiated “baselines,” and actions short of negotiated targets. Yet even if these hazards are avoided, the possibility of a North-South impasse looms; a number of actions could mitigate it, including procedural steps, creative linkages, and advancement of new ideological “templates.” In any case, and certainly if these measures are unsuccessful, attention may shift to a smaller-scale convention among the major greenhouse culprits that could use incentives and penalties to bring other states into its fold later.

Though the United States ultimately shunned the comprehensive LOS accords and was unable to fashion a meaningful seabed minitreaty alternative, it did actively pursue the Montreal accords. It is not at all clear whether the current political complexion

of the United States—given budget stringencies plus the high cost of action in the face of real scientific uncertainties—would lead to its joining, let alone cooperating with, a smaller-scale climate regime (especially in providing significant incentives to LDCs to join). Yet it is perhaps less likely that the United States would now go along with a universal convention that contained substantial greenhouse gas-mitigating measures. Neither fact should dissuade those concerned with such action from proceeding on all fronts. Relative to the alternative of climate inaction and impasse, the choice would seem clear.

Notes

1. The initial IPCC assessment was set for September 1990 as input to the Second World Climate Conference to be held in Geneva two months later. The IPCC established three working groups: the first, chaired by the United Kingdom, is responsible for assessing scientific information on climate change; the second, chaired by the Soviet Union, is charged with assessing environmental and socioeconomic impacts of climate change; and the third, chaired by the United States, is to evaluate policy response strategies. See Intergovernmental Panel on Climate Change, Working Groups I–III (1990). The first IPCC working group (on greenhouse science) published a June 1990 report suggesting that, absent drastic preventive action, global mean temperatures would climb by 5.4°F by the year 2100 and sea levels would rise by 25.6 inches, enough to submerge the Maldives and swamp coastal plains of countries such as Bangladesh (Whitney, 1990). This dramatic report provided the occasion for Margaret Thatcher to call for urgent action and to pledge that, in the context of an international agreement, Britain would reduce its carbon dioxide emission levels to 1990 levels by the year 2005. Though the United States has remained skeptical, other nations such as West Germany have called for and pledged even stiffer action. For a summary of the unilateral and/or group greenhouse gas reduction targets adopted as of November 1990, see, e.g., *Global Environmental Change Report* (1990).

2. For solid evaluations, see, e.g., Intergovernmental Panel on Climate Change, Working Groups I-III (1990); Grubb (1989); Skolnikoff (1990); or Schneider (1989).
3. "Negotiation analysis" is a prescriptive approach to negotiating situations that draws on game-theoretic concepts but does not presuppose full "rationality" of the participants. For expositions, see, e.g., Raiffa (1982); Lax and Sebenius (1986); Sebenius (1990); or Young (forthcoming).
4. For a discussion of the concept of "regime" in a climate change context, see Young (1989) and Lipschutz (1989).
5. The terms "winning" and "blocking" coalitions are used in a looser sense than is common in a well-structured (e.g., parliamentary) context. For traditional discussions of these concepts, see Luce and Raiffa (1957) or Riker (1962). Here, "winning coalitions" are defined only with respect to a set of policy measures from the point of view of a particular actor or actors; such coalitions consist of sufficient numbers of adherents to render the policy effective (again, from the point of view of the specific actor or actors). "Blocking" coalitions are those opposing interests that could prevent a winning coalition from coming into existence or being sustained. The term "actor" should be contextually obvious and can include states, domestic interests, and transnational groupings of either as appropriate. Though the "necessary" conditions described above are extremely important, "sufficient" conditions do not in general exist for an agreement to be reached and impasse or escalation avoided. See Lax and Sebenius (1986) or Sebenius (1990).
6. Climate change is but one of the many subjects for the 1992 conference, which is timed to take place on the twentieth anniversary of the initial U.N. environmental conference held in Stockholm. The vast agenda of the 1992 conference also includes other atmospheric issues (ozone depletion, transboundary air pollution), land resources issues (desertification, deforestation, drought), biodiversity, biotechnology, the ocean environment, freshwater resources, and hazardous waste (U.N. General Assembly, 1989b).
7. For a summary of the treaty's current status, see Council on Ocean Law (1989) or Richardson (1990).
8. Other useful precedents range from the Limited Test Ban Treaty to the nonproliferation agreements, to the Basel convention on hazardous wastes, to the Convention on International Trade in Endangered Species, to the Antarctic Treaty, and to various regional environmental accords such as the Mediterranean Action Plan. For useful distillations of some of the lessons from these and many other related accords, see Young (1989); Thacher (1990); and, especially, Sand (1990).
9. The following LOS discussion generally relies on Hollick (1981); Sebenius (1984); Oxman, Caron, and Buderl (1983); Council on Ocean Law (1989); and Richardson (1990a, 1990b).
10. The following account draws generally on Benedict (1989, 1990); Doniger (1988); Haas (1990); Roan (1989); and Lang (forthcoming).
11. Special exemptions are included for less developed countries and for the USSR. With all the exemptions written into the protocol, there would have been only an estimated 35 percent reduction in the level of CFCs by 1999, not 50 percent.
12. At the first meeting of the parties to the Vienna convention and the Montreal protocol held in May 1989 in Helsinki, the participants recommended a phaseout of the production and consumption of CFCs not later than the year 2000 and a phaseout of halons, an even more ozone-dangerous CFC relative, as soon as feasible. They also agreed to facilitate the development of an appropriate funding mechanism to aid in the transfer of technology and the replacement of equipment at minimum cost to LDCs. See Governments and European Communities Represented at the First Meetings of the Parties

