International Relations and Global Climate Change

edited by
Urs Luterbacher
and Detlef F. Sprinz

International Relations and Global Climate Change

Global Environmental Accord: Strategies for Sustainability and Institutional Innovation
Nazli Choucri, editor

Nazli Choucri, editor, *Global Accord: Environmental Challenges and International Responses*

Peter M. Haas, Robert O. Keohane, and Marc A. Levy, editors, *Institutions for the Earth: Sources of Effective International Environmental Protection*

Ronald B. Mitchell, *Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance*

Robert O. Keohane and Marc A. Levy, editors, *Institutions for Environmental Aid: Pitfalls and Promise*

Oran R. Young, editor, *Global Governance: Drawing Insights from the Environmental Experience*

Jonathan A. Fox and L. David Brown, editors, *The Struggle for Accountability: The World Bank, NGOs, and Grassroots Movements*

David G. Victor, Kal Raustiala, and Eugene Skolnikoff, editors, *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*

Mostafa K. Tolba with Iwona Rummel Bulska, *Global Environmental Diplomacy: Negotiating Environmental Agreements for the World, 1973–1992*

Karen T. Litfin, editor, *The Greening of Sovereignty in World Politics*

Edith Brown Weiss and Harold K. Jacobson, editors, *Engaging Countries: Strengthening Compliance with International Environmental Accords*

Oran R. Young, editor, *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*

Ronie Garcia-Johnson, *Exporting Environmentalism: U.S. Multinational Chemical Corporations in Brazil and Mexico*

Robert G. Darst, *Smokestack Diplomacy: Cooperation and Conflict in East-West Environmental Politics*

Urs Luterbacher and Detlef F. Sprinz, editors, *International Relations and Global Climate Change*

Edward L. Miles, Arild Underdal, Steinar Andresen, Jørgen Wettestad, Jon Birger Skjærseth, and Elaine M. Carlin, *Environmental Regime Effectiveness: Confronting Theory with Evidence*

International Relations and Global Climate Change

edited by Urs Luterbacher and Detlef F. Sprinz

The MIT Press
Cambridge, Massachusetts
London, England

In memory of Harold K. Jacobson, accomplished scholar, beloved teacher, effective administrator, and gentleman.

This book was set in Sabon by Achorn Graphic Services, Inc. and was printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

International relations and global climate change / edited by Urs Luterbacher and Detlef F. Sprinz.
p. cm. — (Global environmental accords series)
Includes bibliographical references and index.
ISBN 0-262-12240-5 (hc. : alk. paper) — ISBN 0-262-62149-5 (pbk. : alk. paper)
1. Climatic changes—Government policy. 2. Global environmental change. I. Luterbacher, Urs. II. Sprinz, Detlef F. III. Series.
QC981.8.C5 I58 2001
363.738′74526—dc21

2001030575

Contents

Preface

Since the early 1990s, we have witnessed the growth of a body of knowledge on global climate change policies. Because climate change by its very nature is a global problem where responsibilities are difficult to attribute and where activities in one country might affect faraway regions, mitigating global climate change can only be achieved efficiently through international collaboration. For this reason, scholars of international relations have devoted considerable attention to this topic. Their various conceptual, theoretical, and methodological approaches to the problems in international cooperation raised by global climate change contribute to a better understanding of the achievements accomplished to date as well as the challenges ahead. This book synthesizes the knowledge provided by scholars in the field of international studies in accessible format, particularly for international relations students and also for public policymakers and members of the interested general public.

The recently elected Bush administration in the United States has declared itself against the Kyoto Protocol and the perspective of deep cuts in emissions of greenhouse gases. Although many European governments appear to be more willing to engage in policies proposed by the protocol, none of them is irreversibly committed to such courses of action. These current diplomatic difficulties clearly emphasize the necessity to analyze and synthesize recent scholarly knowledge about ways to envisage and suggest cooperative strategies on climate change. While the history of global climate change negotiations is an important component of the present study, it is the analysis of the configuration of international actors, their preferences, and the problems encountered in bargaining on global climate agreements that we emphasize in this book. Within this

general framework, we also deal with the issues of effectiveness and compliance raised by the United Nations Convention on Climate Change and the Kyoto Protocol and address the issue of the relationship between climate change policies and other global accords. Moreover, we are concerned about how well these policies fit into the existing bundle of international cooperative arrangements, in particular with the international trade regime defined by the World Trade Organization. In essence, much of what we cover in this book could serve as a template for analyzing other global environmental agreements from the various perspectives of scholarship in international relations. Thus, it is not the purpose of this book to provide a clear-cut answer to the question of what the future global climate policy will be and to argue about how desirable it is. We want, instead, to give the reader the scholarly background and tools necessary to analyze global environmental policy.

When this project was started in mid-1994, roughly a year before the first Conference of the Parties to the UN Framework Convention on Climate Change (1995), the concept for this book was developed as a joint venture between the coeditors Urs Luterbacher of the Graduate Institute of International Studies (Geneva, Switzerland) and Detlef F. Sprinz of the Potsdam Institute for Climate Impact Research (Potsdam, Germany). We began with a compact review of what the global climate policies looked like and organized two authors' meetings in Geneva and Potsdam for this purpose. These meetings helped to further refine and develop the original structure drafted by the coeditors and resulted in two editions of a Potsdam Institute for Climate Impact Research (PIK) report in 1996. These were then distributed to the participants of the Second Conference of the Parties that year in Geneva.

The following year, we had the good fortune to receive encouragement for the development of this manuscript for the MIT Press series Global Environmental Accord: Strategies for Sustainability and Institutional Innovation, edited by Nazli Choucri. An anonymous initial reviewer provided us with a range of constructive suggestions, which we complemented with additional ideas. As a consequence, the original chapters were expanded to their present length, and new chapters were added to put climate change policy into the larger context of other global environmental and economic regimes. Our perspective evolved and led us to

conceive of the book not as a collection of individual chapters but as a more coherent whole. We therefore decided to write links between the various chapters, showing how one type of question led naturally to another. As a result of these revisions, a more balanced book emerged.

Any project conducted over such a long time span becomes indebted to many persons. For brevity's sake we will acknowledge only some of them. Without the "long-distance runner" qualities of our authors, this book would have never materialized. They remained faithful and cheerful to the end, even when we pressed them to meet deadlines and when we insisted on the fine-tuning needed to minimize overlap between chapters. Because all research and scholarly writing depends on support, we graciously acknowledge the financial contribution and vision of Hans Joachim Schellnhuber, Director of the Potsdam Institute for Climate Impact Research (PIK), who made this book an institute project. The generous funding of PIK allowed us to hold the two authors' meetings and to send observers to the various Conferences of the Parties to the United Nations Framework Convention on Climate Change.

Many colleagues provided constructive criticism and help throughout the evolution of this book. We acknowledge in particular the detailed comments by Thomas Gehring, Carsten Helm, Harold Jacobson, James Morrow, Benito Müller, Sebastian Oberthür, Steve Rayner, Arild Underdal, David Victor, and four anonymous reviewers for The MIT Press. We also thank the participants of our panel on International Responses to Global Climate Change at the 36th Annual Convention of the International Studies Association (21–25 February 1995, Chicago, IL), and the participants to the First Open Meeting of the Human Dimensions of Global Environmental Change Community (01–03 June 1995, Duke University, Durham, NC), for their comments and encouragement.

No collaborative project succeeds without the helpful hands and minds of good secretarial support and research assistants. Denise Ducroz arranged the authors' meeting in Geneva and provided secretarial support on early drafts of the manuscripts. Ursula Binder, Petra Schellnhuber, and Andreas Wahl assisted with the Potsdam authors' meeting. The production and redrafting of the PIK reports relied on the never-ending enthusiasm of Sarah Huber. Jan Tiessen and Martin Weiss of the Potsdam Institute and Carla Norrlöf at the Graduate Institute of International

Studies helped with enthusiasm and dedication with the completion of the final manuscript for The MIT Press.

We got considerable help and comfort on the publishing side from our editors at The MIT Press. We happily acknowledge the unwavering support of Nazli Choucri and Clay Morgan, who advanced the book project by providing advice, encouraging the book editors, and helping resolve the small and larger challenges that emerge in the process of publishing a book. Nazli kindly suggested the idea to analyze climate change policies within the larger context of other global environmental agreements; this idea subsequently led to an additional chapter on looking at climate change policies within the larger context of the global trade regime. Clay ably kept the book on track. His quiet and polite manners gave the whole finalizing and publishing process a stable direction, and the book editors only wish that the planning and assembling of the book could have been as smooth as publishing it turned out to be. For the final oversight of the manuscript editing and the proofs, we acknowledge the kind assistance provided by Sandra Minkkinen.

The details of climate policy will inevitably change over the coming years. The present difficulties will certainly generate new proposals and ideas, but the basic tools and methodologies to analyze global climate change should remain more constant. We trust that the reader will share a variation on Herder's dictum that we learn not only from the particular case under investigation but also about the larger theme of the global environmental policy framework.

Geneva and Potsdam
March 2001

I

Introduction

This page intentionally left blank

1

Problems of Global Environmental Cooperation

Urs Luterbacher and Detlef F. Sprinz

1 Global Climate Change in the Context of Interactions Between Society and Environment

Climate and climate change have always been part of the human experience. Anthropologists and paleontologists, basing their assertions on the work of paleoclimatologists, have suggested that a geological rift in Africa four or five million years ago might have caused drier conditions in the eastern part of the continent. This apparently favored savannas over forests. Apelike creatures would have been forced to move over longer distances on their hind legs, a better adaptation to this environment than four-legged walking. Hominids such as Lucy and, eventually, Homo habilis, were the result of this evolutionary process that led to the emergence of modern humans, Homo sapiens sapiens. Modern humans, having displaced all other hominids, faced totally new ecological conditions at the end of the Pleistocene when another change in the global climate, caused by the melting of the huge glaciers covering most of Western Europe and North America, created drier conditions in the Middle East. Archeologists (McCorriston and Hole 1991, for example) tell us that the changing flora and fauna of the Middle East and the drier, more seasonal climate there led humankind to adopt plant cultivation and animal husbandry as new modes of production. A few thousand years later, floods, probably caused by further ice melting throughout the period called the Holocene optimum, led people to regroup in cities, a development that seems to have ultimately led to the emergence of state organizations.

What is remarkable about such developments is not just that climate change influences humankind, but also that people respond with new modes of production and new instruments of social cooperation that are still in some sense with us today. Even the Industrial Revolution can be linked in some degree to climate change. Cold conditions of Northern Europe during the sixteenth and seventeenth centuries drove people to overuse their supplies of wood for heating and cooking, setting in motion the ever-increasing levels of fossil fuel use. As early as a century ago, the Swedish scientist Arrhenius had concluded that the burning of coal and other fossil fuels could increase the atmospheric concentration of the resulting combustion gases called, appropriately, *greenhouse gases* (GHG) to such an extent that they could produce climate change in the form of global warming. These concerns were amplified by intensive research into the Earth system undertaken during and after the International Geophysical Year in 1959. New discoveries about atmospheric chemistry were made. Scientists realized, for example, that the high-altitude ozone layer protecting the Earth against strong ultraviolet radiation was threatened by chlorine and other chemical compounds released into the atmosphere as by-products of various industrial and refrigeration processes. Ozone and chlorofluorocarbons (CFCs), the main culprit in ozone depletion, are also greenhouse gases. This growing understanding of global atmospheric chemistry and physics over the past few decades has contributed to increasing concern about a possibly unfavorable evolution of the climate system.

The creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) produced the first attempts to organize scientific cooperation on this issue. The conclusions of the 1990 and 1995 reports of the IPCC signaled the seriousness of the problem and set in motion the current efforts to mobilize international cooperation to promote global climate policies. In 1995, the IPCC made the by-now famous statement that "the balance of evidence suggests that there is a discernible human influence on global climate" (Intergovernmental Panel on Climate Change 1996, Summary for Policymakers). Since then, evidence continues to mount to support the reality of human-induced climate change and to suggest that climate warming could possi-

bly lead to major instabilities. Paradoxically, Western Europe, for instance, could experience another cold period due to a change of orientation in the Gulf Stream.

This volume—a critical review of social science and international relations literature on the climate change issue—is not about climate change per se nor is it uniquely about the existing or evolving international legal regimes about climate change. Rather, our goal is to use the example of climate change and the human response to it in order to explore international efforts to define collaborative strategies to address phenomena of truly global magnitude. Which institutions are already in place? Which new institutions and forms of cooperation are being added to the existing international framework? What are the strategies that can explain some of the moves made in this context by various protagonists? Who are the major players? What are their interests? How can one think about ways to overcome major obstacles that confront international cooperation on this matter? These are some of the questions that the book attempts to answer.

These questions go far beyond the issue of climate change. They invoke broad social developments and the ways humans organize their relations with the physical system and its processes. Many fundamental developments in recent history are closely linked to the climatic shifts we observe. The period of economic growth that took place in the international system after World War II as well as the internationalization and acceleration of resource movements tremendously increased the impact of human activities on the environment. Substantial population growth has occurred everywhere, especially in the developing countries of Asia and Africa, and has accentuated pressures on the environment. Increases in the use of fossil fuels and fluorocarbons and widespread deforestation, along with increases in agricultural production, urban development, and industrial production, have led to a great rise in the quantity of greenhouse gases. At the same time, environmental degradation and the increased use of natural resources have been associated with social problems, such as mass migration. As a result, according to some researchers, environmental factors have contributed to domestic and international conflict (on this see Homer-Dixon, Boutwell, and Rathjens 1993). Therefore, the demand for international coopera-

tion and for appropriate international institutions has also become greater.

Two approaches dominate studies concerning international responses to climate change. A first group of studies stresses the influence of global climate change on the workings of the international system at all levels, as well as the social and political problems raised by it. These include the search for appropriate cooperative and institutional responses as well as the search for environmental security. A second approach is concerned with the impact of social driving forces on the global environment, and, ultimately, on the climate system. These driving forces include such processes as the effect of the global increase of international and interregional transactions in the form of movements of people, goods and services, and capital. We will briefly examine these two perspectives in turn.

2 Influences of Global Climate Change on the International System

Current global climate change will be an increased challenge to all the Earth's inhabitants, but the impacts will vary substantially from region to region. Previous research into the oil crisis of the 1970s, for example, led to the conclusion that *industrial* societies had sufficient resilience to resist profound shocks to their economic systems (Luterbacher et al. 1987). In the case of climate, evaluation of historical climate trends suggests that the impact of future climate change will be most strongly felt in marginal agricultural areas mostly located in developing countries (Leroy-Ladurie 1971; Parry 1990; Rosenzweig et al. 1993). Common to marginal systems in all historical periods are the absence of redundancies in their production systems that would allow adaptation to sudden changes, and little access to capital (other than land) that would permit rapid changes of production strategies.

Climate warming is thus expected to exacerbate the differences between developing and developed countries' welfare and may have the consequence of increasing migratory tendencies. If migration occurs on a massive scale to more advanced regions, this economic development is likely to lead to both absolute and per capita increases of greenhouse gas emissions in industrialized regions. In conclusion, climate change is likely to lead to both a more fragile and overused resource base and greater

migratory pressures (see Kuhn, Wiegandt, and Luterbacher 1992; Luterbacher and Wiegandt 1991, 1994).

2.1 The Impact of International Driving Forces on the Environment

Given these social processes in which climate plays a significant role, we can imagine that climate change could become a more frequent underlying cause of interregional and international disputes. Uneven resource distribution and differences in natural constraints, as well as dissipation of resources, can be at the root of social conflicts—both within and between societies. Homer-Dixon (1993) in particular has pointed to the importance of environmentally induced conflict. An obvious example is the potential for international conflict over access to water resources that we observe in arid or semiarid regions. Such conflicts could be exacerbated by climate change, as Gleick (1993) and Lowi (1993) have shown. More generally, global climate change could alter the present distribution of resources among nations and, therefore, the balance of power between them. Given that major powers are located mostly in the industrialized world, any politically significant shift in power relations is unlikely at present. Management of these new types of conflict, wherever they might occur, will nevertheless require the creation of new types of international interactions and institutions or a reinforcement of existing international security organizations. More generally, climate change has the potential to exacerbate international inequalities. Current international structures may not be sufficient to alleviate this situation. This issue will be discussed in more detail in chapters 6 and 7 on equity considerations.

The essential role played by property structures in the management of resources was recognized in Hardin's famous article on the "Tragedy of the Commons" (Hardin 1968) in which the author emphasized how productive gains could be dissipated in an open-access system of land use. Private property evolved to deal with such inefficiencies. Some authors have proposed the "privatization" of international commons to make their use by various nations more efficient (Connybeare 1980).[1] In a way such privatization initiatives are also at the root of tradable permit schemes largely incorporated into the Kyoto Protocol of the Framework Convention on Climate Change (FCCC), as stressed by Bodansky in chapters 2 and 10.

In addition to locally organized social institutions that address resource problems, there also exist various forms of exchange and transactions of goods (i.e., trade of goods, including natural resources), people (migration), and financial capital that shape resource use. A representation of the necessary connections between all these factors can be found in the standard models of migration (e.g., Harris and Todaro 1970).

Sometimes social institutions created to avoid inefficiencies and dissipations at the local level will be threatened by an increased recourse to transactions. The transfer of too many resources or people or capital from one location into another social system may lead to the weakening of either system. Such consequences have been evoked with respect to trade liberalization and the Uruguay Round agreements. A thorough discussion of the environmental impact of trade liberalization can be found in Anderson and Blackhurst 1992. Since the present international trade regime allows for discrimination against environmentally harmful products but not against production methods that might endanger the environment, liberalized trade has often been associated with environmental damage.[2] Chichilnisky (1994) examines the negative environmental impact of trade when it takes place between regions with different property systems. Rosenzweig and Parry (1994), however, point to the potentially positive environmental impacts of trade liberalization.

If exchange can have positive environmental effects, international collaboration is necessary to reduce restrictions on trade, capital, labor flows, or incentives that will attract excessive numbers of people into certain areas, such as urban regions (see Owen 1987). To achieve such cooperation, trade-off possibilities must exist between regions and countries. Such trade-off situations exist whenever one region enjoys a comparative advantage in terms of some category of goods, like agricultural goods, or is more successful in some area of economic production than another country. In the latter case, for example, an industrialized country could open up its labor market (and thus eventually lower domestic wages) in exchange for capital exports to developing countries. Similar types of international collaboration have been undertaken to solve the climate change problem through the elaboration of the FCCC and the Kyoto Protocol. However, this international solution to the climate prob-

lem might clash with other collaborative efforts at the global level. We will also discuss this issue in chapter 13.

2.2 Global Climate Change and the Need for International Cooperation

Overcoming the problems engendered by global climate change raises the question of international cooperation and collaboration. In contrast to local environmental questions, which affect specific regions or countries, global environmental change results from activities by individuals, firms, social groups, or entire countries that have global consequences. This is particularly true for climate change, which is in part a consequence of human activities that produce local emissions of greenhouse gases. The mixing of these gases in the atmosphere is so thorough that they are believed to contribute to global climate change by increasing the greenhouse effect on Earth. In this process, there is no a priori relationship between the quantity of greenhouse gases that a region or a country emits and the consequences for that same area in terms of climate change. Global climate change therefore raises the issue of the relationship between the general use of resources by human populations and the ultimate limits of this use. Garrett Hardin's (1968) previously mentioned metaphor of the tragedy of the commons, in which self-interest and the lack of any constraints on access leads to the over exploitation of open-access grazing, is another expression of the resource-use dilemma and seems at first glance to be a useful way to think about the barriers hindering the international community from initiating actions on global climate change. For instance, although some nations are committed to stabilizing, or even reducing, greenhouse gas emissions within a fixed time frame, others appear intent on doing nothing or delaying as long as possible implementation of the steps they first agreed to at the 1992 United Nations Conference on Environment and Development or later at the conference that led to the Kyoto Protocol.

The atmosphere can thus be characterized as a "common"—in other words as a collective good to which everyone has access. The resources associated with this particular common, however, are limited or exhaustible. CO_2 and other greenhouse gases, if they are too numerous in the atmosphere, perturb the normal functioning of the climate system. The

climate system common thus appears as a nonexclusive but rival collective good. A systematic investigation of the whole issue of common limited resources is presented in the volume by Dasgupta and Heal (1979). Their work emphasizes open access as the fundamental problem in the use of limited resources, an analysis that can also be applied, by analogy, to climate change.

Dasgupta and Heal (1979) show that open-access conditions constrain the incentive structure for producers in such a way that the average productivity per producer is, until the resource is completely used up, always superior to marginal productivity. A pool of exhaustible resources will thus always attract additional producers until the surplus that can be achieved from producing vanishes. This can be expressed by thinking of output as a function of input with at first increasing but then diminishing returns, while input costs increase proportionally to their size. Potential input/resource equilibria exist only at *suboptimal* locations where input costs have grown too strongly with regard to output and where all the potential productive surpluses achieved by societies have been dissipated.

This discussion can be illustrated by figure 1.1, which shows the relations between input (or any extractive capability) and output under the assumption of initially increasing but then rapidly diminishing returns. Under this assumption, two equilibria are possible, namely, A and B. Whereas equilibrium A is unstable, because an increase in extractive inputs results in an increase of output beyond input costs, equilibrium B is stable but inefficient, because all the surplus achieved in C has been dissipated. Only taxation, regulatory measures, or a quota system could help achieve a surplus by pushing the straight line (representing costs) higher or by limiting either input or output.

Dasgupta and Heal point out that open-access systems of this type can be controlled through three types of instruments, all of which are applicable to climate change. A first type of measure is a tax on inputs that raises their costs and thus results in limiting output at its optimal level. A second type of instrument establishes rules that limit input to its optimal level. Finally, input quotas can be set to produce an optimal level of output. The latter solution is actually similar to the establishment of new property rights. Their creation will automatically eliminate the open-access problem since each owner of the property right (here an access quota) has an

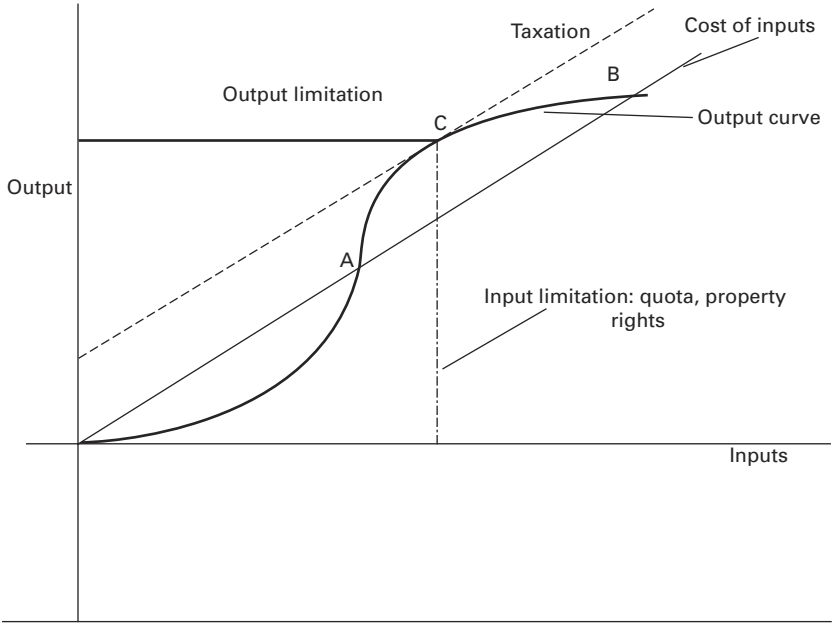

Figure 1.1
Social dimensions of resource use

incentive to use it efficiently. The quota encourages each owner to try to maximize marginal productivity, which will lead producers to maximize productive surplus and restrain their use of productive inputs. This discussion about instruments reflects the negotiations of the Kyoto Protocol, which led to the definition of flexible or Kyoto Mechanisms to reduce emissions levels of industrialized countries by 5.2 percent below their 1990 levels. In principle, these goals could have been met by the simple adoption of special types of taxes, such as carbon taxes. These would tax fossil fuels according to their carbon content and should result, on the one hand, in a decrease of their overall use and, on the other, in a shift from high-carbon fuels (such as coal and diesel fuels) to low-carbon fuels (such as natural gas). However, the analysis above would also lead us to consider other regulatory options. Limits in the use of fossil fuels could also be achieved by administrative-control measures. Finally, there are the solutions that were actually adopted in Kyoto in the form of bilateral

efforts (joint implementation), the creation of new exchangeable property rights (emissions trading), or emission credits for the transfer of technologies (Clean Development Mechanism or CDM). If joint implementation is considered a bilateral form of trading and if the CDM can become part of a trading system as well, the most important Kyoto legacy will have been to suggest the establishment of a new international system of property rights.

Two major problems still have to be solved, however. A first problem is that the Kyoto Protocol does not impose trading as a domestic solution within states. The system resulting from the Kyoto agreement could, and probably will, be very heterogeneous with some international trading mixed with some domestic taxation or command and control measures. Some of the implications of such a "mixed" system will be discussed in chapter 13, which evokes possible conflicts between trade and climate rules. The second problem related to the Kyoto Protocol is that a solution to environmental problems based on property rights has advantages from the point of view of efficiency, but the ethical issues related to how to allocate rights are far from resolved. So far, perceptions of unfair treatment, mostly within the United States, have slowed the ratification of the Protocol there, while developing countries have been wary about joining the process at all. National self-interest also seems to pressure many nations toward free-riding, so that we are currently not doing what is necessary to achieve long-term stability of greenhouse gas emissions. However, we have many historical examples to show that societies in the past did develop institutions to prevent various types of tragedies of the commons from occurring (Berkes 1989; Ostrom 1990). The hope of many is that the international community will also be able to create the necessary institutions and agreements to restrain the pursuit of national interests to the detriment of global well-being.

Qualitative, theoretical approaches as well as formal models are quite useful for an examination of issues of international cooperation, negotiation, and bargaining—especially in the context of international public goods. The case of climate change poses a real challenge to both qualitative and quantitative bargaining theory approaches. Both conceptions usually include the assumption of a priori knowledge of the interests or of the payoff structure of particular nations or subgroups within nations.

It is quite clear, however, that in the area of climate change, such an assumption is hard to justify since the benefits of greenhouse gas emission restrictions are very difficult to evaluate and because the damages associated with global warming are not yet well known. It has even been suggested that some countries or regions might actually benefit from global climate change (on this, see Mendelsohn and Nordhaus 1994).

Therefore, interests or payoffs can only be evaluated in a probabilistic rather than deterministic fashion and conceived of as expectations (expected utilities in technical terms) or only partially determined national or group interests. At the same time, it is generally assumed that actors are concerned about the risks of global warming. In principle, then, theory would lead us to expect that in the climate change case, in which payoffs defined as expectations or poorly articulated interests are combined with concerns about dangers and uncertainties associated with global warming, the precautionary principle should prevail and should lead actors to reduce emissions.

The precautionary principle is, however, contested by a school of thought that stresses the importance of uncertainty and the variance associated with the expected outcome and not just its mean realization, which is the way the expected utility concept works implicitly.[3] Thus even uncertainty and risk by themselves do not necessarily drive actors toward cooperation.

In summary, two major cooperative problems emerge at the international level concerning the environment in general and climate change in particular: (1) International cooperation is often needed to achieve a collective good and to create a particular institutional framework to keep free-riding from occurring. The collective- or public-good problem to be solved is similar to a Prisoners' Dilemma[4] situation where a detrimental equilibrium is obtained in a one-shot situation but where cooperation can emerge over time as a result of successful threat of retaliation strategies. (2) As presented above, international cooperation often consists of enforcing rules of mutual restriction, such as the reduction of greenhouse gas emissions. This leads then to the dilemma of common aversion outlined above. Paradoxically, such a situation might be more difficult to solve because of the ineffectiveness of retaliation threats.[5] The question of international cooperation is complicated further by the fact that the

two categories of collaboration outlined above can often *not* be separated in the analysis of concrete situations. The creation of an international climate change regime involves both the creation of a public good and the establishment of rules for mutual restriction in order to avoid a mutually detrimental outcome.

The successive chapters of this book will show how international bargaining processes and the resulting international legal regimes have attempted to solve these problems. In particular, we will focus on the negotiations that ultimately led to the conclusion of the FCCC and to the Kyoto Protocol, which introduces binding obligations to restrict emissions that are specified for individual industrialized countries (so-called Annex B countries).

It is quite clear that several major issues are competing with each other for international attention. To the extent that the post–World War II international system was associated with security problems arising from the Cold War, or with questions of economic growth or trade liberalization following the reconstruction of Europe and Asia after the war, environmental issues were not seriously considered. Things started to change with the beginning of détente in the 1970s and the realization that the unprecedented period of economic and population growth that had occurred since the 1950s led to major environmental problems. Initially, political emphasis was placed more on local and regional pollution problems. For example, the 1972 Stockholm Conference on the Human Environment, which led to the creation of UNEP, was largely concerned with local or regional environmental issues involving several countries in a given geographic area, such as a particular river basin, a lake, a confined sea, or coastal area. It was only in the 1980s that global environmental issues such as stratospheric ozone depletion, climate change, and biodiversity loss came to the forefront of the international agenda. The end of the Cold War and the reduced importance of international security problems helped to move the international agenda toward addressing global environmental change and sustainable development, two themes that were largely emphasized at the 1992 United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro. An important item on the Rio agenda was the signing of the FCCC. This treaty

has evolved since 1992. The most important development was the elaboration and signing by major countries of the Kyoto Protocol in 1997. Whereas the FCCC treaty imposes a general framework without any well-specified obligations, the Kyoto Protocol enumerates a series of goals and instruments to achieve them by setting binding rules on industrialized (Annex B) countries. Discussions about the application and implementation of the dispositions of the Kyoto Protocol have already generated two new rounds of negotiations in Buenos Aires (1998), Bonn (1999), and The Hague (2000).

3 Overview of the Book

While global climate change presents the international community with a cooperative challenge, it also creates for scholars of international relations incentives to explore new issue areas and to undertake truly interdisciplinary studies. How can we appropriately analyze the problem at hand as well as the prospects for policy makers to successfully respond to these kinds of problems? To review the most important issues in this respect, we have put together a team of highly respected scholars, mostly from the fields of political science and law.

The book is divided into five parts, all of which are closely interlinked.[6] The first part provides an overview of the need for this volume and its structure followed by a historical overview of the climate change negotiations, while the second part analyzes major aspects of the global climate regime from a variety of theoretical and conceptual standpoints. In the third part, we shed light on the politics of global climate change by using game-theoretic and simulation approaches. A detailed legal interpretation and assessment of the difficulties associated with the implementation of specific agreements to the global climate change regime forms the core of the fourth part. In the fifth and final part, we situate the global climate change regime in the larger context of the current global regulatory framework and suggest some possible areas of conflict. Our effort aims to provide the reader with a comprehensive analysis of global climate change policy by providing rigorous theoretical analysis and empirical evidence. In addition, we include Internet references to the major

documents emanating from the global climate regime as reference material.

Following our introductory remarks here, the book turns, in chapter 2, to a history of climate change. Chapter 2 deals especially with the process leading up to the international response to this issue, as well as with the ensuing negotiations over international environmental agreements. Bodansky shows how the predominantly scientific debate over global climate change evolved into a public policy issue, and specifically, how scientific progress influenced the international negotiations that produced the 1992 FCCC and the 1997 Kyoto Protocol. In addition, he makes clear that there are several outstanding issues, such as the precise operational forms of the so-called Kyoto Mechanisms.

In chapter 3, Rowlands analyzes the outcomes of two international environmental agreements from the perspective of dominant theories of international relations—that is, neorealism, historical materialism, neoliberal institutionalism, and cognitive theory. After providing a detailed description of key aspects of the theories and their relevance to concrete environmental issues, Rowlands concludes that none of the grand theories of international relations is, on its own, able to provide a comprehensive explanation of the results contained in the major international agreements on the environment.

In chapter 4, Sprinz and Weiß focus on the domestic-international interface relevant to global climate change policy. In particular, they draw on various qualitative and formal approaches to explain country positions and to account for the constraints domestic institutions impose on government positions during international negotiations. Mindful of the intimate links between the domestic and international arena, they then proceed to analyze a range of country-specific cases. The countries considered include the United States, the European Union (EU), Germany as an especially prominent EU member country, and India given its relative importance as a developing country in the context of global climate policy. The broad range in the case selection is intentional, allowing for greater variance in terms of exploring the interconnection between domestic and international factors. The authors suggest that the U.S. Senate is the most constraining legislature toward its executive. India appears to be the least domestically mobilized, and the European Union is caught

between its high ambitions to mitigate emissions and the limited ability to actually implement such policies.

With the possible exception of Rowland's review of historic materialism, the authors of the first four chapters have adopted the notion that the state is a central actor, and this assumption is crucial to their analysis. In contrast, Raustiala's chapter 5 focuses on nongovernmental organizations and the role of the IPCC. After carefully defining core terminology, such as what constitutes a nonstate actor, and what the possible classifications of such actors are, Raustiala convincingly demonstrates how these entities play an increasing role in the global politics of climate change. Subsequently, the author applies the concept of epistemic communities in order to examine the role of the IPCC. One of the more surprising findings of the study is the considerable role played by non-traditional NGOs—for example, religious organizations.

The last two chapters of part II deal with issues of equity in regulating global climate change. This topic is of the utmost importance since fairness considerations may ultimately decide the long-term viability of global climate change policies and are often invoked in efforts to strike a balance between developing and developed countries. In chapter 6, Paterson discusses the various allocation principles of equity found in the international relations and global climate change literatures and focuses on the implications of various principles of justice. He concludes that such equity considerations may constitute grounds to further increase emissions reductions. In addition, he argues that although the often-discussed per capita entitlement of emissions rights has become an implicit or explicit cornerstone of North-South discussions, it is, in the short run, practically infeasible. In chapter 7, Wiegandt takes a comprehensive approach by highlighting the institutional foundations of equity. She also emphasizes that the issue of responsibility cannot be decoupled from the consequences of specific rights and obligations for particular societal groups. Invoking considerations of equity becomes more pertinent the less there is to distribute. Therefore, this perspective is particularly acute for discerning the potential trade-off between the development and environmental objectives in developing countries. Furthermore, Wiegandt highlights the role that interest (or discount) rates play in determining

the rewards of investing in economic pathways aimed at curbing global climate change.

In chapter 8, which begins part III, Grundig, Ward, and Zorick develop a sequential game in order to further our understanding of the various strategies pursued by countries and the outcomes that can be expected. First, in their repeated-game model, the authors show that if one considers an infinite time horizon, it is theoretically possible to generate an infinite number of results. They agree with Rowlands's findings (chapter 3) that international treaty regimes help to sustain strategies that improve on outcomes and thus avoid situations where parties would otherwise act on incentives to defect. Second, in their bargaining model, the authors show how a country can extract larger concessions from others by simulating nonaction. Third, in the context of the larger debate in international relations on relative versus absolute gains, the authors argue that prospects for cooperation over the reduction of greenhouse gas emissions are drastically hampered when collaborative efforts toward that end are viewed as a public good, since no country can then be excluded from the benefits. In their fourth and final model, the authors use a spatial model where countries are endowed with political capital, which they can use in a given negotiation process to form alliances and influence collective outcomes. In accordance with the results obtained by Sprinz and Weiß (chapter 4), they conclude that the most resilient "veto powers" are able to extract the largest side payments in threatening to block international agreements.

The conceptual and methodological foundations of quantitative simulation models are discussed by Luterbacher in chapter 9. He demonstrates that simulation models endow policy makers with a tool to assess possible negotiating outcomes and their characteristics in terms of efficiency and stability. However, he cautions that, depending on the data and parameters employed, one can arrive at substantively different conclusions when running the same simulation model. Further, he shows the usefulness of game-theoretic models in analyzing interactions between the domestic and international arena and how they are particularly helpful in examining complex issue areas such as global climate change. Game theoretic models, combined with simulations, can reveal domestic interests that

might oppose the ratification of global agreements in some key countries. Knowledge about these possible outcomes would allow negotiators from other countries to imagine other strategies for achieving international cooperation.

In the fourth part of this book, which concentrates on the institutional design of the climate change regime and its legal interpretation, the two chapters raise the problems of compliance and effectiveness related to the climate change regime. In chapter 10, Bodansky interprets the various hard and soft law provisions of the FCCC and the Kyoto Protocol and reviews the problems associated with the overlapping institutions created by these two international environmental agreements. Furthermore, Bodansky also provides a road map of the larger set of unresolved questions and their strategic implications, including the question of decision making under the FCCC and the question of liability (e.g., for damages caused by climate change).

Chapter 11—by Mitchell—deals with the institutional aspects of implementation, compliance, and effectiveness related to the FCCC and the Kyoto Protocol. Mitchell argues that the goals of stabilizing greenhouse gas concentrations in a manner consistent with the provisions of Article 2 of the FCCC should be evaluated against a counterfactual trajectory. He raises the issue of what would happen in the absence of a climate treaty regime. He also extends Bodansky's analysis of the problems posed by compliance with the various provisions of the FCCC and the Kyoto Protocol. In particular, he points to specific methodologies that make it possible to evaluate the problems caused by inadvertent circumstances and the design of a noncompliance regime to provide regulatory stability on a global scale. His chapter also demonstrates the obstacles involved in ensuring a high success rate for the climate change regime over time.

The fifth and final part of the book places the challenge of managing global climate change in the broader context of international cooperation. At issue are the global environmental agreements associated with the 1992 United Nations Conference on Environment and Development and their potential conflict with other international regimes, especially with the regulation of world trade. In chapter 12, Sprinz summarizes the negotiation history and institutional design of the global climate regime

and compares it with the global regimes for stratospheric ozone depletion, biodiversity, desertification, and the ongoing negotiations on global treaties for forests and persistent organic compounds. Subsequently, these environmental agreements are compared across several dimensions, including their decision-making procedures, funding, the degree to which a development component is included, and a preliminary assessment of their degree of effectiveness. In this context, Sprinz argues that a regulatory scheme is efficient if it matches the appropriate political level of organization with the scale of the environmental problem under discussion. Thus, global-scale problems, like climate change, require stringent international agreements, whereas local or regional but widespread problems, like desertification or deforestation, can be controlled by loose global arrangements with few mandatory requirements.

Broadening the scope to other areas of international cooperation, Luterbacher and Norrlöf in chapter 13 address the interface between the global climate change regime and the organization of global trade. They discern potential conflicts between international trade rules, as embodied on the one hand by the General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), and on the other hand by trade-related provisions in international environmental agreements. Especially obvious problems include those that may arise from the operation of the Kyoto Mechanisms in conjunction with international trade rules. They conclude by suggesting possibilities for the management of eventual discord between trade and the environment.

Many of the central themes of this book are synthesized in the concluding chapter—chapter 14—by Luterbacher and Sprinz. This chapter highlights factors related to the effectiveness of the global climate change regime, including the role that scientific advice, the bargaining power of actors, the role of equity or fairness, and the ultimate operation of the Kyoto Mechanisms play. To entice domestic actors and countries that may prefer to exercise domestic vetoes or unilateral solutions for their country, side payments may be helpful. The chapter concludes that the global climate change regime may not be the most effective global accord if compared to other global environmental agreements and that the success of the climate regime may partially hinge on solving potential conflicts with the global trade regime.

4 Alternative Ways to Read This Book

This book has been designed to reflect a progression from a concise historical background (part I, chapter 2), to a presentation of concepts and theories underlying global climate change policy (part II), various methodological approaches used for such analysis (part III), followed by a legal interpretation of the provisions of the various global climate agreements as well as the challenges of their implementation and effectiveness (part IV), to a final discussion of global climate change in the larger context of other recent global environmental agreements, an analysis of the challenges of reconciling environmental and trade issues, and a summary of lessons learned to foster a more effective climate change policy (part V). The modular design can also easily accommodate a variety of needs of readers, be they undergraduate or graduate readers, interested scholars, practitioners, or interested members of the general public.

For readers who wish to begin with a comprehensive factual background of climate change policy, we suggest beginning with chapter 2 and proceeding with part IV before turning to other modules of interest (parts III and V).

Readers mostly interested in international relations approaches to climate change policy are invited to start with chapter 2 and then proceed with part II. Additional methodological insights are provided in part III. Detailed background information and issues regarding the implementation and effectiveness of the global climate regime are covered in part IV.

Readers concerned with the relationship between climate change and other environmental and nonenvironmental regulatory domains are encouraged to become acquainted with the factual background (see above) and then proceed to part V.

Finally, readers appreciating a progression of approaches to the international relations of global climate change that build on each other are invited to simply follow the sequence of the book.

Notes

1. A criticism of the privatization argument can be found in Luterbacher 1994.
2. A thorough discussion of this issue will be presented in the last chapter.

3. Including estimated variance as well as averages to evaluate the likelihood of an outcome is part of the conception put forward by Allais (1953) to assess risky situations. In particular, Allais asserts that individuals avoid outcomes associated with large uncertainties, even if they appear more rewarding than outcomes with small or no uncertainty. The risk-averse nature of actors has also been questioned at the individual level by the studies made by Kahneman, Slovic, and Tversky (1982), who noticed sudden reversals in risk preferences. It is unclear how group preferences evolve as a result of risky, uncertain, and potentially detrimental outcomes. If there are as many differences between groups as there are between individuals, their perceptions of risk and uncertainty might strongly affect bargaining strategies and thus outcomes of attempted international cooperative arrangements. This is clearly an area where more research is needed.

4. See chapter 8 for a more detailed treatment of various games.

5. Ward (1993) presents a good discussion of these issues, which are also considered in chapter 8.

6. For alternative ways to read this book, see section 4 of this chapter.

2

The History of the Global Climate Change Regime

Daniel Bodansky

The development of the climate change regime in the late 1980s and early 1990s rode a wave of environmental activity, which began in 1987 with the discovery of the stratospheric "ozone hole" and the publication of the Brundtland Commission report, *Our Common Future* (World Commission on Environment and Development, 1987), and crested at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro.[1] An earlier wave of international environmental activity, culminating in the 1972 Stockholm Conference and the establishment several years later of the United Nations Environment Programme (UNEP), had tended to focus on local, acute, and relatively reversible forms of pollution—for example, oil spills and dumping of hazardous wastes at sea—by regulating particular pollutants. The more recent cycle of environmental activity has concerned longer-term, irreversible, global threats, such as depletion of the stratospheric ozone layer, loss of biological diversity, and greenhouse warming (Clark 1989, 47; see also chapter 12 in this volume), and has focused not merely on environmental protection per se, but on the more general economic and social policies needed to achieve sustainable development.

The development of the climate change regime until the conclusion of the Kyoto Protocol in 1997 can usefully be divided into five periods: the foundational period, during which scientific concern about global warming developed;[2] the agenda-setting phase, from 1985 to 1988, when climate change was transformed from a scientific into a policy issue;[3] a prenegotiation period from 1988 to 1990, when governments became heavily involved in the process; the formal intergovernmental negotiations phase, leading to the adoption of the FCCC in May 1992;[4] and a

postagreement phase focusing on the elaboration and implementation of the FCCC and the initiation of negotiations on additional commitments, leading to the adoption of the Kyoto Protocol in December 1997.[5]

1 The Emergence of Scientific Consensus

Although the greenhouse warming theory was put forward more than a century ago by the Swedish chemist Svante Arrhenius (1896), climate change did not emerge as a *political* issue until the 1990s. As late as 1979, efforts by the organizers of the First World Climate Conference to attract participation by policy makers proved unsuccessful, and even in 1985, when a major workshop on climate change was held in Villach, Austria, the U.S. government officials who participated went without specific instructions. However, by the late 1980s the U.S. Congress was holding frequent hearings on global warming. The issue was also being raised and discussed in the UN General Assembly; and international meetings such as the 1988 Toronto Conference, the 1989 Hague and Noordwijk Conferences, and the 1990 Second World Climate Conference were attracting numerous ministers and even some heads of government (see Table 2.1).

The development of the climate change issue initially took place in the scientific arena as understanding of the greenhouse problem improved. Through careful measurements at remote observatories such as Mauna Loa, Hawaii, scientists established in the early 1960s that atmospheric concentrations of CO_2—the primary greenhouse gas—are, in fact, increasing. The so-called Keeling curve (Keeling 1960), showing this rise, is one of the few undisputed facts in the climate change controversy, and led to the initial growth of scientific concern in the late 1960s and early 1970s. During the 1970s and 1980s, improvements in computing power allowed scientists to develop much more sophisticated computer models of the atmosphere, which, while still subject to considerable uncertainty, led to increased confidence by scientists in global warming predictions. A 1979 report of the U.S. National Academy of Sciences concluded, after reviewing these models, that, if CO_2 in the atmosphere continued to increase, "there is no reason to doubt that climate change will result and no reason to believe that these changes will be negligible" (National Re-

Table 2.1
Landmarks of the climate change regime

Conference	Date	Organizer	Conclusions and principal recommendations
Villach Conference	1985	WMO & UNEP	• Significant climate change highly probable • States should initiate consideration of developing a global climate convention
Toronto Conference	1988	Canada	• Global CO_2 emissions should be cut by 20% by 2005 • States should develop comprehensive framework convention on the law of the atmosphere
UN General Assembly	1988	UN	• Climate change a "common concern of mankind"
Hague Summit	1989	Netherlands	• Signatories will promote new institutional authority to combat global warming, involving nonunanimous decision making
Noordwijk Conference	1989	Netherlands	• Industrialized countries should stabilize greenhouse gas emissions as soon as possible • "Many" countries support stabilization of emissions by 2000
IPCC First Assessment Report	1990	WMO & UNEP	• Global mean temperature likely to increase by about 0.3°C per decade, under business-as-usual emissions scenario
Second World Climate Conference	1990	WMO & UNEP	• Countries need to stabilize greenhouse gas emissions • Developed states should establish emissions targets and/or national programs or strategies
UN General Assembly	1990	UN	• Establishment of INC

Table 2.1
(*continued*)

Conference	Date	Organizer	Conclusions and principal recommendations
UNCED Conference	1992	UNCED	• FCCC opened for signature
First Conference of the Parties	1995	FCCC	• Berlin Mandate authorizing negotiations to strengthen FCCC commitments
Second Conference of the Parties	1996	FCCC	• Geneva Ministerial Declaration
Third Conference of the Parties	1997	FCCC	• Kyoto Protocol
Fourth Conference of the Parties	1998	FCCC	• Buenos Aires Plan of Action

Source: Adapted from Bodansky 1995.

search Council 1979, viii). Moreover, in the mid-1980s, scientists recognized that anthropogenic emissions of other trace gases such as methane and nitrous oxides also contribute to the greenhouse effect, making the problem even more serious than previously believed. Finally, careful reassessments of the historical temperature record in the 1980s indicated that global average temperature had indeed been increasing since the middle of this century.

2 Agenda Setting, 1985–1988

Despite these advances, whether improved scientific knowledge would have been enough to spur political action is doubtful, particularly given the scientific uncertainties about climate change that persist even now. The growth of scientific knowledge was significant in laying a foundation for the development of public and political interest, but three additional factors acted as the direct catalysts for governmental action. First, a small group of environmentally oriented Western scientists—including Bert Bolin of Sweden, later the chair of the Intergovernmental Panel on Climate Change (IPCC)—worked to promote the climate change issue on the international agenda. As major figures in the international science establishment, with close ties to WMO and UNEP, these scientists acted

as "knowledge brokers" and entrepreneurs, helping to translate and publicize the emerging scientific knowledge about the greenhouse effect through workshops and conferences, articles in nonspecialist journals such as *Scientific American,* and personal contacts with policy makers. The 1985 and 1987 Villach meetings, the establishment of the Advisory Group on Greenhouse Gases under the joint auspices of WMO and UNEP, the report of the Enquete Commission in Germany, the testimony of climate modelers such as James Hansen before U.S. Congressional committees in 1987 and 1988—all of these helped to familiarize policy makers with the climate change issue and to convert it from a speculative theory into a real-world possibility.

Second, as noted above, the latter half of the 1980s was a period of increased concern about global environmental issues generally—including depletion of the stratospheric ozone layer, deforestation, loss of biological diversity, pollution of the oceans, and international trade in hazardous wastes. The discovery of the so-called Antarctic ozone hole, followed by the confirmation that it resulted from emissions of chlorofluorocarbons (CFCs), dramatically demonstrated that human activities can indeed affect the global atmosphere and raised the prominence of atmospheric issues generally. Initially, public concern about global warming rode on the coattails of the ozone issue.

Finally, the North American heat wave and drought of the summer of 1988 gave an enormous popular boost to greenhouse warming proponents, particularly in the United States and Canada. By the end of 1988, global environmental issues were so prominent that *Time* magazine named endangered Earth "Planet of the Year." A conference organized by Canada in June 1988 in Toronto called for global emissions of CO_2 to be reduced by 20 percent by the year 2005, the development of a global framework convention to protect the atmosphere, and establishment of a world atmosphere fund financed in part by a tax on fossil fuels.[6]

3 Early International Responses, 1988–1990

The year 1988 marked a watershed in the emergence of the climate change regime. Until 1988, the climate change issue had been dominated essentially by nongovernmental actors—primarily environmentally

oriented scientists. Although some were government employees, their actions did not reflect official national positions. In 1988, however, climate change emerged as an *intergovernmental* issue.

The period from 1988 to 1990 was transitional: governments began to play a greater role, but nongovernmental actors still had considerable influence. The IPCC reflected this ambivalence. Established by WMO and UNEP in 1988 at the instigation of governments, in part as a means of reasserting governmental control over the climate change issue, the IPCC's most influential output was its 1990 scientific assessment of global warming (Intergovernmental Panel on Climate Change 1990)—a product much more of the international scientific community than of governments. Cognizant of this fact, Brazil insisted on including a statement in the report that it reflected "the technical assessment of experts rather than government positions"—thus at least temporarily reading the "I" out of IPCC.

Among the landmarks of the prenegotiation phase of the climate change issue were:

- The 1988 General Assembly resolution on climate change, characterizing the climate as the "common concern of mankind"[7]
- The 1989 Hague Summit, attended by seventeen heads of state, which called for the development of a "new institutional authority" to preserve the earth's atmosphere and combat global warming[8]
- The 1989 Noordwijk ministerial meeting, the first high-level intergovernmental meeting focusing specifically on the climate change issue[9]
- The May 1990 Bergen Ministerial Conference on Sustainable Development, held in preparation for UNCED[10]
- The November 1990 Second World Climate Conference (SWCC) (Jäger and Ferguson 1991)

Until 1990, the governments interested in climate change were primarily those of Western industrialized countries; these countries had conducted the bulk of the scientific research on climate change and had the most active environmental constituencies and ministries. At the 1989 Noordwijk meeting, the basic split among Western countries became apparent. On the one hand, most European countries, joined to some degree by Canada, Australia, and New Zealand (the so-called CANZ group),

supported adopting the approach that had been used for the acid rain and ozone depletion problems. This entailed establishing quantitative limitations on national emission levels of greenhouse gases ("targets and timetables")—initially, stabilizing carbon dioxide levels at current levels. On the other hand, the United States (supported at Noordwijk by Japan and the former Soviet Union) questioned targets and timetables—the United States quite adamantly, Japan and the Soviet Union less consistently—on the grounds that targets and timetables were too rigid, did not take account of differing national circumstances, and would be largely symbolic. Instead, the United States argued that emphasis should be placed on further scientific research and on developing national rather than international strategies and programs.[11] The differences between the United States and other Western states deepened at the 1990 Bergen Conference and SWCC. The United States continued to block the adoption of targets and timetables, instead insisting on conference language that was neutral as between targets and timetables on the one hand and national strategies on the other.

What accounted for the differences within the West between the United States and other OECD countries? To some degree, they resulted from disparities in the perceived costs of abatement. For example, the United States has large reserves of cheap coal (a relatively high source of CO_2 per unit energy), while Germany still subsidizes coal production and consumption and could potentially save money by switching to natural gas (a relatively "clean" fuel).[12] But a simple explanation in terms of economic self-interest is insufficient, since, from an economic standpoint, a stabilization target would have been easier to achieve for the United States than for many other Western countries, including Norway and Japan, which subsequently backed away from country targets and began to support, instead, joint implementation. A more sophisticated interest-based approach is that the United States was jockeying for a favorable position—and attempting to create a reputation for toughness—in a much larger and longer-term game in which major cuts in emissions levels could be on the table (see also chapter 8).

Another explanation for the differences in national positions lies in domestic politics. Following the Montreal Protocol negotiations, international environmental negotiations were coordinated in the Reagan

administration by the White House Domestic Council, where such major domestic players as the Department of Energy, the Office of Management and Budget, and the Council of Economic Advisers were dominant, all of whom stressed the uncertainties of climate change and the economic costs of mitigation measures (see also chapter 4). In the immediate run-up to the Noordwijk Conference, they wrested control of the climate change issue from the Administrator of the Environmental Protection Agency (EPA), William Reilly, who reportedly supported U.S. acceptance of the targets and timetables approach. In contrast, in countries such as Canada, the Netherlands, and Germany, the climate change issue remained in the hands of the environmental and foreign ministries for a much longer period.[13]

At the SWCC, in late 1990, a second fault line began to emerge in the climate change negotiations, between developed and developing countries, or North and South. Earlier in the year, at the London Ozone Conference, developing countries had successfully pressed to establish a special fund to help them implement the Montreal Protocol on Substances that Deplete the Ozone Layer, and, in the UN General Assembly, they had insisted that the proposed environmental conference for 1992 give equal weight to environment and development. In the climate context, they sought greater representation, and argued that climate change be viewed not simply as an environmental issue but as a development issue as well. For both reasons, they sought to move the negotiations from the comparatively technical, narrow confines of the IPCC, in which they had found it difficult to participate on an equal basis with industrialized countries, to the UN General Assembly. Their efforts proved successful, and the December 1990 resolution authorizing the initiation of negotiations[14] placed the negotiations under the auspices of the General Assembly rather than the IPCC, UNEP, or WMO, as developed countries would have preferred.

Developing countries, however, displayed little more unity among themselves than did the developed countries. They agreed on the need for financial assistance and technology transfer—but on little else. At one extreme, the small island developing states, fearing inundation from sea-level rise, strongly supported establishing targets and timetables for developed countries. At the SWCC, they organized themselves into the Alliance

of Small Island States (AOSIS), which played a major role in the subsequent FCCC negotiations in pushing for CO_2 emissions reductions. At the other pole, the oil-producing states questioned the science of climate change and argued for a "go slow" approach. In the middle, the big industrializing countries such as Brazil, India, and China tended to insist that measures to combat climate change not infringe on their sovereignty—in particular, their right to develop economically. They argued that, since the North has historically been responsible for creating the climate change problem, the North should also be responsible for solving it.

4 Negotiations of the FCCC

Although international environmental law has undergone impressive growth over the past twenty years,[15] when the climate change issue emerged in the late 1980s, international environmental law had little to say about it (Zaelke and Cameron 1990). The only existing air pollution conventions addressed transboundary air pollution in Europe[16] and depletion of the stratospheric ozone layer.[17] While customary international law contains general principles relevant to atmospheric pollution,[18] these principles do not have the specificity and certainty needed to address the climate change problem effectively (Magraw 1990a, 8; see also Developments 1991, 1504–1506). As one leading international scholar has put it, "Customary law provides limited means of social engineering" (Brownlie 1973, 179). Therefore, legal action to address climate change required negotiation of a new treaty.

Initially, two alternative models were considered: (1) a general framework agreement on the "law of the atmosphere," modeled on the 1982 UN Law of the Sea Convention, which would recognize the interdependence of atmospheric problems and address them in a comprehensive manner; and (2) a convention specifically on climate change, modeled on the Vienna Ozone Convention (Zaelke and Cameron 1990, 272–278). Despite initial Canadian support for the former, the latter approach quickly prevailed; the unwieldiness of the Law of the Sea negotiations compared unfavorably with the step-by-step approach used with great success in the ozone regime (Sebenius 1991; Tolba 1989).

The total time for the formal treaty-making process, from the commencement of negotiations to the entry into force of the FCCC, amounted to little more than three years, a comparatively short period for international environmental negotiations.[19] The process began in December 1990, when the UN General Assembly established the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC), to negotiate a convention containing "appropriate commitments" in time for signature in June 1992 at UNCED.[20] Between February 1991 and May 1992, the INC/FCCC held five sessions. It adopted the FCCC on May 9, 1992, and the Convention entered into force less than two years later—on March 21, 1994—as a result of its ratification by fifty states.

In understanding the INC process, two factors were critical. First, the June 1992 UNCED deadline exerted substantial pressure on governments. Given the public visibility of the UNCED process, most delegations wished to have a convention ready for signature in Rio. Second, the desire for consensus decision making gave individual countries (such as the United States) substantial leverage—if not a complete veto—over the final outcome.

The discussions in the INC/FCCC followed a pattern common to international environmental negotiations. At first, little progress was apparent, as states debated procedural issues and endlessly repeated their positions rather than seek compromise formulations. But, while frustrating to those hoping for rapid progress, this sparring process allowed states to voice their views and concerns, to learn about and gauge the strength of other states' views, and to send up trial balloons. Real negotiations, however, began only in the final months before UNCED, when governments realized that they would need to compromise if they wished to have a convention to sign at Rio. Agreement was facilitated by the preparation of a compromise text by the INC chair for the final session, which cleared away many of the incrustations of alternative formulations proposed during the course of the negotiations. Even so, agreement was not reached until late on the final day of the negotiations, following several late-night sessions involving a small group of key delegations.

The initial baseline for the negotiation was the "framework agreement" model used in the preceding decade to address the acid rain and

ozone issues: The 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP) and the 1985 Vienna Convention for the Protection of the Ozone Layer (Lang 1991; Morrisette 1991). Both of these conventions are largely procedural. They establish only very general obligations—for example, to cooperate in scientific research and exchange information. Instead, their main value is to establish a legal and institutional framework for *future* work through regular meetings of the parties and the possible adoption of more substantive protocols.

Virtually all countries agreed on the need to include, at a minimum, the basic elements of such a framework convention—except for the oil-producing states, who would have preferred not to have had a convention at all. The main question was whether a framework convention was sufficient, and, if not, what additional provisions to include. The principal issues included the following:

Targets and Timetables The European Union and AOSIS advocated establishing a target and timetable to limit emissions by developed countries, while the United States and the oil-producing states opposed this idea. Other developing states generally supported targets and timetables, as long as it was clearly understood that these targets and timetables would apply only to developed states.

Financial Assistance and Technology Transfer Apart from targets and timetables, the financial-mechanism issue was the most contentious in the negotiations. Developing countries advocated establishing a new fund, while developed countries wished to use the Global Environment Facility (GEF), a joint project of the World Bank, UNEP, and UNDP that was established in 1991. Developing countries, led by India, also sought to include a commitment that developed countries provide "new and additional" financial resources to help developing countries implement the Convention—that is, money over and above existing aid flows.

Institutions and Implementation Mechanisms OECD countries, including the United States, generally sought to establish strong implementation machinery, including regular meetings of the parties, a scientific advisory body, a committee focusing on implementation issues, detailed reporting

requirements, and a noncompliance procedure modeled on that of the Montreal Protocol. Developing countries preferred the framework-convention approach, fearing that strong institutions and implementation procedures might infringe on their sovereignty.

The FCCC (FCCC 1992, see also Appendix) reflects a carefully balanced compromise on these and other issues. Many of its provisions do not attempt to resolve differences so much as paper them over, either through formulations that preserved the positions of all sides,[21] that were deliberately ambiguous,[22] or that deferred issues until the first meeting of the conference of the parties.[23] From this perspective, the Convention represents not an end point, but rather a punctuation mark in an ongoing process of negotiation.

5 Post-Rio Developments and the Negotiation of the Kyoto Protocol

Recognizing the substantial delays that can occur between the adoption of a treaty and its entry into force (Spector and Korula 1993), the INC/FCCC decided to continue meeting prior to the first meeting of the Conference of the Parties (COP-1), in order to elaborate and implement the reporting and review procedure, to address unresolved issues such as the relations between the COP and the financial mechanism, and to begin consideration of the next steps beyond the FCCC. This "prompt start" to the FCCC process may have helped speed the development of the climate change regime by as much as two or three years, by allowing multilateral negotiations to continue during the interim period before the Convention's entry into force (Chayes and Skolnikoff 1992). In addition, during this interim period, most industrialized-country parties submitted national reports and the international review process began, including the compilation of a synthesis report analyzing the overall progress by industrialized countries in implementing their commitments and the initiation of in-depth reviews of individual national reports.

The Convention entered into force on March 21, 1994, and one year later COP-1 met in Berlin. Among its significant outcomes, the Berlin meeting decided to:

• Establish an ad hoc committee to negotiate a protocol or other legal instrument by 1997 containing additional commitments for industrial-

ized countries for the post-2000 period. This was labeled the Berlin Mandate (see Appendix), and the new negotiating committee became known as the Ad Hoc Group on the Berlin Mandate (AGBM).

- Initiate a pilot phase of "joint activities," involving any country (either developed or developing) interested in participating, but with no provision for credits toward emissions limitation commitments.
- Continue to use, on an interim basis, the Global Environment Facility (GEF) as the FCCC's financial mechanism.
- Locate the FCCC's permanent secretariat in Bonn.

The AGBM negotiations continued for two years, leading to the adoption of the Kyoto Protocol in December 1997. Following the pattern of the FCCC negotiations, little progress was made initially. Some countries questioned the need for legally binding commitments either on targets and timetables (now referred to as "quantified emission limitation and reduction objectives" or QELROs) or policies and measures, while others questioned the authoritativeness of the IPCC's Second Assessment Report.

Against this backdrop, the adoption of the Geneva Ministerial Declaration (see Appendix) in July 1996 at COP-2 marked a turning point for two reasons. First, from a substantive standpoint, it reasserted the conclusions of the Berlin meeting, thereby countering attempts to backslide. In particular, it reaffirmed the need for legally binding QELROs; endorsed the IPCC's Second Assessment Report, which it characterized as the "most comprehensive and authoritative assessment of the science of climate change"; found that the Second Assessment Report indicates that the continued rise in greenhouse gas concentrations would lead to dangerous interference with the climate system, contrary to the objective of the Convention; and instructed delegates to accelerate negotiations on a legally binding instrument. Second, and perhaps more significantly, the Declaration marked the first time that countries were willing to act in the *absence* of consensus. Previously, the desire for consensus had given Saudi Arabia and the other OPEC states a virtual veto power over the negotiations. (Indeed, in the absence of rules of procedure specifying a different voting rule, most assumed that consensus was not merely a desirable goal but a legal requirement for action by the COP.) In the period

following COP-1, however, the OPEC countries overplayed their hand, provoking a backlash. Given the COP's lack of authority to take decisions by majority vote, supporters of the Declaration did not attempt to have it adopted by the COP. Instead, COP-2 merely took note of the Declaration and appended it to the final report, over the opposition of Saudi Arabia (and other OPEC states), Russia, and Australia. The willingness of the European Union, the United States, and most developing states to act in the absence of consensus sent a strong signal to the Berlin Mandate negotiations that these states were prepared to go their own way if necessary, if a small minority continued to block progress.

Nonetheless, for much of the following year, negotiations remained stalemated over two issues: first, the emissions-limitation targets for developed countries; and second, whether mechanisms should be established to allow developed states to meet their targets in a flexible manner. On the first issue, the European Union proposed a comparatively strong target, requiring a 15 percent cut in greenhouse gas emissions below 1990 levels by the year 2010, while other industrialized states such as the United States and Australia proposed weaker targets, with Japan somewhere in the middle. Ultimately the issue was resolved by specifying different emission targets for each party, ranging from an 8 percent reduction from 1990 levels for the European Union, to a 10 percent increase for Iceland. The debate about flexibility was equally, if not more, divisive, and resists easy summary. The United States, supported by some industry NGOs, sought mechanisms that would allow developed countries to achieve their emissions targets either through emissions-abatement projects in other countries or through emissions trading. In contrast, both the EU and developing countries argued that domestic action should be the main means of achieving emissions targets; developing countries, in particular, initially tended to resist any mechanism that would allow developed countries to receive credit for emissions reductions occurring in developing countries. In the end, the Protocol created several "flexibility mechanisms" or Kyoto Mechanisms, including emissions trading and joint implementation among industrialized countries, as well as a "Clean Development Mechanism" (CDM) for emission reduction projects in developing countries, but provided that these should be "supplemental" to

domestic action. The Kyoto meeting deferred to future negotiations most of the detailed issues about how the flexibility mechanisms would work. One year later, at COP-4 in Buenos Aires, the parties agreed on a work plan to develop the detailed rules for the flexibility mechanisms, with a view to adopting these rules at COP-6.

6 Conclusions

In reviewing the development of the climate change issue, several general features should be noted.

First, during the agenda-setting stage, the distinction between governmental and nongovernmental actors was blurred. What stands out was the importance both of a small group of "entrepreneurs," who promoted what they viewed as global rather than national interests, and the series of quasi-official meetings they organized—meetings that were highly influential, due in part to the sponsorship of international organizations such as UNEP and WMO or of sympathetic governments such as Canada, but that were *non*governmental rather than *inter*governmental in character. The 1985 Villach meeting and the 1988 Toronto Conference were particularly important—the former in communicating an ostensible scientific consensus about climate change and raising it as a policy issue; the latter in articulating a set of policy responses.

Second, during the actual negotiation of the FCCC, in contrast, governments were very much in control and nongovernmental actors played a quite limited role. Even the IPCC did not have a substantial effect on the actual negotiations. The one exception was the role played by a British environmental law group—the Foundation for International Environmental Law and Development (FIELD)—which helped organize and support the newly formed AOSIS. NGOs appeared to play a somewhat greater role during the Kyoto Protocol negotiations, particularly industry NGOs seeking either a weaker emissions-limitation commitment or stronger flexibility mechanisms.

Third, in the FCCC negotiations, it was *not* always possible to correlate the positions taken by delegates with "national positions." Many developing-country delegations—and even some developed-country

delegations—did not have detailed briefs from their capitals. Moreover, delegations were not always unified. In many ways, the U.S. Environmental Protection Agency was more closely aligned during the FCCC negotiations with the European Union than with the rest of the U.S. delegation.

Fourth, unlike the FCCC, the Kyoto Protocol specifies clear obligations for industrialized countries to limit and reduce their greenhouse gas emissions (although the specific ways of meeting these emissions targets remain under negotiation).

Finally, although many of the principal issues in the FCCC negotiations—including targets and timetables and financial commitments—were real issues with potentially substantial implications for national interests, the negotiations were often more semantic than substantive in character. Words were debated and selected as much for their political as for their legal significance. Proposed formulations took on a symbolic and even talismanic quality, only distantly connected to the actual meaning of the words. Linguistic debates became a proxy for political confrontation, with success or failure measured not just by the substantive outcomes, but by the inclusion or exclusion of particular terms.[24]

The consolidation of political will at national and international levels depends to a large extent on the domestic and interstate forces that shape the evolution of global politics. The analysis of these forces has traditionally been the focus of international relations theory, especially in the international security and economic fields. A preoccupation with the environment is comparatively recent, and large tracts of international environmental relations are still uncharted. It is nevertheless legitimate to ask to what extent international environmental relations and cooperation (or noncooperation) with respect to climate change can be explained by classical international relations theory. This is the purpose of the next chapter.

Notes

1. This chapter draws extensively from Bodansky 1992, 1994, 1995.

2. For general discussions, see Ausubel 1983; Cain 1983; Kellogg 1987; Revelle 1985; Weiner 1990.

3. See generally Pomerance 1989, 259.

4. See generally Bodansky 1994; Hecht and Tirpak 1995; Mintzer and Leonard 1994.

5. See generally Victor and Salt 1994; Rowlands 1995b; Oberthür and Ott 1999.

6. *Proceedings of the World Conference on the Changing Atmosphere: Implications for Global Security,* Toronto, June 27–30, 1988, WMO Doc. 710 (1989).

7. Protection of Global Climate for Present and Future Generations of Mankind, UN General Assembly Res. 43/53 (1988).

8. Declaration Adopted at the Hague, March 1989, reprinted in UN Doc. A/44/340-E/1989/120, Annex 5, and International Legal Materials 28: 1308.

9. Netherlands Ministry of Housing, Physical Planning and Environment, Noordwijk Conference Report (1989).

10. *Action for a Common Future: Report of the Economic Commission for Europe on the Bergen Conference,* UN Doc. A/CONF.151/PC/10 (1990).

11. The U.S. position on climate change paralleled its position vis-à-vis Canada regarding transboundary air pollution.

12. The FCCC gives Germany additional leverage in overcoming domestic interest groups that oppose reducing coal subsidies.

13. In 1991 and 1992, as economics and energy ministries in countries other than the United States began to recognize the potential implications of the climate change issue, the differences among OECD countries began to narrow.

14. Protection of Global Climate for Present and Future Generations of Mankind, UN General Assembly Res. 45/212, UN Doc. A/45/49 (1990).

15. See generally Sands 1995. There are now well over 150 treaties on the UNEP *Register of International Treaties in the Field of the Environment.*

16. Convention on Long-Range Transboundary Air Pollution (LRTAP), adopted Nov. 13, 1979, Int'l Legal Materials 18, 1442 (1979).

17. Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, Int'l Legal Materials 26, 1529 (1987); Montreal Protocol on Substances that Deplete the Ozone Layer, adopted Sept. 16, 1987, Int'l Legal Materials 26, 1550 (1987).

18. For example, the principle that states should "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" (Declaration of the 1972 UN Conference on the Human Environment (Stockholm Declaration), principle 21).

19. Recent international environmental agreements, however, have typically required less time to negotiate than earlier ones (Weiss 1993, 685–686).

20. Protection of Global Climate for Present and Future Generations of Mankind, UN General Assembly Res. 45/212, UN Doc. A/45/49 (1990).

21. See, for example, Article 11 (financial mechanism).

22. See, for example, Article 4(2) (commitments by industrialized countries to limit emissions).

23. See, for example, Article 13 (directing COP to consider establishing a multilateral noncompliance procedure).

24. Some of the intensity regarding the wording of the FCCC and the ensuing negotiations may stem from the fact that the FCCC constitutes a legal document that will subsequently be interpreted by its parties. Therefore, we will examine the legal implications and attend to the question of implementation in part IV.

II

Regime Creation: Concepts and Theories

This page intentionally left blank

3

Classical Theories of International Relations

Ian H. Rowlands

The purpose of this chapter is to explore the contribution that different "classical theories" of international relations can make to our understanding of international cooperation on global climate change. More specifically, the four approaches that have predominated in the post–World War II international relations discipline are examined.[1] The origins, key elements, and representative works of each are identified. The expectations for the climate change issue, as generated by an application of each approach, are also presented. Additionally, their respective explanatory utility—as suggested by comparing expectations with the progress of the international debate (see chapter 2)—is assessed. To conclude the chapter, a number of challenges, from both inside and outside the discipline of international relations, are identified. In combination, the elements in this chapter present the state of knowledge on the ways in which international cooperation on climate change might be explained, and realized in the future.

1 Realism and Neorealism

For many practitioners of international relations, and within much of the academic discipline as well, the most influential approach during the first quarter century after World War II was "realism." Arising as a reaction to the perceived failure of the policy of appeasement (and idealism) during the 1920s and 1930s (Carr 1983), realists argued that international society was anarchical (Bull 1977), being dominated by individual states that were each striving to maximize their own power and security. Because

these states were predisposed toward conflict and competition, international cooperation would usually prove elusive, even when the potential benefits of such arrangements were universally recognized. Any cooperation that might occur would most likely take the form of transitory alliances, which would serve to balance power among opposing blocs of states (see Morgenthau 1973).

During the past two decades, "neorealists" have further developed many of the basic assumptions of traditional realism (see also Keohane 1986; Waltz 1979). As part of the neorealist research program, some scholars have extended the approach from traditional security questions to the international political economy domain. Though still pessimistic about the prospects for cooperation, they have nevertheless argued that international cooperation on world economic dilemmas might be possible if a single actor with a preponderance of power exists and is willing to use its power resources (Gilpin 1975; Kindleberger 1973). This actor is identified as a "hegemon," and the broader idea is labeled *hegemonic stability theory* (Keohane 1980). It predicts that the degree of international cooperation will be directly proportional to the degree to which one actor dominates international politics. Acting either benevolently or malevolently, the hegemon has the resources to transform international structures so that coordinated policies to address perceived collective-action problems result. Work within this tradition continues today (e.g., Grieco 1990; Lake 1993).[2]

Applied to the climate change issue, an international relations neorealist would look to the distribution of power among the world's states in order to assess the prospects for cooperation. Given the nature of the climate change issue, however, it is difficult to ascertain the most appropriate measure of power. Certainly, the possession of military strength could still be relevant: one actor may be able to issue threats and cajole another into changing its activities that contribute to climatic change. Indeed, war has often been used as a means to achieve foreign policy goals related to natural resource issues (Westing 1986). Similarly, "power," defined in economic terms, could well be pertinent: one major actor might threaten to use trade sanctions against a "climate violator" and, if implemented, deprive the target country of welfare. This has already occurred on other environmental issues, for trade restrictions are

key components of three major international agreements (Montreal Protocol, Basle Convention, and the Convention on International Trade in Endangered Species of Flora and Fauna; see also chapter 13).

More important, however, may be the ability of actors to use their power to transform the particular environmental resource in question—in this case, the ability of the actor to change the global climate. Porter and Brown (1996, 14), for example, argue that in "every global environmental issue there is one state or a group of states whose cooperation is so essential to a successful agreement for coping with the problem that it has the potential to block strong international action. When states oppose such an agreement or try to weaken it they become veto or blocking states and form veto coalitions." In sum, then, a neorealist approach would assume that the "major power" (however defined) would determine the international response to global climate change. This response would also advance, in some ways, the interest of that same major power.

Does neorealism explain the course of the climate change negotiations to date? To initiate this discussion, it is first necessary to ascertain whether there exists a hegemon on this issue. Expanding upon ideas laid out above, we could consider first the case of the "military hegemon." In this regard, it is worth noting that it has become quite common to identify the United States as the world's sole remaining superpower. At the outset, therefore, it might appear that a "hegemon" within the international political system actually exists. Examinations of "economic hegemony" might lend further support to this hypothesis: in 1995, the United States accounted for over 25 percent of the world's gross national product; in second place, Japan generated just under 18 percent (World Resources Institute 1998, 236–237).

Moving more specifically to the case of global climate change, we find that the United States is undoubtedly a major player on the issue (see also chapter 4). In 1995, it was responsible for 24 percent of all carbon dioxide emissions from fossil fuel burning and cement manufacture; moreover, the United States would clearly be affected by both action on the climate change issue (e.g., industry restructuring) and inaction (e.g., agricultural production) on the issue (for an early estimate, see Cline 1992). The next-largest emitters of carbon dioxide (from fossil fuel burning and cement manufacture) in the same year were China, the Russian

Federation, and Japan at 14, 8, and 5 percent of the global total respectively (World Resources Institute 1998, 344–345).

Is this enough to suggest—unequivocally—that the United States is a "hegemon" on this issue? Perhaps not, or perhaps not by means of these particular measures. Even in areas where there has been much more experience in applying hegemonic stability theory (for example, world economic leadership), debates continue as to how power should be measured and as to whether or not a hegemon actually exists.[3] Nevertheless, for the sake of this exploration, let us assume that the United States is such a "climate hegemon." If the United States is indeed a "climate hegemon," this would suggest that the prospects for international cooperation on climate change are high. Moreover, it would also suggest that the resulting arrangements would reflect the preferences of the United States. Let us consider the extent to which these expectations have been fulfilled by events in the real world.

There certainly have been instances in which the apparent preferences of the United States have been reflected in international agreements. Perhaps the best example comes from the negotiations leading up to the agreement of the Framework Convention on Climate Change (FCCC) in 1992. The United States opposed the others (particularly a number of European countries) that wanted a timetable for greenhouse gas emission reductions. Largely because of the U.S. position, the members of the international community could only agree to the provision that industrialized countries would try to ensure that their greenhouse gas emissions in the year 2000 were no higher than they were in 1990 (FCCC 1992, Article 4(2)). Because of the desire for consensus decision making during the negotiations—and also because of the desire to have U.S. participation in the subsequent regime—the United States appeared to act like Porter and Brown's aforementioned "veto state" (Porter and Brown 1996, 14, 96).

A more recent example comes from the Third Conference of the Parties to the Climate Change Convention in Kyoto, Japan (December 1997). The "Kyoto Protocol" contains a number of elements whose inclusion came only after U.S. insistence. Most significantly, a number of "flexibility mechanisms" or Kyoto Mechanisms to meet the industrialized countries' emission-reduction objectives were included in the Protocol. These

are "tradable emission permits" (Kyoto Protocol, Articles 3(10), 3(11), and 17), "joint implementation" (Kyoto Protocol, Article 6), and the "Clean Development Mechanism" (Kyoto Protocol, Article 12). These inclusions occurred in spite of the fact that they were not high on other countries' lists of priorities. Similarly, the fact that the key "basket" of greenhouse gases numbers six (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride), rather than three (carbon dioxide, methane, and nitrous oxide), is another example of how the final agreement reflects U.S. preferences, rather than those of the European Union. Together, these incidents suggest that the United States effectively acted as a climate hegemon.

Are these, however, only isolated examples? We must recognize that the aforementioned Kyoto Mechanisms will be used to meet a specific target—a target that the United States clearly opposed. During the lead-up to the negotiations in Kyoto, U.S. President Bill Clinton expressed his desire that "the United States . . . commit to the binding and realistic target of returning to emissions of 1990 levels between 2008 and 2012" (Weekly Compilation of Presidential Documents 1997). Though this might well have simply been a public negotiating position in order to facilitate the realization of true desires, it remains that the United States emerged from Kyoto with a 7 percent reduction obligation. This is quite distinct from the ambition articulated less than two months earlier. Moreover, the fact that this obligation was agreed to in the absence of "new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period"—something that runs counter to the U.S. Senate's Byrd-Hagel Resolution—represents a further challenge to neorealist suppositions.

Thus, an application of neorealism to the global climate change issue would appear to be unable to accommodate the considerable influence of other nation-states, let alone that of nonstate actors.[4] Nevertheless, it is certainly the case that the United States—clearly the world's most powerful state today (even if not a hegemon)—is a crucial player in the international response. Indeed, the members of international society appear to have implicitly acknowledged that it holds a veto on the issue: "The requirement that not only 55 countries ratify the [Kyoto] protocol but also that Annex I countries represent at least 55 percent of those

countries' total carbon emissions in 1990 effectively gives the United States a veto over the agreement because the United States accounted for no less than 35 percent of all such emissions in that year" (Ott 1998, 44, referring to Article 25 of the Kyoto Protocol). As a result, it is certainly reasonable to argue that the fate of the climate change regime is in the hands of one hundred individuals in the U.S. Senate; their actions regarding ratification of the Kyoto Protocol will be highly influential (see also chapter 4).

More generally we should not overlook the role of power in the response to global climate change: "It would indeed be very surprising if superior access to financial, military, or research resources did not affect an actor's ability to influence the contents and form of a negotiated regime" (Stokke 1997, 40). This might include individual states—"lead" states, like Germany, Denmark, and the Netherlands (Porter and Brown 1996, 172)—as well as groupings of states. The latter might be formalized, like the European Union or the G77 of less industrialized countries, or ad hoc, like the "JUSCANZ"[5] group of Japan, the United States, Canada, Australia, and New Zealand that played a significant role at the First Conference of the Parties in Berlin. Or it could include the "Umbrella Group" of JUSCANZ plus Russia and Norway that worked together at the Fourth Conference of the Parties in Buenos Aires (see also chapter 5). A number of scholars have suggested that bargaining blocs, supported by different instruments of power, have been (and may continue to be) important during the negotiations (Hampson 1989–90; Paterson and Grubb 1992; Sebenius 1991; Young 1993, see also table 3.1).

2 Historical Materialism

The second general approach identified in this chapter has not attracted as much attention as some others in the field of international relations, particularly within the United States. Labeled, among other things, "historical materialism" and "neo-Marxism," this approach comprises diverse authors and ideas.[6] Most of the authors, however, are united by their concentration on economic relations within a global and historical context. They agree that existing patterns of international cooperation can be best explained by focusing attention on the most powerful actors

Table 3.1
Summary of major theoretical approaches

Approach	Key concept(s)	Hypothesis on international cooperation on global climate change	Explanatory value on global climate change experience to date
Realism/ neorealism	Hegemonic stability, power	Major state power(s) determine(s) the international rules on global climage change.	Undoubtedly power has played a role (as has the most powerful country, the United States), but the "less powerful" have still exerted influence.
Historical materialism	Power asymmetries in the world economy	"Capital" determines the international rules of global climate change; North imposes its preferences on South.	Activities of many elements of "capital" (e.g., fossil fuel lobbies) have proceeded according to expectations, as have many North-South debates, but divisions within capital, as well as the North and the South are much greater than anticipated.
Neoliberal institutionalism	"Contractarian": cooperation under anarchy, utility maximizers	If actors deem the costs of climate change to be greater than the benefits of continued greenhouse gas emissions, then rules to limit emissions will be agreed on.	Useful in highlighting the divergent interests of actors in light of global climate change; however, more cooperation actually realized than anticipated.

Table 3.1
(*continued*)

Approach	Key concept(s)	Hypothesis on international cooperation on global climate change	Explanatory value on global climate change experience to date
Neoliberal institutionalism (*continued*)	"Constitutive": organizations and institutions	Formal organizations and informal institutions ("rules of the game") will promote cooperation on global climate change.	Activities of international structures have been important, but not all-determining.
Cognitive approaches	Epistemic community, science and policy, decision making under conditions of uncertainty and complexity	Experts with access to decision makers will strongly influence international rules on global climate change.	Hypothesis supported at the stage of agenda setting, but weaker at the stage of negotiating and agreeing on rules to manage global climate change.

within the capitalist world economy (e.g., Amin et al. 1982). Though divisions between the more and less powerful do not always follow international borders congruously, the vast differences in wealth between the countries of the industrialized North and those of the less industrialized South nevertheless mean that international cooperative structures will most often favor the former. Indeed, one highly visible strand of such writings, namely dependency theory, concluded that Northern domination and exploitation of the South has continued during the so-called "postcolonial period." Compared to colonial times, the only difference is that political domination has now been replaced by economic influence.

What expectations on global climate change would be generated by historical materialism approaches? To begin to try to answer this question, we would need to determine the ways the interests of "capital"

would be affected by both action and inaction on global climate change. After having determined these various impacts, we would expect capital to advance an international agreement that most protects and/or advances its interests. Additionally—and drawing on the work of, in particular, dependency theorists—we would expect some North-South tensions to exist on global climate change, though we would also expect some agreement between core elites in North and South.

Capital, nowadays, is a term ordinarily used to refer to relevant transnational corporations (TNCs) as well as those states whose well-being is inextricably linked to them. In the case of global climate change, it is generally accepted that the part of capital that will be most affected is the energy industry. This results from the fact that most of the world's commercial energy (approximately 90 percent; British Petroleum 1998) is currently produced by the combustion of fossil fuels. This, in turn, releases carbon dioxide and hence contributes to global warming.[7] Indeed, it has been estimated that close to 60 percent of anthropogenic global warming is attributable to fossil fuels (Houghton 1994, 29–30). As such, prescriptions to mitigate global climate change inevitably involve a reduction in fossil fuel production and consumption. Hence, the interests of fossil fuel–related companies generally—and the integrated oil companies, the so-called majors specifically—would not be well served by such action.[8]

It is worth recognizing that these companies are significant global actors, since they are among the largest economic entities in the world. In terms of sales in 1996, two of the world's largest five transnational corporations were oil majors: the Royal Dutch/Shell Group ranked third, while Exxon ranked fifth.[9] Moreover, the companies that ranked first and second in the same list generate their profits from the use of fossil fuels in their products, namely, car and truck manufacturers: General Motors (ranked first) and Ford Motor (second) (quoted in Weber 1998, 52). We, therefore, are considering a very large and potentially powerful subset of global capital.

Indeed, the reaction of many of the companies involved in fossil fuel production and use (particularly coal and oil) has been as would be expected by a historical materialism analysis. Consider, for example, the Global Climate Coalition—a grouping of (primarily) U.S. industry inter-

ests that has been working hard to discredit the international scientific consensus on climate change and to highlight the economic costs of emission reductions. Gail McDonald, president of the coalition, argued in January 1998 that "the Kyoto Protocol worked out in Japan in December is an agreement that hands countries like China, Mexico, and India, American jobs, harms our economy, endangers our children's future and promises to do virtually nothing to improve the environment. In the end, it's an agreement long on compromise but short on common sense" (McDonald 1998). Indeed, many elements of industry are trying to resist a proactive response to global climate change (see, for example, Levy and Egan 1998).

Many individual states are also highlighting the impact that emission limits would have on their economic well-being and hence broader welfare. Paterson maintains that "arguably the most important factor in explaining the difference between the positions of the US and other industrialized countries, and to a lesser extent between countries generally, is the underlying difference in energy resources and the structure and culture of the energy industries" (Paterson 1996a, 78). He identifies the United States as the key country in a group that has large energy resources and has fostered an energy culture based on cheap and readily available fuel (Paterson 1996a, 80). Indeed, concerns about trade balances and competitiveness more generally have frequently been prominent in the debate on global climate change (e.g., Elliott 1998, 68).

Similarly, there have also been some of the expected divisions between North and South on the climate change issue (see Hyder 1992). In particular, there have been debates about the size, composition, and governance of resource transfers between the two sets of countries. Critics contend that the North-South arrangements that have been concluded on this issue have reflected the interests of the capitalist, industrialized countries. They maintain that the domination of the Global Environment Facility (see chapter 10) is a case in point. By presenting the climate change issue as a problem for the South—instead of the North—attention on industrialized countries' consumption patterns, and related greenhouse gas emissions, has effectively been distracted (Tickell and Hildyard 1992). A more appropriate focus on the activities of the North has, in this way, been missing (Sklair 1994).[10]

Other pieces of evidence, however, are not as consistent with expectations generated by a historical materialist approach. On the climate change issue, the interests of capital do not consolidate to the extent suggested by these theorists. Some industries, such as coal, certainly feel threatened by the possibility of an emission-reduction target. However, others—for example, renewable energy technologies—see it as a commercial opportunity. Even within something as relatively restricted as the fossil fuel industry, views differ. The oil industry is certainly being challenged, but natural gas, at least in the short term, may find its global appeal heightened because it releases less carbon dioxide per unit energy produced.

Differences even exist among the oil majors. For example, at the 1998 meeting of Exxon shareholders, Chair Lee R. Raymond maintained that on the global climate change issue, there "needs to be a much better understanding of this extremely complex subject before governments or international bodies mandate cuts in fossil fuel use." He went on to argue that "arbitrary cuts such as the targets set in Kyoto would have serious financial and social impacts worldwide, severely damaging economies, industries and jobs" (Raymond 1998). However, Cor Herkströter, chair of the Committee of Managing Directors with the Royal Dutch/Shell Group, has said that "we in Shell, on the whole, welcome the outcome of Kyoto as progress on a long road. . . . It is a significant signal for change" (Herkströter 1998). The juxtapositioning of these two comments suggests that a united view among capital does not exist. The fact that only some majors remain members of the Global Climate Coalition is further evidence. Indeed, not only have BP/Amoco and Royal Dutch/Shell left the Coalition, but so too has the Ford Motor Company.