to the Vienna Convention and the Montreal Protocol (1989).

13. Benedick (1989); Tolba (1989); and Zaelke and Cameron (1990:274).
14. There were, of course, limitations on various activities (e.g., coastal state seaward territorial claims, marine scientific research) negotiated in the LOS context. Not surprisingly, they were among the most difficult aspects of the conference.
15. There were true commons LOS issues, such as the marine environment and the depletion of fish stocks, but they were far less important in a negotiating sense than navigation and seabed resource issues.
16. For a fuller account of these observations, see Sebenius (1984).
17. For discussion of the following figures, see, e.g., Lashof and Tirpak (1989); Intergovernmental Panel on Climate Change, Working Groups I and III (1990); Grubb (1989); and Schneider (1989).
18. See Richardson (1990) or Sebenius (1984).
19. For a general treatment of the underlying theoretical issues of issue linkage and separation or "negotiation arithmetic," see Sebenius (1983) or chapter 9 of Lax and Sebenius (1986).
20. This view is in line with Young's (1989) precept that successful institutional bargains should be "integrative"; issue linkage for joint gain is a prime method of ensuring this situation. See Sebenius (1984) or Raiffa (1982).
21. The Barcelona Framework Convention (for the Protection of the Mediterranean Sea Against Pollution) required adherents to agree to at least one protocol. See Barcelona Convention (1976).
22. See Sebenius (1984) for an elaboration of the following discussion.
23. Analogously, NIEO demands became much more salient after the first oil embargo, when the price of ignoring them appeared to be vital energy deprivation.
24. After noting that "those extensive parts dealing with navigation and overflight and most other parts of the convention are consistent with United States interests," President Reagan said that he rejected the treaty because of his "deep conviction that the United States cannot support a deep seabed mining regime with such major problems." In part, this view reflected the administration's heightened concern about assured access to "strategic minerals" (including manganese nodules) and a feared "resource war" with the Soviets.
25. Further, the deputy chairman of the U.S. delegation to the final LOS negotiating session contended, perhaps with some bitterness, "the primary U.S. objective in fact was the eradication of ideological impurity" (Ratiner, 1982:1011). Other observers shared the view that the "dangerous precedents" in the treaty were the "major forces shaping U.S. policy." See, e.g., Caron (1983) or Berns (1981).
26. This statement does not, of course, mean that developed country action by itself would be useless; it could help mitigate the problem and buy valuable time to fashion other responses.
27. The following points are largely based on Brodeur (1986); Benedick (1989, 1990); and, especially, Haas (1990).
28. U.S. Council of Economic Advisors (1990:234), based on Manne and Richels (1990). For a critique, see Williams (1989); see also Nordhaus (1990).
29. *New York Times*, Nov. 19, 1989:A18. By the Second World Climate Conference a year later, however, Japan and the United Kingdom had joined the progreenhouse control group. See *Global Environmental Change Report* (1990).
30. These are not the only bases for opposition; for example, clashing values or different attitudes toward risk or the passage of time may engender opposition.

31. For a summary, see Heymann (1987).
32. Shirley Williams has noted, however, a drawback to such action: though some states would have taken early antigreenhouse measures and chalked up the credit under a baseline proposal, their possibly important "breakthrough" leadership at a tough later stage of the negotiations would have been lost.
33. Many of these possibilities were explored during 1989–90 by members of the Harvard Negotiation Roundtable.
34. Indeed, the legal discussions that led to the Vienna convention began in 1981, four years after UNEP had formulated a World Plan of Action on the Ozone Layer. See Thacher (1990:108–109).
35. For a detailed analysis, see Sebenius (1984).
36. A number of such events are now under way.
37. See, generally, Ehrlich and Ehrlich (1990). Even if the United States did not go along with such a proposal, the amount of money required at the margin to increase the effectiveness of population programs is relatively small enough that contributions of other nations could be effective.
38. See, e.g., Rothstein (1979) for an earlier such engagement.
39. The idea of a smaller-scale agreement has been considerably discussed and developed in the discussions of the Harvard Negotiation Roundtable during 1989–90. For a perceptive discussion of other such alternatives, see Grubb (1989:47–52).
40. The experience of the Long-Range Transboundary Air Pollution Convention, in which groups of expanding size acceded to the sulfur and nitrogen oxides protocols, is also generally in accord with this suggested approach. See Jackson (1990) for a summary.

References

- Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution (February 16, 1976). *International Legal Materials* 15(1976):290.
- Benedick, R.E. 1989. "Ozone Diplomacy." *Issues in Science and Technology* 6:43–50.
- Benedick, R.E. 1990. "The Montreal Ozone Treaty: Implications for Global Warming." *The American University Journal of International Law and Policy* 5(2):227–34.
- Berns, W. 1981. "Mining the Seas for a Brave New World." *Regulation* (November-December):57–89.
- Brodeur, P. 1986. "Annals of Chemistry: In the Face of Doubt." *New Yorker*. June 9:70–87.
- Browne, M.W. 1990. "93 Nations Agree to Ban Chemicals That Harm Ozone." *New York Times*, June 30, A1.
- Caron, D.D. 1983. "Reconciling Domestic Principles and International Cooperation." In *Law of the Sea: U.S. Policy Dilemma*, edited by B. Oxman et al., pp. 3–12. San Francisco: ICS Press.
- Chayes, A. 1990. *Managing the Transition to a Global Warming Regime or What to Do until the Treaty Comes*. Harvard Law School. Printed here in Part IV.
- Council on Ocean Law. 1989. *The United States and the 1982 UN Convention on the Law of the Sea: A Synopsis of the Status of the Treaty and Its Expanded Role in the World Today*. Washington, D.C.
- Darman, R.G. 1978. "The Law of the Sea: Rethinking U.S. Interests." *Foreign Affairs* (January):373–95.
- Doniger, D.D. 1988. "Politics of the Ozone Layer." *Issues in Science and Technology* (Spring):86–92.
- Ehrlich, P.R., and A.H. Ehrlich. 1990. *The Population Explosion*. New York: Simon and Schuster.