Similarly, the North-South division is not as pronounced as might be expected. For one, a number of apparent Southern preferences have found their way into the international agreements. Perhaps most significantly, developing countries have successfully resisted efforts to limit their greenhouse gas emissions. Moreover, the South is not necessarily a coherent unit on the climate change issue. During the Fourth Conference of the Parties in Buenos Aires, for example, Argentina and Kazakhstan announced that they were prepared to undertake emission-limitation

commitments. Indeed, negotiating coalitions have often cut across the North-South divide: the United States has sometimes been allied with oil-producing and oil-exporting states, and the more environmentalist Europeans have often had more in common with the Alliance of Small Island States (AOSIS) than with other Organisation for Economic Cooperation and Development (OECD) countries (though this might have as much to do with North-South core linkages that, as mentioned above, would be anticipated).

Industrial interests ("capital") are certainly playing an active, and occasionally influential, role in the development of the international response to the challenge of global climate change. Moreover, with substantial resources (both material and intellectual) behind them, it would be naive to ignore their activities. Nevertheless, it is also the case that their positions on the issue have not been immediately reflected in international agreements. As was the case in our study of realism and neorealism, historical materialism's contribution to our understanding of global climate change is important, yet ultimately limited (see table 3.1).

3 Neoliberal Institutionalism

Captured within this broad heading of "neoliberal institutionalism" is a set of ideas whose roots can be traced back (at least) to the writings of Grotius on international law. Further expounded by Kant—and later operationalized by the idealists in the form of the interwar League of Nations—it experienced a hiatus in light of the post–World War II challenge by the realists (see section 1 above). Nevertheless, increased attention to potential and actual integration led to a resurgence of interest during the late 1950s and 1960s particularly in Europe. The works of the functionalists and neofunctionalists (e.g., Haas 1958) led to studies in the 1970s examining "interdependence" more broadly (e.g., Keohane and Nye 1977). "Regime theory," developed during the 1980s, is a more recent incarnation (e.g., Krasner 1983).[11]

For the purposes of this section, we follow Oran Young's lead by looking at two particular strands of this broader family of ideas—what he calls "contractarian" and "constitutive":

> Contractarians assume the prior existence of actors with a clear sense of their own identities and of the interests flowing from these identities. Such actors will be motivated to create institutional arrangements when they discover that proceeding individualistically leads to joint losses or to an inability to reap joint gains. . . . The constitutive perspective, on the other hand, assumes that institutions play a major role in defining the interests of participants and even in shaping their identities. Membership in the European Union, for example, requires states to adjust their domestic systems to conform to the requirements of the union. According to this account, institutions have formative effects on their members rather than the other way around (Young 1997a, 276).

Both perspectives claim at least some interest in the concept of regime, so it is useful to define the term.

The standard definition originates from Krasner:

> Regimes can be defined as sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice (Krasner 1983, 2).

Though this is probably the most often cited definition of regimes in the international relations literature, it is not without its critics. O'Riordan and colleagues (1998, 361), for example, argue that it

> is rather broad and ambiguous in delimiting whether phenomena fall under the rubric of international regimes in empirical research. It includes both formal governmental organizations (such as the various UN agencies) and regularized forms of policy coordination on a specific issue.

It is beyond the scope of this chapter to investigate fully this debate. Instead, we return to the distinction between formal organizations and forms of policy coordination below; for now, we consider Young's two strands identified above. Those ideas identified here as "contractarian" have earlier been labeled the "cooperation under anarchy" school. In this view, states (as the usual unit of analysis) will act as utility maximizers, continuously evaluating the relative benefits and costs of cooperative action. Should a sufficient number of states deem it to be in their interests to cooperate, they will do so. The prospects for cooperation grow, the argument continues, when any or all of the following more specific conditions are satisfied (Rowlands 1995b, 21–22): mutual interests exist, the

shadow of the future is long, and the number of participants is relatively small. Let us consider each of these in the context of global climate change.

At first glance, mutual interests would appear to exist on the issue of global climate change. Indeed, some have imagined the global climate change challenge as akin to a "tragedy of the commons" (Hardin 1968). If this were truly the case, players would concede that ongoing greenhouse gas emissions result in suboptimal outcomes; they may further recognize that they have an interest in cooperating to reduce such emissions. In other words, they may accept that if they do not cooperate in the short term, they will all suffer from a warmer world in the long term.

The issue of global climate change, however, may not actually be accurately represented as a global tragedy of the commons. Because of the spatial differences in climate change impacts, as well as the differences in the net benefits or costs of abatement, some have greater motivation than others to endorse climate change policies. Varying vulnerability to both action and inaction means that different players have different perceptions of the relative costs of action and inaction, and therefore adopt different strategies. While the interest of the small-island states in an international agreement limiting emissions is probably self-evident, Russia may actually prefer the status quo, for it would appear to lead to warmer and shorter winters. Thus, a paradigm case of a tragedy may not be occurring, for "ruin [may not be] the destination toward which all men rush" and "freedom in a commons [may not bring] tragedy to all" (Hardin 1968). Simply on this basis, contractarians would have mixed expectations about the prospects for international agreement.

Is the "shadow of the future" any longer on the global climate change issue than it is on any other international issue? Given the institutional developments that have taken place during the 1990s (particularly the establishment of the Conference of the Parties and its Secretariat and various associated bodies; see the discussion below), the prospects for ongoing interactions may actually be considerably higher than is the average for an international issue. This, in turn, would lead states' representatives to have more confidence about the persistence of the issue on the international agenda, and, therefore, they will be more apt to cooperate.

Finally, the number of participants in the climate change issue is quite high. Given its globality, every country in the world has an interest in the form that any international agreement takes. Not surprisingly, therefore, virtually every country in the world is involved—at least to some extent—in the negotiations.[12] Though this does not bode particularly well for reaching agreement, the involvement of negotiating blocs (see above) may prove encouraging for those striving for international cooperation: their presence effectively serves to lessen the number of players involved in some negotiations.

In conclusion, contractarians might be only cautiously optimistic about the prospects for cooperation. Have developments unfolded as they would expect? To some extent, they have. It has been clear that interests have played a key role in the development of the international response to date (e.g., Fish and South 1994; Rowlands 1995b). Indeed, this was perhaps best exemplified during the negotiations over differentiated targets in the Kyoto Protocol (Paterson and Grubb 1996; Rowlands 1997). Representatives of a range of countries (not least of all, Australia) were highlighting the impact that alternative differentiation regimes would have upon their citizens' welfare. Given, however, the divergent interests we see on the climate change issue, a strict application of contractarian ideas could well find it difficult to envisage the extent of agreement that we have actually seen to date—among 181 countries, no less!

Let us now turn to what Young labels constitutive. How are international arrangements (either formal organizations or informal institutions) important? Levy, Keohane and Haas (1993) postulate that international environmental institutions can do any or all of three things: they can increase governmental concern, they can enhance the contractual environment, and they can increase national capacity. Let us now examine the climate change experience to see the extent to which this has occurred. It is certainly the case that international organizations were instrumental in setting and advancing the agenda on global climate change. The World Meteorological Organization (WMO; and, in its previous form, the International Meteorological Organization) has been involved in the study of climate for over a century. More recently, the WMO, in conjunction with the United Nations Environment Programme (UNEP), established the Intergovernmental Panel on Climate Change (IPCC). Since the late 1980s,

this entity has been charged with establishing the "state of the art" knowledge on the subject of global climate change. By completing two major assessments (in 1992 and 1995 and a third one scheduled to be released in 2001), the IPCC has proved to be an important purveyor of scientific information on global climate change.[13]

As chapter 2 has argued, however, national governments had become much more active players by 1991 with the creation of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC). Hence, the relative influence of the IPCC—particularly with respect to its ability to impact directly the political agenda—lessened. There was now an intermediary organization—the INC, superceded by the Conference of the Parties (COP, particularly the COP's Subsidiary Body on Scientific and Technological Advice)—acting as a gatekeeper through which scientific information has to pass. These new organizations are still *international organizations,* and hence have relevance for our discussion. And though they are probably more representative of state preferences than is the IPCC (that is, operated as a contractarian might expect), organizational dynamics nevertheless still play a role in their work.[14] As such, their ability to increase governmental concern still exists: Levy, Keohane, and Haas (1993, 406) further postulate that to enhance the contractual environment means to "provide bargaining forums that reduce transaction costs [and] create an iterated decision-making process; conduct monitoring of environmental quality, national environmental performance [and] national environmental policies; [and] increase national and international accountability."

In these respects, the activities of the COP and the Climate Change Secretariat are certainly worth noting. The Conference of the Parties provides representatives with a regular series of multilateral meetings whereby climate change issues receive top priority. Moreover, the requirement to publish reports on action on climate change (FCCC 1992, Article 12) and their assessment has meant that some kind of framework for monitoring and accountability has been established and implemented. In particular, the Bonn-based FCCC's Secretariat has provided important information and monitoring functions on global climate change. (For more on the implementation of the FCCC's commitments, see chapter 11 in this volume.)

Turning to national capacity, representative institutional activities include the transfer of resources, skills, and information (Levy, Keohane, and Haas 1993, 406). A key theme of the FCCC is North-South assistance (e.g., FCCC 1992, Articles 4(3), 4(4) and 4(5)). Although this has been operationalized primarily through the work of the Global Environment Facility, bilateral programs developed by, in particular, the United States and Germany have also been prominent (United Nations Environment Programme 1998, chap. 1). Consequently, there has certainly been evidence that the formal international organizations established in (or invigorated by) the development of the international regime on global climate change have been active. The extent to which they are directly responsible for any increased levels of international cooperation may be more difficult to ascertain.[15]

The focus in the discussion above has been on "organizations" explicitly. This is often the concern of scholars, as they look for the ways in which formal entities have become more than the sum of their parts—that is, instances in which their actions can no longer be fully explained by tracing preferences back to constitutive states. Others, however, have used many of the same ideas to examine the influence of broader institutions. At this point, it is probably most useful to distinguish between the two: "Institutions are interlocking sets of rights and rules that serve to guide the interactions of parties in specific issue areas. Organizations, by contrast, are material entities possessing offices, personnel, equipment, budgets and legal personality" (Young 1992b, 15).

With regard to the issue of global climate change, Paterson examines the influence of broader institutions. He argues that "one of the interesting features of climate politics was the norm-generating process which occurred between 1988 and 1991, through the spate of unilateral targets to limit emissions by industrialized countries" (Paterson 1996a, 127–128). One could also look to the Preamble of the FCCC itself, to obtain a list of potential norms on global climate change that have developed institutionally within international society. Paterson concludes that

> it can therefore be seen that, at least up to 1991, institutions were very important in influencing outcomes regarding global warming. However, looking at the later period, after formal negotiations had started, the development of these norms and their acceptance by states seems to have frozen (Paterson 1996a, 130).

He goes on to argue that this may be explained by the fact that the UN's organizational framework (see above) took center stage. As a result, an "interstate, universal, consensual method of decision making" was imposed (Paterson 1996a, 130).

Indeed, this final statement serves as a timely reminder that approaches examined here under the broadly interpreted term *neoliberal institutionalism* may have strong explanatory powers, but only part of the time. Given the desire for consensus that has characterized much of the international negotiations on climate change, the views of the contractarian would appear to be vindicated. However, given the influence of international structures on how issues are perceived and interests are defined, insights offered by a constitutive approach would appear necessary. Even together, however, they would not be able to explain some of the outcomes we have described in the previous two sections.

4 Cognitive Approaches

A fourth set of approaches directs attention to the ways actors receive, process, interpret, and adapt to new information about their environment and about each other. Cognitive factors, its proponents argue, are the keys to understanding the dynamics of international cooperation. Those perceived to have control over knowledge or privileged access to it are highly valued during times of political uncertainty and may be given greater access to decision makers. Therefore, to explain international cooperation on challenges involving complexities and uncertainties, one should look to those who control knowledge and the ways they act within decision-making processes.

The work of Peter Haas has perhaps done the most to highlight such ideas within international relations. He has advanced various propositions about "epistemic communities," and defines them as "transnational networks of knowledge-based communities that are both politically empowered through their claims to exercise authoritative knowledge and motivated by shared causal and principled beliefs" (Haas 1992, 41).

Although such cognitive approaches have gained considerable prominence during the 1990s, the basic tenets date back to the interparadigm debate of the 1970s and 1980s (Banks 1985; Deutsch 1966; Steinbruner

1974). In response to critiques that their explanatory value had yet to be fully explored (e.g., Young 1992b), cognitive approaches have been more widely used during the past decade (see Haas 1992). In particular, cognitive explanations have attracted considerable interest among those studying international cooperation on environmental issues, because environmental issues, including global climate change, are often remarkably complex and full of uncertainties, accessible only to those with expertise in particular branches of the natural and social sciences. As a consequence, considerable reliance may be placed on experts to assist policy decisions. Therefore, cognitive approaches suggest that transnational networks of scientists and policy makers would exert particularly strong influence during the development of international agreements.

What expectations are generated by these ideas? To begin to try to answer this question, we accept that developments may well be contingent on whether or not an epistemic community is in place. If it is, we would expect the preferences of this epistemic community to be reflected in international agreements.[16] Let us turn more specifically to the case of global climate change.

In many ways, the IPCC of the late 1980s and early 1990s satisfied the criteria for an epistemic community. As illustrated in chapters 2 and 5 of this book, these environmentally oriented scientists were instrumental in raising the profile of the climate change issue. With close links to WMO and UNEP, they acted as "knowledge brokers," helping to translate and publicize the emerging scientific knowledge about global warming through various means (Lunde 1991). But the *influence* of this epistemic community (that is, in Haas's words, the extent to which they were "politically empowered") has effectively been more limited since 1991. In that year, national governments became more strongly involved in the climate change issue—most importantly, by relieving UNEP and WMO of its lead responsibilities and moving the issue more closely into the New York–based activities of the United Nations (closer to the UN's "high politics"). As a consequence, the participation of most atmospheric scientists became subsumed under this intergovernmental umbrella. Science was still important, because the IPCC remained the "scientific supreme court" in the climate change issue, but the outputs were more managed. The political empowerment of alternative communities with

contrarian views on global climate change (Gelbspan 1997) also effectively limited the influence of this group.

Finally, perhaps what will be more influential in policy making is the way economic epistemic communities emerge and operate. In 1992, Peter Haas, in a sidebar, commented: "It is interesting to note that an economic epistemic community might have greater influence, because it would be able to mitigate uncertainty about the costs of action" (Haas 1992, 58). The ongoing debate between "top-down" and "bottom-up" economists suggests that two relatively distinct sets of "shared causal and principled beliefs" are in existence (see, for example, Hourcade and Robinson 1996).

What is clear, however, is that global climate change is characterized by complexities and uncertainties. As a result, the scientific debate will continue to be a key part of the political process. Insights from cognitive approaches would therefore appear to be crucial to a full understanding. Again, however, they only offer part of the answer as we strive to understand more fully the processes associated with international cooperation on global climate change.

5 Challenges

The above classification of the major contributions to the international relations discipline is by no means unchallengeable. Some would argue (for good reason) that the boundary between the work of the historical materialists and the cognitivists may be more illusionary than justified (Cox 1977). Use of the concept of power clearly links the realists/neorealists and the historical materialists. And the dominance of the realist/neorealist and the neoliberal institutionalist schools of thought in the mainstream of international relations has meant that much work appears to contain themes from both.[17] Critical theorists and postmodernists, meanwhile, would lament these efforts to classify different approaches, and argue that post-Enlightenment Western thought itself is in crisis (Brown 1994). For their part, gender analyses in international relations would also have difficulties with these traditional categories (Tickner 1992).

Beyond the borders of the discipline, as defined by academic structures, challenges also arise. Many argue that in order to explain world events,

the study of the state system should not be privileged to the extent that it is by the mainstream of scholarship in international relations. The international system of states is but one set of social relations that have global breadth. Consequently, any efforts to understand what we have (perhaps mis-)labeled *international relations* must be cognizant of the whole range of social relations, including global commodity production and exchange and global culture, which together make up world society (Shaw 1994; Sklair 1994). Leading logically from these efforts to conceptualize a global sociology, many focus on social movements as key agents of any change (Yearly 1994), an analysis that has particular relevance for international environmental issues (Gerlach 1991). Indeed, we have seen that those who work in a historical materialist tradition are already addressing this concern. Additionally, some of the work within a broad interpretation of the neoliberal institutionalism tradition considers global civil society to be a key institution (for a related discussion, see Wapner 1995). Finally, cultural theorists have argued that multiple rationalities can simultaneously exist (for the case of sustainable development, see Thompson 1993). They maintain that the "participation of governments in treaties is likely to be influenced by the relative strengths of each type of institutional culture in the national decision-making arena as well as by the more obvious factors of political and economic self-interest" (Rayner 1991, 92). In these ways, challenges are forthcoming from a variety of directions.

6 Conclusions

This chapter has reviewed the state of knowledge with respect to the ways international cooperation on climate change might ensue. To this end, brief synopses of the major approaches within the international relations discipline have been presented. Table 3.1 provides a summary. Each of the four perspectives seems able to offer some explanation as to the developments to date of the international negotiations on climate change. For example, cognitive approaches are particularly helpful in illuminating the way global climate change became a major international issue. Moreover, the contractarian approach within neoliberal institutionalism is useful in analyzing how interests affect negotiating positions, once the issue is

firmly on the international agenda; neorealist and historical materialism approaches, however, highlight the fact that some players' interests may be more important than others. Finally, the constitutive approach within neoliberal institutionalism reveals that organizations and institutions, once established, may be more than the simple sum of their parts. Together, then, these comments suggest that every approach potentially offers insights. At the same time, however, each approach contains its own particular anomalies. This suggests that faith should not be exclusively placed in any one approach. Finally, a range of challenges to the four main approaches were offered, revealing the debate is not only lively, but increasingly multidisciplinary as well. Indeed, though substantial differences of opinion persist, academic activity has advanced our knowledge about the processes associated with the realization of international cooperation. This is of great utility as policy makers, scholars, and citizens continue to confront the challenges of global climate change.

Notes

1. For other reviews of the factors encouraging international cooperation, see Osherenko and Young 1993; and Efinger, Mayer, and Schwarzer 1993.

2. For a critical commentary, see Snidal 1985b.

3. For a general discussion, see Strange 1996, chap. 2. On the issue of global climate change more specifically, Paterson (1996a, 108) argues that "since the distribution of capabilities with respect to global warming must be regarded as fundamentally ambiguous, analyzing outcomes at the international level purely by reference to this structural factor is bound to be inadequate."

4. See, in particular, chapter 5 in this volume.

5. Originally, "JUSCANZ" or "JUSSCANZ" also included Switzerland. Since the constitution of the "Umbrella Group," Switzerland has been virtually excluded from the group.

6. For relevant reviews, see Brown 1985 and Smith 1994.

7. Natural gas production, transportation, and use also releases methane, another greenhouse gas.

8. Indeed, this is especially the case given that the vast majority of the majors' activities consists of searching for, extracting, refining, and selling fossil fuels and associated products. In the case of the ozone-layer challenge, by contrast, ozone-depleting chemicals made up a relatively small (perhaps 2 to 3 percent; Rowlands 1995b, 113) share of the overall activities of the large chemical companies.

9. Exxon's merger with Mobil places this new major even higher in the rankings.

10. For other critiques focusing on North-South issues, see Lipietz 1992 and Tanzer 1992.

11. More formal approaches within this tradition are examined in chapters 8 and 9.

12. As of December 10, 1999, 181 countries had ratified the FCCC; others could participate as observers, should they so desire.

13. This is not to suggest that the work of the IPCC has not been without controversy. See, for example, Boehmer-Christiansen 1996. See also chapter 5 in this volume.

14. Paterson argues that bodies servicing the convention were "given significantly more freedom to make proposals, allowed leeway in how they interpreted requests or instructions from the INC meetings" (Paterson 1996a, 127).

15. Considering the more general case, Young calls this the challenge of "spurious correlations" (Young 1997b, 13). On effectiveness, see, for example, Bernauer 1995, Sprinz and Helm 2000, as well as chapter 11.

16. It is worth noting that notions about epistemic communities are distinct from those about "scientific consensus as a precondition for international cooperation." Moreover, the literature on epistemic communities has, hitherto, not significantly considered the extent to which scientific knowledge is "socially constructed" (e.g., Jasanoff and Wynne 1998).

17. Paterson (1996a, 101ff.), for example, argues that the contractarians (which he labels as the "cooperation under anarchy" school) are more closely related to those identifying themselves as realists and neorealists.

This page intentionally left blank

4

Domestic Politics and Global Climate Policy

Detlef F. Sprinz and Martin Weiß

National governments represent their countries in international environmental negotiations, but they are not entirely free to formulate policy positions. While it may be possible for these representatives to ignore domestic constituents in the prenegotiation phase, national governments in democratic states ultimately rely on majorities in legislatures or in public referenda in order to ratify international agreements. Furthermore, even the ratification of international environmental agreements cannot guarantee that these will be successfully implemented since industries, courts, and interest groups often find sufficient leeway to delay and, potentially, circumvent the implementation of international obligations at the domestic level. Therefore, government positions are likely to be influenced by domestic pressure groups in anticipation of the challenges posed by ratification.[1] This chapter summarizes some major qualitative and formal approaches to the study of multiple-level governance (sections 1 and 2) and evaluates them empirically in relation to global climate change policy (section 3) before offering some inferences on the relationship between domestic politics and international negotiations (section 4).

1 Domestic Constraints on International Bargaining: Qualitative Perspectives

The two-level metaphor for the linkages between the domestic and international politics was most compellingly introduced to international relations theory by Putnam:

> At the national level, domestic groups pursue their interests by pressuring the government to adopt favorable policies, and politicians seek power by

constructing coalitions among those groups. At the international level, national governments seek to maximize their own ability to satisfy domestic pressures, while minimizing the adverse consequences of foreign developments. Neither of the two games can be ignored by central decision-makers, so long as their countries remain independent, yet sovereign (Putnam 1988, 434).

This interrelationship between the domestic and international level constrains the actions taken by the chief of government (COG), where the range of domestically feasible international agreements is referred to as "win sets." With respect to the FCCC negotiations, it is important to keep in mind that countries may either *not* be willing to enter into international agreements (voluntary defection), or they may be trapped in what is referred to as *involuntary* defection by failing to comply with international obligations signed earlier. The latter case may arise from the failure of domestic actors to ratify the international accord. This can either correspond to the defeat of the international agreement in a domestic referendum or defeat in the legislature (Putnam 1988, 438). For example, in relation to the Kyoto Protocol, such a situation may ensue if, for ratification purposes, the president is not able to command a two-thirds majority in the U.S. Senate (see section 3). As we saw in chapter 2, threats of *voluntary* defection from the FCCC (i.e., withholding signature) were used by some pivotal governments—supposedly on behalf of their domestic agents—to transform the FCCC from a global agreement to reduce greenhouse gas (GHG) emissions into a treaty that only requires advanced industrial countries to freeze emissions.[2] Furthermore, as Moravcsik suggests, national governments may influence the domestic constituencies of their international counterparts, for example by providing resources to environmental NGOs (Moravcsik 1993, 32). In conclusion, COGs face the challenge of what Evans, Jacobson, and Putnam call "double-edged diplomacy" (Evans, Jacobson, and Putnam 1993), because they negotiate on two levels and can use domestic and international factors to expand and reduce their win sets. The two-level metaphor provides a more complex representation of international negotiations compared to theories that do not take into account domestic constraints in explaining international bargaining outcomes.

Two types of explanations derive the interests of domestic political actors. First, the "interest-based explanation of international environmental policy" (Sprinz and Vaahtoranta 1994) deduces government posi-

Table 4.1
Predictions of the interest-based explanation for government negotiating positions

		Ecological vulnerability	
		Low	High
Abatement costs	Low	Bystanders	Pushers
	High	Draggers	Intermediates

Source: Sprinz and Vaahtoranta 1994, 81 (reprinted with permission of The MIT Press, Journals Division).

tions from information about the country's ecological vulnerability and abatement costs (see table 4.1). Applied to the case of global climate change (GCC), this approach suggests that countries will act as "pushers" for substantial emission reductions whenever their ecological vulnerability to climate impact is high and their abatement costs for greenhouse gases are low. In contrast, countries characterized by high abatement costs and low ecological vulnerability can be expected to act as "draggers" in such negotiations, due to the low benefit-cost ratio of pursuing emission reductions. Countries with both high ecological vulnerability and high abatement costs are caught in between the former two groups as they face an "intermediate" benefit-cost ratio, while countries that are neither affected by the environmental problem nor face high abatement costs will act as "bystanders" in international negotiations. The interest-based explanation suggests that pushers are most likely to sign demanding international environmental agreements and draggers are least likely to sign such international agreements, with intermediates and bystanders falling in between. In a study of the climate change policies of twenty-four countries, Rowlands (1995a) finds that the negotiation positions of eleven countries are explained by the interest-based explanation and concludes that this explanation "may be helpful" in understanding national environmental foreign policy. In addition, the study by Kawashima (1997) reviews a broader set of explanatory factors and highlights the role of the interest-based explanation to account for the negotiation position on global climate policy of five industrialized countries.[3] The interest-based explanation allows an initial understanding of the possible positions taken by countries in international environmental negotiations.

The subsequent inclusion of other variables then permits a finer-grained analysis. However, even within its original framework, it is well suited to making comparative-static predictions. For example, changes in information with respect to either of the two key variables can cause a change in government interests. If countries receive new evidence that their ecological vulnerability is higher than they originally expected, their propensity to support stringent international environmental agreements may increase. Similar changes can be foreseen if technological progress lowers abatement costs.

Similarly, the second explanation finds that the severity of environmental problems, as well as the level of economic wealth, determine the policies undertaken by industrialized countries toward ameliorating environmental problems. These incentives are complemented by structural adjustment of economies that reduce aggregate emissions of pollutants as a side effect (Jänicke 1996; Jänicke and Mönch 1988). Extending this analysis of structural change, Prittwitz develops the "capacity hypothesis" of environmental policy to explain how governments respond to environmental challenges by combining socioeconomic aspects with the political-institutional capacity of states (Prittwitz 1990, 108).

In addition, Prittwitz has developed a concise method for explaining state interests and how they relate to the expected behavior of domestic political actors. In particular, he focuses on

- Polluter interests (welfare gains from continued pollution—for example, CO_2 emissions from the combustion of fossil fuels);
- Victim interests (welfare losses induced by pollution effects—for instance, devastation of agricultural regions); as well as
- Third-party interests (*Helferinteressen;* including, inter alia, the capacity to monitor, provide, and use pollution-abatement technology, or substitute the polluting activity or product)[4] (Prittwitz 1984; Prittwitz 1990).

As a consequence, countries with dominant polluter interests are expected to behave as draggers in international environmental negotiations, whereas victim countries are expected to push for stringent international environmental agreements. Under most circumstances, third-party interests will favor pusher rather than dragger interests (see table 4.2). The combination of these three aspects is supposed to account for the aggregate national position in international negotiations.

Table 4.2
Types of domestic political interests

Type of interests	Important factors	Domestic political actor(s)	Expected effect on country position
Polluter	Polluting industry or pollution-inducing consumer activity	• Major polluting industry, e.g., carbon-intensive industries • Electorate (as consumer)	Dragger (or laggard)
Victim	Environmental effects (actual or anticipated)	• General public as electorate (as victim of environmental impacts, e.g., on low-lying Pacific islands) • Environmental NGOs and professional NGOs of adversely affected sectors • Green parties (or "greened" traditional parties)	Pusher (or leader)
Third party	Among others, interested parties furthering the substitution of production and/or consumption of the polluting activity	Actors representing • Monitoring • Abatement technology • Substitution technologies, e.g., providers of renewable energy	Often leaning toward pusher

Many of the factors influencing governmental positions in international negotiations also influence compliance with international environmental agreements. As the study by Weiss and Jacobson (1998) demonstrates, country-specific factors such as the wealth of a country, the domestic institutional structure, and the political strength of environmental NGOs vis-à-vis major polluting industries influence the degree of compliance.[5]

2 Formal Perspectives on Two-Level Bargaining

Developments in noncooperative game theory provide a refined perspective of the conditions under which governments or electorates take particular decisions. These approaches assume that governments face domestic constraints, such as the hurdles involved with the formal ratification of international treaties.

In their work on negotiations about the deepening of European integration, Schneider (1994) as well as Schneider and Cederman (1994) propose a sequential game with incomplete information—that is, countries take turns making and accepting offers without perfect knowledge about the information the other side holds. In particular, they assume that some countries (draggers) are less willing to abide by the demands of a "strong" international treaty to reduce emissions, because domestic constituents prefer a "weak" treaty (e.g., to freeze GHG emissions). In addition, one can imagine two different types of draggers, a *strong* dragger who prefers a weak treaty to a strong treaty, and who can credibly threaten to exit negotiations; and a *weak* dragger who also prefers a weak treaty to a strong treaty, but who prefers to back down in favor of a strong treaty rather than to exit.[6] The central problem is for environmental-push countries to find out whether the dragger is either of the strong or the weak type. Since knowledge of the particular type is not available ex ante, push countries are involved in a game of incomplete information. As Schneider and Cederman (1994) show, if push countries tend to believe that the dragger is of the strong type, they will mostly accept a weak treaty proposed by the strong draggers. On the other hand, push countries confronted with weak draggers will sometimes agree to a weak and sometimes to a strong treaty. In terms of global climate change, strong draggers will coerce ambitious push countries to either accede to a less stringent treaty or risk exit—with unfortunate outcomes for both sides. As we saw in chapter 2, the United States may be seen as a strong dragger during the FCCC negotiations because of the influence of domestic constituents, which also extends to its positioning on the Kyoto Protocol.

After concluding the international negotiations of an agreement, countries have to ratify the treaty, either via legislative approval or by way of a referendum. Often, a weak treaty is more desirable for many domestic

constituents than a strong treaty due to the magnitude of the required changes as well as the political hurdles that a strong treaty entails. For push countries the implementation of ambitious greenhouse gas reductions demanded by an international treaty is unlikely to impose new far-reaching changes.[7] However, the political cost for the United States to accept a strong treaty may be quite high, especially at the stage of ratification. In a model with incomplete information, which captures this situation, the electorate does not know if it faces a strong or a weak treaty, but it receives signals in the form of a campaign from the executive to convince the electorate or the legislature of the treaty's merits. The solutions of this incomplete information game show that constituents reject all agreements that are not followed up by a campaign. Only if there is a belief that the government will present a weak treaty (i.e., less rather than more demanding emission reductions) will the electorate always ratify the treaty. In the absence of the required belief, it is possible that even weak treaties are rejected (Schneider and Cederman 1994). As long as a national government anticipates such problems for the ratification stage, a pivotal country may clearly use either justified threats or bluffs to bolster its bargaining position in international negotiations.[8]

As the work of Dupont shows, the foregoing conclusion may not always be warranted. In a two-period sequential bargaining model, he demonstrates that the outcome may depend on the type of actor that is the target of these threats or bluffs (Dupont 1994). In particular, if the target country is "dovish," the use of domestic constraints to threaten another country may work, but the same result will not necessarily hold for a "hawkish" country, because such an actor would be willing to forgo an international agreement (Dupont 1994; see also Milner and Rosendorff 1997b).

Wolinsky (1994) establishes a link between international environmental negotiations and electoral success in a sequential model with incomplete information. In particular, her model sheds light on the impact of the electorate's evaluation of the government. Concluding international environmental agreements is perceived as a signal to the electorate that the government is effective—rather than not. Her model shows that

> [less effective governments] make high concessions in equilibrium when the electorate is uninformed about the agreement, cares little about the effectiveness of

the government, and has higher costs of replacing the government. Less effective governments are thus likely to make high concessions even when such concessions are not necessary for reaching an agreement, as long as the issue under negotiation is not very salient (Wolinsky 1994, 7).

In the climate change negotiations, this corresponds to the observation by many that in developing countries whose governments are less effective and where domestic constituencies do not view climate change as a salient issue, participation in the climate change negotiations occurred mostly in exchange for the industrialized world's commitment to negotiate on economic development. In fact, the name *United Nations Conference on Environment and Development* (UNCED) reflects such an arrangement. Thus, this concession by less industrialized countries can be seen as exemplifying the relatively low pressure exerted by developing countries' domestic constituents on the climate change agenda.[9]

Research by Milner and Rosendorff (1997b, chap. 3) integrates many of the research efforts that we have summarized above. They develop a spatial model of the interaction between governments and domestic ratification agents, either a legislative body that holds preferences different from the executive or the electorate in case of a referendum. Their model shows that the ratifying agent can only constrain international outcomes if its preferences are closer to the status quo ante than those of the executive (Miller and Rosendorff 1997b, 80–81). In particular divided government, exemplified in the United States by the opposition between the Senate and the executive branch, may lead to problems for the ratification of the Kyoto Protocol (see also chapter 8). Once NGOs act as endorsers and thereby assist the legislative decision-making process, these results may change. Such support can enhance the scope of international agreements, and the NGO positioned most closely to the preferences of the legislature is often most influential. In the case of the United States, it is therefore of crucial importance how business and environmental NGOs position themselves over time. As the U.S. executive tries to entice larger segments of the business sector to subscribe to policies favoring greenhouse gas reductions, it improves its opportunities to reach international agreements—and also to get them ratified. The creation of a financial sector in the United States that is expected to benefit from the Kyoto Mechanisms confirms this conclusion.

The qualitative and formal approaches yield a range of major hypotheses that we wish to explore in the cases to follow. In combination, the *qualitative* theories suggest four hypotheses:

- The more ecologically vulnerable a country is, the more likely it is in international negotiations to demand strong emission reductions.
- The higher the abatement costs, the less likely a country is to demand strong emission reductions.
- The stronger third-party interests are, especially if they are assisting emission reductions, the more likely a country is to strive for strong emission reductions.
- The stronger environmental NGOs are relative to NGOs representing pollution interests, the more likely a country is to demand strong emission reductions.

Among the *formal* perspectives, we wish to highlight the following three hypotheses:

- Strong dragger[10] countries will be able to achieve international treaties closer to their preferences as compared to weak dragger countries.
- Governments can only succeed in ratifying international environmental agreements if they actively campaign for them.
- Domestic constraints on the bargaining and ratification process are the more effective the closer these actors position themselves to the ratifying agent (especially in systems of divided government).

Since a systematic test of these hypotheses has not been undertaken in previous research, we will explore the extent to which these hypotheses provide guidance in explaining particular country positions in the following section.

3 Empirical Perspectives and Evaluation of Theoretical Approaches

This section reviews the empirical record of global climate change policy in light of the hypotheses generated by the qualitative and formal approaches described above.

The implications of Prittwitz's typology of interest patterns were tested for the case of GCC policies in two empirical studies by Oberthür (1993)

and Fischer (1992). Their analyses showed that countries with strong polluter interests (e.g., the Arabic OPEC members, the United States, and some less industrialized countries) were trying to retard the inclusion of provisions for emissions reductions in the FCCC, whereas countries holding major victim interests (including the Alliance of Small Island States [AOSIS], the United States, and some European countries) were strongly pushing for emissions reductions to be incorporated in the FCCC. While many industrialized countries also show a high potential for third-party interests to influence their position, this did not materialize on an equal level with polluter interests and victim interests during the international negotiations on the FCCC (Oberthür 1993, 93–94).[11] Predictions about the interests of countries seem to be corroborated by the exploratory analyses of the FCCC by Fischer (1992), Nilsson and Pitt (1994), and Oberthür (1993); this scheme, however, only sheds light on partial aspects of a country's position and does not explain the aggregate position of a country (e.g., the United States), nor why countries (or blocs of countries) with the same configuration of interests take different policy positions (e.g., the European Union vs. the United States; see Oberthür 1993, chap. 4).

To explore the implications of the various theories and models, we selected a small set of countries and focused on the interface between domestic and international factors. We chose the United States as the world's largest emitter of greenhouse gases, the EU because of its institutionalization of multiple levels of bargaining, Germany as the biggest single emitter within the EU, and India as a representative of an important developing country that is expected to be a major future emitter of greenhouse gases. Furthermore, India belongs to the leaders of the "G77 plus China" negotiation bloc (see chapter 5).

3.1 The United States

When analyzing ecological vulnerability and abatement costs, Oberthür and Ott find that the U.S. stance on climate change is "largely determined by its position as the world's largest producer of coal, oil and gas, although it is a net importer of energy" (Oberthür and Ott 1999, 18). On the other hand, they conclude that the United States is seriously vulnerable to adverse impacts of climate change.[12] At the same time, environmental NGOs are well organized within the Climate Action Network (CAN).

With respect to abatement costs, Oberthür and Ott (1999) as well as Bernow et al. (1999, 27) see a potential for low-cost means of greenhouse gas emission reductions and energy savings within the energy-intensive sectors of the economy and by changing U.S. lifestyles. These opportunities are, however, outweighed by the public perception of exorbitant abatement costs, which are amplified by well-organized industry lobbyists. Agrawala and Andresen's (1999) examination of the role of scientific communities reveals a paradox of U.S. climate policy: although the United States has been the "single largest contributor to the science of climate change since the late 1950s," there is apparently a "sharp division between physical scientists who worry about climate damages and senior policy analysts who worry about the costs of emission reductions to the US economy" (Agrawala and Andresen 1999, 29).

Business interests, opposing GHG emission reductions, had a disproportional impact on the first Bush administration prior to the Rio summit. However, the environmentally more ambitious Clinton/Gore administration had also failed to facilitate a sound climate change protection policy in the 1990s. Agrawala and Andresen find the United States engulfed in a complex "interplay between pressures and deadlines forced by an emerging international regime on the one hand, and not the least the fairly unique US domestic political process on the other" (Agrawala and Andresen 1999, 3). Consequently the United States does not espouse a reluctant negotiating position, but there are waves of public concern about economic performance and personal commitments of key actors around the White House. The range for the executive to maneuver is clearly constrained since, on the one hand, "Congress cannot compel the President either to sign or not to sign a particular treaty, . . . [and] the executive branch on the other hand cannot compel the Senate to ratify a treaty that is already signed" (Agrawala and Andresen 13).[13] This is in marked contrast to the situation of most European countries, where ratification by the legislature is often automatic.

Another important factor in explaining the U.S. position may lie with the influence of "powerful ideologues close to the president" (Agrawala and Andresen 1999, 31). The reluctant behavior under the Republican Bush administration and the considerable move toward mainstream OECD positions under the Democratic Clinton presidency is, for instance,

explained by the fact that the U.S. negotiating team is established by the executive. Partisanship does not, however, explain the unanimous passage of the Byrd-Hagel Resolution by a 95:0 vote in the Senate in 1997, only months before the conclusion of the Kyoto Protocol. In this resolution, the Senate declared that it would not ratify any treaty that harms the U.S. economy or does not entail meaningful participation by major developing countries. Notably both negative economic side effects and meaningful participation lack a clear and precise interpretation. This requires a review of the "micropolitics" of U.S. legislation, which changed with respect to at least three important characteristics in the 1990s. Agrawala and Andresen (1999) find changes toward a decline of presidential power, less importance of party membership in Congress, and a new type of House member or senator, which makes it easier for members of Congress to break away from their party line and "cater to interests that coincide with their local electorates" (Agrawala and Andresen 1999, 16).[14]

Conservatives and Democrats with coal or energy constituencies are not the only ones who may be reluctant to combat global climate change. Given broadly popular reliance on the market in the United States and bearing in mind that new taxes and higher prices threaten mainstream Democratic constituencies, neither of the major two parties is expected to sponsor a substantial increase in gasoline taxes because of their particular effect on the poor (see also Skolnikoff 1997). Possible benefits from energy efficiency and technological development are questioned and thus cannot offset these political costs. Most authors therefore conclude that U.S. climate change policy is conditioned by the *perception* that economic costs are exorbitant. In this respect Agrawala and Andresen (1999, 32) suggest that European countries should attempt to influence the behavior of U.S. multinational companies with significant business interests in Europe and thereby lessen the resistance of these transnational companies within the U.S. domestic political arena.

The impact of economic well-being is strongly underscored by the relation between climate change policy and the U.S. economy—that is, its weak performance in 1992 (UNCED conference) and strong performance in 1997 (Kyoto Protocol). Like Agrawala and Andresen (1999), Oberthür and Ott (1999) conclude that the persistence of a healthy U.S. economy

is one of the preconditions for Senate ratification of the Kyoto Protocol—a position supported by the capacity hypothesis (see section 1). Because U.S. compliance with an international accord is at stake, the absence of preceding domestic legislation as well as not-so-minor obligations incorporated into the Kyoto Protocol have enhanced the likelihood of policy gridlock (see Glennon and Stewart 1998, 196).

In conclusion, the United States can be viewed as a dragger in international climate negotiations as compared to the EU because of the strong influence of domestic business. Though cautious about the costliness of its obligations, the Clinton administration tried to encourage major corporations to contribute to greenhouse gas emissions reductions in return for partial tax credits. Clearly, the U.S. government was constrained by domestic politics, since the preferences of Congress did not coincide with those of the Clinton/Gore executive branch.

While we do not undertake formal tests of the hypotheses, the case of the United States serves as a good illustration of their merit. Clearly, it is torn between demanding larger emissions reductions because of its ecological vulnerability, but many segments of its administration and general public seem to fear the expected abatement costs even more. Less can be said about third-party interests, except that there is growing interest among its leading financial services in the operation of the Kyoto Mechanisms. While the environmental NGOs are well organized, their effect on the administration is counterbalanced by powerful and well-financed industry interest groups that wish to avoid stringent obligations in terms of emission reductions. The United States is undoubtedly a strong dragger, which has enabled it to avoid clear-cut emission-reduction obligations in the FCCC and to accept deep cuts in the Kyoto Protocol. In fact, the United States holds much of the future of the Kyoto Protocol in its hands by way of the important signal that ratification of the Protocol will have for other industrialized countries. But without a strong and sustained campaign by the U.S. executive branch making ratification of the Protocol a high priority in its relations with the Senate, prospects for ratification by a two-thirds majority of the Senate are dim. Finally, domestic political interests have ensured by way of the Byrd-Hagel Resolution in 1997 that major developing countries will not be able to reap a competitive advantage from being spared emissions reductions.

3.2 The European Union

Federal states or supranational institutions usually add more levels of analysis than do unitary countries. Analyzing the negotiating position of the European Union suggests a focus on three major and interlinked levels: (1) the European Union within the global context, (2) the EU institutions and relations with EU member states, and (3) single EU members within the international context. For purposes of this chapter, we will concentrate on the first aspect and defer treatment of the third aspect to the following subsection.

Focusing on abatement costs, the studies by Fischer (1992), Oberthür (1993), and Oberthür and Ott (1999) all show that the European Union is the world's third largest emitter of CO_2 and thus has strong polluter interests. However, given its dependence on energy imports for about 50 percent of its energy consumption, it also has an interest in energy efficiency (see the discussion of third-party interests in section 1). Furthermore, abatement costs are perceived to be moderate, because different studies in 1996 and 1997 identified low-cost means for reducing CO_2 emissions by 15 percent relative to 1990 levels by the year 2010 (Oberthür and Ott 1999, 16). Since European firms are at the forefront of research and development of renewable energy and energy-efficiency technology, international regulations create a significant economic potential for long-term gains.

In terms of the European Union's moderate ecological vulnerability, a growing impact of sea-level rise, shifting vegetation zones, reemergence of vector-borne diseases, and increased desertification in Southern member countries are expected. This amounts to a mixed-interest constellation, as in the case of the United States, but the European Union does not have as strong polluter interests and is perceived to face lower abatement costs.