- Evensen, J. 1986. *Working Methods and Procedures in the Third United Nations Conference on the Law of the Sea*. The Hague: Hague Academy of International Law.
- Global Environmental Change Report (Cutter Information Corp., Arlington, Mass.). 1990. 2(19):1-5.
- Governments and the European Communities Represented at the First Meetings of the Parties to the Vienna Convention and the Montreal Protocol. 1989. *Helsinki Declaration on the Protection of the Ozone Layer*.
- Grubb, M. 1989. *The Greenhouse Effect: Negotiating Targets*. London: Royal Institute of International Affairs, Energy and Environmental Program.
- Grubb, M. 1990. "The Greenhouse Effect: Negotiating Targets." *International Affairs* 66(1):67-89.
- Haas, P.M. 1990. Ozone Alone, No CFCs: Ecological Epistemic Communities and the Protection of Stratospheric Ozone. Paper presented at conference on Knowledge, Interests and International Policy Coordination, Wellesley College.
- Hardin, G. 1968. "The 'Tragedy of the Commons.'" *Science* 162:1243-48.
- Heymann, P. 1987. *The Politics of Public Management*. New Haven: Yale University Press.
- Hollick, A.L. 1981. *U.S. Foreign Policy and the Law of the Sea*. Princeton, N.J.: Princeton University Press.
- Intergovernmental Panel on Climate Change, Working Group I. 1990. *Policymakers' Summary of the Scientific Assessment of Climate Change*. World Meteorological Organization and United Nations Environment Programme, Intergovernmental Panel on Climate Change.
- Intergovernmental Panel on Climate Change, Working Group III. 1990. *Policymakers' Summary of the Formulation of Response Strategies*. World Meteorological Organization and United Nations Environment Programme, Intergovernmental Panel on Climate Change.
- Jackson, C.I. 1990. "A Tenth Anniversary Review of the E.C.E. Convention on Long-Range Transboundary Air Pollution." *International Environmental Affairs* 2:217-26.
- Kissinger, H.A. 1975. "International Law, World Order, and Human Progress." Speech before American Bar Association annual convention, Montreal, Aug. 11. U.S. Department of State Press Release:9.
- Koh, T.T.B., and S. Jayakumar. 1985. "The Negotiating Process of the Third United Nations Conference on the Law of the Sea." In *United Nations Convention on the Law of the Sea 1982: A Commentary*, edited by M.H. Nordquist. Boston: Martinus Nijhoff Publishers.
- Krasner, S.D. 1983. *International Regimes*. Ithaca, N.Y.: Cornell University Press.
- Krasner, S.D. 1985. *Structural Conflict: The Third World against Global Liberalism*. Berkeley: University of California Press.
- Lang, W. Forthcoming. "Is the Ozone Depletion Regime a Model for an Emerging Regime on Global Warming?" *UCLA Journal of Environmental Law and Policy*.
- Lashof, D., and D. Tirpak. 1989. Policy Options for Stabilizing Global Climate, U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation.
- Lax, D.A., and J.K. Sebenius. 1986. *The Manager as Negotiator*. New York: The Free Press.
- Lipschutz, R.D. 1989. "Bargaining among Nations: Culture, History & Perceptions in Regime Formation."