The influence of the public is assessed to be modest within the European Union, since only the European Parliament is directly elected, and it only enjoys limited influence on EU climate policy (Michaelowa 1998, 478). More important, different studies reveal that ambitious targets are often not achieved because of the complexity of the policy-making process. For example, Ringius highlights why the European Union cannot act like a unitary actor: competing and opposing interests among member states, fragmented supranational institutions, as well as tensions and

competition between member countries and EU institutions prevent the EU from playing such a role. Still, some member states support the "ambition to perform a global environmental leadership role" with the help of national resources (Ringius 1999, 6).

The reason for this aspiration on the part of some member states may be illustrated by comparing this situation to the protection of the environment in the United States. The United States highlights the costs of any measures through a bottom-up approach that aggregates the costs implied by the measures. But European politicians often use a top-down approach, initially setting targets that "seem" feasible and then accepting the associated costs—at least to some extent. In fact, while pushing for targets and timetables at the UNCED conference, only three of the EU member states had prior written plans on how to reduce (domestic) CO_2 emissions. This casts doubt on the credibility of the European Union's intentions. Furthermore these intentions and leadership ambitions have been significantly reduced, specifically from a 15 percent reduction to only 8 percent under the Kyoto Protocol in only two years. Since the European Union has not (yet) managed to implement a common climate and energy policy, Haigh argues that the responsibility for fulfilling these obligations should revert to the member states. That is, they should be held individually responsible for their national obligations within the EU burden-sharing agreement by devising national measures to ensure compliance with these targets (Haigh 1996, 182).

An alternative explanation for the gap between political targets and actual measures could rest with the strong and institutionalized influence of interest groups at the EU level. Since business groups are much better organized than environmental groups at the EU level, they can quickly provide the information needed by the European bureaucracy and influence much of the European Union's policy output. Environmental NGOs generally lack major funding and have to rely partly on income from the European Commission's (!) budget. The overall lack of democracy and transparency of decision making opens the door to substantial influence over the range of policies pursued by the European Union in the global arena.

As Ringius (1999) concludes, the European Union does not act as a rational unitary actor. Instead, a distinction can be made between at least

three groups of member countries: "rich and green," "rich, but less green," and "poorer and least green." Because the Council of Ministers makes the final decision on any common EU policy and many effective CO_2 reduction measures require unanimity within this institution, less green member states hold considerable veto power over climate protection policy (Böckem 1998, 263). This may explain why the European Union's common climate policy is often characterized by uncoordinated measures taken at the *national* level and the preference for inefficient economic instruments at the EU level as opposed to a grand European design. The European Union may favor victim interests over polluter interests, but the latter group knows how to exert influence once polluting industries become subject to regulation. Since the European Union is fragmented in legal terms, European interest groups and national interest groups both push and pull the European position in global climate negotiations.

The European Union[15] is a mixture of countries with partially differing preferences. This also makes an assessment of our hypotheses more difficult as compared to an analysis for single countries. The qualitative hypotheses seem to be well supported, because the member countries are, on average, perceived to be vulnerable, they face moderate abatement costs, and they are trying to develop industries that lessen the impact of fossil fuel generation. Furthermore, environmental NGOs are well mobilized but also face credible opposition once core industries are affected by regulations. In combination, these factors clearly explain why the EU is the most consistent pusher among the industrialized countries. The merits of the hypotheses derived from the formal analysis are not applicable to the European Union, since they pertain more appropriately to sovereign nation-states.

3.3 German Climate Policy

Among the "rich and green" EU member states, Germany stands out as the largest single emitter of greenhouse gases. While it resembles many EU countries in terms of pollution interests and reliance on energy imports, Germany is ecologically less vulnerable than much of the European Union and hosts some leading business firms that develop and produce solar and wind technology. These industries are likely to gain from the diffusion of

those technologies on a global scale (third-party interests). The economic costs of CO_2 emission reductions are moderate,[16] mainly because roughly half of the voluntary commitment of reducing 25 percent of its 1990 CO_2 emissions by 2005 have been accomplished due to the decline and subsequent restructuring of the economy of the former German Democratic Republic. The potential for further reductions is great, since the "neue Länder" have not yet come close to reaching the productivity and energy efficiency of their Western counterparts (Schäffler et al. 1999, 7). Nevertheless, some studies suggest that the ability of national measures to accomplish the national target is limited, and the credibility of the ambitious goal of a 25 percent reduction of CO_2 by the year 2005 (relative to 1990) has been questioned (Beuermann and Jäger 1996, 204; Sachverständigenrat Umweltfragen 2000, 398).

Some authors stress the importance and success of the First Enquete Commission of the German Bundestag for developing and proposing this ambitious national target, which enjoys support across party lines (Beuermann and Jäger 1996, 193). But others argue that the German reduction goal was driven by "political enthusiasm" rather than by a serious assessment of relevant abatement costs (Skolnikoff 1997, 7). Michaelowa (1998) explains the apparent gap between political targets and actual measures as a way to attract green votes by an "announcement effect," while concrete measures to achieve this goal would have to be taken by subsequent governments. Though the present federal government still strongly supports the national 25 percent reduction target, economic conditions have changed since 1990. The recession of the early 1990s, the underestimated costs of reunification, as well as a high level of unemployment have consumed resources and public attention that can no longer easily be allocated to climate protection (Beuermann and Jäger 1996, 223).

Did the change from a conservative-liberal coalition to a social democratic–green government have an impact on climate policy? At a first glance, the change in leadership in the 1998 elections seems to have had moderate influence. However, a study published by the Forum for Environment and Development found significant progress by the new government coalition in creating a new energy tax system based on taxing energy-related activities (Schäffler et al. 1999). Change, however, is slow

due to industry lobbying with the relevant ministries. Since business NGOs traditionally hold close relationships with several federal ministries involved in climate policy, the Federal Ministry of the Environment has often tried to offset their influence within the cabinet (Chasek et al. 1998, 32). As a result of this bargaining structure, Beuermann and Jäger (1996) argue that measures to reduce emissions of industry or energy consumption are often introduced on a voluntary basis. Consequently, the role of German industry in contributing to the national emissions-reduction target was construed as a voluntary obligation for nineteen branches of industry to reduce their specific CO_2 emissions and energy consumption by 20 percent until 2005 relative to 1990 emissions (Schäffler et al. 1999, 14). Following this announcement, the former government abandoned plans to regulate heat use and to impose taxes on energy use.[17] This reflects major influence by business NGOs, since unlike most laws, voluntary restrictions are not likely to carry a penalty for noncompliance. In the year 2000, the German Industry Association signed an agreement with the federal government to reduce its specific emissions of all Kyoto greenhouse gases by 35% until 2012 relative to emissions in 1990.

Counterbalancing business interests, Skolnikoff (1997) and Chasek et al. (1998) find that green NGOs hold substantial influence over public opinion and the Federal Ministry of the Environment, especially since the latter is now led by a minister from the Green Party. By contrast, the influence of environmental NGOs on actual policy outcomes is rather limited because of the weak position of the Federal Ministry of the Environment within the cabinet and even within the interministerial working group that prepares policy recommendations on climate change. Consequently, since 1990 the different ministers have all used international efforts to advance national climate policy (Beuermann and Jäger 1996, 202).

In conclusion, Germany may act as an international push country within the European Union as well as globally, but its chances of delivering ambitious policies are restricted by well-organized domestic business interests. While the costs of climate change are expected to be minor as compared to other countries, Germany faces a double constraint. On the one hand, environmental groups are able to motivate any government to subscribe to an ambitious climate policy. On the other hand, German

industry interests are well enough organized to be able to avoid a sharp rise in costs at the implementation stage. This is true even though an increasing number of companies are pursuing long-term policies aimed at reconciling environmental imperatives with sustained profitability. The final challenge for a German government is to turn words into deeds, especially if the government wants to further its international reputation in this respect.

Germany combines (perceived) moderate ecological vulnerability and abatement costs, an increasingly strong non–fossil fuel energy sector, and environmental NGOs that influence the programmatic orientation of the government. At the same time, relevant polluting industries have sufficient weight to prevent the actual implementation of strong emission reductions. This constellation of factors supports the qualitative hypotheses. Furthermore, ratification of international accords does not pose a problem in Germany due to the lack of political cleavage in Germany on climate policy and to the country's moderate international obligations. The fact that the German government controls a majority in the lower chamber of Parliament (Bundestag) is also relevant.[18] Truly radical positions, on either side, play no role in the consensus-oriented German climate policy.

3.4 Climate Change Policy of a Developing Country: India

The greenhouse gas emissions of the major developing countries are expected to grow very substantially during the twenty-first century. Therefore, the climate policies of countries such as India, China, and Brazil are of central importance for the overall success of international efforts to mitigate global climate change. Developing countries organized in the "G77 plus China" have also succeeded in shaping the FCCC so as to reflect developing countries' major priorities: the alleviation of poverty, economic growth, and food security. Among this group, India is occupying a leading role. Demand for its energy is rapidly growing, by an average of 5.8 percent per year (Jakobsen 1998, 5). Economic growth is perceived to be the primary determinant of progress by the public as well as the bureaucracy, and the use of coal as an energy source is part of the national strategy of self-reliance. Polluter interests are strong due to the burning of fossil fuel. Furthermore, the extent of methane emissions from

rice paddy fields has been a matter of controversy in the run-up to the Rio summit between the U.S. Environmental Protection Agency and the Indian Center for Science and Environment. Nevertheless, no one in India would like to conclude an international agreement that would limit rice production because of its greenhouse gas–related emissions.

The country is extremely vulnerable to the possible impact of climate change, especially sea-level rise and shifts in monsoon cycles, because agriculture contributes approximately 30 percent to the gross domestic product and employs about two-thirds of the labor force. As in other developing countries, the overall capacity to adapt to adverse impacts of climate change is low, and the damages are expected to be high in the poorest regions.

Given a combination of both high environmental vulnerability and relatively high abatement costs, the interest-based explanation would classify India as an "intermediate" country. However, unlike major developed countries such as the United States or Germany, India plays a rather reactive and passive role within the FCCC process. Due to drastic domestic economic restructuring since the 1980s, climate change ranks low on the public agenda (Kandlikar and Sagar 1997, 16). As a consequence, public attention to the issue is low, and most environmental organizations are dealing with local problems. Only NGOs like the Centre for Science and Environment (CSE) are systematically trying to influence the government's position on global climate change. Since most of these institutes receive major funding from abroad, the Indian research agenda is significantly shaped by the industrialized countries' agenda. The influence of scientists and experts is considerable due to the administration's dependence on their advice. However, the general lack of financial resources for research and formalized relationships between research institutes and relevant ministries seriously constrains the scientists' influence on climate policy. Because most of the energy-intensive industries like steel, cement, aluminum, fertilizer, and chemicals are publicly owned as a consequence of the national strategy of self-reliance, there is little business pressure on the Indian government. Another reason for the virtual absence of business lobbying is that, so far, Indian industry appears to be unconcerned about "potential repercussions for future industrial activities from international agreements on climate change" (Jakobsen 1998,

29). Since the local environmental legislation—for example, on water and air pollution or waste treatment—is already very demanding for Indian industry, Indian business is only marginally concerned about international environmental accords but is generally aware of environmental regulations at the national level.

Besides considering the influence of interest groups, we will briefly touch on the Indian government itself. The Indian government has obviously learned from earlier international negotiations on the protection of the stratospheric ozone layer, that refraining from active participation during the early stages of international negotiations may have repercussions for the domestic economy and economic development. Furthermore, NGOs like the Tata Energy Research Institute (TERI) and CSE have helped the Indian government understand the link between global environmental problems (and negotiations) with development and general North-South issues. Consequently, the government has constrained its negotiating team to only participate and monitor, stress the question of the adequacy of industrialized countries' commitments, and prevent any outcome contrary to Indian interests. On the one hand, the limited resources devoted to input of knowledge about the science and politics of global climate change is at the root of this rather defensive negotiating position. On the other hand, the IPCC was received in India with great suspicion because of the marginal involvement of developing countries in the creation of the first and second assessment reports. The IPCC involved more developing-country scientists in its third assessment report. Still, the relatively few invitations extended to Indian scientists to participate in the IPCC meetings are often sent personally to scientists or institutes and not, as formally required, to the Indian government. Consequently, the contribution of scientists from India to the IPCC process is limited, and the IPCC consensus is not seen in India as a global one but as a private Western consensus.

Furthermore, key positions within the Ministry of Environment and Forestry are filled with generalists on short-term assignments. As a consequence, the policy-making process lacks continuity, and it is hard to find long-term experience in international negotiations within the Ministry of Environment and Forestry (Biermann 1999, 17). As a result, environmental policy is generally characterized by problem-driven,

issue-specific reactions and there is only ad hoc initiation of expert advisory committees.

Within the context of the more immediate concerns of public health, economic growth, and poverty alleviation, there is little attention to global environmental problems like climate change. Rather than trying to push for effective international agreements, emissions-reduction measures taken so far are primarily aimed at avoiding economic damage resulting from power shortages and at meeting the rapidly growing energy demand (Reid and Goldemberg 1997). Furthermore, as national measures like carbon taxes are determined to be costly,[19] technological assistance from, and subsidized by, the North will be required in order to address emission reductions in the future. In light of these abatement-cost figures, it appears unlikely that India would accept voluntary obligations that mandate stabilization of its emissions without external assistance.

In the case of India, the hypotheses derived from the qualitative approaches are mostly applicable. While India is vulnerable to climate change damage, it only demands emissions reductions from industrialized countries for equity reasons (see chapter 7)—which is not explained by the first hypothesis. High perceived abatement costs for an issue that does not receive high internal priority supports the second hypothesis, and the lack of strong third-party interests as well as rather weak environmental NGOs explain why India is less enthusiastic about taking over stringent international commitments itself. Most of the hypotheses derived from the formal models are not applicable, since like other developing countries, India has not yet taken over relative or absolute emission-reduction obligations at the international level, and domestic mobilization on the issue of climate change is only starting.

Taking these four cases together, the interest-based explanation (which combines abatement costs and environmental vulnerability) provides a good first approximation in most cases. Furthermore, the influence of industries that wish to substitute fossil fuel industries is correctly predicted, although the degree to which these industries are advancing in the various countries varies considerably across our four cases. The same also holds for the relative importance of environmental NGOs vis-à-vis organizations representing polluting interests (see table 4.3).

Table 4.3
Empirical support for the hypotheses

Hypotheses	United States	European Union	Germany	India
The more a country is *ecologically vulnerable,* the more likely it will demand strong emissions reductions in international negotiations.	+	+	0	−
The higher the *abatement costs,* the less likely a country will demand strong emissions reductions.	++	++	+	+
The stronger *third-party interests* are, especially if they are assisting emissions reductions, the more likely a country will strive for strong emissions reductions.	+	++	++	+
The stonger *environmental NGOs* are relative to NGOs representing pollution interests, the more likely a country will demand strong emissions reductions.	+	+	+	+
Strong dragger countries will be able to achieve international treaties closer to their preferences as compared to weak dragger countries.	++	NA	NA	NA
Governments can only succeed in ratifying international environmental agreements if they actively *campaign* for them as opposed to not campaigning.	++	NA	++	NA
Domestic constraints on the bargaining and ratification process are the more effective the closer these actors position themselves to the ratifying agent.	++	NA	+	NA

Scale: ++ = strongly confirming
+ = confirming
0 = neither disconfirming or confirming the *hypothesis*
− = Disconfirming
−− = Strongly disconfirming
NA = not applicable

The hypotheses generated by the formal models are only partially applicable to our cases, because not every country is facing the ratification of strong international treaties that may affect it directly. Therefore, these hypotheses are mostly applicable to the case of the United States and, in some instances, the case of Germany.

4 A Brief Look at the Future

This chapter has provided an overview of qualitative and formal models relevant to the link between the domestic and international levels found in decision making on international environmental regulation. Subsequently, we shed light on the internal decision making on global climate change within some major countries and the European Union. In this concluding section, we will highlight some relevant aspects of domestic decision making for the future of global climate policy.

The European Union often appears to act as a pusher, while the United States is considered a dragger. Following the model suggested by Schneider and Cederman (1994), the United States should be expected to negotiate in favor of a "weak treaty." While empirical evidence corroborates this assumption, the question remains whether the United States can be seen as a weak or strong dragger. On the one hand, Agrawala and Andresen (1999) observe that, between 1992 and 1997, the U.S. negotiating position has moved to favor stronger obligations, which would imply that the United States can be viewed as a weak dragger that prefers to negotiate rather than to exit. On the other hand, the United States succeeded in substantially weakening the Kyoto Protocol in terms of mandatory emissions reductions by threatening to exit negotiations. It also managed to successfully introduce key elements of its original negotiating position, which culminated in the Kyoto Mechanisms. This implies that the United States has so far been regarded as a strong dragger by the European Union. The European Union has shown a declining ambition to push for stronger emission targets. Some observers even suspect that it is secretly satisfied with less stringent targets and timetables (Skolnikoff 1997, 15).

By contrast, Oberthür and Ott (1999, chap. 25) propose that the EU should exercise international leadership without waiting for the United

States to follow suit. Their proposal requires the European Union to ratify the Kyoto Protocol early and integrate Japan, Russia, and other economies in transition into its initiative. The European Union would also be required to introduce effective measures for domestic implementation so as to serve as a role model for other countries. The studies reviewed in this chapter, however, raise questions about the European Union's capacity to act convincingly in the proposed direction. Internal decision making within the European Union has to take into account the less green interests of the Mediterranean countries. Furthermore, there is no cohesive EU-wide climate policy, and some push countries, such as Germany, are at the limit of pursuing credible domestic policies. Thus, prospects for conclusive unilateral action by the European Union appear more visionary than realistic.

Since almost all countries have national ratification requirements, the question of ultimate domestic control over agreements negotiated at the international level is central to domestic-international linkages. In the case of the United States, these requirements are demanding in two respects. First, the U.S. Senate has to approve any international agreement by a two-thirds majority, and second, there is rarely strong partisan cohesion between Congress and the executive branch. Since the Senate is strongly influenced by lobbying groups, the executive branch must aim at weakening the bloc of global warming skeptics, like the Global Climate Coalition, and must heighten the influence of either environmental NGOs or business firms that have third-party interests regarding greenhouse gas emission reductions. Examples of the latter group include Royal Dutch/Shell, BP-Amoco, and several automakers that have left the Global Climate Coalition. Some of these firms are even strongly promoting the market for renewable-energy technologies with a view toward long-term profitability. Within these multinational firms, policies of combining emissions reductions with international emissions trading have already been devised. Their ambitions lead to an unpredicted international challenge: Which *countries* can claim emissions reductions? Regardless of the answer given, the more resources such firms invest in renewable energy and emissions reductions, the more they will pressure governments to grant them tax reductions or other incentives that will allow them to remain globally competitive.

By contrast, governments in Europe are somewhat more independent of domestic interest-group pressure than the U.S. government is. But as the German example illustrates, governmental ambitions supported by environmental NGOs do not suffice. Ultimately, only implemented policies will matter for environmental performance. Thus it could be the case that much of the U.S. regulatory process precedes international negotiations, whereas in the European Union and its member countries, much of the internal debate heats up once internationally agreed-on cost measures have to be implemented. Further, the EU may wish to gain global stature by pursuing an ambitious global climate policy, whereas the United States, an established and confident global power, considers the protection of the climate system to be just one of many issues worthy of attention.

The nexus between domestic and international policies matters most for participatory polities. Domestic politics often constrain governments in their pursuit of international policies. Conversely, successful international bargains may strengthen domestic support for the government. The domestic-international interface is indispensable—particularly at the stage of compliance and implementation (see also chapter 11). At this stage it will be decided whether policies, domestic or international, benefit the environment or if they run the risk of failing to meet the challenge of protecting the Earth from possible climate change.

This chapter has emphasized the role of domestic forces in shaping the climate policy negotiation and ratification process. These domestic forces will not usually uniquely try to influence their own governments. They will also organize internationally and try to influence the debate from outside. Moreover, international governmental organizations themselves will try to influence global negotiation processes and outcomes. UNEP and WMO—and for that matter the World Bank—were to some extent influential in trying to shape the agenda and the discussions around climate change, including the creation of the IPCC by the first two organizations. Thus for global environmental questions, nonstate actors in the form of governmental and nongovernmental organizations as well as international movements play a significant role. The analysis of this role will be undertaken in the next chapter.

Notes

We are grateful to Steinar Andresen for helpful comments on an earlier version of this chapter and to Vinayak Rao for guidance and information on India's climate change policy.

1. Although international agreements often need domestic ratification, failure to arrive at an international agreement *does not* necessitate formal domestic "ratification." This built-in asymmetry of international and constitutional law has rarely been attended to in international relations theory. For an exception, see Wolinsky 1994 on the role of international treaty making for the electorate.

2. International negotiations can also be used to alter domestic coalitions and to negotiate agreements that were not feasible beforehand (see Putnam 1988, 447).

3. For a detailed review of the interest-based explanation, see Sprinz and Vaahtoranta (forthcoming).

4. For this particular specification, see Oberthür 1993.

5. On compliance, see chapter 11. See also Sprinz and Vaahtoranta (forthcoming) for an extension of the interest-based explanation of international environmental policy to compliance with international environmental agreements.

6. "Weak" and "strong" treaties refer to freeze versus pollution-abatement treaties, whereas a "weak" versus "strong" actor refers to the degree of willingness to exit from international environmental negotiations rather than accept a "weak" treaty.

7. See Sprinz 1992, chap. 5, for the international regulation of transboundary air pollution in Europe.

8. Empirically, the obstacles to a strong treaty can be illustrated by the lack of enthusiasm of many legislatures in OECD countries for transferring the necessary sovereignty to international institutions in order to manage the income generated by a potential international carbon tax scheme.

9. It should be noted that the obligations for the less industrialized countries under the FCCC and the Kyoto Protocol are minor—and assisted by not precisely quantified resource transfers from industrialized countries.

10. That is, they prefer weak treaties.

11. It should be emphasized that countries may simultaneously hold a combination of interests. In particular, the U.S. delegation showed fragmentation along representations of polluter and victim interests during negotiations on the UNFCCC.

12. The United States has a long coastline, is prone to extreme weather conditions, and faces a northward shift of vector-borne diseases such as malaria. Nevertheless, it is difficult to quantify the cost of the damages induced by global climate change because of the high degree of uncertainty about the magnitude of these events.

13. According to Agrawala and Andresen (1999, 13), over eighty international agreements were pending ratification in the U.S. Senate.

14. Surprisingly, Democratic Senator Byrd positions himself strongly against ratification of the Kyoto Protocol. His constituency is in the coal-producing state of West Virginia.

15. More precisely, only the European Community is a subject of international law.

16. Over the past decade, the German coal-producing industry has lost substantial economic and political influence.

17. The latter were, nevertheless, introduced in the year 2000 on a moderate scale.

18. The remaining hypothesis is not applicable to the German case.

19. Using carbon taxes to stabilize greenhouse gas emissions by 2010 would result in a 13 percent reduction in the gross domestic product. See Mabey et al. 1997, 179.

5

Nonstate Actors in the Global Climate Regime

Kal Raustiala

States and the institutions they create are the traditional focus of the study of international relations and of international law. The study—and practice—of the politics of international climate change also primarily revolves around the actions of governments. Yet in scholarship as well as diplomacy, increasing attention is being paid to the role of nonstate actors. Governments have granted nonstate actors extensive access to the international climate policy process, and nonstate actors participate in the meetings of the parties, lobby governments, prepare policy reports, and interact with the public and the media. Whether this heightened presence signals a fundamental shift in international politics or merely incremental evolution, nonstate actors are now a significant part of the political landscape.

The Framework Convention on Climate Change (FCCC), the core legal instrument at the heart of the climate regime, was negotiated as part of the 1992 United Nations Conference on Environment and Development (UNCED). It was negotiated in numerous rounds termed *Intergovernmental Negotiating Committees* or INCs. Since the FCCC's coming into force there have been five annual Conferences of the Parties (COPs), as well as a host of smaller meetings, organized around specific issues as well as involving the adjustment and elaboration of the treaty commitments. Nonstate actors have played a role in all of these conclaves; detailed summaries and analyses of the history and politics of the FCCC negotiations can be found in chapter 2 of this volume. UNCED itself was a watershed event for the involvement of nonstate actors—specifically nongovernmental organizations (NGOs)—in the process of international diplomacy. While NGOs were active even in the creation of the UN in San

Francisco and had been a presence at the 1972 Stockholm Conference on the Human Environment (as well as at many other UN meetings), never before had so many gathered together and never before had their presence and activities been such a central focus of a major international meeting. Since that time, while their presence and accountability are sometimes questioned, nonstate actors have been increasingly considered an established part of international diplomacy within the UN system.

Former UN Secretary-General Boutros Boutros-Ghali's 1994 comment to a gathering of NGOs at the UN's New York headquarters reflects this newer view that NGOs are integral to the international policy process:

> I want you to consider this [the UN] your home. Until recently these words might have caused astonishment. The United Nations was considered a forum of sovereign states alone. Within the space of a few short years, this attitude has changed. Non-governmental organizations are now considered full participants in international life.

Rhetoric, of course, is not reality. But clearly a shift in worldview, beginning in the 1990s and continuing today, has occurred concerning the relationship between states and nonstate actors within the UN system and in multilateral cooperation more broadly. The terms and legal structure of the international climate change regime reflect this shift. Like most recent international environmental treaties, the terms of the FCCC explicitly allow for and encourage participation by nonstate actors through various formal and informal procedural mechanisms. Under the FCCC, "Any body, or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by the Convention . . . may be so admitted [to negotiations and meetings] unless at least one-third of the Parties present object" (FCCC Article 7.6). In addition, all Parties are obliged to "promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of [NGOs]" (FCCC Article 4.1). The Conference of the Parties, the highest body under the FCCC, shall furthermore "seek and utilise . . . the service and cooperation of, and information provided by, competent international organizations and [NGOs]" (FCCC Article 7.2). Thus while the FCCC is a creature of states, and the international climate regime is dominated by governments, as a formal matter, nonstate actors are encouraged and

enabled to participate in its operation and evolution. In practice, NGOs are now a pervasive presence.

This chapter explores the activities of nonstate actors within the climate change regime and the structures within which these actors behave. Rather than examine normative issues, such as the accountability or democratic pedigree of nonstate actors, it analyzes, in positive terms, the roles and impact of these actors in the climate regime. It first identifies some of the major actors and distinguishes between two main types of nonstate actors: NGOs and "epistemic" or expert/scientific communities. Special attention is given to a uniquely important scientific, though not purely nongovernmental, body: the Intergovernmental Panel on Climate Change (IPCC). The chapter describes and analyzes the activities of nonstate actors, examines their influence on current international responses to global climate change, and assesses the significance of their newfound prominence.

1 What Is a Nonstate Actor?

The term *nonstate actor* generally refers to any organization that does not have a formal or legal status as a state or agent of a state, or as a constituent subunit of a state such as a province or municipality. This chapter examines two kinds of nonstate actors. *NGOs*—private, voluntary interest groups—are the most common and the most familiar. Many analyses and discussions of nonstate actors are explicitly or implicitly limited to NGOs. NGOs are defined here as organized nonstate groups that seek to effect change in policy: in this context, in the type, shape, or scope of international, national, and local responses to climate change. This definition encompasses "traditional" environmental interest groups (such as the Swiss-based World Wide Fund for Nature, commonly known as WWF), business and trade associations (such as the U.S.-based Global Climate Coalition), research organizations (such as the India-based Tata Energy Research Institute), and the fast-growing category of (generally Southern) environment-social development groups (such as the Bangladesh Rural Action Committee). Most NGOs active in the climate regime have "consultative status" with the United Nations, a status that allows them formal access to UN documents, negotiations, and deliberations.

Epistemic communities, the second category of nonstate actors, are generally defined in the literature on international relations as communities of experts—typically scientists—who share both positive and normative beliefs about a given issue area or problem, common notions of validity, and a common policy enterprise (Haas 1992).[1] Unlike NGOs, epistemic communities are rarely self-defined: They have neither offices nor formal hierarchies, budgets nor membership lists. Rather they represent informal coalitions of like-minded and influential individuals. The notion of an epistemic community is a theoretical construct attributed to a group by an analyst, and as a result the identification of an epistemic community is not straightforward and often very contestable. Analysts have identified several epistemic communities argued to be important players in international public policy generally, and in environmental affairs particularly (Haas 1992). In this chapter I employ a broad definition of epistemic communities, and examine some communities that approach, but arguably do not fulfill, that definition.

In addition to these three categories of nonstate actors, there is one additional, sui generis, organization that merits special attention and is examined below: the IPCC. The IPCC was formed to provide regular, synthetic assessments of the current state of climate science to governments negotiating and implementing the FCCC. It is composed of over 2000 scientists, and while it is formally "intergovernmental," the IPCC reflects a broadly scientific rather than purely political consensus. While the creation of the IPCC signals the importance that science plays in the climate process, it also highlights the efforts of states to organize, channel, and control the production of politically relevant scientific knowledge.

2 NGOs and the International Response to Climate Change

NGOs are the nonstate actors most commonly thought of and analyzed in the context of international environmental cooperation. The development of an international response to the climate change threat, in the form of the FCCC and IPCC, has been closely monitored by NGOs cognizant of the fact that climate policy addresses one of the most significant environmental problems of the twentieth and twenty-first centuries. Climate policy, because it is intimately linked with energy, transport, and

forestry policies, has the potential to radically alter consumption and production patterns throughout the industrialized world—and to a lesser extent in agricultural societies. Thus it has the potential to influence, synergistically, a host of other environmental and social problems. In this sense climate change is more than just a new and significant environmental threat. While climate change can be viewed as a highly complex social problem amenable to the sort of regulatory approaches deployed to tackle acid rain or ozone depletion, for some it represents the fallout of an anachronistic industrial paradigm of unchecked and constant growth, and its solution the means by which the world can be moved toward a more sustainable, less environmentally destructive future. For many NGOs interested in such a move (or mortally opposed), climate change is the single most important environmental issue on the international agenda.

For these reasons climate change has received a perhaps disproportionate degree of attention from the NGO community. It was an important concern of many of the nearly 10,000 NGO members at UNCED. This high level of concern has continued: At COP-1 in Berlin, nearly 1000 NGO representatives were accredited from some 165 NGOs—outnumbering the delegates themselves (FCCC/CP/1995/3). By COP-3, the birthplace of the Kyoto Protocol, the numbers were even larger; NGO and IGO delegates numbered nearly 4000, a large percentage of which were Japanese. In contrast, equally if not more pressing and immediate global issues, ranging from biodiversity loss to contaminated water, are far less closely followed. For governments and many NGOs alike, climate change is and remains center-stage diplomacy.

2.1 The Nature of the NGO Community

As the climate change issue has risen in salience and complexity, the NGO community surrounding it has evolved considerably. Where environmental groups once dominated the landscape, a wide array of business and trade organizations now exist. To take one example, at the March 1997 meeting of the Ad Hoc Group on the Berlin Mandate (AGBM6), a specialized meeting in preparation for COP-3, there were approximately 35 business NGOs, with some 150 representatives, and 25 environmental NGOs, with about 90 representatives. The NGOs at COP-3 were very

diverse. Among the more unusual and unexpected were representatives of the AFL-CIO (the largest trade union in the United States), the Japan Bicycle Promotion Institute, the Uranium Institute, the United Methodist Church, the National Association of State Fire Marshalls, the Alliance Internationale de Tourisme, the Citizen's Coalition for Economic Justice, the Japan Prefectural and Municipal Workers Union, and the International Solar Car Federation. Clearly, interest in the FCCC has moved beyond the usual suspects of WWF, Greenpeace, and the Global Climate Coalition.

The expanding array of NGOs illustrates a seeming paradox in the evolution of the climate regime: even as concern with the global environment continues to drop in many advanced industrial democracies (the home of the most internationally active NGOs), attention to the FCCC process is growing in a wide array of quarters. The best explanation relates to the shift in focus within the regime. As the climate regime matures and increasingly addresses complex but often tedious issues of implementation and commitment design, actors with tangible stakes in the outcomes have begun to perceive their stake in the process. As a result they have become increasingly involved in the FCCC and its debates. Meanwhile media attention has waned in the wake of blockbuster events like UNCED, diminishing popular attention. The result is a change in the character of the active NGO community toward more numerous, more obscure, and more narrowly focused groups. Climate change politics is still about big issues—when and how much emissions will be reduced—but it is also, increasingly, about smaller, more technical matters of implementation that animate a wide range of diverse interest groups. Thus the flourishing of NGO activity follows, rather than contradicts, the shift in the regime from high-profile politics to detailed regulatory negotiation. Below I briefly discuss some major categories of NGOs involved in the FCCC process.

Environmental NGOs Environmental NGOs, which in relation to climate change also include many groups with a strong development and/or poverty focus, vary widely in terms of factors such as the following: membership; policy positions; focus on advocacy, research, or grassroots operation; geographic orientation (global, national, Southern, local); and resource base. Most share a deep dissatisfaction with the current FCCC

commitments and seek greater cuts in greenhouse gas emissions. While this represents common ground, significant differences divide the NGO community. On issues like joint implementation and the Clean Development Mechanism, which would allow developed countries to partially implement their agreed emissions reductions via projects in other countries at much lower costs, environmental NGOs have been sharply divided. And as in nearly all interest-group politics, insider strategies (aimed at careful conciliation with state power) and outsider strategies (aimed at more dramatic and fundamental critiques) coexist uneasily.

While the prominence of individual environmental NGOs has wavered, collectively they are likely to remain a presence in international environmental politics for some time. But while environmental NGOs once dominated the ranks of nonstate actors in the climate regime and in international environmental politics generally, increasing numbers of business NGOs have become involved in the policy process.

Business NGOs The potential regulatory impact of the FCCC and its protocols is enormous. Business groups with a wide variety of stakes in the policy outcome have mobilized to monitor and influence the proceedings. The major interested industries include, among others, fossil fuels (coal, oil, natural gas), automobiles, insurers, power generation, and alternative energy suppliers (hydroelectric, solar, wind).

As the climate regime has become more specific, and the likely legal and regulatory structures more certain, business NGOs have multiplied, but they also have, as a group, fractured along lines determined by economic interests. The focus of regulatory controls will in the near term continue to be carbon dioxide, and any efficient control scheme may well differentiate among energy sources based on carbon content. Oil and coal suppliers, who produce the most carbon-rich energy sources, have most vigorously resisted the imposition of binding emissions-reduction targets. Some natural gas suppliers favor emissions controls on a moderate scale, which will give them a competitive advantage against coal and oil: gas is a relatively "clean" fuel, but if severe carbon emissions controls are implemented (presently an extremely unlikely event), even natural gas producers may suffer. Carbon-free energy suppliers, such as those supplying solar and nuclear energy, generally stand to gain from strict carbon

controls, though there is strong debate over the use of nuclear power as a carbon substitute. The U.S.-based Council for Sustainable Energy and the European Business Council for a Sustainable Energy Future both represent renewable and low-carbon intensive energy sectors, and have held presentations at FCCC negotiating sessions promoting the potential of sustainable energy sources.

Outside the energy field a similar diversity exists. Many insurers, faced with potentially crippling losses from climate-related storm damage, favor stronger, swifter action to dampen their risk. Hurricanes and other storms caused large losses to insurers in the early 1990s; insurers and reinsurers have as a result begun to endorse reductions in greenhouse gas emissions.[2] UNEP has developed an "Insurance Industry Initiative," involving over eighty insurance companies from around the world, which addressed delegates at COP-4 on the insurance impact of climate issues (see also Hofman 1998; Unsworth 1998). The chemical industry is also a player in the climate process. For example CFCs, currently controlled by the Montreal Protocol on Substances That Deplete the Ozone Layer, are greenhouse gases, but so are many of the substitute products developed by industry (see chapter 12). The chemical sector is represented by the International Climate Change Partnership, a group based in the United States and including, among others, Dow, Dupont, Elf Atochem, and 3M. Perhaps the most powerful broad-based business NGO is the U.S.-based Global Climate Coalition, which has an annual budget of $2 million and a membership roster that comprises many of the most powerful American and European corporations, including several from the energy sector (Franz 1998). The Global Climate Coalition alone fielded a delegation of fifty members at COP-3 (Franz 1998). It has, however, lost some prominent members including BP-Amoco, Royal Dutch/Shell, and DaimlerChrysler.

Consumer groups Almost exclusively active in the United States, which has a long tradition of consumer advocacy, consumer groups are newcomers to the climate change debate but potentially powerful players. One prominent example is the "Cooler Heads Coalition," formed in 1997 as part of the National Consumer Coalition. The latter comprises over two million Americans. The Cooler Heads Coalition, focused on

energy and gasoline costs for American consumers, was highly critical of the Clinton administration's proposals in the lead-up to COP-3 and was a critic of the Kyoto Protocol itself (Samson 1998).

Religious Organizations Another relatively new but potentially significant phenomenon is the involvement of religious organizations in environmental matters broadly and in climate change in particular. While the relationship between many of the world's larger organized religions and the environment is complex, for many religious orders the climate change problem represents a moral concern of great scale. This focus is not only ethical, in the sense of a concern with poverty and fairness across societies and generations, but is also connected to specific creation beliefs. For some religious groups the climate—as well as the earth's stock of species and ecosystems—is the patrimony of a supreme being, to be preserved by humankind if at all possible. Threats by religious organizations to exclude DaimlerChrysler from the portfolio of their pension fund allegedly led DaimlerChrysler not to renew its membership in the Global Climate Coalition.

The involvement of organized religions in the climate change debate is still at a low and exploratory level. But the potential reach of the world's organized religions is enormous, and a concerted, coordinated effort to influence the path of policy—and, most importantly, the choices and acts of their members—could have marked consequences for the climate problem.

2.2 NGO Activities

NGO's activities directly relating to global climate policy and the FCCC process can be divided into five basic categories (Raustiala 1997b):

- Helping to set the international agenda and raise awareness of environmental challenges
- Providing policy advice and information
- Influencing the process of international negotiation through political pressure
- Monitoring governmental actions
- Assisting in the process of implementation

Setting the Agenda NGOs (in this context primarily environmental NGOs) have been great popularizers of environmental problems, and as such have focused—in conjunction with the news media and with scientific epistemic communities—significant public and government attention on climate change. They have often been the conduit between climatologists and the public, providing (at times oversimplified) distillations of the latest research and stimulating political action. In doing so they have kept the issue of climate change alive as one of the important problems governments must address, or at least appear to address. In the words of one former U.S. official, describing the NGO-organized Villach and Bellagio meetings that helped initiate the international climate change policy process that led to the FCCC: "The two workshops, the meetings of the Advisory Group on Greenhouse Gases and other activities . . . indeed played a significant catalytic role in establishing the IPCC. . . . Governments could no longer permit . . . NGOs to drive the agenda on the emerging climate issue." While NGOs vary widely in their approach to agenda setting, their public activities help frame issues politically and motivate political action. Greenpeace is often the most flamboyant. The day before COP-1 began, for example, three Greenpeace activists occupied a coal plant chimney near Cologne to focus attention on the source of a chief greenhouse gas, CO_2. At the opposite end of the spectrum are relatively dry and technical conferences and presentations held, often at the negotiations themselves, on various alternative energy sources and policy issues. The more private lobbying efforts of NGOs, which also vary substantially, can influence governmental assessments of the "climate change problem" and hence negotiating calendars and topics.

Providing Policy Recommendations Climate change is a complex multidimensional problem that challenges governments to develop flexible, effective, and efficient policy responses. The nature of the problem, its depth and severity, the potential costs, and the potential impact of various solutions are all subject to great uncertainty. NGOs, to varying degrees, have devoted attention to these and other issues and often seek to develop and promote particular substantive assessments and practical policy measures. For governments that lack resources and expertise in this area,

especially of the smaller, less developed states, NGOs in the aggregate may provide useful information that is relatively "costless." NGOs engage in and fund scientific research; NGOs in the United States have been particularly active in this regard. NGOs may serve as a "voice for the voiceless," or for those with limited political power, and thereby seek, in their own view, to provide both a human face and a concern for justice to the often technocratic and abstract process of regulation (Tolbert 1991). Just as frequently, however, they are voices for the powerful.

In practice, as noted above, NGOs have made use of the access they have received to provide government delegations with policy analyses and recommendations, as well as critiques of proposed policies. These have come from both environmental and business NGOs. Since the FCCC has come into force meetings have proliferated, and NGO participation, both formal and informal, has become fairly regularized. For example, meetings of the Ad Hoc Group on the Berlin Mandate (AGBM), which negotiated the Kyoto Protocol, nearly always included at least one formal NGO intervention. These interventions typically addressed specific issues under negotiation and offered suggestions as well as critiques. The following excerpt, from the Climate Action Network, is representative:

> The Berlin Mandate called on Parties to advance implementation of Article 4.1 of the Convention, an article that applies equally to all Parties. Our first general comment is that the current proposal . . . fails to adequately advance implementation of Article 4.1. The text is riddled with qualifications and weak language with respect to the level of action required by Parties. In fact, many of the articles . . . are weaker than their original 4.1 version. . . . With respect to Article 1(e) the Climate Action Network is surprised to see brackets around an article requiring development of indicators to assess climate change and its impacts. These brackets should be removed. With respect to the reference to incorporating climate considerations into decision-making of the multilateral development banks, CAN would like the language strengthened to reflect the view that multilateral development bank lending guidance and development assistance must fully reflect climate criteria to promote climate-friendly technologies. . . . Article 4.1 is ultimately linked to technology transfer and policies that support that transfer. The process, however, cannot and should not be reduced to just dollars. Resources are limited and innovative approaches are needed to lever private sector involvement. It may be possible to enter into convenants with key business sectors to transfer the best technology. The US House Committee on International Relations has suggested that specific incentives should be provided, including tax relief, export credits, and expanded political risk insurance . . . (www.econet.apc.org/climate/a8–6-ngo.html [30 October 1997])

NGOs "intervene" informally as well. Friends of the Earth UK, for example, released a report in 1995 titled *Government Climate Target Compliance by Accident* that criticized the United Kingdom's implementation of the FCCC and suggested that UK compliance was wholly accidental, a concomitant of other market trends and unrelated regulatory changes. The Environmental Defense Fund (EDF) published *More Clean Air for the Buck: Lessons from the Acid Rain Emissions Trading Program* in 1997 as an attempt to influence the development and implementation of market-based regulatory mechanisms in the Kyoto Protocol. At COP-4 EDF, a presentation was made on the idea of "early action" in the United States (a proposal to allow U.S. companies to receive partial credit in the United States for emissions reductions undertaken before the first Kyoto commitment period).

NGOs also make more public announcements, directed not at delegates and insiders directly but rather at the broader milieu within which political debate takes place. Corporations take out newspaper ads, issue press releases, and make speeches concerning climate change policy. Such efforts are direct attempts to influence the public perception of the problem and of the effects of proposed solutions. Trade groups also make collective statements, such as the *Statement of Environmental Commitment by the Insurance Industry,* released with the cooperation of the UN Environment Programme in 1995.[3] Environmental NGOs do the same, albeit with smaller budgets and sometimes more dramatic techniques. At times the public policy positions of nonstate actors run counter to expectations: the chair of Shell Oil UK, for example, stated to the Congress of British Industry in 1997 that achievable, globally realistic targets on carbon emissions should be set (Smith 1997). Such statements can have a powerful effect on the political debate because of their counterintuitive nature. At other times, NGOs aim to influence other NGOs and bypass altogether the international, intergovernmental policy process: Citizens Trust, a family of socially responsible mutual stock funds worth over $300 million based in San Francisco, wrote an open letter in 1997 to five major U.S.-based insurance and reinsurance companies urging that their policies reflect sound climate science and policy.[4]

Members of NGOs have also appeared on several government delegations and have acted as consultants for governments. One of the most

prominent examples is the relation between the London-based Foundation of International Environmental Law and Development (FIELD) and the Alliance of Small Island States (AOSIS). Members of FIELD, mostly international lawyers, consulted extensively with members of AOSIS, appeared on their delegations, and at times acted as the delegation of certain AOSIS members. The tiny member governments of AOSIS, often lacking much indigenous expertise about climate change and the policy possibilities, became a more powerful negotiating force in conjunction with FIELD. Business NGOs have also played this role—for example, members of the U.S.-based Global Climate Coalition have been present on U.S. delegations to FCCC meetings.

Political Pressure NGOs can apply political pressure both directly and internationally—at negotiations themselves—as well as indirectly and domestically through national-level lobbying and media action. The ultimate impact of direct pressure at negotiations is debatable. While many participants in international environmental negotiations emphasize the social pressures and atmosphere of negotiations (such as "the spirit of Leesburg" described in Richard Benedick's account of the stratospheric ozone talks; Benedick 1998), and NGOs can influence that atmosphere, ardor often cools. In the end, the efficacy of international accords rests on their ratification, implementation, and subsequent interpretation—actions relatively immune to the specific social climate of the negotiation process (see also chapter 11). National-level pressure has a firmer base in domestic politics. Particularly in the developed democracies, NGOs can be powerful organizations with a large and politically active membership. While climate change is currently low on the political radar in many states, in some industrialized democracies issues retain political salience. If the underlying problem is itself not politically salient, possible solutions including: gasoline taxes, mass transit subsidies, and the like, are controversial issues in nearly every industrial economy. These proposed solutions become domestic political issues on which NGOs often weigh in (see also chapter 4). Since international responses are the collective result of many national decisions, this indirect pathway of influence can be significant.

Indeed, the political power of environmental NGOs and the access they have gained in the climate negotiations has stimulated the activities of

business NGOs to the point that the majority of observers at recent meetings are those representing business interests. In short, the international response to climate change has taken place in a politicized atmosphere, with many divergent interests represented. NGOs are important domestic actors that governments listen to in addition to, and regardless of, the "useful" roles enumerated above and below.

Monitoring Government Actions Like most international environmental agreements, the FCCC uses a reporting process in which governments self-report on their actions with limited collective oversight. Other governments, therefore, have few means by which they can assess their counterparts' actions in a formal and transparent way. NGOs have helped "multilateralize" information about national actions by preparing analyses of what governments have claimed to do, what they have actually done, and what is likely in the future. For example, the Climate Action Network, a consortium of many environmental NGOs, has prepared comprehensive reports of climate pledges and actions, and has made them readily available to governments, private interests, and the media (e.g., Climate Action Network US and Climate Network Europe 1994). While "enforcement" is too strong a word for this role, and often too much is made of NGO monitoring activity, through these and similar efforts NGOs have the potential to aid in achieving compliance with and implementation of the FCCC.

Implementation Activities International agreements generally must be put into practice if they are to be effective. The implementation of accords and the resulting policy feedback is a central part of the politics of environmental cooperation (Victor, Raustiala, and Skolnikoff 1998). NGOs have, in other issue areas, played important roles in the implementation of environmental commitments. For the Convention on International Trade in Endangered Species (CITES), for example, NGOs have both been granted "bureau duties" (essentially running the CITES secretariat) and have played critical roles in CITES' monitoring and enforcement apparatus. Often, however, NGOs fail to sustain the same level of interest in regime implementation that they do in regime negotiation (Victor, Raustiala, and Skolnikoff 1998).

The FCCC did not contain clear programmatic or emissions commitments, beyond national reporting requirements and a vague emissions-reduction pledge for industrialized states, until the negotiation of the Kyoto Protocol in 1997. The Kyoto Protocol, should it enter into force, will greatly expand the range of implementable obligations. The implementation of the Kyoto Protocol will depend heavily on the evolution of emissions trading, joint implementation programs, and the Clean Development Mechanism (see also chapter 11). As these mechanisms develop, NGOs may have greater opportunities to influence the implementation of the FCCC.

Nonregime Activities While NGOs have been influential in shaping the international response to climate change, it should be remembered that this response is not the only global response. Rather, many NGOs often take action to alleviate or address environmental problems directly, without the help of governments (Wapner 1996). One of the most important actions they take is the dissemination and popularization of information about the risks and causes of climate change. By acting to educate the public around the world—particularly in the industrialized North, the historical source of most greenhouse gas emissions—NGOs may effect as much change as that achieved by law and regulation. As Princen and Finger argue, NGOs can be "agents of social change" and therefore are "significant contributors to learning our way out. Indeed, rather than focusing on traditional politics, environmental NGOs build communities, set examples, and increasingly substitute for traditional political action" (Princen and Finger 1994, 64–65).

3 Experts, Epistemic Communities, and the FCCC

A prominent strand of international relations theory explores the importance of transnational expert, or "epistemic," communities in fostering international cooperation. Unlike the NGOs discussed above, epistemic communities are not formal organizations with headquarters, leaders, and fax machines. An epistemic community is an informal network of experts with shared causal beliefs, methodologies, and normative stances, as well as a common policy enterprise (Haas 1992, 3). Proponents of

epistemic community theory argue that epistemic communities are most likely to arise and become influential in issue areas plagued with high levels of uncertainty. In these situations governments face incentives to seek advice from experts, and these experts may often gain prominent positions and influence within the policy process as a result. When experts share, across nations, views on the nature of an international problem and on potential solutions, proponents argue this expert "community" may become a major influence on the resulting international regime (Haas 1989, 1990; but see Raustiala 1997). Even where analyses of international environmental politics do not employ the concept of an epistemic community, attention to scientific and other expert groups is often high (e.g., Benedick 1998; Brenton 1994). The scientific nature of the climate change threat and the high levels of uncertainty associated with the underlying science make the climate change regime a strong candidate for epistemic activity and influence (see also chapter 3).

Because epistemic communities are not formal organizations, identifying an epistemic community is never easy or noncontroversial. Nonetheless, the scientists associated with the early Villach, Bellagio, Toronto, and Noordwijk meetings on climate change share some broad attributes of an epistemic community. Many held an abiding interest in climate change and felt strongly about the need for a policy response by governments. By making statements, disseminating data, appearing before legislative panels and committees, and generally discussing the issue, they helped to propel climate change to the top of the international agenda in the late 1980s. In this sense this community, to the degree it existed, was instrumental in creating the attention and concern necessary for a coordinated international response. But beyond these limited agenda-setting activities the role of the putative epistemic community appears more circumscribed.

One reason is that the creation by the world's governments of the IPCC (see below) endogenized the provision of scientific advice. Providing advice to governments and alleviating policy makers' uncertainty have been the hallmarks of epistemic community power. This power to reduce uncertainty—that is, to provide compelling interpretations of the state of the world—was in part usurped and controlled by the creation of the IPCC, whose mandate is the provision of expert scientific information to

policy makers. Moreover, once the FCCC negotiations were underway, many of the issues of contention were in fact tangential to the science of climate change: funding, institutional design, reporting requirements, and so forth dominated negotiations but had a negligible scientific component. Other groups, such as economists, policy analysts, and lawyers, had both equal if not greater expertise and influence and have come to play a major role in the international process.[5]

With intensifying debates over the need and structure of emissions controls in wake of the Berlin Mandate, for example, economic analysis has become more central. In 1997 some 2000 economists (mostly American), including 6 Nobel laureates, signed an open letter titled the *Economists' Statement on Climate Change*. In addition to collectively endorsing a system of carbon taxes and permit auctions, the economists stated that

> many potential policies to reduce greenhouse gas emissions exist for which the total benefits outweigh total costs. For the U.S. in particular, sound economic analysis shows that there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run. (*Economists' Statement on Climate Change,* February 13, 1997)

Public health experts have also attempted to use their expertise to influence the path of negotiations. For example, in 1997 the organization Physicians for Social Responsibility drafted and circulated an *International Physicians' Letter on Global Climate Change and Human Health*. Addressed to the delegates of an AGBM meeting, the letter stated that the assembled physicians

> concerned about the potentially devastating and possibly irreversible effects of climate change on human health . . . urge you to take prompt and effective actions—both domestically and internationally—to achieve significant reductions in greenhouse gas emissions . . . Climate change of the scale currently projected would have pervasive adverse impacts on human health and result in significant loss of life. . . . Impacts include increased incidence of vector-borne diseases . . . diseases related to water supply and sanitation . . . [etc.]. (Physicians for Social Responsibility)

Like the economists, the physicians are trading on their expertise and perceived political neutrality and legitimacy to influence and inform the parties to the FCCC. While neither the economists nor the physicians involved in climate politics fit the general definition of an epistemic

community, they clearly represent organized expertise brought systematically to bear on the international policy process. As the politics around the climate change issue intensifies, such efforts—and a proliferation of groups engaged in them—are likely to become ever more common.

4 The IPCC and the FCCC

The IPCC was formed in November 1988 in an effort to organize the assessment of global climate change as a scientific phenomenon. Previous informal scientific assessments had come out of nongovernmental meetings, such as those in Villach, Bellagio, and Toronto discussed above. The ability of scientific assessments to play a role in shaping international environmental regimes was evident from the negotiations over stratospheric ozone depletion. The creation of the IPCC, a panel of climate experts entrusted with the task of assessing and summarizing the state of scientific knowledge on climate change, represented an attempt to centralize and formalize the interaction between science and politics, and to put governments in charge. Nevertheless, the IPCC leadership has not been completely passive, and the IPCC's work has served as a major reference in nearly all debates. Regardless of position on the substance of climate policy, IPCC reports are commonly quoted when debating the future of the FCCC. While controversy has at times brewed over the IPCC's methods, its credibility has not been fatally shaken.

Institutionally, the IPCC was initially divided into three working groups: one on climate science, a second on impacts, and a third on response strategies. Powerful states dominated the leadership positions of the IPCC, feeding the perception that it was an industrialized-nation club. The United States, Russia, and the United Kingdom held three of the top five positions (the others were filled by Sweden and Australia). The first IPCC assessment was presented to the UN in October 1990, and involved the work of nearly 500 scientists (Bolin 1993). Working group I was considered by many to be the most important, and the group's assessment that unchecked carbon emissions and "business as usual" would lead to a rise in global average surface temperature of 0.3°C per decade was widely cited. However, the IPCC provided ammunition for all sides: the first assessment also stated that the size of the predicted warming (0.3°C

to 0.6°C over the next 100 years) was broadly consistent with the predictions of climate models, but was also of the same magnitude as natural variability. Thus those opposing and those supporting strong commitments in the FCCC could look to the first IPCC report for support. In general IPCC reports have been broadly centrist, in part because the nature of the IPCC peer-review process serves to weed out outlying and extreme views.

The much-awaited second assessment report of the IPCC, dubbed SAR, was released just prior to COP-2, which was held in Geneva in August 1996. For the first time the IPCC concluded, in a carefully worded passage, that "the balance of evidence suggests a discernible human influence on global climate." SAR also detailed some likely results of climate change, including fluctuations in agricultural activity, heightened risk of coastal and riparian flooding, expansion of many disease vectors, and so forth. In contrast to the first report, SAR's tone exhibited greater certainty and a greater sense of risk in the face of collective inaction. Despite attacks by some scientists, SAR was widely hailed. One criticism proved persistent and media friendly: in a *Wall Street Journal* op-ed, two Americans, associated with business NGOs and conservative think tanks, argued that certain changes to the text of SAR had violated the peer-review process and corrupted the findings of SAR. Environment NGOs countered that the IPCC process was sound and that business NGOs like the Global Climate Coalition were amplifying the views of a small minority of climate scientists. Thus the IPCC's widely perceived neutrality and political influence have made it the target of competing NGO spin efforts in the public media.

For many governments without extensive indigenous scientific expertise, the IPCC has been a central source of essentially disinterested scientific advice. Its strongly intergovernmental nature is an important component of the IPCC's effectiveness in this regard. Jean Ripert, the founding chair of the INC process, has noted that the IPCC educated many governments about climate change and in the process made them more willing to engage in negotiations (Agrawala 1997, 5). In fact, Ripert suggested that the FCCC would not have been possible without the creation and operation of the IPCC (Agrawala 1997, 26). While some may view this as an exaggeration, there is no question that the IPCC has

played a central role in guiding the pace and tone of international climate negotiations.

The IPCC's conservatism, however, and the release of its reports after major international negotiations, have resulted in less impact for the IPCC than might otherwise be expected. Indeed, the IPCC was criticized in 1994 by INC Chair Raul Estrada-Oyela as "suffering from a Frankenstein Syndrome" for allegedly ignoring the needs of its parent, the political negotiating process (Agrawala 1997). But the assessments of the IPCC have continued to be useful benchmarks against which policy proposals can been evaluated, even if the current negotiations seem increasingly disconnected from the scientific and technocratic debates within the IPCC. Interestingly, IPCC Working Group III is currently preparing a report on procedures to enhance NGO participation within the IPCC process. The draft report discusses the distinctive contributions of NGO experts and argues that NGO and public trust of the IPCC would be improved if NGO participation was increased. On the other hand, problems of balance, transparency, neutrality, quality, and peer review are significant. What is most interesting about this effort is the degree to which it illustrates the political importance of addressing NGO concerns and enhancing NGO participation within the climate process. The implicit message is that NGO participation in the avowedly political negotiations over the climate regime is not enough; NGOs now must be incorporated into the scientific/information provision functions of the IPCC, which, while clearly political, are at least formally purely advisory and scientific.

5 States and Nonstate Actors in International Climate Change Policy: Conclusions

This chapter has briefly surveyed and analyzed the varied roles of nonstate actors in the international climate regime but does not intend to overstate their importance. Indeed, a central question in the broader study of nonstate actors in international affairs is to what degree they actually matter in a world of sovereign states. While traditionalist views of international law rarely acknowledged nonstate actors—and the dominant approaches to international relations are similarly state-centric—

the rising empirical importance of nonstate actors within international environmental cooperation has brought about greater theoretical attention to their impact and power vis-à-vis states.

The research on epistemic communities, for example, suggests that expert communities are often the major shapers of international environmental cooperation. Certainly climate scientists have been an important part of international climate politics. To a lesser but growing degree the same is true of economists. But the creation and operation of the IPCC highlights both the significance of these experts and the power of governments to organize and direct the flow of politically relevant scientific knowledge. Depending on one's view, the IPCC can be read as demonstrative of the critical role and power of scientists and other experts, or as illustrative of the enduring power of states and their ability to organize and control alternative power centers.

Research on NGOs has similarly emphasized their significance and, in some cases, their rising power and the concomitant diminishing centrality of states (e.g., Mathews 1997). Many see the new roles and prominence of NGOs as evidence of a weakening state, diminished sovereignty, and the power of global civil society. NGOs are certainly more prevalent and more active in international affairs generally. Yet much of this NGO activity largely comes not at the expense of state power, but rather to the mutual advantage of states and NGOs (Raustiala 1997b). The participation of NGOs in formal international cooperation such as the FCCC enhances the ability, both in technocratic and political terms, of states to regulate new areas through new international agreements. States have incorporated NGOs into international environmental institutions because it is politically advantageous to do so, but they have not done so unequivocally or randomly. The terms of that incorporation generally reflect the resources and skills NGOs bring to the intergovernmental process. NGOs do not have untrammeled access to negotiations and decision-making centers: they are at times excluded from negotiations and informal meetings of government officials. Yet when their contributions are deemed potentially useful, NGOs are also formally invited to contribute to specific policy debates in a focused manner. For example, when the Secretariat of the FCCC sought to elaborate the "Multilateral Consultative Process" created in Article 13, it expressly invited NGO

opinion papers and analyses. Thus NGO input is often channeled or rejected at the discretion of the governments involved. As David Wirth notes, "We [in liberal democracies] are accustomed to thinking of public access to the workings of government as essential to the democratic process. But in multilateral treaty negotiations, where [NGOs] may be excluded from drafting sessions and interim negotiating texts may be unavailable to the public, such guarantees are not to be taken for granted" (Wirth 1996, 2–3).

Given the present structure of the international system, the international response to climate change remains mainly an affair for governments. The role of all the nonstate actors discussed in this chapter was limited to ways in which they tried, successfully or not, to influence the actions and beliefs of governments: to shape and influence international law and politics. While much of the activity of nonstate actors toward global climate change is devoted to attempting to shape government action, it is important to underscore that nonstate actors often try to influence human behavior more directly. Education programs, for instance, by teaching individuals about the likely ecological consequences of their actions, may result in higher reductions of greenhouse gas emissions than would a government-imposed tax scheme. That remains an open question, subject to empirical testing. But many nonstate actors appear to think otherwise. As evidenced by their own allocations of resources and efforts, they believe that state-created and sustained international regulation is the best route to positive human change and in turn to limited global change.

Indeed, nonstate actors, as demonstrated by this chapter, often claim to be representing the interests of parties who would otherwise lack the access or the means or even the knowledge to influence the development of international negotiation. NGOs, for example, were instrumental in organizing AOSIS, politically weak states directly and imminently threatened by climate change. Environmental NGOs often see their role as reestablishing some degree of fairness and equality between nations and groups. As emphasized by H. Peyton Young (1994, 1–9), whenever a new international regime is being discussed and created, equity considerations will be raised. These issues will often have a decisive influence on the outcome of the negotiations and will determine whether various

groups of countries will participate in them. Allocation and distribution principles will be invoked as major arguments by states and nonstate actors alike. Questions surrounding the equity of global climate policy will be analyzed in the next chapter.

Notes

1. See also chapter 3.
2. See, for example, http://www.munichre.com.
3. See http://www.efund.com/climate_change (released November 23, 1995).
4. See http://www.efund.com/climate_change.
5. One hesitates to call them an "epistemic community" because the range and diversity of views is so great.

This page intentionally left blank

6

Principles of Justice in the Context of Global Climate Change

Matthew Paterson

Concerns for equity, or distributive justice, are widely recognized by observers and participants in international climate negotiations as central to effective responses to climate change. There is, however, no widespread agreement on what this crucial principle means. This and the following chapter outline the main positions with regard to this question and how they have translated into concrete proposals in the climate negotiations. This chapter outlines principles of international justice in general in relation to climate change, while the following chapter looks at more concrete proposals concerning the application of equity in climate negotiations.

Political theorists and philosophers have developed a rich and varied set of arguments concerning justice. Their concerns are to find the most persuasive foundation for normative claims concerning particular policy projects or outcomes. Analysis of justice by political philosophers is based not in a description of how different individuals or groups conceive of justice, nor in descriptions of their personal preferences, but in specifically normative arguments concerning the contents of justice. Rather than conceive justice as cultural discourse, it is considered here as deriving from rational argument. Thus, justice does not arise from individual preferences, it evolves from a considered, rational debate in which those preferences themselves become part of what needs to be negotiated.

This chapter draws mostly on this perspective of justice. After outlining the various types of justice, it will provide an overview of the challenge of intergenerational justice before turning to the implications of justice in the case of global climate change.

1 Content of Justice

In a series of works on this question, Shue poses four questions that provide the most useful framework for discussing the subject (Shue 1992; 1993, 51; 1994, 344; 1996):

1. What is a fair allocation of the costs of preventing the global warming that is still avoidable?
2. What is a fair allocation of the costs of coping with the social consequences of the global warming that will not, in fact, be avoided?
3. What background allocation of wealth would allow international bargaining (about issues, like 1 and 2) to be a fair process?
4. What is a fair allocation of emissions of greenhouse gases (over the long-term and during the transition to the long-term allocation)? (Shue 1994, 344).

Various perspectives can be brought to bear on these questions. Within the literature on international agreements on climate change, Grubb et al. give the most comprehensive list. These perspectives include:

1. "Polluter pays" rationales, based either on current emissions or historically accumulated contributions to global warming.
2. Equal entitlements approach (all individuals have an equal right to use the atmospheric commons).
3. "Willingness-to-pay" justification (derived from welfare economics).
4. Each participant should shoulder a "comparable" burden.
5. Recognition of distributional implications of any agreement (a position drawing explicitly on Rawls (1973).
6. Preservation of the status quo (present emitters have established some common law right to use the atmosphere as they presently do).
7. "Reasonable" emissions compatible with (a fairly generous interpretation of) basic needs (paraphrased from Grubb et al. 1992, 312–314).

Within the more general literature on justice in international relations, six approaches to justice are often identified.

1. A rights-based approach, which suggests we have rights to a stable climate.
2. An approach based on responsibility: those causing a problem have a responsibility to resolve it (Brown 1992, 159–162).
3. A utilitarian position: we should act to maximize overall human welfare, which most commonly will involve transferring resources from rich to poor (e.g., Singer 1972).
4. The Kantian categorical imperative, and developed with regard to international justice by Onora O'Neill (1986, 1991): justice requires that we act on principles that can be universally applicable, such as not endangering the global climate system.

5. A Rawlsian position (related to the previous one), which specifically suggests that the distributional effects of social institutions should benefit the worst off.
6. The approach of Brian Barry (1989b): agreements should be negotiated not under a Rawlsian veil of ignorance, but in order to reach agreements that none could reasonably reject. This integrates notions of power and of intersubjectivity into the question of justice.[1]

Within these various approaches, two different conceptions of justice should be distinguished. On the one hand, *retributive* justice entails that those who cause a problem have the responsibility to make amends for it; this is the principle of justice underlying the criminal justice systems. This is largely undisputed as an ethical principle, but in the climate change context it becomes complicated by the empirical debates concerning responsibility for causing climate change. It does underlie, however, various proposals that have emerged in climate negotiations—including those for "differentiation" of commitments (see below) or at its most basic, the recognition that developing countries do not have any obligation to reduce CO_2 emissions under the FCCC at this time.

On the other hand, principles of *distributive* justice underlie any scheme that involves distributing costs (or benefits) among interdependent parties. Most of the principles of justice outlined above concern this point of view. Within the philosophical debates, the last three approaches in the preceding list are commonly regarded as the most persuasive (the second, of course, refers to retributive justice). Rights-based approaches are often regarded as difficult to apply, especially concerning complex phenomena such as international justice, since it is often impossible to derive obligations on or prescriptions for specific institutions from particular rights (e.g., O'Neill 1991). In the case of climate change, the right to a stable climate does not translate easily into specific obligations for individuals, states, or other institutions. Utilitarianism is also regarded as ethically problematic. In particular, it undervalues the specificity of individual (and collective) identities by ignoring questions of basic rights, and by treating individual preferences as inviolable.

2 Intergenerational Justice

The discussion so far has focused on justice *within* generations. However, *inter*generational justice is also normatively important, since many of the

likely impacts of climate change will be felt by people in future generations to a larger degree than by current generations. As a consequence, most writers on this subject suggest that present generations also have major obligations to future generations (see, e.g., Barry 1989a; Brown Weiss 1989). The argument used is a Rawlsian one, since we should consider, for example, under the Rawlsian "veil of ignorance" the future effects of actions by present generations. Given this, we would create institutions and rules that would involve conservation of options (conserving the diversity of the natural and cultural resource base), conservation of quality (leaving the planet no worse off than received), and conservation of access (equitable access to the use and benefits of the legacy) (Brown Weiss 1989, 320).

Little attention was paid to intergenerational justice as compared to *intra*generational justice within the negotiations. This is largely because questions of justice within existing generations clearly affect the bargains states can make and the power relations between them, as emphasized by Paterson (1992) and Young (1994b, 48–50). However, intergenerational equity can primarily operate as a normative argument that, if taken seriously, would make arguments for aggressive global action to reduce greenhouse gas emissions much more forceful (Grubb 1995, 464) and might possibly lead to the creation of an insurance fund to compensate victims of global climate change impacts (see below, and for a general discussion, see Page 1999).

3 Implications of Justice

The implications of retributive justice are fairly clear, and represent an important strand in policy debates on climate change. The implications are twofold. First, it is reflected in the "polluter pays" principle. In climate negotiations, this has come through in proposals both for carbon taxes, and more specifically in an international context, tradable permit systems. At Kyoto in 1997, negotiators agreed to adopt such a system, although its specific form is still being developed. In this context, there is (at least superficially) a close fit between concerns of justice and concerns of economic efficiency. Similarly, such joint concerns underlie proposals for differentiation of commitments.

Second, retributive justice raises questions of compensation. It follows from the responsibility-based principle and relates to Shue's first question. The Alliance of Small Island States (AOSIS) advocated in the negotiations the establishment of a fund, to be provided by those who have caused global climate change, to compensate those who have suffered as a consequence. This suggestion, however, has hitherto been ignored by most states and is reduced in the FCCC to the provision: "The developed country Parties . . . shall also assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects" (FCCC 1992, Article 4(4)). Perhaps perversely, questions of compensation have also been raised by OPEC countries. They argue that since implementation of the FCCC will impose disproportionate costs on them, they should be compensated for any such losses (Kassler and Paterson 1997).[2]

Concerning distributive justice, most of the literature concerning equity in climate negotiations and justice in general argues that justice requires policy responses that significantly address existing international inequalities (e.g., Shue 1999). The general political theory literature argues this most clearly. The climate change literature, being more policy oriented, tends to favor an equal per capita emissions position as the most equitable solution. However, it is considered, at least in the short term, to be politically infeasible. Thus a mixture of the egalitarian with the "comparable burdens" position is advocated (e.g., Grubb et al. 1992, 321; Young 1991): emissions are to be distributed over time in a fashion that moves from the existing distribution toward an egalitarian one. However, an egalitarian position (at least in the sense that radical reductions in existing inequalities are advocated) is still seen as the primary implication of justice; the "comparable burdens" position is seen as a consequence of practical politics.

This argument in favor of at least a significantly more egalitarian world leads to a number of conclusions on how to address equity concerns in relation to global climate change. Two practical questions arise in this context. The first is the distribution of emissions reductions and the costs associated with them. There is a clear consensus that the primary costs should be borne by industrialized countries, and the "historical responsibility" argument has been invoked most often in climate negotiations.

This is also reflected in the FCCC, especially Article 3(1) on the principle of "common but differentiated responsibilities," and in the division within Article 4 between obligations of all parties and obligations to limit emissions for the developed-country parties. Conflict has arisen over the fair allocation of emissions over the longer term; developing countries, and some commentators (e.g., Agarwal and Narain 1990; Bertram 1992; Epstein and Gupta 1990; Grubb 1989; Krause, Koomey, and Bach 1989) have argued that long-term emissions should be allocated on an equal per capita basis. While this position is explicitly rejected by most industrialized-country negotiators as unjust (because of the immediate burden it may place on them) and by many commentators as politically impractical (because of the objections of powerful states), it remains the most persuasive argument on ethical grounds. Indeed objections to it as a basic principle have subsided to an extent (practical objections nevertheless remain), enabling some to go on to specify in detail how the emissions levels of industrialized and developing countries may converge over time (e.g., Jepma and Munasinghe 1998; Meyer 1994; Shukla 1999).

The second question raised in the negotiations concerns "financial resources and technology transfers." The implications of justice involve substantial financial and technological transfers from North to South, to assist developing countries in minimizing the growth of their greenhouse gas emissions during phases of accelerated economic growth. By way of example, Grubb puts likely North-South transfers to address global warming at $100 billion per year (Grubb 1990, 287). This magnitude of transfers envisioned is not uncommon. The argument is justified on the basis that Northern countries have caused global climate change, and any actions by the South must be conditional on financial and technological assistance from the North (see FCCC 1992, Article 4(7)). However, in practice, it has been much more conflictual. While accepting, in principle, that this would be a just distribution of the burden, Northern countries have, in practice, refused to provide anything more than nominal sums. On the institutional side, however, significant advances have been made with the emergence of systems and mechanisms such as Joint Implementation and the Clean Development Mechanism, which may provide for new financial resources and technology transfers in the future (see chapters 2, 11–13), both of which can be said to reflect acceptance of principles of

justice that reduction of international inequalities is a necessary consequence of justice in climate negotiations.

A fairly strong consensus exists among analysts that one of the most practical ways of addressing both these former questions is to devise a system of tradable permits for greenhouse gas emissions (e.g., Grubb 1989). This would enable an egalitarian principle of the distribution of emissions to be matched with minimizing the costs to the North of meeting reduction targets, and would also facilitate North-South financial and technological transfers. It has the advantages, too, of meeting the concerns of economists and policy makers for efficiency in implementing obligations.

Finally, the question of distributive justice raises distributive issues among industrialized countries. This has emerged in negotiations in terms of the problem of "differentiation"—whether Annex I countries' obligations under the FCCC should be differentiated or not.[3] The problem is clearly less acute than that between North and South because of the smaller variations of per capita gross domestic product. But both "natural" variations (land area, climate, dependence on particular commodities) and past efforts in promoting energy efficiency and conservation, both of which affect a country's marginal costs of emissions abatement, have been used by various countries to suggest that commitments should be differentiated because of the equity considerations. The deal struck at Kyoto reflects such concerns to an extent. While that agreement appears to be primarily a result of Realpolitik, according to the position advocated by Brian Barry at least (see above), the deal may reflect an acceptance by negotiators that "none can reasonably reject" arguments that countries' situations should be taken into account while negotiating particular agreements.

4 Conclusions

Most contemporary commentators regard notions of equity or justice to be central to the successful formulation of global climate change policies. They also predominantly suggest that a position that explicitly aims to reduce existing international inequalities, through North-South transfers and a disproportionate burden sharing by the North, is most likely to

satisfy the implications of justice. The empirical relevance of justice depends on which theoretical orientation given in chapter 3 (realism, historical materialism, institutionalism) is considered most plausible. However, this discussion directs questions to each perspective. Realists would need to demonstrate that the way that justice was used in climate change negotiations was purely rhetoric and had no substantive impact on the outcome. This would be a difficult claim to sustain in this policy field. Marxists would also be skeptical about the value of talking about justice in relation to international negotiations on global climate change. They would suggest that the reductions in international inequality cannot be achieved within the present world capitalist system. The argument in favor of equity or justice fits most easily with the liberal institutionalist perspective, which emphasizes the importance of norms. The challenge is posed by asking how questions of justice become institutionalized in international processes—that is, how the varying conceptions of justice produce stable norms over the long term. In the negotiations, justice was used to support specific arguments or positions, and sometimes was used to back up interests, as realists and Marxists would both emphasize. However, the reliance on a discourse of justice meant that not all positions could be supported. This approach also exerts a constraint on the outcomes of future negotiations on the further development of a global climate change regime.

Notes

1. For an overview of these positions, see Brown 1992. For an extended analysis of how they apply to climate change, see Paterson 1996b.

2. This has been only one of many arguments made by them in negotiations, primarily to slow down the pace of those negotiations and limit efforts to reduce CO_2 emissions. See Kassler and Paterson 1997 for a full analysis.

3. See the various contributions to Paterson and Grubb 1996 for differing perspectives on this question.

7

Climate Change, Equity, and International Negotiations

Ellen Wiegandt

Distributive issues are at the core of negotiating an effective climate change agreement. There are costs of the potential climate change itself. Who will bear them? Benefits have accrued from the use of resources now believed to be sources of global warming. Should those be redistributed? The negotiations being undertaken under the United Nations Framework Convention on Climate Change (FCCC) are moving toward a binding agreement to limit worldwide greenhouse gas emissions. The new institutional arrangements under discussion to limit greenhouse gas emissions in effect define new forms of property rights. What criteria should determine their allocation? Equity considerations are implicit in the debate over all of these questions, which go far beyond direct costs and benefits of climate change to invoke broader issues of past and future access to resources and related responsibility for the quality of the global environment. There is currently little agreement about what a fair climate change regime should look like. The previous chapter showed how this is, in some measure, due to differing assumptions about the meaning of *fairness*. An additional problem is the lack of consensus about the effect of different policies and mechanisms on various distributional issues.

These are crucial dilemmas for climate change negotiators, who must nevertheless elaborate a clear concept of equity that can be translated into policies that achieve desired outcomes. This is a particularly delicate process in international relations because global-scale institutions available to implement and enforce agreements are often weak or nonexistent. The willingness of sovereign states to first adopt and then comply with international agreements will thus depend in part on the extent to which they are consistent with national preferences. In the case of the FCCC,

the document emerging from inevitable compromises due to diversity of interests and perceptions at the international level may be unacceptable to various national constituencies. Issues of equity within countries and between them are critical stumbling blocks of the climate change negotiations. The divisions between developed and developing countries are some of the most obvious ones, but there also exist differences between the United States and the European Union, or internal opposition among strong lobbies within the United States that could jeopardize international consensus. In the long run, achieving global acceptance and effectiveness will be fostered if most nations perceive the Convention to be fair. What fairness means to different parties and how it is being discussed within the FCCC process is addressed in this chapter.

Many aspects of the climate change debate—from the definition of the problems to assumptions about their causes and mitigating strategies—have differential effects on potential parties. For this reason, the FCCC is particularly attentive to fairness concerns and invokes the concept of equity several times, referring to sharing the burdens among all contracting parties and respecting the needs of future generations. In accordance with their "common but differentiated responsibilities and respective capabilities" (FCCC 1992, Article 3(1)), the Convention "notes" in its introduction that "the largest share of historical and current global emissions of greenhouse gases has originated in developed countries." This justifies the special obligations, defined in Article 4(2)(a), of developed countries, responsible for the major portion of emissions, to take the lead in modifying their longer-term trends. Article 4(3) more fully details the responsibility of developed toward developing countries because of the latters' special vulnerabilities to the adverse effects of climate change and their reduced capacity to implement mitigating and adaptive strategies. Given the importance accorded to equity considerations in the FCCC and in the literature analyzing the negotiating process,[1] it is important to examine what the concept means in the context of the climate change negotiations, what mechanisms are proposed to achieve the desired goals, and what scholarly analyses are able to tell us about the likely relation between goals of equity and likely outcomes.

The subject of equity has engaged thinkers from many disciplines since antiquity. Philosophers from Plato and Aristotle in Western thought

to Confucius and Mencius in the East (presented in Waley 1963) have addressed the problem of creating a just society. This question is a fundamental one and naturally underlies any discussion of distributive issues in a particular domain. Chapter 6 outlined the work that political theorists and international relations scholars have undertaken in this area. Following on this basic discussion, the current chapter will examine the way equity principles are implicitly or explicitly incorporated into the debate about causes and effects of climate change and the specific proposals to adapt to or mitigate its effects. Thus, following H. Peyton Young, emphasis will be placed on equity "in the small" (Young 1994, 6) as it relates to the climate change debate or the FCCC negotiation process itself. To grasp the wide implications of equity issues, climate change science is invoked, as are time and space issues that affect the interactions between resources and populations. The policy alternatives that are most likely to emerge from the negotiation process are also examined from the perspective of their impacts on intergenerational and interregional equity.

1 Equity in the Context of Property Rights Theories

Equity is about the fair allocation of something: goods, rights, or obligations. Societies must devise rules that assure a generally accepted pattern of distribution of these elements. These rules constitute property rights regimes that in turn are embedded within institutions (such as judicial systems) that protect distribution and transfer arrangements. Property rights and equity issues are therefore closely intertwined because no mechanism to ensure equitable allocation can exist in the absence of clearly defined rights over the element to be allocated. For many years, conventional wisdom held that, over the course of history, society moved from common property regimes to systems of private ownership in order to achieve greater efficiency and because institutions, such as the state, evolved to protect individual holdings. From this perspective, as society advanced, property rights became increasingly privatized and formally codified. Influential thinkers in economics demonstrated that these private property systems produced optimal use of resources. Under clearly specified assumptions (of universality, exclusivity, transferability, and en-

forceability), Harold Hotelling showed in 1931 that individual ownership of nonrenewable resources led to their optimal management through time because of the propensity of the owner to incorporate forgone future benefits of exploitation into present production decisions (Hotelling 1931). Ronald Coase (1960) later demonstrated that individual property ownership combined with private bargaining schemes resulted in efficient allocation of resources under environmental externalities because the distribution of costs and benefits is indifferent to the initial allocation of liability and entitlement. On the basis of these insights, various scholars have argued that the definition of new property rights can solve environmental problems (Chichilnisky 1993, 1994; Dasgupta 1982; Dasgupta and Heal 1979; Demsetz 1967) and claimed that property rights solutions are in fact superior to other regulatory mechanisms (Chichilnisky 1994).

These considerations do not directly address the question of the fairness of the allocation, however. In the neoclassical economic framework, a solution is Pareto optimal, and therefore efficient, when any change would make someone worse off. This says nothing about equity, because the original distribution need not have been carried out on the basis of equity considerations. One might nevertheless argue, as does Chichilnisky (1994), that, given a particular allocation scheme, Hotelling and Coasian principles would predict that inefficiencies resulting from ill-defined property rights would lead to environmental degradation, which in turn imperils overall welfare. Under these conditions, efficiency criteria might indeed provide higher welfare than equity principles that are not accompanied by clear property rights. This still leaves open the question of whether an allocation scheme based on ethical principles embedded in effective institutional arrangements could lead to higher levels of equity without sacrificing efficiency. This possibility is invoked by the Schelling/Barrett focal-point theory, presented in more detail below.

The current climate change debate rekindles these discussions about effective, efficient, and equitable property rights systems. It also reintroduces comparisons of the merits of common versus private property regimes.[2] The atmosphere has characteristics of a common that is becoming increasingly rival because it is shared by all, emissions from one region influence the climate at the global level, and it is impossible to establish

a clear link between cause and effect at the individual (or state) level. These aspects all preclude assigning responsibilities and obligations according to private property principles. As common property, much of the neoclassical economic literature would argue, the atmosphere will be managed such that it will produce various forms of environmental degradation. If this is indeed a consequence of the atmosphere as commons, it would be problematic for climate change mitigation efforts, and the question thus merits some attention here. Policies must identify this public-good aspect of climate change and address its particular problems, especially those of free-riding. As our analysis will show, part of the solutions currently being proposed include measures based on private property rights, thus placing the policy debate within the context of theories of property systems, equity, and efficiency.

2 Defining the Field of Inquiry

If equity is primarily about distribution, crucial issues concern allocation of what, allocation to whom, and according to what rules. Underlying all of these are notions about the fairness of this allocation.[3] Determining what is fair is one of the three major challenges to achieving equity. A second is agreeing on the rules that will lead to the desired outcome. The third is ensuring that the rules are applied and that they do indeed lead to the desired result. Fairness as discussed here is not an objective measure but refers to the perception of the appropriateness of distributive arrangements and outcomes. A consensus on appropriate distributions and how to achieve them is a source of major disagreement within countries and often characterizes the most fundamental oppositions among political parties and interest groups. At the international level, these differences are exacerbated by profound historical and cultural differences among countries, by the difficulty institutions have in producing a consensus, and by the lack of institutions enforcing international agreements. In the climate change arena, major uncertainties both about the causes and impacts of climate change and about the most effective mitigating strategies are additional complicating factors. Taken together, they all lead to a negotiating environment of extreme complexity. The previous chapter has shown how there is a rich and varied set of philosophical traditions

concerning the subject of equity. It provides the basis for the following analysis of different policy choices that are intended to produce particular outcomes incorporating equity considerations.

3 Providing a Climate System Free from Dangerous Anthropogenic Interference

The objective of the Framework Convention on Climate Change (FCCC) is to ensure that current populations of the world and future generations will live under climate conditions that permit sustainable social and economic development. In a sense, a new good has been created because scientific knowledge has provided the means to begin to distinguish between climate events that can and cannot be influenced by human activities. Moreover, distributive aspects begin to matter: negative aspects of some climate trends (global warming and its related effects) mean that climate is no longer a pure public good but now includes some rivalry because the "use" by some regions or groups diminishes the benefits others can extract from it.[4] This inevitably raises the question of allocation, management, and cooperation and leads us directly to consideration of the FCCC process.

The overall objective of the FCCC is to provide a climate system free from dangerous anthropogenic interference by reducing human-induced greenhouse gas emissions. Thus allocation problems are about how to distribute rights to emit or, conversely, limits to emissions. This is already a difficult problem, as we will see shortly, but it has been preceded in the negotiations by decisions about how greenhouse gases are to be defined, how responsibility for their production is to be allocated, and which time period is relevant. The "what" in the equity debate is thus far from straightforward.

It is obvious that the choice of gases designated as greenhouse gases itself confers advantages and disadvantages on different groups according to their levels and types of technology. The Third Conference of the Parties of the FCCC deliberated this question in Kyoto. It finally defined a particular mix of gases that would be considered greenhouse gases for the purposes of emissions reductions as well as the social sectors likely to have activities that produce substantial quantities of these gases (Kyoto

Protocol 1997, Annex A). The methodology adopted to estimate these emissions by sources and removal by sinks is based on the calculation of global warming potentials (GWPs). These define quantitative equivalents of carbon dioxide for all non-CO_2 gases referred to in the Protocol. Despite the Protocol's reference to the need for scientific consensus, which should emerge from the Intergovernmental Panel on Climate Change (IPCC) process (see chapter 5), the complexities of understanding the relationships among different gases and their different behaviors over time make unambiguous calculation of these GWPs problematic (see Smith and Wigley 2000a, 2000b for the scientific basis for this debate). Thus application of this methodology to the definition of country-by-country levels of production and rates of change in emissions may exacerbate rather than reduce disagreement in the negotiation process.

The importance of properly defining the "good" or "bad" to be allocated cannot be overestimated because compliance with an international agreement depends in part on its meeting stated goals. Adequately defining the problem is not the only challenge, however. Allocation of responsibility for causes, which will lead in turn to distribution responsibility for solutions, is a next step in the process. In the case of climate change in general and global warming in particular, this phase raises the special problems of public goods. Everyone shares the quality of the atmosphere and the concentration of greenhouse gases is essentially the same worldwide, irrespective of the variation in the level of emissions at local and regional scales. The atmosphere itself is thus indivisible even though the effects of the change in climate resulting from atmospheric changes will not have the same impacts everywhere. Nor is the responsibility for climate change equally distributed if one accepts the scientific consensus of the IPCC report linking human production of greenhouse gases to climate change (Intergovernmental Panel on Climate Change 1996, WGI) because some regions have emitted more than others over time. However, establishing a clear-cut link between some amount of emissions to some amount of climate change and this on a regional or country basis is impossible. Numerous studies have estimated past emissions and attempted to relate them to present concentrations (Smith 1993; Gruebler and Nakicenovic 1994). Others have added additional information on emission-absorbing practices.[5] Their findings contribute to the ongoing scientific

investigation of complex climate processes, but they contain too many uncertainties to provide an unambiguous guide to policy making.

Past behavior is nevertheless clearly important for assessing responsibility for the current and future climate, because the residence time in the atmosphere of various greenhouse gases means that what was done in the past is influencing what is happening now and what will occur in the future. The choice to emphasize the accumulation of past emissions, however, assigns different responsibilities to various groups than an assessment of current and future emissions would. In the former case, industrialized countries assume the greater burden; in the latter, countries such as India and China would be singled out for making the greatest mitigation efforts.

Responsibilities are distributed in yet another pattern depending on whether indices are based on total-country emissions or on per capita rates. Per capita emissions rates identify the far greater role played by industrial countries' ways of life, while total emissions reflect the importance of population numbers in determining future emissions, and therefore identify the growing contributions of developing countries with high population growth rates. The basic architecture of the emerging environmental regime and the important first steps taken in Kyoto are thus not self-evident.