- Paper presented at workshop on Managing the Global Commons, Knoxville, Tenn.
- Luard, E. 1977. *The Control of the Seabed: An Updated Report*. New York: Taplinger.
- Luce, R.D., and H. Raiffa. 1957. *Games and Decisions*. New York: Wiley.
- Manne, A.S., and R.G. Richels. 1990. "Global CO₂ Emission Reductions—The Impacts of Rising Energy Costs." Electric Power Research Institute, Menlo Park, Calif.
- Mathews, J.T. 1989. "Redefining Security." *Foreign Affairs* 68 (Spring):162–77.
- Moomaw, W.R. 1990. "A Modest Proposal to Encourage Unilateral Reductions in Greenhouse Gases." Tufts University.
- New York Times*. 1989. Nov. 19, A18.
- New York Times*. 1990a. July 12, A1.
- New York Times*. 1990b. "Excerpts from Economic Declaration by Chiefs of Seven Industrial Nations." July 12, A15.
- Noordwijk Declaration for the Ministerial Conference on Atmospheric Pollution and Climate Change. 1989. Noordwijk, The Netherlands. Nov. 7.
- Nordhaus, W.D. 1990. "Greenhouse Economics: Count before You Leap." *The Economist*. July 7:21.
- Oxman, B., D. Caron, and C. Buder. 1983. *Law of the Sea: U.S. Policy Dilemma*. San Francisco: ICS Press.
- Raiffa, H. 1982. *The Art and Science of Negotiation*. Cambridge: Harvard University Press.
- Ratiner, L. 1982. "The Law of the Sea: Crossroads for U.S. Policy." *Foreign Affairs* 60:1011.
- Richardson, E.L. 1990a. "Law of the Sea: A Reassessment of U.S. Interests." *Mediterranean Quarterly: A Journal of Global Issues* 1(2):1–13.
- Richardson, E.L. 1990b. "Statement of Elliot L. Richardson, Chairman, Council on Ocean Law." Statement to U.S. Senate Committee on Foreign Relations. May 1.
- Riker, W. 1962. *The Theory of Political Coalitions*. New Haven: Yale University Press.
- Roan, S. 1989. *Ozone Crisis*. New York: John Wiley.
- Rothstein, R.L. 1979. *Global Bargaining: UNCTAD and the Quest for a New International Economic Order*. Princeton, N.J.: Princeton University Press.
- Sand, P.H. 1990. *Lessons Learned in Global Environmental Governance*. Washington, D.C.: World Resources Institute.
- Schneider, S.H. 1989. "The Greenhouse Effect: Science and Policy." *Science* 243:771–81.
- Sebenius, J.K. 1981. "The Computer as Mediator: Law of the Sea and Beyond." *Journal of Policy Analysis and Management* 1:77–95.
- Sebenius, J.K. 1983. "Negotiation Arithmetic: Adding and Subtracting Issues and Parties." *International Organization* 37:281–316.
- Sebenius, J.K. 1984. *Negotiating the Law of the Sea: Lessons in the Art and Science of Reaching Agreement*. Cambridge: Harvard University Press.
- Sebenius, J.K. 1990. "The Negotiation Analytic Approach." In *International Negotiation: Problems and New Approaches*. Edited by V. Kremeneuk and I.W. Zartman. San Francisco: Jossey-Bass.
- Skolnikoff, E.B. 1990. "The Policy Gridlock on Global Warming." *Foreign Policy* (Summer): 77–93.
- Stanley, R.H. 1990. *Environment and Development: Breaking the Deadlock*. Report of the 21st U.N. Issues Conference, 1990. Muscatine, Iowa: The Stanley Foundation.
- Stone, C. 1990. "The Global Warming Crisis, If There Is One, and the Law." *The American University*

- Journal of International Law and Policy* 5(2):497–511.
- Thacher, P.S. 1990. "Alternative Legal and Institutional Approaches to Global Change." *Colorado Journal of International Environmental Law and Policy* 1(1):101–126. Reprinted here in Part IV.
- Tickell, C. 1988. "Remarks." In *Proceedings of the Second North American Conference on Preparing for Climate Change*. Washington, D.C.: Climate Institute.
- Tolba, M. 1989. "A Step-by-Step Approach to Protection of the Atmosphere." *International Environmental Affairs* 1(4):304–308.
- U.N. General Assembly. 1989a. "Resolution on the Protection of the Global Climate." G.A. Res. 43/53, A/RES/43/53. Jan. 27.
- U.N. General Assembly. 1989b. "United Nations Conference on Environment and Development." G.A. Res. 228, 44 U.N. GAOR Supp. 49:300, U.N. Doc. A/44/49.
- U.S. Council of Economic Advisors. 1990. *Economic Report of the President*. Washington, D.C.: Government Printing Office.
- U.S. Environmental Protection Agency. 1989. Whitney, C.R. 1990. "U.N. Warning on Warming: Cut Emissions 60% Now, or Else." *International Herald Tribune* (Zurich). May 26–27:1, 4.
- Williams, R.H. 1989. *Low Cost Strategies for Coping with Carbon Dioxide Emission Limits*. Princeton University, Center for Energy and Environmental Studies.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford: Oxford University Press.
- Young, O.R. 1989. "The Politics of International Regime Formation: Managing Natural Resources and the Environment." *International Organization* 43:349–75.
- Young, O.R. Forthcoming. *Negotiation Analysis*. Ann Arbor: University of Michigan Press.
- Zaelke, D., and J. Cameron. 1990. "Global Warming and Climate Change—An Overview of the International Legal Process." *The American University Journal of International Law and Policy* 5(2):249–90.