The negotiations raised the issue of the reasonable and equitable way to link cause to effect in order to assign responsibilities for adopting mitigating strategies. The document that emerged, the Kyoto Protocol, set the base year of 1990 against which future reductions during the first commitment period (2008–2012) will be measured. The relevant units are defined as total (rather than per capita) emissions by countries (Kyoto Protocol 1997, Article 3(3)). During this first period, these conditions apply only to industrialized countries. The Kyoto Protocol thus acknowledges different histories and levels of development of various countries and therefore that perfectly equal treatment does not necessarily result in fair outcomes. Recognizing the dynamics of population and economic growth, the Kyoto Protocol defined a bounded commitment period and thus set in motion a process that will allow progressive adjustments to changing realities. It has not, however, devised a principle to resolve major issues linked to questions of equity. The debate about the time frame

and the method of assigning emissions levels, and their accompanying equity considerations, will reemerge at the next stage, especially if new parties are incorporated into the agreement.

Lowering emissions levels and, therefore, allocating rights to future emissions, are the key to mitigating climate change, but other aspects of the global response also include equity aspects that are addressed within the FCCC. To the extent that some climate change cannot be reversed, populations will have to adapt. The Convention acknowledges the need to develop plans for adaptation to impacts of change and recognizes the unequal distribution of impacts and of costs of adaptation (FCCC, Article 4(1)). Distributing the costs of abatement also involves equity criteria because nations must also agree on how these costs should be shared. Responding to climate change thus includes attention to both causes and consequences. What needs to be allocated therefore includes several categories: emissions levels themselves, costs of adaptation, and costs of emissions abatement. Decisions about how to allocate what with the attendant equity implications cannot, however, be separated from an analysis of the groups to which these calculations will be applied. The importance of defining "allocation to whom" was already evident in the discussion of the differences between measuring emissions by country or per capita. Before turning to questions of costs, another facet of the "what" that needs to be allocated, it is therefore helpful to examine the importance of the criteria of group definition, which is the focus of the next section. The introduction of new criteria relevant for equity decisions introduces a methodological shift. The previous discussion of emissions and later presentation of questions of costs tend to emphasize formal approaches, whereas the following attention to social groups invokes primarily qualitative methods.

4 Population Questions

Choices about what elements are subject to distribution clearly have equity implications, but they are only part of a broader set of decisions that determine the overall distributional scheme. The definition of the groups who are recipients of allocations, whether they be "goods" or "bads," will also determine costs and benefits of complying with the FCCC and

therefore has the potential to influence the perception of the fairness of the agreement and to change the welfare status of countries.

Within the climate change debate, the most obvious distributive inequities are noted between developed and developing countries. It is between these two groups (we will see momentarily that this simple categorization is in itself problematic) that the greatest differences about the appropriateness of certain allocations are observed. Developing countries note that most environmental damages, and certainly global warming, result from practices occurring predominantly in industrialized countries. Yet they also fear that imposing limits on their future emissions either directly or through pressures to reduce population growth will impede their economic and social development. Industrialized countries may concede their past role in contributing to climate change but argue that for the future, all nations must be involved in emissions reduction because of the public-good aspects of the atmosphere. Even if developed countries assume the major portion of the costs, the benefits will be shared equally by all nations. Developed countries therefore wish to reduce these free-riding aspects of abatement by placing some responsibilities on developing countries. Moreover, developed countries note that patterns of emissions are changing and that future trajectories must be taken into account in apportioning abatement targets. The implication is that population growth and economic development in developing countries will lead to both higher per capita and higher total emissions rates. These conclusions are not established facts but are based on projections of future growth. Numerous scenarios have been proposed, and both their assumptions and results have been strongly contested by different interest groups.[6] Irrespective of the scientific validity of these projections and analyses, it is evident from various countries' negotiating positions and from domestic discourse that these are key issues. Public opinion in the United States is unwilling to concede any special responsibility for the current climate situation, and its leaders certainly believe that any agreement that does not demand commitments from developing countries will have no chance of ratification. Similarly, political positions in the developing world make equally clear the perception the current problem is largely the result of industrialized nations' profligate behavior and that compensatory provisions must be part of any negotiated settlement.

Another factor sharpening the difference between North and South is the evaluation of impacts of and vulnerability to the potential consequences of climate change. It is generally agreed that developing countries are mostly found in the tropics, and it is these regions where the negative impacts of climate change will be greatest. Developing-country economies are strongly dependent on agriculture, a sector particularly vulnerable to shifts in climate (see among others, Parry et al. 1999). Developing-country agriculture is small scale and low technology and thus lacks the flexibility to make substitutions in crops or cultivation techniques (Rosenzweig and Parry 1994). Moreover, their levels of human and financial resources make adaptation to other forms of production more difficult. This observation underscores the importance of maintaining a global perspective even while undertaking regional analyses. Better understanding of local dynamics is crucial to advancing our understanding of the complexities of climate change and for elaborating local adaptation and mitigation strategies. Regional analyses should not, however, obscure the fact that fewer negative consequences of climate change for the developed world poses serious questions about equity because loss of political will (primarily in the less-affected developed world) will further exacerbate existing inequalities between North and South.

To address these concerns of initial responsibility and capacity to act and at the same time to put in place a process that ensures a global response without free-riding, the Kyoto Protocol divided the world into groups of countries with differential responsibilities for emission abatements. This has the merit of recognizing differences among countries and at the same time calling for symmetrical behavior among equals. Developed countries are identified by name and assigned emissions limitations as percentages of emissions in a base year. Countries not named in this list presently have no obligation to reduce their emissions. Moreover, developed countries are urged to assist developing countries in "achieving sustainable development and in contributing to the ultimate objective of the Convention" through the establishment of the Clean Development Mechanism (CDM) (Kyoto Protocol 1997, Article 12). Under this initiative, developed countries can fund projects in developing countries that lead to "real, measurable, and long-term benefits related to the mitigation of climate change" (Kyoto Protocol 1997, Article 12 (5)(b)), and

the emissions reductions accruing from these projects will contribute to the developed countries' abatement targets.

The CDM can be viewed as the convergence of two related principles: equity and efficiency. CDM introduces emissions trading, which should allow for the most cost-efficient solutions to reducing emissions. It also addresses equity considerations by encouraging the trading to occur between developed countries and developing countries. The CDM therefore seeks to meet two goals. By reducing emissions, it will contribute to preserving the atmosphere for the good of all. At the same time, it intends to shift resources from developed to developing countries, which will reduce the economic disparities inherent in the process of achieving global emissions reductions. Bargaining theories, such as those presented by Grundig, Ward, and Zorick in chapter 8, emphasize the importance of incentives in the form of side-payments to overcome possible vetoes from negotiating parties. The transfer of resources between North and South through the CDM could thus be seen as a side-payment in a bargaining process.

The North-South distinction is the most fundamental one underlying differential allocation of emissions rights between blocks of countries. The implicit goal of these schemes is to balance responsibility for cause, degree of impact of effects, and capacity to assume costs for greenhouse gas abatement schemes. The choices revolve around conceptions of fairness and use the criteria of group definition and membership to achieve equity goals.

The North-South divide is, however, not the only distinction among different types of interests in the climate change arena. Thus mechanisms agreed to under the Kyoto Protocol refer to groups of countries other than those defined according to the developed/developing dimension. We will discuss the mechanisms themselves in more detail below, but it is important to note in this context that policy measures create groups of nations with particular rights and responsibilities, which has the effect of reallocating resources at some level. Equity issues are implicit in these decisions. For example, some sets of countries are allowed to be considered jointly in calculation of emissions reduction. The European Union, for example, is considered in the Kyoto framework as an entity responsible as a whole for the pledged 8 percent reduction in greenhouse gas

emissions. The group can share the effects of different past circumstances for the benefit of the each member. Thus the decline in coal use in England after 1990 and the deindustrialization of Eastern Germany after reunification mean that the 8 percent reduction for the European Union as a whole includes the possibility that some countries can increase their emissions from 1990 levels. This will mean lower costs in achieving emissions-reduction targets than if emissions levels had increased in every country since 1990. Countries that have a history of clean technology, like Switzerland, will incur higher marginal abatement costs because significant declines in greenhouse gas emissions occurred before 1990.

Measures allowing joint implementation will create yet other groups and redefine costs and benefits. Under joint implementation, for which contract rules and accounting systems are not yet defined, the Kyoto Protocol, in addition to permitting country-level emissions trading, also allows firms to trade emissions within the context of their governments' commitments. Industries in one country can initiate projects that reduce emissions in another and then claim these reductions against the donor-country commitments. Under joint implementation, these arrangements are limited to developed countries. The CDM will be the vehicle to allow similar linkages with developing countries. Developing countries currently have no obligations to limit emissions and therefore the incentives for participating in the CDM are difficult to evaluate, especially since there has been a very limited test phase. Questions have nevertheless been raised about the long-term equity implications of joint implementation-type projects (including CDM) because donor industries may benefit from the least costly emissions reductions in the early phases, leaving the costs of more expensive ones to developing countries should they take on commitments at some later date. Moreover, joint projects may transfer emissions abatement from the developed to the developing world, keeping developed-country per capita emissions high and further aggravating per capita emissions differences worldwide. Such outcomes would perpetuate one of the most contentious aspects of the current confrontation between North and South, namely, hugely different per capita levels of emissions.

The language of the FCCC is evidence that its drafters are greatly concerned with the relationship among countries and the special obligations that link developed and developing countries. We have seen that many

articles of the Framework Convention and the Kyoto Protocol deal explicitly with North-South differences. These are not the only areas where equity considerations will affect the success of the climate change negotiations. An international agreement also has implications for domestic relations. Without a perception that an international agreement is fair to the country as a whole and to its constituent interest groups, approval is unlikely and international effectiveness is jeopardized. The FCCC does not directly address this question, but national representatives are clearly sensitive to domestic implications. They recognize that the terms of the ultimate climate change agreement will influence chances for acceptance nationally and affect later compliance and effectiveness (see chapter 11). Studies of other policy arenas provide insight into the importance of domestic institutions and policies in determining a wide range of distribution patterns within countries. In the case of implications of the climate change agreement, national investment in public transportation or the design of energy taxes will influence both the real consequences of compliance with the agreement and perceptions of its fairness. For example, the higher energy costs expected to result from the agreement will have uneven effects on different economic sectors and social groups. The American public is extremely sensitive to the price of gasoline, for instance, and higher gas prices put a real burden on lower-income families, who feel proportionally heavier burdens because of the regressive effects of price increases. In addition, energy-intensive industries will feel greater impacts, affecting employment levels in particular regions and overall national economic growth. The impacts of domestic reactions on international policy elaboration within the climate change negotiation process are presented in comparative detail in chapter 4.

Equitable distribution of costs of climate change and its abatement within and between countries is not the only goal of the FCCC negotiation process. Article 3(1) exhorts the parties to "protect the climate system for the benefit of present and future generations of humankind on the basis of equity." Because climate change itself and the effects of any decision to modify the climate processes have long time trajectories, it is appropriate that a dynamic approach is explicitly incorporated into the policy process. However, it also introduces yet another debate, namely, what is the best way to value the present compared to the future. The

underlying assumption of sustainable development is that present and future generations have equal rights to economic, environmental, and social resources. This perspective in effect expands the "who" in the allocation process to include populations yet unborn. Can this ideal view be applied and, if so, what are the implications for the way societies now internalize this principle and for its application to the concrete case of climate change mitigation?

Economists have a long and rich history of trying to compare the economic consequences of particular policies over the long term as a guide for making socially optimal choices. Their approach relies on quantitative analysis through the use of the discount rate to calculate the net present value of alternative policies, which allows a transparent and rigorous mechanism for making efficient choices.[7] Equity between present and future generations is implicit in these choices, however, and differences in basic assumptions account for the significant disagreements that characterize discussions of intergenerational equity. The debate centers on time preferences, consumption paths, and marginal utility of consumption. Discounting cannot provide answers to equity issues but can help to clarify the implications.

Arrow et al. (1996) have identified two broad schools relevant to understanding the debate over discounting in the climate change arena. One approach, which they call *prescriptive,* begins with ethical principles that in their strictest interpretation argue that all individuals, present and future, should be valued the same (Ramsey 1928). Cline (1992), for example, adopts this view as a basis for his calculation of a discount rate, giving the value of a pure time preference as zero, which is a quantitative expression of this egalitarianism. Other factors determining the discount rate reflect the evaluation of the likelihood of growth in consumption and the amount of decline of marginal utility with increased consumption. Those who adopt the prescriptive approach believe that there are limits to the possibility of ensuring intergenerational transfers. This means that, to preserve resources for the future, the discount rate should be lower than the producer rate of interest. The result will be that more will be spent on climate change in the present, because of its goal of preserving the quality of the future atmosphere, as opposed to the case if the producer rate of interest were taken (Arrow et al. 1996, 131).

The contrasting approach is identified as descriptive and emphasizes observed investments and focuses on opportunity costs of capital. It uses these values to calculate the discount rate. A discount rate calculated in this manner leads, from this perspective, to the most efficient use of investments to maximize consumption (Nordhaus 1994). This approach does not ignore the rights of future generations but argues that directing investment to choices with the highest rate of return will maximize the economic resources available to future generations and thereby present them with the greatest number of choices.

5 Allocation Rules: Principles and Practices

The FCCC set in motion a process whose goal is to define measures to reduce greenhouse gas emissions in order to slow climate change. The Kyoto Protocol begins to define those measures. The previous sections have demonstrated that equity considerations have strongly shaped the whole process. We have shown that fairness is an issue in the very definition of the problem (allocation of "what") and in designating the groups that must assume responsibilities and bear costs (allocation to "whom"). It is perhaps even more obvious that the design of the policy and the adoption of the principles that guide policy choice (allocation according to what rules) have direct consequences for equity among all the actors we have previously identified. The debate about the mechanisms has overshadowed that about relevant gases or appropriate country groupings but, as we will see, cannot be untangled from these other categories.

Several criteria are invoked to guide allocation processes in general. We will see that they are adopted implicitly or explicitly in the climate change domain. The relevant actors can be treated equally, according to parity principles. Differences among them can be acknowledged as a basis for differential allocation according to some proportionality principle. These differences can derive from various social or economic attributes, or they can be a consequence of past position or behavior. The latter variant establishes a priority principle.

The public-good aspect of the global atmosphere means that everyone should have equal access to it. However, the climate is changing and future populations in different regions will not have the same benefits.

Remedial measures must be introduced, and these measures will not be apportioned equally. Indeed, the language of the Framework Convention and its Kyoto Protocol essentially exclude pure parity in the imposition of emissions reductions or the distribution of costs of abatement or costs of adaptation. Early discussions of a worldwide uniform carbon tax were abandoned because it was quickly recognized that a single measure did not have identical effects and that different tax structures, resource endowments, and stages of development would lead to substantially different and inefficient outcomes (Chichilnisky and Heal 1994). Their effects would also be unequal.

If uniformity does not lead to equitable outcomes, other criteria must be adopted. Proportionality principles posit that some existing condition is measured and the good or right or obligation to be distributed is calculated according to levels of the chosen parameters. In the climate change negotiation process, the decision was made to apportion rights to future emissions. The relevant factors that different negotiating partners have proposed to assign quotas for emissions include: per capita emissions, per capita economic welfare, per capita gross national product, emissions intensity of gross domestic product, relative historical responsibility, share of renewables in total energy, and land area (Müller 1998, 4). The research community has nevertheless devoted considerable attention to the rationale and consequences of adopting one distribution scheme over another. Allocation in proportion to national populations has been proposed by Grubb (1989), for example. This provides developing countries with high levels of entitlements because their per capita emissions are low and population high compared to developed countries. Other proposals have adopted the same population rule but applied it retroactively, giving equal entitlement stocks and factoring in intergenerational transfers (Gruebler and Fujii 1991). This has the effect of making industrialized countries responsible for their past emissions and reducing their current allocation relative to countries that have emitted less in the past.

Ignoring the past and acknowledging present activity leads to allocations based on current behavior. This is a form of grandfathering: rights derive from existing patterns. Such an allocation scheme contradicts most of the equity principles evoked so far, and it has been presented as a

starting point in developing a game-theoretic analysis of negotiating positions and their dynamics (Barrett 1992; Müller 1998).

Formal and game-theoretic analyses of equity questions draw on the work of Thomas Schelling (1960) and especially his study of tacit coordination strategies and behavior. Schelling notes that in multilateral negotiations, parties often tend to coordinate tacitly around some positions about which they share common knowledge and which he consequently refers to as *focal points*. In other words, the different parties to a negotiation process are trying to some degree to guess each other's expectations and will adhere quasi-naturally to an "equitable" position. Barrett (1992) extends these notions to the climate change negotiations and claims that

> the outcomes that seemed compelling did not derive their attraction from their ethical properties. Rather, the ethical rules were known to each party, and were known by each party to be known by the other party, and so on. The ethical rules thus served as focal points (Barrett 1992, 87).

The Schelling and Barrett position thus states that equitable solutions will endogenously and implicitly emerge out of a negotiation process and that therefore *no* explicit and rigorous allocation rule is really necessary. This position is strongly contested by Müller (1998), who claims that different focal points pulling parties in different directions might be generated by a bargaining round in such a way that different points of view about equity are merely left unresolved or papered over. The difficulties encountered by the Kyoto ratification process, as well as the arguments raised, particularly among some groups in the United States[8] and in developing countries about various forms of unfairness, underscore Müller's point of view. The application of an explicit allocation rule seems difficult to avoid. Formal and game-theoretic methodologies are precisely able to design such rules in such a way that they appear fair, envy free, and negotiation proof.[9]

Many important similarities exist between positions based on formal criteria and more qualitative ones, which implicitly acknowledge the need to clarify the concepts underlying the policy initiatives. Shue emphasizes that justice considerations are intrinsic to the negotiation process and that ignoring them will only create new injustices (Shue 1992, 394). At the same time, he and others recognize the biases introduced by adoption

of a single criterion, which has led to several proposals to develop mixed systems combining population and historical criteria. Accounting for different factors that determine countries' responsibilities and capacities is believed to produce more equitable allocation rules. Mixed systems take into account both the egalitarian principle that all people are entitled to equal access to atmospheric resources, and the burden-sharing principle differentiates among abilities to contribute to abatement (Grubb and Sebenius 1992; Shue 1993). Assigning weights to these components would be part of a bargaining process and could evolve over time. One could argue here that Shue's position is fundamentally similar to that taken by Müller (1998); the latter has the advantage of providing a precise tool for computing allocations.

Noting the different components of equity acknowledges the negotiated quality of the climate change agreement that will ultimately emerge. It will of course derive from scientific evaluations of the natural processes and the role of human behavior in shaping them. Concepts of equity will guide the policy choices to ensure certain outcomes. But the Convention is, fundamentally, an *agreement,* and it will emerge from a bargaining process where fact and principle will be embedded in conflicting national and group interests (see chapter 8). The Kyoto Protocol puts forward different national emissions-reduction commitments as they emerged from negotiation; they are not the result of a straightforward application of a particular equity principle. The Protocol adopted a proportionality rule for allocating emissions reduction commitments, which take into account past responsibility by assigning different levels of reduction to different countries or groups of countries. This choice is consistent with the "polluter pays" principle, a variant of the proportionality principle, often invoked to calculate compensation for various forms of environmental damage. Moreover, the Kyoto Protocol includes a priority principle because emissions reductions are calculated in relation to the base year of 1990. This grandfather clause is also the result of negotiation. These commitments have been made for a first period, from 2008 to 2012. The question will then arise whether 1990 continues to be the base year, in which case, with trading, OECD countries would be able to offset abatement costs. Eastern Europe and the former Soviet Union would be net beneficiaries, while new burdens would be placed on developing countries

as purchasers of emissions rights to permit their economic development (Müller 1998, 7).

Another form of proportionality is expressed in the language of "differentiated responsibilities and respective capabilities" evoked in the FCCC. The discussion on North-South relations reflected how this principle would be put into practice in the form of requiring greater efforts from developed countries because of their greater ability to pay for abatement and damage costs. The notion is that each country would be making an equal effort to address climate change but each has different levels of ability to do so (see also chapter 6).

6 Outcomes

The Kyoto Protocol defines rights to future emissions levels by countries. By so doing, it defines a new kind of good in the form of rights to emit greenhouse gases and then determines initial allocations. The previous sections have discussed the equity implications of adopting one criterion rather than another to determine this initial distribution. Property regimes define not only the nature of the entitlements but regulate the transfer either across space, in this case between countries, or through time, as in inheritance rules. Thus the Kyoto Protocol also had to consider under what conditions rights could be reallocated or transferred. Elaboration of trading rules addressed precisely this problem. There has also been considerable study of the implications of various rules of exchange, and these are as closely tied to equity considerations as the initial allocation itself. Indeed, implicit in the discussions of the initial distribution are views about how it would evolve. Most proposals assume that exchange of rights would be allowed and that emissions trading would meet both efficiency and equity criteria. Chichilnisky and Heal (1994) raise important and unexpected linkages between the two in the context of the climate change arena. We have noted that the atmosphere is a public good, where rivalry is in principle absent. However, climate change is transforming the atmosphere into a good with elements of rivalry. Emissions trading grants rights to trade aspects of this public good: "the rights to use the atmosphere as a sink to absorb emissions" (Chichilnisky 1996, 19). Private and public goods have, however, very different characteris-

tics. For pure public goods there is no rivalry in consumption, no restriction on access, and everyone's consumption is connected (although we noted that climate change introduces rival aspects to the atmosphere as public good). The Coasian assumption of efficient allocation under competition therefore does not hold here, among other reasons because consumers cannot choose independently of each other the quantities they want to consume. For private goods, each individual can consume independently of another. According to Chichilnisky, these differences do not mean that efficiency criteria cannot be met, but she argues that it requires special attention to the initial allocation process because it will affect the long-term dynamics of exchange. Her argument is that those who have fewer private goods should have more rights to the public good than those who hold more private goods. This means that industrialized countries should receive proportionally smaller endowments in property rights as a precondition to assure efficiency (Chichilnisky 1996, 19). This analysis thus links efficiency to equity—by balancing developed and developing countries' needs—and ties outcomes to initial allocations. Chichilnisky's proposal for regulating these exchanges is to establish an institution, an international bank for environmental settlements that would regulate the market and thus guarantee that the goals of the climate change agreement will be met over time.

7 Implications of Equity Considerations for the Future of Climate Change Negotiations

Perceptions of justice are an integral part of the design of climate change policy, which seeks to alter human influence on atmospheric processes without further aggravating differences in welfare among different countries and social groups. Part of the rationale is to foster compliance (the notion being that countries will only agree to do what they believe is fair); part of it comes from broader underlying notions of equity that describe overall societal orientations. Having looked at equity "in the small," as it relates to climate change, it is now useful, in conclusion, to refer briefly to more general considerations about the role of norms and institutions in shaping social relations. We see that specific policy proposals derive from general principles. Within a particular ethical framework,

given choices appear optimal, but there is no rational and scientific basis on which to choose among different conceptions of ethics.

Chapter 6 distinguished among several broad philosophical traditions of justice. The various proposals in the FCCC process to set caps on emissions and to distribute costs of emissions abatement and costs of climate change itself are grounded implicitly or explicitly in one or another of these conceptions of equity. Arguments about equity reflect visions of society that cannot be solved by appeals to rigor or consistency; they refer to conceptions about the way the world should be. The advantage in specifying the basic principles and values underlying negotiating positions and policy measures is to permit an analysis of the extent to which particular policies will meet normative goals. Explicit presentation of principles and their link to actions will elucidate cases where apparently different measures may produce similar equity outcomes. In this case, compromises on policy may be achieved because they lead to compatible ethical outcomes. Knowing, however, that policy alternatives are incompatible with deeply held principles of justice in different societies will, conversely, alert negotiating parties to the impossibility of reaching agreement on those actions.

This chapter has stressed the importance of applying rigorous criteria to clarify issues of equity both within and between nations. It has also emphasized other dimensions of the equity debate, such as property rights issues, which are implicitly contained in the dispositions of the Kyoto Protocol in the form of tradable emissions rights and the implicit allocation criteria discussed and applied so far.

Because equity issues are deeply embedded in the very perception of the problem of climate change as well as in the degree to which different countries and regions will agree to various measures to reduce its impacts, this and the previous chapter have outlined the range of interrelated issues that invoke principles of equity. Doing so involved discussion of institutional aspects of society, such as property rights, as well as reference to principles of justice, economic welfare, and regional disparities. These two chapters have also invoked methodological issues by referring to quantitative and qualitative approaches. Chapter 6 stressed the importance of establishing explicit equity principles that could then become a subject of debate. Chapter 7 indicated the importance of formal method-

ologies to analyze these principles and formulate rigorous criteria to address questions of fairness and equity within and between nations. Formal procedures to achieve equity and fairness have been extensively discussed in the above-mentioned work of Young (1993) and Brams and Taylor (1996), and have been specifically applied to climate change by Müller (1998). Formal methods and models do not apply uniquely to equity questions. Their use, especially through the adoption of rational choice approaches as well as game and bargaining theory, directly concerns the analysis of international negotiations, accords, ratification, and renegotiation processes. We do not conceive formal methodologies and models as goals in themselves. However, they may usefully complement and illustrate other methodologies and draw attention to questions that are usually ignored by other approaches. The next chapter will present a systematic review of some of their achievements with respect to the climate change policy process and the negotiation and implementation of the Kyoto Protocol.

Notes

1. There is a substantial literature on this question, and for reasons of space in a volume on the broader question of international relations and climate change, this chapter does not intend to present a comprehensive review of equity issues or even of the literature devoted to equity and climate change. However, for recent discussions on the topic, see Banuri et al. 1996; Müller 1998; Toth 1999.

2. There is a vast literature on property rights, and an analysis of the issue goes far beyond the scope of this chapter. It is nevertheless important to refer to the relation between property regimes and environmental issues. The current round in the discussion was launched by Garrett Hardin's (1968) affirmation that common property systems led to environmental degradation because of free-rider problems under conditions of open access. Numerous examples, including McCay and Acheson 1990 and Bromley 1992, cast a different view on the historical record. The enlarged debate is relevant in the context of the recognition of the global-commons aspect of international climate change.

3. H. Peyton Young (1994) categorizes core issues related to equity in much the same way in his very clear exposition of the general problem. He does not, however, introduce the notion of the population of actors subject to allocation rules. It seems clear that defining such group-membership criteria is a crucial aspect of the FCCC negotiations and therefore needs particular attention in this discussion.

4. A pure public good is nonexclusive and nonrival. No one can be excluded from using it (or benefiting from its existence), and the use by one individual does

not diminish the level of access for any other user. A pure private good is exclusive and rival. Its use is controlled by a single owner, and the use by one diminishes the quantity or benefit available to another user.

5. See Banuri et al. 1996, 93–94 for a discussion of the debate on the calculation of carbon sinks.

6. Banuri et al. (1996) review the conflicting views in this literature and show how the debate has shaped the negotiation process leading up to COP-3 and influenced the decisions taken by the Kyoto Protocol.

7. Present value translates future values back into their current worth through the application of an interest rate, which is called the *discount rate*. By this calculation, it is possible to evaluate choices according to their dynamic efficiency. Allocations are dynamically efficient if they maximize the present value of net benefits of a particular allocation compared to all possible other ways of allocating resources over the period under consideration.

8. This refers for instance to the argument used in the United States that industrializing countries such as China and India are not contributing to climate change abatement processes as defined in the Kyoto Protocol.

9. An important literature exists that offers solutions to these problems (Steinhaus 1948; Brams and Taylor 1996).

III

Regime Creation: Methods

This page intentionally left blank

8

Modeling Global Climate Negotiations

Frank Grundig, Hugh Ward, and Ethan R. Zorick

Looking back over the past years to the Rio Earth Summit in 1992, it is difficult to be optimistic about the international community's chances of dealing effectively with the climate change issue. A start has been made with the Framework Convention on Climate Change (FCCC) that sets up rules, procedures, and monitoring arrangements. At the Fourth Conference of the Parties in Kyoto, the rich countries agreed in principle to make binding commitments, amounting to an average reduction of their greenhouse gas emissions of about 5.2 percent in 1990 figures for the time frame 2008–2012. However, little progress was made at the follow-up conference in Buenos Aires on a number of contentious issues arising from the Kyoto Protocol. Difficult questions include, for example, how to measure some emissions and enhanced sinks that will count according to the United States's preferred "comprehensive approach." Another contentious issue is how to implement flexibility mechanisms or Kyoto Mechanisms that would allow countries like the United States to do less domestically by buying the pollution rights of other states or by carrying out low-cost projects in developing countries. On the positive side, the process has not ground to a halt, but on the negative side, the international community is nowhere near agreeing on cuts in emissions recommended by consensual scientific opinion as necessary to achieve the ultimate goal of the FCCC (see FCCC 1992, Article 2). The threat that the U.S. Senate will not ratify the Kyoto Protocol without developing countries making binding commitments is very likely to arrest progress. In light of this, Hardin's metaphor of the tragedy of the commons (Hardin 1968), in which self-interest and the lack of any constraints on access lead to the overexploitation of the commons, seems useful. In an anarchic

world system in which states are sovereign, national self-interest pressures many nations toward free-riding. States often also lack the capacity and legitimacy necessary to effectively intervene at the local level. So a major challenge is posed to the international system (Hurrell 1994; Sandler 1997).

Climate stability is a relatively pure public good: nations paying no part of the cost cannot be excluded from the benefits; there is jointness of supply, because all can enjoy the benefits without prejudice to others' consumption (Sandler 1997, chap. 2; Weale 1992, 193).[1] The benefits of the stabilization of global climate change are likely to outweigh the costs in the long term, even excluding the most difficult-to-quantify benefits (Cline 1992, chap. 7).[2] This by no means guarantees that states will act to supply such a public good. Energy-conservation measures can lead to significant reductions in CO_2 emissions at low or even at zero cost. They constitute "no regrets" policies that are worth undertaking even if global warming does not turn out to be a reality and even if other nations do not act. However, major reductions in emissions are predicted to be costly. Synthesizing a large literature, Cline concludes that a global freeze on CO_2 emissions would cost from 1.5 to 2.5 percent of world gross national product in the first half of the twenty-first century and about 3 percent in the second half (Cline 1992, chap. 4).[3] Thus, the heart of the problem is that the impossibility of exclusion may make it rational for a country to free-ride, taking any benefits produced by others' sacrifices without paying the significant costs.

Why is it so difficult to achieve progress? In this chapter, we discuss four models that seek to explain the difficulties in achieving international cooperation on this issue, and indeed on other issues. These models look at related questions but in different ways. Although there are conceptual similarities between them and they share certain assumptions (notably assumptions that players are rational and self-interested), they are to be seen as four distinct vantage points, not a single cohesive framework with which to view the problem. With a phenomenon as complex as climate change we regard it as unlikely that a single model will capture all that can usefully be said from the formal modeling perspective that we adopt here.

The first model suggests that, assuming nations do not discount the future too heavily, many different ways of distributing the burden of dealing with the climate change issue efficiently could be stable under threats to punish those who do not stick to the agreed pattern (section 1). This leaves the question of which of these patterns will actually be agreed on.

Drawing on the literature on bargaining, we discuss two themes in section 2. First, there may be tactical advantages to committing to doing little or nothing so as to off-load the costs onto others and to institute a favorable pattern. Second, we show that those who are impatient to get some sort of action going are likely to end up bearing a greater proportion of the costs, because impatience makes one accept unfavorable offers rather than holding out for something better. These two themes are actually related: pretending not to be concerned about rapid resolution of the issues is another effective bargaining tactic.

We consider the impact of traditional concerns about international security in section 3. Neoinstitutionalists working in the international relations field usually assume that states seek absolute gains—that is, they are only concerned about whether cooperation makes them better off than no cooperation. Neorealists dispute whether states care only about absolute gains, postulating that the nature of the anarchic system and the possibility of war forces states to care primarily about relative gains—that is, how much better do you do than other states? We argue that if realists are right, it may be more difficult to achieve cooperation over global climate change than over issues like free trade.

Finally, in section 4 we show how a small number of reluctant actors can prevent agreements from being reached. This section is based on the observations of unequal power among actors in international politics. Some actors are capable of pushing the international agenda and some are not. Those with greater ability can use inducements and threats to persuade the reluctant not to veto change. Such side payments may also be used to persuade others to block change, though. We show that the distribution of side payments in an agreement will be unequal, because it costs more to move the position of those reluctant to change the status quo. The interplay of these inequalities in power and national positions determines the outcome of international negotiations.

1 Repeated Play and the Possibility of Cooperation

The time dimension is crucial, because those who currently free-ride may be punished in the future. Although this idea is now central to general accounts of international cooperation, it only became prominent in the literature on global climate change a decade ago (Barrett 1990, 72–73). In this section, we use repeated Prisoners' Dilemma games to understand international cooperation—and the difficulties involved in achieving cooperation.

The basic assumption is that nations can be viewed as unitary actors making choices between strategies so as to maximize their expected payoffs. Generally, a nation's payoff from adopting a particular strategy varies with the strategies chosen by others. Thus, to make a rational choice, a nation has to be able to predict the responses of others. In the model we develop here, which is the simplest possible case, it is assumed that nations know not only their own payoffs but also those of all the others. Also, it is common knowledge that all nations are rational players. Thus, one nation can predict others' responses to any strategy it chooses. In equilibrium, each nation's strategy is a best response to others' strategies.[4] Rational nations will play strategies corresponding to an equilibrium because, then, no side has an incentive unilaterally to change strategy.

We assume for simplicity that negotiations are bilateral or that two blocs of countries face each other. Call these blocs *X* and *Y*. Each side has two strategies: to cooperate (C) in some measure that it is believed will help stabilize the global climate by, for example, reducing greenhouse gas emissions, or not to cooperate (NC). If the game is played only once, it is called a one-shot game. Such games form the building block for games with a time dimension, so it is convenient to start with them. In a one-shot Prisoners' Dilemma, it is rational for both sides to choose NC no matter what the other does. The game matrix is shown in figure 8.1. The outcomes are rank ordered from the least to the most desirable, the payoffs reflecting this rank ordering.

The equilibrium is where both players choose NC. No player can improve its payoff if both players are playing (NC) by unilaterally changing its strategy choice to (C). Similarly, any other strategy pair would leave open the possibility of at least one of the players improving its payoff by

		Player A	
	Strategy choice	Cooperate (C)	Not cooperate (NC)
Player B	Cooperate (C)	(y, y')	(w, z')
	Not cooperate (NC)	(z, w')	(x, x')
		$w < x < y < z$ and $w' < x' < y' < z'$	

Figure 8.1
One-shot Prisoners' Dilemma

unilaterally changing its strategy choice. Consider the strategy choice where both players play (C). In this pair, either player could improve his or her payoff by unilaterally choosing (NC). The equilibrium (NC, NC) is not Pareto-efficient.[5] There is a collective action failure in which the rational pursuit of interests leads to an inefficient outcome. Nations could escape the dilemma if there was some way to bind themselves to cooperation, both agreeing to play (C). The assumption here is that international law does not provide a way of ensuring that treaty obligations will be met, so that the game is noncooperative.[6]

One-shot games are inadequate models of international cooperation, although they provide important metaphors for certain forms of collective action failure at the international level (Keohane 1984, chap. 5; Snidal 1986, 48). Even if an international agreement has been signed, the possibility that some may overtly break away from it or more or less covertly fail to implement it needs to be allowed for. Thus, nations should be pictured as having repeated opportunities to make decisions about whether or not to cooperate. They play supergames in which they repeatedly play a one-shot game, the number of rounds being infinite or uncertain. Their supergame strategies tell them how to play in any contingency that can arise at any point in the game. Players choose supergame strategies so as to maximize the sum of their own supergame payoffs through

time. In calculating this sum, future payoffs weigh less heavily—that is, they are discounted.[7] For *X*, from the perspective of round 1, a payoff of ρ gained in round *t* is worth $\delta^t\rho$, a smaller value of δ meaning heavier discounting of future payoffs. *Y*'s discount parameter is δ′.[8]

The key to stable, cooperative collective action when binding agreements are impossible is typically that players' cooperation is conditional on the cooperation of others. If one side fails to cooperate, this triggers retaliation in the form of refusal to continue to cooperate. For instance, the European Union (EU) might press ahead with making cuts to its emissions so long as the other major Northern economies were doing the same, but if they failed to cooperate in this way, the European Union could switch strategy, scrapping its plans to make further cuts or even allowing emissions to increase. This way nations may be able to avoid collective action failure, even if they cannot make binding agreements.

Whether conditional strategies deter free-riding depends on the threatened penalties and the credibility of the threat. To illustrate this, suppose that the one-shot game is Prisoners' Dilemma. S is the conditional strategy: start by playing C in the first game; continue to play C as long as both sides played C in the last round; otherwise play NC. If both players stick to S, there is cooperation in every round. The threat is that if one side ever free-rides for a round, the other will punish it by provoking a permanent breakdown of cooperation. When this occurs, the play reaches an equilibrium. If one side always plays NC, the other loses in any round in which it does not do the same—that is, *X* would lose $(y - w)$—the payoff from mutual noncooperation it was expecting minus the value it receives for cooperating in the face of noncooperation by the other player—in any round in which it played C. It is important that the threat built into a conditional strategy is credible (see Fudenberg and Tirole 1991, chap. 5). If both players play strategy S, threats are credible. Failure fully to carry out the threat implies playing C in some round or rounds after the threat has been activated. But this is sure to lead to an even lower payoff when the other side always plays NC. Therefore, (S, S) is an equilibrium if and only if neither side can strictly increase its payoff by changing from S to the strategy of always playing NC.[9] This is true if

$$\delta = \frac{z - y}{z - x} \quad \text{and} \quad \delta' = \frac{z' - y'}{z' - x'}.$$

For the row player the gain from free-riding once is $(z - y)$, and the loss per round from the breakdown of cooperation is $(y - x)$. Thus, the algebra tells us that if gains from short-term free-riding are low, if penalties per round from the breakdown of cooperation are high, and if payoffs in future rounds are not too heavily discounted, there will be an equilibrium in which everyone conditionally cooperates. Variation in these factors across issue areas and across time may help explain differences in levels of cooperation. For example, it is often suggested that it was easier to achieve cooperation in relation to ozone depletion than it will be in relation to global warming because the total economic costs of abatement are much higher in the second case (Lipson 1984, 1–23).[10]

There is no guarantee that a Pareto-efficient outcome like all-round cooperation will be stable, even if the nations employ conditional strategies. If too little weight is put on the future or if the short-term gains from free-riding are too high, there will be a failure to achieve an outcome that is an all-round improvement on the noncooperative status quo. This failure is analogous to the one-shot Prisoners' Dilemma outcome. Even if conditional cooperation is an equilibrium, there are still potential problems, because of the existence of other equilibria. For instance, if the game being repeated is Prisoners' Dilemma, noncooperation is always an equilibrium. In fact, if any Pareto-efficient outcomes are equilibria, there will generally be an infinity of equilibria, as demonstrated below.

Suppose that two blocs of countries repeatedly play the Prisoners' Dilemma. Then the feasible payoffs for the supergame all lie within the quadrilateral shown in figure 8.2 (Fudenberg and Tirole 1991, 152–153). The average payoff per round if both blocks always fail to cooperate is x for row and x' for column. These payoffs are the *security levels* of each side: no matter what happens, they can never get a lower payoff, even if the other side is carrying out a threat against them because of their failure to cooperate. The Folk Theorem (so-called because no one can recall who first proved it) shows that each payoff point in the quadrilateral is an equilibrium so long as each bloc puts a high enough weight on future payoffs, and each bloc gets more than its security level—in this case, x and x' per round (Fudenberg and Tirole 1991, 153–155). So long as enough weight is placed on future payoffs to make the punishment substantial and it lasts long enough, the threat to drive payoffs down to the

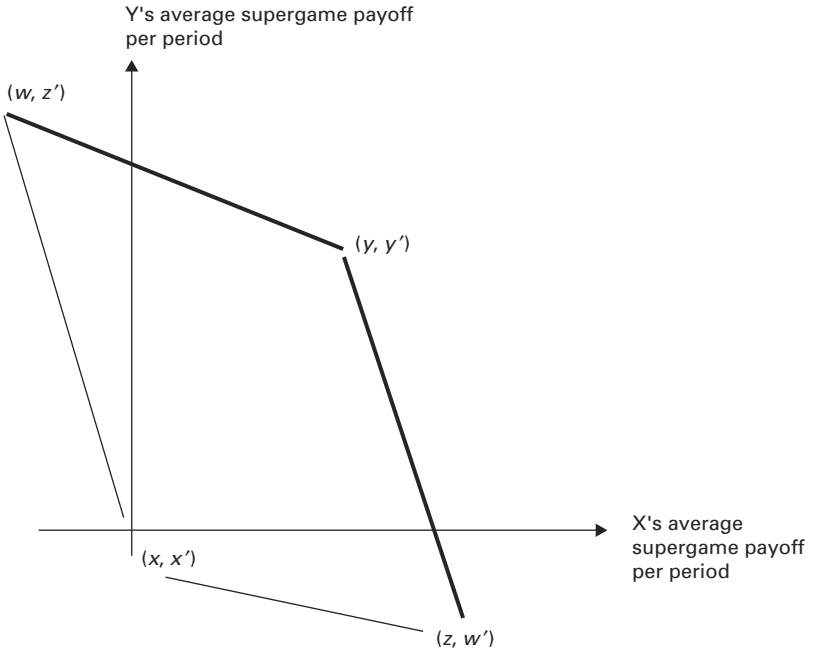

Figure 8.2
Average supergame payoffs per round when the stage game is a (2 × 2) Prisoners' Dilemma

security level will deter both sides from breaking away from any pattern of play.[11] Patterns where some nations start cooperating immediately and others do so later or patterns where some cooperate to a greater extent than others may be stable. The Pareto-efficient patterns are along the northeast frontier, drawn in heavy lines. Any point not on this Pareto frontier is such that there is at least one point on it that is better for both sides.

In effect, a nation's security level is defined as the payoff it can get in case bargaining over some form of conditional cooperation breaks down. As its security level goes up, its payoff in the worst equilibrium that could come about gets better. Thus, in this model countries that can walk away from negotiations and still do well have an important form of bargaining power.

The supergame model identifies heavy discounting of future payoffs and uncertainty about benefits as problems. Politicians discount future

payoffs heavily, because their focus is on the short-run dynamics of support and the reaction of capital markets in which heavy discounting of future investment returns is the norm. The problem of short-termness is exacerbated by a time pattern in which the financial and other benefits from current cooperation arise in the future. Also, uncertainty about the level of future benefits makes risk-averse decision makers less prone to take gambles to get them.

Regimes of cooperation consist of formal and informal institutions, shared principles, norms, rules, rights, and decision-making procedures that provide more favorable circumstances for the existence of conditionally cooperative equilibria (Krasner 1982, 185; List and Rittberger 1991, 89–90; Young 1989, 12–13 and chap. 2). Regimes constrain interdependent decision making in a way that makes inefficient outcomes less likely by coordinating actions and fostering various forms of collaboration (Stein 1982; see also chapter 3 of this book). First, regimes may alter the incentives to free-ride by threatening to reduce the payoffs of free-riders (Axelrod and Keohane 1985, 241–246; Oye 1986, 9–11). Second, they provide an institutional context within which a reputation for trustworthy cooperation and for carrying out threats can be built up and then "cashed in," both in future rounds and in related bargaining forums (Young 1989, 75). Monitoring arrangements are typically built into the regime (Levy, Haas, and Keohane 1993, 402–403). Third, this encourages conditional cooperation, because it makes free-riding more visible (Oye 1986, 6–9). Fourth, diplomatic activity on the part of the secretariats of institutions associated with regimes may help to dispel distrust and increase the capacity of nations actually to meet treaty obligations (Levy, Haas, and Keohane 1993, 405–407). Even if a regime has no current value, nations may maintain it because the regime may be useful in the future or because it has attained legitimacy in its own right (Stein 1982, 315–316; Young 1989, 26). Finally, regimes can help players choose from among the infinite number of equilibria that a supergame might have. In doing so, they help the players coordinate on a single equilibrium, such as the conditionally cooperative equilibrium based on strategy S discussed above.