James K. Sebenius is Associate Professor and Co-Director of the Negotiation Roundtable, Kennedy School of Government, Harvard University. This paper is also a discussion paper originally from the Global Environmental Policy Program of the Center for Science and International Affairs at the Kennedy School. The paper benefited from the ideas and helpful comments generously offered by Lance Antrim, Arthur Applbaum, Sorin Bodea, Albert Carnesale, Abram Chayes, William Clark, Robert Dorfman, Tommy T.B. Koh, Henry Lee, Marc Levy, Ronald Michell, Bradford Morse, Howard Raiffa, Elliot Richardson, Jeffrey Rubin, Eugene Skolnikoff, Lawrence Susskind, John Swing, Peter Thacher, and Shirley Williams as well as members of the Negotiation Roundtable and the Salzburg Environmental Initiative. Support of the Office of Policy and Evaluation of the U.S. Environmental Protection Agency is gratefully acknowledged.

World Resources Institute

1709 New York Avenue, N.W.
Washington, D.C. 20006, U.S.A.

WRI's Board of Directors:

Matthew Nimetz

Chairman

John E. Cantlon

Vice Chairman

John H. Adams

Robert O. Anderson

Robert O. Blake

John E. Bryson

Ward B. Chamberlin

Richard M. Clarke

Edwin C. Cohen

Louisa C. Duemling

Alice F. Emerson

John Firor

Michio Hashimoto

Cynthia R. Helms

Curtis A. Hessler

Martin Holdgate

Thomas E. Lovejoy

C. Payne Lucas

Alan R. McFarland

Robert S. McNamara

Scott McVay

Paulo Nogueira-Neto

Thomas R. Odhiambo

Saburo Okita

Ruth Patrick

Alfred M. Rankin, Jr.

Roger W. Sant

James Gustave Speth

M.S. Swaminathan

Mostafa K. Tolba

Russell E. Train

Alvaro Umaña

Victor L. Urquidi

George M. Woodwell

James Gustave Speth

President

Mohamed T. El-Ashry

Senior Vice President

J. Alan Brewster

Vice President for Administration and Finance

Jessica T. Mathews

Vice President

Wallace D. Bowman

Secretary-Treasurer

The World Resources Institute (WRI) is a policy research center created in late 1982 to help governments, international organizations, and private business address a fundamental question: How can societies meet basic human needs and nurture economic growth without undermining the natural resources and environmental integrity on which life, economic vitality, and international security depend?

Two dominant concerns influence WRI's choice of projects and other activities:

The destructive effects of poor resource management on economic development and the alleviation of poverty in developing countries; and

The new generation of globally important environmental and resource problems that threaten the economic and environmental interests of the United States and other industrial countries and that have not been addressed with authority in their laws.

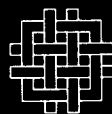
The Institute's current areas of policy research include tropical forests, biological diversity, sustainable agriculture, energy, climate change, atmospheric pollution, economic incentives for sustainable development, and resource and environmental information.

WRI's research is aimed at providing accurate information about global resources and population, identifying emerging issues, and developing politically and economically workable proposals.

In developing countries, WRI provides field services and technical program support for governments and non-governmental organizations trying to manage natural resources sustainably.

WRI's work is carried out by an interdisciplinary staff of scientists and experts augmented by a network of formal advisors, collaborators, and cooperating institutions in 50 countries.

WRI is funded by private foundations, United Nations and governmental agencies, corporations, and concerned individuals.



WORLD RESOURCES INSTITUTE

1709 New York Avenue, NW
Washington, DC 20006
USA