While it is common outside the formal modeling literature to identify short-termness as a problem (Hurrell 1994, 152), the supergame Prisoners' Dilemma model tells us more:

- There is a "multiplier effect" whereby nations that do not discount the future so heavily but are playing conditional strategies switch to noncooperation as a result of the failure of their threats to deter.
- The outcome where all sides cooperate to a high degree is among the efficient outcomes.
- The outcome where all sides cooperate to a high degree is not necessarily an equilibrium.
- Regimes can facilitate cooperation by increasing payoffs, reducing uncertainty, and helping to coordinate equilibrium selection.

2 Bargaining Theory and Climate Change Negotiations: Why Commitments to Do Nothing May Be a Useful Tactic, and Why the Impatient Get a Worse Deal

In the previous section, we pointed out that, provided nations do not discount future payoffs too heavily, a range of patterns of play will be stable. Some will benefit a particular nation more than others. Along the Pareto frontier, where the efficient patterns lie, there is direct conflict of interest. This is illustrated in figure 8.3, where the efficient patterns are on the northeast frontier of the feasible set—the Pareto frontier. Along this frontier when one bloc increases its payoff, the other's payoff is driven down. Which of these patterns might emerge? One answer is that nations will commit themselves to a pattern that favors their interest—for instance to one under which they do little and others pay high costs (Ward 1996). This illuminates the bargaining tactics in arenas like Kyoto, where some players threatened to scupper the agreement rather than go back on commitments to do little. The sidelining of the issue of binding emissions-reduction targets for poorer countries at the Conferences of the Parties at Kyoto and Buenos Aires suggests that some countries are attempting to use commitment tactics. The danger of this tactic is apparent: if the G-77 countries are committed to avoiding binding targets for themselves and the United States is committed to getting the G-77 to adopt them, the whole climate change convention may unravel. More generally, where several nations make different commitments to a range of patterns, cooperation through time will either never start or rapidly be aborted as deterrent threats are brought into play.

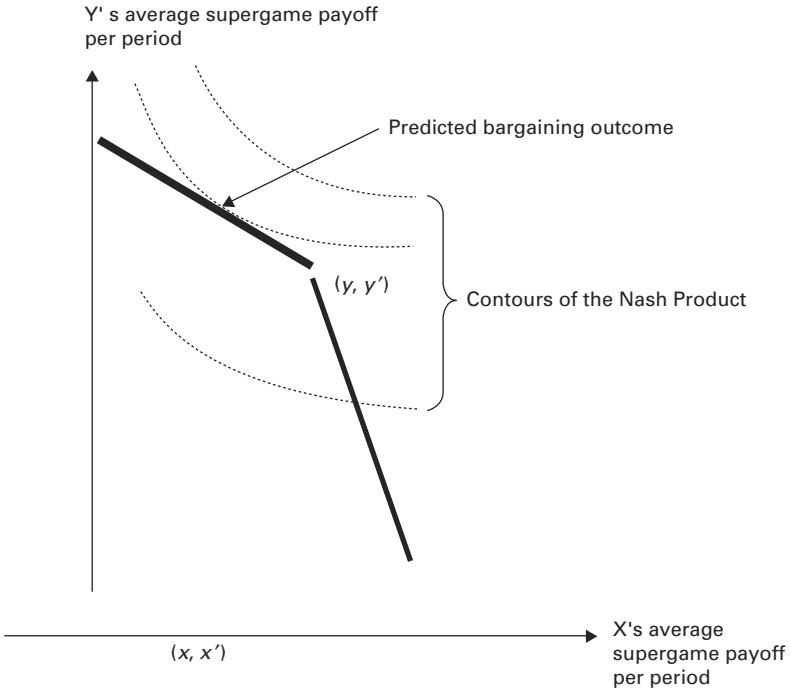

Figure 8.3
The generalized Nash bargaining solution for a supergame where the stage game is a (2 × 2) Prisoners' Dilemma

We now focus in more detail on another approach to bargaining. Although there are numerous theories of bargaining, by far the most influential is the Nash Bargaining Solution.[12] One reason for this is that it has been shown that, when the set of payoffs takes the form shown in figure 8.2, this prediction corresponds to a certain stylized model of the process of offer and counteroffer, without the necessity of assuming that players can sign binding contracts (Rubenstein 1982). As we saw above, assuming players do not discount the future too heavily, any supergame payoff vector giving each side more than its security level is associated with some equilibrium of the supergame. Imagine the two sides bargaining in a pregame over which of these feasible payoffs will occur. They take turns making offers. As soon as one side accepts the other's offer, the pregame terminates and both sides play the associated supergame strategies, which we assume are in equilibrium. The pregame goes on indefinitely if a deal

is not struck. Suppose that the stage game of the supergame is a 2×2 Prisoners' Dilemma, as in section 1. It is then simplest to assume that in the pregame players receive their security-level payoff of x or x' per time period—that is, they do not cooperate while bargaining.[13]

According to this model of bargaining, the less heavily a player discounts future payoffs the higher will be its payoff. The players' bargaining power derives from their ability to hold out for a better agreement. The intuitive reason why this is so is not difficult to see. Any bargain will be on the Pareto frontier, or else at least one side could be made better off. Along the Pareto frontier, there is direct conflict of interest: if *Y*'s payoff goes up, *X*'s goes down. Supposing it is *X* who has to make an offer, it will make *Y* the lowest offer it will accept in favor of holding out for a settlement, because this way it maximizes its own payoff. In an equilibrium of the pregame, *X* makes an offer that leaves *Y* indifferent between accepting and holding out. *Y* discounts future payoffs. The more heavily it discounts them, the lower the maximum payoff it can get if it holds out, discounting payoffs back to the time period that *X* makes its offer. So the deal *X* offers will be better for *Y* the more patient it is.

It can be shown that there is a unique equilibrium of the pregame when time periods between bids approach zero. Denote *X*'s payoff in this equilibrium by u_X and *Y*'s by u_Y. Then these payoffs will be such that, considering the whole feasible set, the following Nash Product is maximized:

$$(u_X - x)^{\chi} (u_Y - x')^{\upsilon}$$

where x and x' are the two sides' security levels, χ is *X*'s bargaining power, and υ is *Y*'s bargaining power, with bargaining power being a function of how heavily future payoffs are discounted. In figure 3.3, contours of this Nash Product are drawn. The predicted outcome occurs where one of the contours is just tangential to the Pareto frontier (compare to figure 8.2). As *X* discounts the future less heavily, the contours of the Nash Product become steeper everywhere, so *X* is predicted to get a higher payoff.

The way this result is interpreted depends on what assumptions we make to link nations' observable behavior to discount rates, and also on whether we are willing to make comparisons of payoffs. Granted that comparisons are meaningful and that nations pushing for a rapid resolu-

tion of the substantive problems have higher discount rates during bargaining (because they seek to avoid delay), we would expect them to get worse outcomes, other things being equal. This might shed some light on the asymmetries that began to emerge in the climate change regime on the way to the Kyoto Protocol: the European Union wanted rapid movement toward definite targets and timetables, whereas the United States was less worried about a failure to resolve things within the time frame set by the Berlin Mandate. This also helps explain why the European Union must reduce its emissions more than the United States has to within the time window 2008–2012.[14] It would be possible to explain part of the bargaining power of countries like China and India in the same way: because they are less worried about resolving the issue quickly, they could be expected to get a better deal.[15]

If impatient players get worse deals, it will pay to pretend to be patient if you can get away with it, even if this is not true. Alongside committing to doing nothing go claims that you care little about whether the issue is rapidly resolved. To deal with this second tactic, game theorists have started to develop models of bargaining under incomplete information—a useful area for further research into climate change negotiations.[16]

3 Absolute vs. Relative Gains: Why the Politics of the Global Commons Is Different from the Politics of Trade

Neoinstitutionalists usually assume that states seek absolute gains—that is, they are only concerned about their own payoffs from cooperation rather than those from noncooperation.[17] Realists frequently dispute this, arguing that the anarchic nature of the international system and the ever-present possibility of war force states to care primarily about relative gains: the difference between their own and other states' payoffs.[18] In the late 1980s and early 1990s this question sparked the absolute- versus relative-gains debate between neoinstitutionalists and neorealists on the prospect of economic cooperation, both sides using game theory in general and the Prisoners' Dilemma supergame in particular to shed light on the possibilities of international cooperation.[19]

The problem is that nations concerned about relative gains have an additional incentive to free-ride in a two-player Prisoners' Dilemma

supergame. In the round where it breaks away from conditional cooperation, using the notation of section 1, X would make an absolute gain of $(z - y)$ but also a relative gain of $(z - w')$ over Y. As we saw, conditional cooperation is unstable if there are great enough absolute gains from free-riding once and adding in relative gains makes it less likely that conditional cooperation will be stable. However, things are more complex with more than two players. Assuming that relative as well as absolute gains matter to states, Duncan Snidal has argued that the effect of relative gains varies with the number of states, n (Snidal 1991b, 191). If $n = 2$, cooperation can be seriously impeded by consideration of relative gains (Snidal 1991b, 197). However, the effect of relative gains on the possibilities of cooperation diminishes with increasing n, other things being equal (Snidal 1991b, 193, 196). The intuition is that while state I is cooperating with state J, it is making relative gains over $(n - 2)$ other states that are not taking part in this cooperative enterprise; and $(n - 2)$ grows with n, so that the incentives to cooperate increase with the number of states, so long as states care about relative gains. Suppose for simplicity that each state's absolute payoffs are the same and that each can either cooperate or not in a 2×2 Prisoners' Dilemma played with others. Consider whether it is worth it to A and B to cooperate through time when no other pair of countries is cooperating. In each round they increase their payoff by $(y - x)$ relative to each of the $(n - 2)$ states that do not cooperate. So their relative gain over these other states is $(n - 2)\ (y - x)$ per round. As we saw in section 1, the bigger the gain per round from mutual cooperation over mutual defection, the more likely players are to conditionally cooperate in a supergame. The relative gain of $(n - 2)\ (y - x)$ over noncooperators needs to be added to the absolute gain of $(y - x)$. The relative gains over states not participating in the cooperative enterprise offset the higher incentives to free-ride to a certain degree whenever there are more than two relevant states in the system. This effect becomes ceteris paribus the stronger the larger the value of n. For large n, there is essentially no impact of relative gains on the possibility of cooperation.

The crucial assumption in Snidal's model is that all $(n - 2)$ other states can be excluded from the benefits of A's and B's cooperation. Where these other states cannot be excluded, relative gains cannot arise. Thus the benign effect that offsets the incentive to break away due to relative

gains from cheating does not exist when the good that is to be provided is nonexcludable. Excludability is plausible for trade issues: tariffs, for example, can be set at different levels for different states, thereby excluding certain states from the benefits of free trade. Excludability is not a plausible assumption where environmental cooperation on mitigation is concerned. As we have already argued further above, global environmental issues typically involve public goods that are nonexcludable and indivisible, as in the case of climate. If we assume that states care about relative gains, the fact that environmental cooperation brings about the provision of nonexcludable goods potentially has a serious impact on the likelihood of cooperation.[20] The reason is that cooperators do not make any relative gains over states not participating in the cooperative enterprise, since free-riders cannot be excluded from the benefits. Here Snidal's argument does not apply, then: although n is large, the relative gains problem significantly decreases the chances of cooperation.

In conclusion, taking relative gains into consideration leads to very different predictions about the prospects for international cooperation for different goods. The prospects for the provision of excludable goods such as trade are better than those for nonexcludable goods such as climate stability.[21] While GATT/WTO has largely been viewed as a success story, most people would conclude that attempts to reduce greenhouse gas emissions have been rather unsuccessful, especially if one considers the bleak prospects for ratification of the Kyoto Protocol in the U.S. Senate. Successes in areas like trade should not be extrapolated to global environmental problems.

4 Power, Interests, and International Bargaining: Buying Out Vetoes to Change the Status Quo

It is a conventional move to link the bargaining positions of states over climate change with the configuration of their domestic and geopolitical interests (e.g., Paterson and Grubb 1992; Rowlands 1995b, chap. 6). Thus the U.S. position at Kyoto and Buenos Aires can be linked to the heavy dependence of its industry and consumers on fossil fuel use. Another factor is the influence of its domestic fossil fuel lobby, articulated through Congress and especially through the possibility of a Senate veto

of ratification of the treaty (see also chapter 4). Also relevant are U.S. concerns about destabilization of the global balance in key areas like the Middle East with a move away from the fossil fuel–based economy. In a similar vein: explanations of the European Union's position would allude, among other things, to the importance of the domestic green lobby, especially in light of the 1998 German elections (see also chapter 4). Further, OPEC's outright opposition to progress and demands for compensation at Buenos Aires are linked in an obvious way with its economic interests, especially as real prices for oil are falling. And Japan's concern to set lower targets is linked with the relative energy efficiency of its economy and its dependence on nuclear power, both of which arose as a reaction to the oil crisis of the 1970s.

It is undeniable that such factors are only a starting point for analysis. The reason is that the context of international negotiations is one of *strategic rationality*. States' ability to get what they want is constrained by the willingness of other countries to go along and by the potential enforceability of the deal struck.[22] A state's bargaining position must take account of the interests of *other* states, setting up the sort of mutual interdependence that game theory concerns itself with. Simple narratives about links between national interests and bargaining positions fail to give adequate weight to this point.

Such narratives are essentially static. They do not adequately explain, for instance, why the position of former President Clinton's administration on global climate appeared to change in the run-up to Kyoto. Clinton was elected on a ticket that included Al Gore, an avowed environmentalist who had himself written on global climate change. The way former President Bush had blocked a stronger version of the FCCC was used to gain the sympathy of American voters. Opinion-poll evidence suggests significant and possibly even growing concern among American voters, although some suggest citizens are ambivalent about paying the price of action. The former Clinton administration appointed Timothy Wirth as Under Secretary of State for Global Environmental Affairs, and he advocated an aggressive plan for significant cutbacks in U.S. emissions. The United States in fact met its treaty obligation under the FCCC to present a national plan to stabilize emissions, although emissions actually grew very rapidly in a booming economy. Clinton proposed spending $6.3 bil-

lion over five years on a technology initiative to boost energy efficiency and encourage cleaner energy sources through tax breaks and research-and-development incentives—which encountered stiff Republican opposition in the U.S. Congress. The administration envisaged capping U.S. emissions and instituting a system of internally tradable permits by 2007. Why did the Clinton administration appear to deviate during the Kyoto round from the path it intended to take? Our answer is that it sought to prevent a deal further from the status quo than it liked by counter-lobbying against the EU position. We develop this idea further below in a spatial model of bargaining over climate change.

Our model draws on spatial models of decision making frequently used to analyze domestic politics but seldom used at the international level.[23] Putnam develops a framework for understanding "two-level games" that incorporates many of these issues (Putnam 1988; see also chapter 4 in this volume).[24] While Putnam's approach is suggestive, it is not a fully developed model of international bargaining. Exact linkages, the availability and role of side payments, and specification of lead actors as well as their interaction with the veto actors in bargaining are all sketched in Putnam, but they are never developed into a full game-theoretic model.

The approach we advocate here draws in many ways on regime theory. Fundamentally, we assume that equilibria in the game we deal with are structured by rules that are built into a regime. In relation to global climate change and most other significant international environmental treaties, changes have to be agreed on unanimously across the parties to the treaty nation states but also by some other entities like the European Union. Certain blocs of countries or even individual countries have the de facto power to veto an agreement because, if they do not go along, the situation will deteriorate, at least in the long run, no matter what others will do. The de jure situation is partly a reflection of this. But we believe that the rules borne by international regimes matter in their own right. Our model incorporates the possibility of treating international organizations that play a role in structuring the agenda and dynamics of international politics as actors in their own right.[25] We can do this by treating them as a group that can veto movements away from the status quo when the direction of the movement is contrary to what they have defined as progress on an issue. In a formal sense we can treat them in

a way that is symmetrical with the other actors in the model, such as states, that have vetoes. In using our model to interpret events, we can build on many insights of regime theory by seeing how this veto changes the outcome and how it interacts with other considerations.

We draw on and extend the setter model of legislative politics,[26] in which some actor makes proposals on a (typically) one-dimensional agenda; these are then voted on by legislators, allowing the setter considerable power to get outcomes near the setter's perceived ideal, constrained by necessity to offer something better than the status quo to each member of a majority. We alter the canonical model in the following respects: we replace legislators with veto groups; because the "rules of the game" in global environmental politics require unanimity, we replace the majority-rule assumption; we introduce two lead actors[27] competing through the use of side payments to destabilize the other's support. We build domestic politics into the model in two ways: first, lead-actors' payoffs may reflect domestic electoral (or more general political) support and, second, some domestic actors, such as the U.S. Senate, are seen as having veto power.

Our model divides the actors between lead actors that make proposals and others that have veto power over any proposal. The veto actors are not necessarily nations. They might be legislative veto groups (such as thirty-four U.S. Senators required to block ratification of a treaty in the United States) or coalition partners in European parliamentary democracies. Veto actors also include other states or groups of states that can effectively block implementation of an agreement. Prominent examples in the case of greenhouse gas agreements include China, India, and other prominent newly industrialized countries (NICs). No international agreement would be possible or effective without the agreement of these countries (Porter and Brown 1996). Veto actors might also include powerful business and domestic political lobbies, such as oil or automobile companies, labor unions, important groups of exporters, and the like. International negotiation is not like legislating in a national assembly. Without the agreement and backing (possibly bribed and coerced) of all the major players, no effective agreement is possible and deadlock on the status quo can result.

Lead actors are defined by their ability to "unfreeze" deadlock on the status quo by making side payments. At Kyoto and Buenos Aires, the

lead was taken by the European Union and the United States. We assume that lead actors are the only groups that can make proposals in our model. Of course the rules of the FCCC give all participating countries the ability to propose changes to treaty text. What our model seeks to capture is the importance of the *major players* like the European Union and the United States to forge final agreement (see also chapter 4). We argue that only they can get other players to drop their vetoes when, as is typically the case, there has been little or no progress until close to the end of the negotiations. In the "high-level segment" where much of the real business is done, the key compromises are proposed by lead actors and "lubricated" by their resources. Inevitably very few actors have the ability to forge compromises in this context, and their ability comes from their general power in the international system and their ability to bribe or to cajole others.

In formal terms, we treat the international lead actors themselves as if they have no veto power. Of course leaders like the United States *can* scupper agreements. But there are high political costs if such powerful players are seen *directly* to act in this way, especially where they have invested significant political capital in regime building already and have participated in the process leading up to the negotiations. Rather, if they want to block change, they will rely on other veto actors doing this for them. Recall that our model distinguishes the U.S. negotiators at Kyoto from the U.S. Senate. If the former Clinton administration wanted to kill the climate change process (which we believe it did not), it would have been better to leave this to the Republican majority in the Senate rather than being seen to do it directly. If necessary, lead actors that do not want change in the status quo will spend resources to get other players to veto. So our assumption that lead actors can be treated "as if" they do not have a veto is not as unrealistic as it might appear at first sight.

In our model, the actors are concerned with policy outcomes in a single-dimensional issue space. Many issues were discussed at Kyoto. In our view, though, once the G-77 had vetoed any talk of their accepting binding obligations, the real issue was how much domestic action would be required of rich, developed countries. The flexible Kyoto Mechanisms, such as emissions trading and joint implementation with developing

countries, were ways to ensure that rich developed countries—especially the U.S.-led alliance including Canada, Australia, and New Zealand—could do less domestically, yet meet a given level of binding obligation. The issue dimension of the Kyoto Mechanism effectively correlated with that of domestic action.

Veto actors' ideal points on the policy dimension will reflect a range of concerns, depending on their interests. It is worth being a little more specific about lead actors. We assume that each lead actor in the model has an ideal point determined by two separate factors. First, lead actors have a *support ideal point*—that is, the policy position that maximizes their domestic political support. Electoral outcomes are important to lead actors inasmuch as some veto actors also have the ability to influence electoral/domestic political outcomes in their countries. This is true of the "carbon lobby" in the United States, for example. Second, they have a *policy ideal point* that reflects what they would ideally like to do in policy terms—if support did not matter. Their overall ideal point reflects some balance between their support and policy ideal. For example, the former Clinton/Gore administration thought it desirable for the United States to sign up to binding commitments, because an energy-efficient economy would be more competitive in the long run, even though electoral considerations swayed it the other way.

The lead actors each have a reserve of *political capital* that can be used to influence the veto actors. We view this as the ability of political leaders to engage in pork-barrel politics through distribution of spending projects and political favors. It also represents the ability of actors to dispense political favors in other countries by approving arms or technology transfers, for instance. The available pool of side payments might include direct aid or technology transfers to other countries, tax breaks or antitrust exemptions for domestic corporate lobbies, or favorable implementation regimes for EU members.

In effect the model begins when the "high-level segment starts," bargaining up to this point being seen as largely an exchange of information about ideal points and potential vetoes. Formally the model begins with the lead actors simultaneously spending their capital.[28] Then lead actors take turns sequentially to announce policy proposals. A proposal is then either approved or rejected by the veto actors. As implied by their name,

approval by the veto actors must be unanimous for the proposal to be a viable alternative to the status quo. If no proposal is accepted, the status quo remains as the policy position. Any proposal that is a solution of the game is assumed to be enforceable in the same sense that we discussed in relation to supergames above: players do not discount future payoffs so heavily that the proposal cannot be enforced under conditional cooperation.

We assume that at least one veto actor exists that is the constraining factor in determining the policy outcome. In other words, we assume that there is always at least one veto actor absolutely closer to the status quo than each of the political actors is.[29] Then there are two possibilities. The first is that the lead actors' ideals are on opposite sides of the status quo. In this case they will spend their political capital countering each other's efforts at finding a resolution of the issue. If one lead actor favors a "greener" approach while the other prefers the status quo to any change in this direction, they will work directly to counter each other's lobbying efforts. Only one lead actor—the effective leader—will actually bring about a *net* change in a veto group's position through lobbying. The effective leader is the one with the most political capital, the other actor's efforts being entirely used up countering the stronger actor to the greatest extent possible.

In general, the veto actor farthest from the ideal of the effective leader will reap the greatest side payments. This actor has to give the most policy ground in moving toward the effective lead actor. The most conservative veto group will receive side payments until either the pool of effective political capital is exhausted or its effective ideal point is the same as that of the second most conservative veto group. Then these two groups (now jointly the most conservative veto groups) will receive side payments until the pool is exhausted or they have the same effective ideal points as the next most conservative group. This process is repeated until the pool of capital is exhausted or the effective ideal points of all groups are the same as the ideal point of the proposal actor with the most political capital.

Figure 8.4 illustrates this process for the simplest possible case. In this figure there are two agenda setters, A and B, and a single veto group, C. There is a single issue dimension, and the origin is the status quo. Agenda setter A has an ideal point of 6 and 3 units of political capital. Agenda

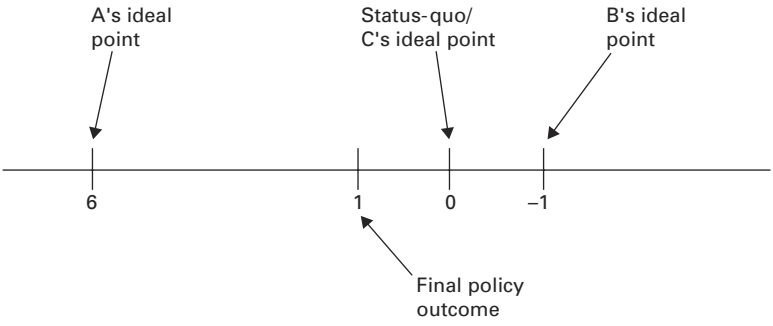

Figure 8.4
The agenda-setting model with lead actors on different sides of the status quo

setter B has an ideal point of −1 and 2 units of political capital. The veto group has an initial ideal point of 0. Agenda setter B will spend both of its units of political capital trying to prevent change, effectively canceling two of A's units of political capital. A will then spend its remaining political capital, adjusting C's ideal point to 1. A will then propose 1 as a new policy, and it will be approved, because C prefers it to the status quo once side payments are taken into account.

The second set of cases are those in which both lead actors favor change in the same direction from the status quo—for example in a "greener" direction. In this case, one of two things will happen. They may act in concert to move as many veto actors close to their ideal points as possible. Alternatively, when one lead actor desires more radical change than the other actor, they may work against each other, even though both desire change in the same direction. The lead actor desiring less radical change might counterlobby against the other lead actor to prevent a more radical realignment of the status quo than would occur if it lobbied for change. This is illustrated in figure 8.5.

In this figure, there are again two agenda setters, A and B, and a single veto group, C. There is a single issue dimension, and the origin is the status quo. Agenda setter A has an ideal point of 6 and 4 units of political capital. Agenda setter B has an ideal point of 2 and 2 units of political capital. The veto group C has an initial ideal point of 0. Agenda setter B will spend both of its units of political capital trying to prevent change, effectively canceling 2 of A's units of political capital. A will then spend

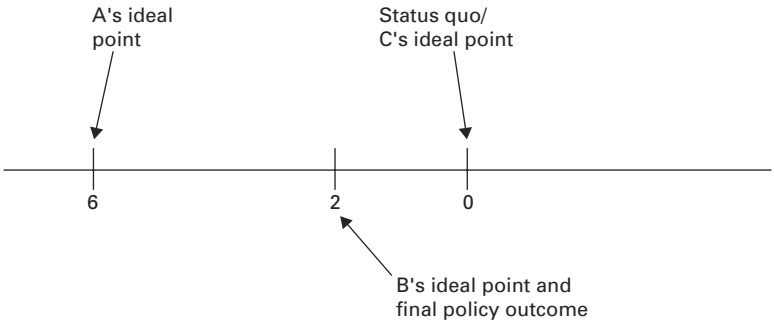

Figure 8.5
The agenda-setting model with lead actors on the same side of the status quo

its remaining political capital of 2 units, adjusting C's ideal point to 2, which is also B's ideal point. Thus B, despite having less political capital than A, will end the negotiation with its ideal point as the *new* status quo.

This analysis leads to several novel and surprising findings. First, after lobbying and side payments are made, all veto groups must be willing to accept changes to the status quo in the same direction. If any group capable of vetoing an agreement is still opposed to change after lobbying, change is obviously impossible. So if the effective leader is on the conservative side of the status quo and any veto group has its ideal on the same side, there can be no progress. Also, the side payments available for furthering progress, allowing for any competition between leaders, must be at least enough to move the effective ideal points of all veto groups of the conservative side of the status quo to the other side if progress is to be made. Second, the group most resistant to change receives the largest side payments. Since this group requires the most persuading before it will accept change, it will receive the most inducements before agreeing to change. The status quo will not be revised beyond the point that the most radical lead actor favors, so any group more radical than this will never be part of the lobbying and negotiation process. This is why we do not see politicians dispensing political and economic favors and incentives to groups that are on the same side of the status quo as they are but in more extreme positions. In particular, it is why radical environmental groups always appear to be on the "outside" in climate change negotia-

tions. Side payments made to, and lobbying of, these groups would do nothing to further the chances of an agreement being ratified.

It is difficult to give a definitive interpretation of the climate change process using this model, partly because things are far from being finalized and partly because not all the moves made are easy to observe. As we have already said, we think that the ideal point of the former Clinton administration and the ideal point of the European Union were on the progress side of the status quo. The Clinton administration had hoped to buy out the veto that certain sections of U.S. big business can mount (through their influence on the Senate) partly by federal funding of energy efficiency but also through emissions trading, which appeals to U.S. financial markets and to some energy-intensive industries. Presumably the administration calculated that it has done enough to ensure that the "carbon lobby" will not call all the shots, but the delay over going to Congress suggested that Clinton/Gore were not sure about this. The European Union had to buy out the potential veto of Spain, Portugal, Greece, and Ireland by an EU-wide emission bubble and through steering flows of funds within the European Union in ways that favored these countries' interests. There are doubts about whether the oil-producing states that demanded compensation for their potential loss of oil revenues at COP-4 in Buenos Aires really have enough independence from U.S. foreign policy to veto any change if they do not get their way. Also, many nations and NGOs were incensed by these countries' claims. Nevertheless, if their claims remain on the table, any flow of compensation they might get can certainly be seen as a side payment. The G-77 countries and former Eastern bloc countries varied in their positions on what we see as the crucial issue dimension of how much domestic action would take place in rich, developed countries. Despite the temporary sidelining of the issue of whether any G-77 countries should make binding commitments, the suspicion must be that some of them were lukewarm about *developed* countries making binding commitments, on the grounds that this will inevitably push forward the point in time at which they will have to act. The Clean Development Mechanism (CDM) was not uniformly welcomed by the G-77 either. Some claimed that it was a way for rich countries to evade their historical responsibilities and that the easy ways of saving emissions in the South would be bought at low cost by the North,

leaving only high-cost options to be taken up at a later date through domestic action by developing countries. Nevertheless, the potential flow of funds under the CDM is not unwelcome in some countries. With some considerable ambiguities, the flow of funds under the CDM can be seen as side payments to get lukewarm developing countries on-side.

Our interpretation is that the EU position was more progressive than that of the United States, partly because the initial bargaining positions of the two sides at Kyoto were 15 percent apart, with the United States proposing binding commitments to stabilize emissions at 1990 levels in rich countries and the European Union proposing 15 percent cuts. Our model leads us to expect that, with lead actors positioned on the same side as the status quo, there should have been competition, with the European Union trying to ensure an outcome further from the status quo and the United States resisting this, if necessary by counterlobbying. This is the point at which it is particularly difficult to bring evidence to bear on our model. However, it is not implausible to claim that the United States has greater ability to make side payments and could easily prevent EU attempts to move things considerably further than its preferred position. Recognizing that the European Union's and United States's initial bids of 0 and 15 percent were just initial bids exaggerated for tactical effect, it is not difficult to justify the view that the deal cut is closer to what the United States actually wanted than what the European Union wanted.

The conventional interpretation of the shift in the former Clinton/Gore administration's position before Kyoto is that domestic opinion hardened against action, and economic policy advisors in the White House lobbied hard against Wirth's proposals. We can easily accommodate this insight in our model: the United States's ideal point is a function of the position that maximizes domestic support and what the administration ideally wanted in policy terms, so our model predicts a hardening of the U.S. position when domestic attitudes harden and policy advice hardens. However, our model suggests that this explanation, based on a static rather than a strategic view of the relation between interests and bargaining positions, could be incomplete. If the United States took an even tougher position than expected, as some observers believe, this would be in line with an attempt to countervail EU pressure for a more proactive agreement than it ideally wanted.

5 Conclusions

In this chapter we develop four separate theoretical models of international negotiation applicable to climate change. Each represents a different viewpoint on international negotiations and highlights a different set of difficulties. However, all the models do suggest that major difficulties must be overcome in solving the global climate change problem:

- The supergame model highlights short-termness and the pursuit of narrowly defined national interest as key problems.
- The bargaining model highlights commitments to doing nothing and the difficulty of resolving distributional issues as key problems.
- Concerns about relative gains suggest that climate change will be particularly difficult to resolve compared to other issues of importance to the international community.
- The agenda-setting model emphasizes the difficulty of moving far from the status quo in the face of the veto power of various actors and the importance of relatively scarce side payments to achieving progress.

One crucial lesson learned by game theorists over the last forty years is the importance of understanding how institutional structure influences the outcomes of strategic interactions (e.g., North 1990). We now know that apparently insignificant features of institutions may matter enormously (e.g., Marshall and Weingast 1988; Shepsle, Krehbiel, and Weingast 1987; Shepsle and Weingast 1994). This indicates that we need to develop models for the specific context of climate change—as we have started to do with the agenda-setting model. This line of research also indicates the importance of developing theories of how actors interact with their institutional environment rather than just carrying out descriptive case studies.

One of the major problems with formal modeling in this area is that no *systematic* attempt has been made to use relevant evidence to test models. This is a particular problem when it comes to theoretical insights into how to design institutions to overcome collective action problems (e.g., Sandler 1997, chap. 5). Without systematic empirical evidence it is difficult to determine what sorts of agreements have been successful in achieving progress. There are now regimes of cooperation in relation to a large

number of global environmental problems, some more institutionalized than others. It is vital that formal models are tested by seeing whether they can explain variation across these cases in the progress that has been achieved.

Formal methods are closely connected to more complex models that are simulated on a computer rather than analyzed with the help of algebra and other forms of mathematics. Computerized game theoretic representation has been common since the pioneering work of Axelrod (1984). That game theoretic approaches can be embedded in more elaborate descriptions of an underlying reality (such as cost models of climate change or greenhouse gas reduction policies) will be shown in the next chapter, which also features a more general presentation of simulation models.

Notes

1. As Sandler points out, a range of private goods and semipublic goods may also be implicated.

2. On the security dimension of benefits, see Homer-Dixon 1991 and Peterson and Ward 1995.

3. Cline (1992) recognizes that technical change induced by carbon taxes might reduce these figures. An OECD survey suggests reductions in annual growth rates of the gross domestic product of between 0 and 0.3 percent from a baseline figure of around 2 percent (Hoeller, Dean, and Nicholaisen 1990, 17). Nordhaus's survey suggests that the 60 percent cuts in CO_2 emissions that some scientists suggest eventually will be necessary to stabilize global temperatures could cost around $300 billion at 1989 prices (Nordhaus 1991).

4. Technically we are assuming that states are playing Nash equilibrium strategies. A strategy combination is a Nash equilibrium if and only if no player is willing to *unilaterally* deviate from the strategy he or she is required to play in equilibrium. See Fudenberg and Tirole 1991 and Morrow 1994 for a more complete treatment of this and other game theoretic topics.

5. Pareto-efficient outcomes are such that there is no alternative that is better for one side without making the other side worse off.

6. This is the essence of the assumption that international relations are *anarchic,* which is made by many international relations scholars using formal modeling—for example, Bueno de Mesquita and Lalman (1992) and Keohane (1984). It is also central to realism and neorealism (see Waltz 1979).

7. This discounting can be thought of in two different ways. First, it can represent the lesser value players place on future payoffs. This effect is similar to assuming that there is inflation and that the value of money in the future will be discounted

by the rate of inflation. Alternatively, it can represent the chance of not having the opportunity to play the game again, so players will not receive any future payoffs.

8. Thus, for example, if both players cooperated in each round, row's supergame payoff is:

$$\lim_{t\to\infty} \sum_{t=1}^{t=t^*} (\partial y + d^2 y + d^3 y + \ldots d^{t^*} y) = \frac{\partial y}{1 - \partial}$$

9. Suppose row's best reply to column's strategy of S starts with C. Then column plays C in the second round. But if row's best reply to this was C in the first round, it is also C in the second round: because the game is infinite, the decisions row faces in the first and second rounds are the same. The argument repeats, so that if row starts by playing C, it is rational always to do so, which is equivalent to playing S. On the other hand, if row's best reply starts with NC, column plays NC in the second and in all subsequent rounds. Then row must rationally reply with NC in all subsequent rounds. This establishes that the stated condition for equilibrium is sufficient. It is necessary because, by definition of an equilibrium, (S, S) must be stable against one side switching to always playing NC.

10. See Axelrod (1984, 226–254). Sandler (1997, chap. 4) uses a similar framework to that discussed here to analyze a range of differences between these two cases and between other problems of global collective action.

11. These arguments generalize to other games (e.g., chicken, stag hunt) played in a repeated supergame context; see Ward 1996.

12. Nash (1953) considered a game in which the two sides were symmetric with respect to their "bargaining powers," but his model was subsequently generalized to allow for differences in bargaining power; see Binmore and Dasgupta 1987.

13. This assumption is not necessarily the most satisfactory from a theoretical point of view, though. Busch and Wen (1995) consider a game where players play a Prisoners' Dilemma in every round while bargaining over a "larger" set of issues, with payoffs in the larger game only being obtainable after an offer is accepted by one side and disagreement payoffs being set in the smaller game. Considering the whole process, equilibria can be inefficient and settlement can be delayed. This does not occur in the generalized Nash bargaining model discussed in the text, but seems empirically highly plausible in relation to climate change. Moreover, the way climate is now interlinked with trade and development (see chapter 13), and the way progress in the "bigger" game of sustainable development has become contingent on progress over climate, might suggest further investigation of this sort of model would be helpful.

14. Of course many other factors were at work here, notably the U.S. arguments against the EU "bubble" under which some EU countries can increase their emissions while others have to decrease their greenhouse gas emissions.

15. On the other hand, poorer countries may more heavily discount the future, because they are focused on issues of poverty and economic growth in the short term.

16. The literature on sequential bargaining with one side having incomplete information is surveyed in Fudenberg and Tirole 1991, 424–427. One problem is that there are multiple equilibria. Also, in the empirical context under discussion, both sides are likely to have incomplete information about each other.

17. Writings in this tradition include, among others, Keohane 1984, 1993; Axelrod and Keohane 1985; Stein 1982; List and Rittberger 1991; Oye 1986; Snidal 1985a, 1986; Young 1989.

18. This can be found most prominently in Waltz 1979, esp. 105.

19. From the neorealist perspective, see Grieco 1988, 1990, 1993. On the neoliberal side, most notably, see Snidal 1991a, 1991b. The use of supergames has been criticized by Powell 1991. For a discussion of the debate, see also Grieco et al. 1993. For a different view on how to model relative gains issues, see Powell 1991 and Morrow 1997.

20. Given the case that states care about relative and absolute gains, cooperation is only impeded (Grundig 1995). If states are, however, relative gains maximizers, it can be shown that cooperation is impossible (Grundig 1995). Snidal (1991a) comes to a very different conclusion for the case of goods where exclusion can be practiced.

21. Authors like List and Rittberger fail to realize this when they draw conclusions from Snidal's model for environmental cooperation. See List and Rittberger 1991, 94; Snidal himself does not consider the impact of the nature of the good, either.

22. Indeed, for authors such as Keohane (1984), these enforcement issues are the primary problem to be overcome in reaching Pareto-optimal international arrangements.

23. For notable exceptions, see Bueno de Mesquita, Newman, and Rabushka 1996 and Morgan 1994.

24. For a much more formal treatment of some related themes, see Dupont 1994.

25. This is an approach advocated by many neoliberal authors, especially Keohane.

26. For a survey of the relevant literature, see Rosenthal 1990; for the setter model, see, for example, Krehbiel 1988.

27. More than two agenda setters can easily be introduced into the model. However, we choose not to do so for the sake of analytic clarity.

28. The order of actions in this model is not critical. All players are in fact playing dominant-strategy equilibrium strategies—that is, outcomes inferior for any combination of outcomes are irrelevant for choices and the resulting equilibrium. These strategies are robust, and our basic conclusions are robust to small variations in the structure of the game.

29. This is done because we believe that at least one veto actor with a vested interest in the status quo always exists.

This page intentionally left blank

9

Simulation Models, Global Environmental Change, and Policy

Urs Luterbacher

The discussions and negotiations before and after the Kyoto Protocol of the Framework Convention on Climate Change (FCCC) have shown that considerable and to some extent irreconcilable differences have existed and still exist among several important countries or regional groupings. The fact is that the Protocol has not yet been ratified by a sufficient number of countries. A major stumbling block on the road is confirmation of the ratification by the U.S. Senate. There is general agreement that such confirmation will greatly depend on the attitudes of some of the major developing countries such as India and especially China. The United States will probably not ratify the Protocol unless these countries express a willingness to accept some form of commitment to climate policies. The analytic frameworks we have presented so far suggest that such opposition to an agreement is not accidental and usually rests on the formulation of too narrow a win set in specific countries[1] by the executive or by international bodies. In other words, powerful domestic interests exist that do not see any gain for themselves in the ratification of an agreement and thus use all their influence to derail the confirmation process.

1 Introduction: Resource Use, Climate Change, and Policy

As this brief discussion shows, the external environment poses complex challenges to policy making. Pressure comes from different arenas, and its form and stringency will depend as much on existing rules as on external actors' use of these rules. Actors, both domestic and international, can thus be considered as strategic players under specific decision-making rules and procedures. Within this perspective, external pressure can be

envisioned as a process of eliminating domestic options that fall outside the range of feasible outcomes at the international level. In other words, it is important to determine a kind of external "win set"[2]—that is, a set of domestic options that can accommodate external developments and thus be viable.

If external pressure reduces the range of viable options domestic actors can choose, it still leaves open a significant range of choices. Accordingly, the analysis should focus on bargaining at the national level inside the externally restricted space. Major actors have to be identified and their interests determined. Assessing interests is difficult; however, simulation methods allow one to do it in a novel and rigorous way.

Based on the premise that key determinants of actors' preferences are the costs associated with various policy changes, one can follow an *aggregate quantitative path*. This way of proceeding is justified because a macroapproach should reveal the costs but also the benefits of different types of policies for a country as a whole.

Simulation approaches will yield a measure of the utility that domestic and international actors assign to various options. On that basis, simulation analysis of decision making is similar to the analysis of spatial voting (see Enelow and Hinich 1990; Hinich and Munger 1997; and chapter 8 in this volume) to determine the set of policy options that can be accepted at the domestic level. The size and location of this set will reflect the interests of actors and their power, as well as the agenda-setting effect of various institutional structures (for a use of spatial preference analysis in the framework of macrosimulation model, see Luterbacher, Schellnhuber, and Wiegandt 1998; Nordhaus and Yang 1996). Simulation approaches of this kind usually base their results on the analysis of decision making within the framework of resource use. In particular, they try to tie together the evolution of a resource base influenced by various partially exogenous processes (such as climate change) and the resulting preference analysis and decision-making scenarios.

Simulation models represent one of the approaches being used to capture the interaction between natural processes such as climate change and human activities. In this chapter, we describe some of the essential features of this type of simulation, briefly review some characteristic formulations, and discuss their strengths and weaknesses. As we will point out,

there are numerous simulation approaches that offer a great variety of conceptions. Since we are focusing here on the international aspects of global climate change we will, after a brief discussion of various simulation concepts, mostly discuss models that include policy processes explicitly within their framework. In other words, our purpose here is not to thoroughly review "classical" descriptive simulation models of climate or climate-induced ecosystem and socioeconomic changes or classical costs of climate change or climate change mitigation models.[3] We focus instead on models that may employ some of these features to explain the evolution of either policy making or the negotiation process surrounding the climate change agreements.

2 Simulation Models of Social Systems and Global Climate Change

Climate itself is the outcome of highly complex and nonlinear relations linking the atmosphere, oceans, sea and land ice, snow, land and its features, and hydrology. To understand the system as a whole and to predict its evolution, it is necessary to account for feedback and interaction among its components. The complexities of the system and the uncertainties about many of the key processes and interactions preclude use of empirical or statistical models. Climate must therefore be studied with numerical models based on physical principles.

Social systems can also be defined in terms of relations and feedback among economic, political, sociocultural, and demographic processes. To capture the most important features of social systems, social scientists have constructed various types of models. The ones considered here are *quantitative simulation models*—that is, those that use mathematical formulations to express key relationships within the system. Theories about the function of physical and social systems are the basis on which these models are developed. They are elaborated in quantitative terms so that it is possible to test hypotheses about the importance of changes in key variables for the evolution of other aspects of the system and to explore different trajectories they may take in the future. Such an approach can provide important insights for decision making about global environmental change because it permits an analysis of impacts of physical change for social processes and vice versa. Modeling policy alternatives also allows

for the assessment of consequences of political and economic measures for the physical system and for society. Therefore, in contrast to simple empirical or statistical testing procedures such as regression or factor analysis, simulation has the advantage of providing the decision maker with a tool that can be adapted to answer specific questions about the effectiveness or consequences of policy choices. Simulations are a set of instruments that can be used many times. They can and should be improved and modified according to new insights or new questions. The fact that simulation models can be manipulated in light of different research questions and assumptions is one of their strengths, along with the computational accuracy and true representation of the referent world that they offer.

These features are particularly important when looking at the interactions between social systems and global environmental change. Many predictions concerning global environmental change, such as climate change, cannot be based entirely on extrapolation from empirical observations. Modeling plays an important role in the prediction process itself, which is highly contingent on assumptions about some physical aspects but especially about social trends. Such social trends are often considered exogenously within the natural science model of global environmental change but are best analyzed in terms of their feedback structures with natural processes.

For instance, simulation of socioeconomic processes can show the sequence that occurs in figure 9.1. In this conception, global environmental

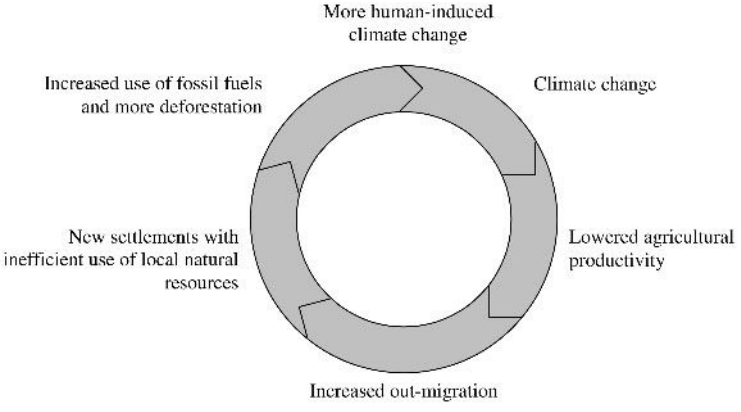

Figure 9.1

change may generate unstable socioeconomic amplifying feedback processes, which in turn produce instabilities in the "natural" components of environmental processes.

To produce such results, simulation models of social processes interacting with global environmental change usually have the following characteristics:

- A *theoretically well-articulated representation* of a "real" or at least paradigmatic[4] social system. This representation might be based on an idealized view of some aspects of that reality, which assumes, for example, that all markets are in equilibrium or population rates are stable.
- The theoretically well-articulated representation is embedded in a *formal language, preferably a well-defined mathematical structure*. This permits computational analyses of the simulation models through calculation of logical consequences of the model formulation using appropriate computer programs.
- Particular assumptions about relationships among variables are expressed through *parameters* that measure their size and direction. These computations, also referred to as *simulation output,* can be displayed in the form of graphs or other visual representations to allow a *comparison of simulation output* under several types of parameter configurations, and a possible *comparison of simulation output with different kinds of empirical observations*.

In this latter case, the procedures permitting the comparisons are usually made explicit. They are generally statistical analyses based on comparisons between observed and computed data. Such statistical analysis is often in the form of an optimization process by which the parameters of the simulation model are slowly adjusted to minimize a discrepancy between observed and calculated values. Such optimization processes can also be used to implement the consequences of a scenario. They adjust the parameters of a simulation model to an outcome that appears desirable either from the point of view of the experimenter or from the point of view of various actors or agents represented in the model. This feature is particularly important for global change analysis. It allows for the evaluation of the extent to which behavior must change in order to make a certain policy effective. It also links simulation models explicitly with

decision-making models such as the ones represented within game theory. This combined methodology facilitates the analysis of strategic implications (in the sense of the rational execution of planned political actions) of various policies.

The basic characteristics of simulation models illustrate their advantages for the analysis of complex situations in which policy choices will influence the evolution of the system. Simulations clarify feedback relations and allow for a comparison of impacts of different policy options. A note of caution about simulation is nevertheless warranted. Simulation output represents only a *particular solution* of the formal model on which it is based. Therefore, its results do not have general validity in terms of its formal consistency. Only a pure formal analysis leading to the establishment of theorems provides analytically consistent results. Nevertheless, simulation is useful in visualizing consequences of formal models, especially if the complexity it describes renders purely analytic representations difficult or impossible.

2.1 Types of Simulation Models

Many types of simulation models have been developed. They can be distinguished by their different conceptualizations of time, level of analysis, or degree of empirical representation. Each has its strengths and weaknesses that will be discussed in the context of descriptions of particular formulations.

Usually researchers who study the relations between global environmental change and societies insist on looking at these interactions through time. Such approaches can be *truly dynamic* in the sense that the models generate their own time evolution or take a *comparative static perspective* where several runs of a model computed for different moments are put together and compared. The models that generate their own time evolution can rely on events or on an explicit, continuous, or discrete time reference. Event-driven dynamic simulation models change their evolution when a particular event, such as a decision, takes place within them. A decision tree is a good example of such types of models. Models that rely on either a discrete or a continuous time referent change in step with the evolution of that referent. A model may thus evolve over time because budgetary decisions are taken once a year by a government,

which would make it a discrete-time simulation. If a model changes at all moments or at random moments sufficiently close to each other, continuous time is then usually the preferred mode of representation. Demographic simulation models are expressed in continuous time because the discrete events that characterize them—births, deaths, or migrations—occur randomly but close to each other through time.

Models can also be distinguished by the level of aggregation of phenomena they describe. Families of models exist that emphasize *aggregate behavior;* others describe the *microlevel* and thus will focus on the individual or on a sector of society. They can also be either essentially *theoretical* or *empirically based, dynamic* or *equilibrium formulations.* Models in all these categories have been constructed to deal with social aspects of environmental change, and it is useful to examine various types to assess their effectiveness. At present, few models fully endogenize both physical and social processes. Ultimately, this will be essential for exploring the feedback between climate and society. Indeed, policy choices must be made with knowledge about the impacts on both the physical environment and on social organization and behavior of measures devised to adapt to or mitigate climate changes. A review of existing formulations will nevertheless provide insights about particularly fruitful directions for future research.

2.2 Simulation Models: Methodological and Conceptual Aspects

Simulation models differ from each other both conceptually and methodologically. We have already mentioned the conceptual difference between descriptive and cost models on the one hand and the policy-interest-based models that help us understand the dynamics of a negotiation process on the other hand. We will first briefly review the methodological differences and then examine the policy models in greater depth.

Methodologically, simulation models can be envisaged either at the microlevel or at the macrolevel. Microlevel simulations present their object of research from the "bottom up," looking at particular individuals, groups, and institutions such as firms or sectors of an industry. For environmental questions, such approaches have tended to investigate how individuals influence each other on environmental matters (Gutscher and Mosler 1995) or how particular technologies work themselves out in

terms of their impact on energy consumption (and thus emissions) through land use and specific industrial scenarios (Alcamo 1994).

As interesting as these microapproaches are, they are usually limited to sectoral representations because a full description of a social system at the microlevel would lead to vastly complex formulations. Therefore, macrolevel simulations seem more adequate to examine problems related to global environmental change.

Macrolevel simulations focus on particular aggregates such as various types of demand and supply of goods (in particular, natural resources or fuels) or productive capacities, government expenditures, or averages, such as public opinion data. Macrolevel models are formulated either as dynamic (sometimes called econometric) or general equilibrium approaches. These two types of modeling are quite different in their scope and methodologies.

General equilibrium models contain an explicit representation of economic agents at the aggregate level and of their linkages. Price mechanisms lead to clearing equilibria in all markets. These equilibria are conceived a priori as perfect and complete. Models are designed in such a way that they are realized at a given moment. This conceptualization ignores the adjustment path to equilibrium and ignores suboptimalities, such as imperfect labor or capital markets. General equilibrium models lead thus to comparative-static type evaluations. Time evolutions are in principle represented via crucial parameter changes (such as taxation rates, for example). The new general equilibria are then recalculated and lead to a new model solution, which is then compared with the old one. Such models have the advantage of always leading to precise analytic solutions since these are, by the logic of general equilibrium modeling, defined at each relevant moment in time. Their strength lies in their ability to be simulated far into the future because they will not collapse under the influence of inherent instabilities.

It is therefore not surprising that most macromodels dealing with global environmental change have been formulated as general equilibrium models. These models include the following: the International Energy Agency (IEA) model; the MR model (Manne and Richels 1992); the Edmonds and Reilly model or ERM (Edmonds and Reilly 1983); the OECD General Equilibrium Environmental Model (GREEN) (OECD

1993); the Whalley and Wigle model (1991); and the Nordhaus DICE (Nordhaus 1994) and RICE (Nordhaus and Yang 1996) models. Most of these focus on energy production and consumption and on the production of greenhouse gases (usually exclusively CO_2) to assess the impact of the economy on the Earth's climate system as well as the cost to the economy or the trade system of various abatement and mitigation policies.

Dynamic formulations are primarily designed to reproduce the underlying "reality" of a social system and its time evolution. They do not say—in contrast to general equilibrium models, which have a prescriptive dimension in their representations—what this reality ought to look like given certain equilibrium constraints introduced extraneously. Once this "reality" is reproduced correctly, the researcher can raise general questions of the choice of strategies to reach certain goals. A dynamic perspective is not incompatible with optimization questions addressed by general equilibrium models.

To date, however, most dynamic models have not focused on optimization questions and have concentrated on more or less sophisticated descriptions of the evolving reality. At best, different paths of adjustment are evaluated in terms of different possible scenarios, but not in terms of finding a best possible policy either from a national or a world perspective. Moreover, due to computational difficulties, these types of models have incorporated either short time horizons or relatively crude formulations that minimize feedback loops within the social structure. This is the case, for example, of the International Futures (IF) model devised by Barry Hughes (1993) or the successive IMAGE models developed at the National Institute of Public Health and Environmental Protection (RIVM) of the Netherlands (Alcamo 1994). The study of various impacts of global change, such as the studies undertaken by Rosenzweig et al. (1993) on the effects of global climate change on agriculture, use similar combinations of dynamic modeling extrapolated into the future under various scenario assumptions.

The accuracy and usefulness of dynamic modeling can be increased by incorporating optimization procedures into the model structure, thereby improving the closeness of fit between model results and empirical observations. This in turn enhances the reliability of projections into the future

and comparisons of impacts of different policy options. The combination of dynamic modeling with optimization procedures that adopt either global optimum calculations or best-reply strategies of decision makers with respect to each other is very useful. A first application of such optimization procedures uses statistical analysis to calibrate a simulation model to data series (usually time series, but spatial calibration can also be envisaged). A second application consists precisely in calculating best-reply strategies through the maximization of utility functions that are attributed to the various actors. Only models of this latter type, because of their emphasis on the policy and negotiation process, will be examined in more detail here.

2.3 Policy Models

Policy models provide useful tools to assess various countries' positions in a negotiation process as well as their evolution under different proposals. A systematic use of simulation techniques can thus greatly benefit the student and the negotiator of climate change and other environmental agreements.

Game theory can usefully provide the framework within which the decision-making process is simulated. The "game" amounts, then, to two or several actors maximizing their particular value or utility function with the strategic consequences that derive from this optimizing behavior. These utility functions can be defined as resulting from some economic-benefit calculations, such as maximizing consumption or income or some other more strategic variable. Two broad categories of game-theoretic approaches provide the basis for the particular decision models integrated into the simulation.

Differential game approaches investigate attempts by one or several decision makers to follow what they consider to be an optimal trajectory through time but subjected to certain constraints. Optimal trajectories can be described in terms of several objective functions that are to be reached during a given period of interaction between decision makers (here, simulation period). Calculations of objective functions can proceed along the lines outlined above for the statistical estimation of parameters. The dynamic equations of the simulation model act as constraints on the object of optimization. An objective function can often be expressed in

terms of revenue maximization over time (global consumption minus costs due to environmental degradation and to mitigation policies, for example). Several scenarios can be envisaged. Decision makers can try to reach their optimal trajectories separately or cooperatively. Different game theoretical equilibria will emerge accordingly. An analysis of the application of such differential game techniques shows that often but not always, as shown by Nordhaus and Yang (1996), separate approaches lead either to unequal or to suboptimal results for the individual countries or regions represented by the decision makers.

Backward-induction techniques can also be used within the context of dynamic simulation procedures to explore, for instance, effects of the implementation of particular mitigation policies. Take, as an example, two countries A and B who have the choice of implementing either separately or jointly a tax to limit emissions of a given pollutant. The simulation model allows for the calculation of costs and benefits of taxation policies. If, for each country individually, the cost of taxation exceeds the benefits of pollution reduction, a tax-alone policy might not succeed and a joint taxation policy for the two countries might be necessary. However, there is, in this case, an incentive not to cooperate because an individual country could be better off letting the other one deal alone with pollution abatement. Backward-induction techniques will indicate whether the countries do or do not have an advantage in implementing taxation policies jointly or in letting a country tax by itself. Moreover, a simulation approach can also determine if a country has sufficient retaliatory means at its disposal to induce the other country to adopt pollution-abating taxation policies. These notions are illustrated in figure 9.2.

Figure 9.2 shows how country A could force country B to join a taxation policy rather than pollute, because of retaliation by A toward B. If A figures out that by threatening strong retaliation—whose effects can be calculated with the simulation model at the end of this decision sequence—B would have an incentive to tax jointly with A rather than to continue polluting. A, who by assumption prefers taxation, will initiate a taxation policy. Such a decision will appear to be best because calculations of policy choices carried out from the end of the above decision tree (hence *backward induction*) will determine the optimal policy sequence from the beginning for an actor.

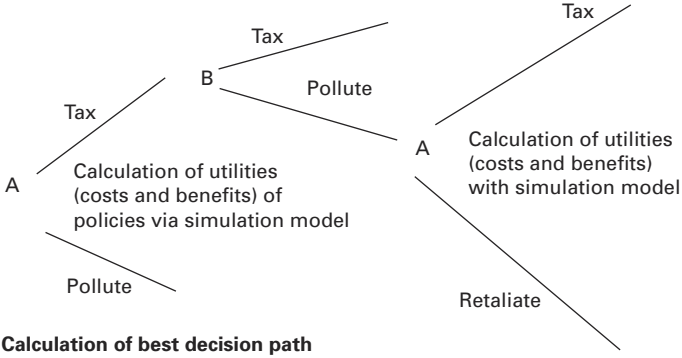

Figure 9.2
Example of backward-induction calculation with a simulation model for climate change policies

The Nordhaus DICE and especially RICE models constitute good examples of such a focus on policy processes because they try to assess the economic costs of climate change in interaction with the production part of the economy. Thus, abatement and mitigation policies are evaluated in terms of their impact on reducing the economic costs of climate change. In other words, Nordhaus introduces a cost-benefit analysis that leads to what could be called an optimal pollution level in terms of all greenhouse gases (not just CO_2). Moreover, the Nordhaus-Yang RICE model represents a *regionalized* version of the DICE model with the same general approach. The regionalization perspective leads Nordhaus and Yang (1996) to an interesting comparison of more local effects of abatement policies. They can then assess possible divergences in interests between regions that are hit differentially by abatement policies. These differences in interests between the various regions and relevant actors in the climate change debate are calculated by using backward-induction techniques specially adapted to simulation models. We will refer back to these techniques later. Hence the possible impact of particular dispositions of global environmental accords, such as the FCCC, can be evaluated, as can the likelihood of compliance and noncompliance. The dynamic feedback characteristics of the Nordhaus-Yang perspective make it very useful for the evaluation of international policies. With respect to the negotiation

process connected to the evolution of the FCCC and the Kyoto Protocol, the Nordhaus-Yang perspective can thus shed some light on the evolution of national or regional interests with respect to the climate change policy debate. If a particular actor gains little from the realization of a worldwide climate policy such as the one included in the Kyoto Protocol, problems in the ratification of the agreement have to be expected. As we will point out again later, the Nordhaus-Yang analysis stresses that the United States would obtain a smaller gain with respect to its long-term economic interests (even if the effects of climate change are included in the model) by cooperating with the international community in this matter than by implementing its own noncooperative policies. Their simulation predicts in some way the expected difficulties in the ratification process. These results are obtained, however, under certain assumptions about the dynamics of climate change for the United States and about the use of particular instruments to implement mitigation policies such as carbon taxes. Other instruments, such as tradable permits, technology transfers, or an emphasis on carbon sinks, might change the incentive structure inside the United States and alter the politics of ratification. The win set for the Kyoto Protocol could thus be completely changed and could lead to a change in the attitude of the U.S. Senate. The importance of the simulation technique lies in the fact that such elements can be analyzed precisely through changes in the relevant variables or parameters included in the model.

The results obtained by simulation models demonstrate the usefulness of the methodology. Based on their data and initial parameter values—which include cost estimates of reducing CO_2 emissions, climate damage estimates for each major climate actor, and emissions from land use and industrial production—Nordhaus and Yang (1996) conclude that the win set for the United States in the climate negotiation is not adequate and that it is better off not joining the rest of the world in a cooperative policy to solve the climate problem. This can explain why the United States sought the inclusion of more greenhouse target gases and more instruments such as tradable permits, joint implementation, and the consideration of carbon sinks in the drafting of the Kyoto Protocol. However, by using the same model with different initial conditions and parameters,[5] Eyckmans and Tulkens (1999) come to a totally different conclusion:

China's win set is unsatisfactory, given that country's development goals and growth targets. China would thus be the nation that does not benefit from a cooperative solution and has the biggest incentive to free-ride. If we assume that both analyses could be right, we can conclude that simulation techniques have the potential to show why and under which conditions inadequate win sets for particular nations or groups of nations might emerge. Moreover, the precise values of the variables involved can be pinpointed and eventual corrective measures analyzed. Simulation techniques can thus show why China is so reluctant to take on any obligations in terms of climate change policies. Further calculations and elaborations of the model should allow researchers and possibly also policy makers to determine the conditions under which developing nations such as India and China could join the Kyoto process more actively and take on some commitments similar to the ones taken by Annex I countries. In a totally different context, Luterbacher, Schellnhuber, and Wiegandt (1998) show that cooperation on the use of water resources in the Middle East benefits all parties unless an extreme asymmetry between the countries exists, such as a difference in their position in a river basin. The upstream nation in particular—if it also enjoys demographic and economic predominance—has a big advantage in terms of bargaining power and can thus mostly impose its own views to the detriment of the others. More recently, Underdal (1998a) has started to build a massive simulation model of the climate change negotiations. His plan is to complete elaborate cost models similar to the ones presented by Nordhaus and Yang (1996) and Eyckmans and Tulkens (1999), with advanced representations of the interests of the major state actors involved, an explicit enumeration of the policy options available, and, finally, an evaluation of the feasible outcomes at the end of a negotiation process. It will be interesting to compare Underdal's results with the ones by Nordhaus and Yang (1996) and Eyckmans and Tulkens (1999).

After an extensive discussion of various theoretical questions and approaches, it is now time to return to our central concerns. Before we can proceed further, the legal regime surrounding both the FCCC and the Kyoto Protocol has to be more precisely specified. Issues that have been resolved and those still open also need to be mentioned. The next chapter will attempt to enumerate the legal characteristics of the present climate

change regime in terms both of obligations and of the ways various parties may meet them.

Notes

1. This was emphasized in the chapters 4 and 9 in this volume.
2. The original formulation of this concept in the context of the interface between domestic and international politics is presented in Putnam 1988.
3. For a good review of these, see Mabey et al. 1997.
4. By *paradigmatic* we mean an artificial but exemplary and generic representation of a social system, such as a market or a partially controlled economy or an authoritarian or democratic system, without reference to a precise empirical case.
5. Their estimate of climate damage and costs of CO_2 reductions are different.

This page intentionally left blank

IV

Regime Design: Implementation, Compliance, and Effectiveness

This page intentionally left blank

10

International Law and the Design of a Climate Change Regime

Daniel Bodansky

The climate change regime has employed the framework convention/protocol model used previously to address such problems as acid rain in Europe, depletion of the stratospheric ozone layer, and the protection of regional seas. As its title indicates, the Framework Convention on Climate Change (FCCC) establishes the basic framework for the climate change regime.[1] Despite early hopes that it would include a clear commitment to stabilize or even reduce greenhouse gas emissions, it contains only a convoluted and ambiguous aim by industrialized countries to return to their 1990 emissions levels by the end of the decade. Instead, the FCCC's main achievement is to establish a long-term process for addressing the climate change issue, including:

- An overall objective of stabilizing atmospheric concentrations of greenhouse gases at a safe level
- General principles to guide future work, including principles of equity, precaution, and cost-effectiveness
- A process intended to improve our information base, to encourage national planning and response measures, and to produce more substantive standards should scientific evidence continue to mount that human activities may change the Earth's climate
- Institutions to oversee the implementation and development of the Convention

The 1997 Kyoto Protocol, in contrast, sets forth much more specific obligations and mechanisms to control the greenhouse gas emissions of so-called developed countries, listed in Annex I of the FCCC.[2] Its provisions include

• Specific emissions targets for each developed country party, for the 2008–2012 "commitment period," which have the aim of reducing overall developed country emissions by 5.2 percent from 1990 levels

• A variety of mechanisms to allow states to achieve these targets in a flexible manner, including "bubbles," emissions trading, and a Clean Development Mechanism (CDM)

The Protocol was opened for signature on March 16, 1998, and will enter into force after it has been ratified by fifty-five states, representing 55 percent of the total 1990 carbon dioxide emissions of developed countries. Although this does not allow any one country to block the Protocol's entry into force, in practice, entry into force will be extremely unlikely without ratification by the United States.

1 Hard and Soft Approaches to International Law

Legal scholarship on the climate change problem reflects two contrasting approaches to international law—what could be termed a "hard" and a "soft" approach. The former approach views international law essentially in domestic criminal-law terms, as a command backed by the threat of sanctions, while the latter views international law in facilitative terms.

The "hard" approach to international law reflects the following core propositions:

• The main purpose of international law is to impose specific obligations on states.

• These obligations should be enforceable through compulsory, binding dispute resolution.

• Violators should be subject to sanctions.

Subscribers to this approach—primarily environmental NGOs—believe that the object of a climate change treaty should be to impose rules with "teeth." For example, the former prime minister of New Zealand, Geoffrey Palmer, has argued that the climate change problem necessitates the development of new types of international institutions:

> First, there must be a legislative process which is capable of making binding rules which states must follow, even when they do not agree. Second, there must

be some means of having compulsory adjudication of disputes, if not to the International Court of Justice, then perhaps to a special tribunal. . . . Finally, there needs to be . . . an institutional authority capable of monitoring what the nation states are doing, blowing the whistle on them when necessary, and acting as an effective coordinator of what action needs to be taken (Palmer 1992, 17).

The 1989 Hague Conference Declaration (see also chapter 2), which called for the development of a "new institutional authority" to combat global warming, with nonunanimous decision-making and enforcement powers, reflects this approach.

An alternative function of international law is to *facilitate and encourage,* rather than *require,* international cooperation. Instead of attempting to develop supranational institutions, this "soft" approach accepts state sovereignty as a given, and attempts to foster cooperation within that system—in particular, by

- Building scientific and normative consensus incrementally, through joint assessments of scientific knowledge, the creation of regular forums for discussion and negotiation, and the establishment of international organizations (Gehring 1992)
- Encouraging rather than enforcing compliance—for example, by addressing barriers to compliance such as mistrust between states and lack of domestic capacity (Chayes and Chayes 1995)

These contrasting approaches to international lawmaking are ideal types; international legal regimes generally have elements of both. But some regimes are "harder" than others. For example, the European human rights regime—with its compulsory system of adjudication and its extensive body of decisional law—represents a hard type of international law. In contrast, the World Heritage Convention, which seeks primarily to promote national action and contains only very general international norms, reflects a soft approach.

In the environmental realm, most treaties adopt a rather soft approach; they rarely define strict norms or contain strong enforcement mechanisms. Exceptions include the Convention on the Prevention of Pollution from Ships (generally referred to as MARPOL), which creates a detailed regulatory regime, including specific technology standards for vessels

(Mitchell 1994), and the new Antarctic Environment Protocol, which provides for compulsory dispute settlement.

The "framework convention/protocol approach" combines both soft and hard elements. Framework conventions such as the FCCC create a long-term process intended, eventually, to develop specific, hard obligations in protocols. The most successful example of this process to date has been the stratospheric ozone regime, which began with the very soft Vienna Convention on the Protection of the Ozone Layer, and led to the much harder Montreal Protocol on Substances That Deplete the Ozone Layer, which sets forth detailed obligations to limit the use of ozone-depleting substances, with trade sanctions to deter free-riders.

2 Key Elements of the Climate Change Regime

The FCCC takes a relatively soft approach, like most other first-generation instruments addressing global-commons issues. It establishes an infrastructure of institutions and legal mechanisms intended to create a long-term process to address the climate change problem, rather than imposing strict obligations. Indeed, its two main obligations—national reports and financial assistance by OECD countries to developing countries for preparing reports—are both essentially procedural in nature; they are intended to *encourage* rather than require national action to combat climate change. The Kyoto Protocol represents a progression in the climate change regime toward harder law, defining more precise commitments of developed countries to limit their greenhouse gas emissions, and suggesting the need for stronger compliance measures.

The FCCC and Kyoto Protocol build on the experience of existing international environmental regimes in promoting participation through differential obligations and selective incentives (including financial and technological assistance), encouraging regional and national actions, and considering implementation issues even before the convention had entered into force (Sand 1990). The basic features of the FCCC's legal framework are set forth in table 10.1, and of the Kyoto Protocol in table 10.2.

Table 10.1
Key provisions of the FCCC

Objective	Stabilize atmospheric greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system, within a time frame sufficient to: allow ecosystems to adapt naturally, protect food production, and allow economic development to proceed in a sustainable manner (Article 2).
Principles	Intra- and intergenerational equity; differentiated responsibilities and respective capabilities; special needs of developing-country parties; right to sustainable development; precaution; cost-effectiveness; comprehensiveness; and a supportive and open economic system (Article 3).
Commitments	*All countries*—General commitments to: develop national greenhouse gas inventories; formulate national mitigation and adaptation programs; promote and cooperate in scientific research, education, training, and public awareness (Articles 4(1), 5, 6). *Developed countries* (listed in Annex I)—Recognize that a return to earlier emissions levels of CO_2 and other greenhouse gases by the end of the decade would contribute to modifying long-term emissions trends, and aim to return to 1990 emissions levels (Article 4(2)). *OECD countries* (listed in Annex II)—Commitments to fully fund developing-country inventories and reports; to fund the incremental costs of agreed mitigation measures; to provide assistance for adaptation; and to facilitate, promote, and finance technology transfer (Article 4(3)–(5)).
Institutions	Conference of the Parties (COP) (Article 7), secretariat (Article 8), Subsidiary Body for Scientific and Technological Advice (SBSTA) (Article 9), Subsidiary Body for Implementation (SBI) (Article 10), financial mechanism (Article 11).
Reporting ("communication of information")	*All countries*—National greenhouse gas inventories; steps taken to implement the Convention (Article 12(1)). *Developed countries* (Annex I)—Detailed description of policies and measures to limit greenhouse gas emissions and enhance sinks, and a specific estimate of their effects on emissions (Article 12(2)). *OECD countries* (Annex II)—Details of financial and technological assistance measures (Article 12(3)).
Adjustment procedure	Reassessment of the adequacy of commitments every three years, based on the best available scientific information (Article 4(2)(d)). First reassessment at COP-1 (Berlin, 1995).

Source: Adapted from Bodansky 1995. The text of the FCCC can be found at http://www.unfccc.de

Table 10.2
Key provisions of the Kyoto Protocol

Aim	Reduce Annex I–country emissions by about 5% from 1990 levels during the 2008–2012 commitment period (Article 3(1)).
Commitments	Specific "assigned amount" (listed in Kyoto Protocol Annex B) for each Annex I country to reduce emissions from 1990 levels during the 2008–2012 commitment period (selection): • EU, other W. European countries: −8% • U.S.: −7% • Japan, Canada: −6% • New Zealand, Russia: 0% • Norway: +1% • Australia: +8% • Iceland: +10% Applies to "CO_2-equivalent" emissions of basket of six greenhouse gases (CO_2, methane, nitrous oxide, HFCs, PFCs, and SF_6).
Institutions	Same as FCCC, except decision making by Meeting of the Parties (MOP), which meets as part of FCCC Conference of the Parties (COP/MOP) (Article 13).
Flexibility mechanisms	*Bubbles* (Article 4)—Any group of Annex I parties may, when ratifying, agree to pool their assigned amounts and fulfill their emissions commitments jointly. *Joint implementation* (Article 6)—Annex I parties may earn "emission reduction units" (ERUs) for investments in mitigation projects in other Annex I parties. ERUs are "supplemental" to domestic action. *Clean Development Mechanism* (CDM) (Article 12)—Annex I parties may earn "certified emission reductions" (CERs) for emissions-reduction projects in non–Annex I parties. *Emissions Trading* (Article 17)—Annex B countries may engage in emissions trading "supplemental" to domestic action.
Compliance	COP/MOP to consider the question of compliance. Legally binding consequences for noncompliance would require amendment of Kyoto Protocol (Article 18).

Note: The text of the Kyoto Protocol can be found at http://www.unfccc.de

2.1 Objective

The FCCC defines the climate change regime's "ultimate objective" as the stabilization of atmospheric concentrations of greenhouse gases at safe levels (i.e., levels that would "prevent dangerous anthropogenic interference with the climate system"; FCCC 1992, Article 2), within a time frame that allows ecosystems to adapt naturally, does not threaten food supplies, and permits sustainable development. The future development of the climate change regime will involve spelling out the meaning of this objective, in particular, what concentration levels and rates of change are safe, and what emission levels are necessary to achieve these levels and in what time frames (Moss 1995).

2.2 Principles

The FCCC embodies several general principles of international environmental law (FCCC 1992, Article 3). First, climate change is the "common concern of mankind." The "common concern" formulation is weaker than the "common heritage" concept in the 1982 UN Convention on the Law of the Sea, which connotes common ownership (Attard 1991). Second, states should protect the climate for the benefit of future as well as present generations, reflecting the principle of intergenerational equity (Brown Weiss 1989; see also chapters 6 and 7 in this volume). Third, action to combat climate change should not await full scientific certainty (the precautionary principle) (O'Riordan and Cameron 1994).[3] Fourth, states have differentiated responsibilities (Magraw 1990b)—developed countries should take the lead in combating climate change, while the special needs and circumstances of developing countries should be given full consideration.[4] The first of these principles, common concern, is the basis for international interest in the climate change problem, and the fourth is operationalized in the FCCC through differential commitments for different classes of parties. The Convention sharply differentiates between the obligations of developed and developing countries. Developing countries have quite limited reporting requirements, along with general obligations to develop measures to limit emissions of greenhouse gases and enhance sinks (FCCC 1992, Article 4(1)). Developed countries, in contrast, have more stringent reporting requirements, a quasi-target and timetable to limit their emissions of greenhouse gases (FCCC 1992,

Article 4(2)), and (for OECD countries) an obligation to provide financial assistance to developing countries for mitigation and adaptation measures (albeit at unspecified levels) (FCCC 1992, Article 4(3)–(5)). The principles of intergenerational equity and precaution, in contrast, set forth general orientations, but do not provide any specific guidance for how the climate change regime should develop.

2.3 National Climate Programs

Under the FCCC, parties must inventory their existing greenhouse gas emissions and develop policies and measures to limit emissions and to conserve and enhance sinks (FCCC 1992, Article 4(1)). One of the main functions of the FCCC, at least initially, is to encourage and facilitate these national climate activities.

2.4 Targets and Timetables

From the outset of the FCCC negotiations, it was generally accepted that any quantitative limitations on greenhouse gas emissions would apply, at least initially, only to industrialized countries (listed in Annex I of the FCCC, and generally referred to as "Annex I parties"). After months of deadlock in the pre-Rio negotiations, the United Kingdom and United States finally brokered a compromise formulation on an emissions target and timetable in late April 1992, shortly before the final session of the INC. The compromise sets forth, in very nebulous language—the legal status of which remains uncertain—the general aim of returning anthropogenic emissions of greenhouse gases by Annex I parties to 1990 levels by the year 2000 (FCCC 1992, Article 4(2)), an aim that most Annex I parties did not succeed in achieving.

The Kyoto Protocol builds on the FCCC by establishing legally binding quantitative limits on the greenhouse gas emissions of Annex I parties for the 2008–2012 "commitment period," with the aim of reducing overall Annex I–country emissions by 5 percent from 1990 levels. Like the FCCC target, the Kyoto Protocol targets are based on historical emissions (generally keyed to the year 1990).[5] But, in contrast to the FCCC, which sets a uniform target for all industrialized countries, the Kyoto Protocol (1997) establishes a specific target (an "assigned amount" of emissions) for each

party, ranging from an 8 percent reduction in emissions for members of the European Union and a 7 percent reduction for the United States, to an 8 percent increase in emissions for Australia and a 10 percent increase for Iceland. (These country-by-country targets are listed in Annex B of the Protocol.) These targets apply, not on a yearly basis, but to the five-year, 2008–2012 commitment period, and apply to a basket of six greenhouse gases (carbon dioxide, methane, nitrous oxide, and three trace gases or groups of gases).

Both in the FCCC and the Kyoto Protocol negotiations, developing countries resisted any commitment to limit their greenhouse gas emissions, arguing that they were not responsible for creating the climate change problem and had other priorities, most importantly economic development. However, industrialized countries and, in particular, the United States have argued that, unless developing-country emissions are contained, a solution to the climate change problem is impossible. Thus a continuing theme of the climate change discussions has been the debate about the "meaningful participation" of developing countries in particular, namely, whether they should assume "voluntary commitments" to limit their greenhouse gas emissions—for example, by joining Annex I of the FCCC or Annex B of the Kyoto Protocol.

2.5 Flexibility or Kyoto Mechanisms

To promote flexibility, the nebulous language of the FCCC left open the possibility of trade-offs in emission controls between different greenhouse gases (the "comprehensive approach") (Stewart and Wiener 1992), and between countries (joint implementation) (Kuik, Peters, and Schrijver 1994). The Montreal Protocol contains precedents for both of these regulatory devices. Its limitations apply to specified baskets of chemicals, rather than on a chemical-by-chemical basis, and it allows, to a limited degree, joint attainment of control measures through transfers of production for industrial rationalization purposes.

During the period immediately following the adoption of the FCCC, joint implementation—that is, providing money or technology for mitigation measures undertaken in another country—emerged as one of the major controversies in the climate change regime. Some developed

countries—and, in particular, the United States—sought to be allowed to meet their emissions targets through support for mitigation projects in developing countries. They argued that this would allow them to achieve their emissions targets in the most cost-effective manner, and could lead to substantial transfers of financial resources and technology to developing countries (Kuik, Peters, and Schrijver 1994). Joint implementation, however, provoked strong objections from developing countries and environmental NGOs, which argued that it would be both inequitable and difficult to administer and police (Climate Network Europe 1994). Accordingly, COP-1 authorized only a pilot phase of joint implementation, during which industrialized countries would not receive credits toward meeting their FCCC target for joint implementation projects.

The Kyoto Protocol goes considerably farther in allowing states to meet their emissions targets in a flexible manner. This flexibility was part of the trade-off that allowed some developed countries, such as the United States, to accept stronger emissions limitation targets. The flexibility provided for in the Kyoto Protocol includes the following:

Comprehensive Approach The Kyoto Protocol targets apply to CO_2-equivalent emissions of a basket of six greenhouse gases, rather than to each gas individually. This gives each party flexibility in choosing the mix of gases to limit in order to achieve its emissions target. In addition, in calculating emissions during the 2008–2012 commitment period, parties may include some sinks, in particular net changes in carbon stocks due to specified land-use changes and forestry activities.

Bubbles (Kyoto Protocol 1997, Article 4) Under the Kyoto Protocol, any group of developed-country parties may, prior to ratifying the Protocol, agree to pool their emissions targets. This provision allows the European Union, in particular, to create an emissions bubble.

Emissions Trading (Kyoto Protocol 1997, Article 17) Parties listed in Annex B of the Kyoto Protocol may trade parts of their "assigned amounts" with each other. According to the Buenos Aires work plan, the principles, modalities, and rules for emissions trading were to be worked out by COP-6.

Joint Implementation among Annex I Countries (Kyoto Protocol 1997, Article 6) Developed-country parties ("Annex I parties") may receive

"emission reduction units" (ERUs) through investments in projects in other developed-country parties that result in emissions reductions that are "additional" to any that would otherwise occur. These ERUs are added to the assigned amount of the acquiring state and subtracted from the assigned amount of the transferring state. Like emissions trading, the acquisition of ERUs are to be "supplemental to domestic actions."

Clean Development Mechanism (Kyoto Protocol, Article 12) The Kyoto Protocol establishes a "Clean Development Mechanism" (CDM) that will allow private and public entities to fund projects in Annex I countries, in order to generate "certified emission reductions" (CERs) that developed-country parties may use to meet part of their emissions commitments. In essence, the CDM allows joint implementation between developed-and developing-country parties, to supplement Article 6, which permits joint implementation among developed-country parties. The CDM will be under the control of the COP and will be supervised by an executive board. As with emissions trading, the modalities and procedures of the CDM still need to be elaborated, and the Buenos Aires work plan gave priority to this task. A share of the proceeds from certified project activities will be used to cover the CDM's administrative costs, as well as to assist developing-country parties that are particularly vulnerable to climate change.

Issues relating to the flexibility or Kyoto Mechanisms that were still unresolved as of November 2000 include:

- Rules for mechanism eligibility
- Whether to impose quantitative limits ("caps") on the amount of an Annex I party's commitments it can meet through the Kyoto Mechanisms, and, if so, what these limits should be
- Whether CERs and ERUs can be traded
- The degree to which nonstate entities (including private actors and international organizations such as the World Bank) can participate in the flexibility mechanisms—for example, by buying and selling ERUs, CERs, and parts of assigned amounts under Articles 6, 12, and 17 respectively
- Whether sink projects will be allowed in the CDM
- Liability for excess emissions by parties trading parts of their assigned amounts under Article 17.

2.6 Financial Resources

In contrast to earlier framework conventions, the FCCC provides for transfers of financial resources from OECD to developing countries (FCCC 1992, Article 4(3)) and defines a mechanism for this purpose (FCCC 1992, Article 11). The inclusion of these financial provisions reflects the emergence of a strong North-South dimension in global environmental politics in the late 1980s, which manifested itself in the establishment of the Montreal Protocol Multilateral Fund, the preparatory work for UNCED, and the negotiations to restructure the Global Environment Facility (GEF) (see also chapter 12). In the climate change context, two particular factors account for the FCCC's financial provisions: the essential role of developing countries in solving the climate change problem, and the high level of concern of OECD countries. Nevertheless, developing countries were unable to give teeth to the FCCC's financial commitment—for example, by setting specific amounts or providing for mandatory assessments. While they obtained a commitment from OECD countries to fully finance their required national reports on climate change, the Convention does not require any particular country to contribute any particular amount.

Both the FCCC and COP-1 entrusted the GEF with the operation of the Convention's financial mechanism, albeit only on an interim basis. The restructuring of the GEF in 1994, which made the GEF functionally autonomous from the World Bank and created a thirty-two-member Council, balanced between developing and developed countries, allayed some of the concerns of developing countries about World Bank (and donor-country) dominance of the GEF. However, the nature of the operational linkages between the GEF and the FCCC has remained a source of contention (Jordan 1994), as has the degree to which the GEF should provide assistance for adaptation as well as mitigation costs. Initially, GEF financing has focused on assisting developing countries in preparing their initial national reports under the FCCC.

2.7 Institutions

The FCCC goes beyond earlier framework conventions by establishing not only a Conference of the Parties (COP) for decision making and a secretariat for administrative functions, but also standing bodies to pro-

vide scientific and technical advice and to assist with implementation (FCCC 1992, Articles 7–10) (see table 10.3). The Conference of the Parties (COP) is the principal forum for elaborating the climate change regime, through the negotiation of amendments and protocols (Gehring 1992). The subsidiary bodies perform more technical/analytic functions, although recently they have played the leading role in negotiations under The Buenos Aires Plan of Action. If and when it enters into force, the Kyoto Protocol will utilize the FCCC institutions (Kyoto Protocol 1997, Articles 13–15).

Both the COP and its subsidiary bodies are essentially intergovernmental rather than supranational in character; they serve as forums for consensus building among states, and do not have legislative, adjudicatory, or enforcement powers. Nonetheless, as the FCCC's "supreme body," the COP has a broad mandate. COP-1, for example, initiated the round of negotiations leading to the Kyoto Protocol, which was adopted at COP-3. COP-1 also established a pilot phase of joint implementation, adopted reporting and review procedures, designated a permanent secretariat, and defined the roles of its subsidiary bodies. The COP's voting rules have been a source of contention. Thus far, the parties have been unable to agree on whether to allow supra majority voting (two-thirds or three-quarters) on all substantive matters, or whether to require consensus for important decisions such as the adoption of protocols.

2.8 Reporting and Review

For purposes of planning and assessment, and to encourage national action, the INC has established an elaborate system of national reporting and international review for the FCCC. Under this procedure, industrialized states must submit extensive information on their climate change policies, together with projections of how these policies will affect emissions. These national reports are then synthesized in order to determine the overall progress of Annex I parties in implementing the Convention, as well as subjected to in-depth reviews by teams of experts nominated by FCCC parties and selected by the Secretariat. The first round of reporting by developed countries was completed in 1997.

The FCCC's reporting-and-review procedure is intended to be nonconfrontational and facilitative in nature. Its functions include promoting

Table 10.3
Climate change institutions

Name	Acronym	Description
Intergovernmental Negotiating Committee	INC	Established December 1990 by UN General Assembly. Negotiated the FCCC. Now replaced by the FCCC Conference of the Parties (COP).
Conference of the Parties/ Meeting of the Kyoto Protocol Parties	COP/MOP	Established by FCCC Article 7. "Supreme body" of FCCC. COP will serve as meeting of the parties (MOP) of Kyoto Protocol (Kyoto Protocol Article 13). Functions: regular review of FCCC implementation; decisions necessary to promote effective implementation; adoption of amendments and protocols. Meets yearly.
Secretariat		Established by FCCC Article 8. Administrative functions in support of COP and other Convention institutions. Located in Bonn.
Subsidiary Body for Scientific and Technological Advice	SBSTA	Established by FCCC Article 9. Composed of government experts. Provides assessments of scientific knowledge, reviews scientific/technical aspects of national reports and effects of implementation measures.
Subsidiary Body for Implementation	SBI	Established by FCCC Article 10. Composed of government experts. Reviews policy aspects of national reports; assists COP in assessing aggregate effect of implementation measures.
Financial mechanism		"Defined" by FCCC Article 11. Operation entrusted to GEF on interim basis.

Table 10.3
(continued)

Name	Acronym	Description
Intergovernmental Panel on Climate Change	IPCC	Established in 1988 by WMO and UNEP to provide assessments of the science, impacts, and policy aspects of climate change. First Assessment Report in 1990; Second Assessment Report in 1995; Third Assessment Report in spring 2001.
Global Environment Facility	GEF	Established by World Bank, UNDP, and UNEP in 1991. Restructured in 1994. Serves as the financial mechanism of the FCCC.
Clean Development Mechanism	CDM	"Defined" by the Kyoto Protocol, Article 12. Under the control of the COP and supervised by an executive board.

transparency and focusing peer and public pressure on states. But, since it relies primarily on self-reporting rather than international monitoring and inspection[6] (in contrast, for example, to the Convention on the Conservation of Antarctic Marine Living Resources), it falls short of the strict verification regime that may be needed to deter free-riders (Wettestad 1991)—in the event, for example, that the stricter commitments contained in the Kyoto Protocol come into force. Accordingly, under the Buenos Aires Plan of Action, the parties are elaborating a more precise and authoritative review process, for the purpose of determining compliance with the Kyoto Protocol.

2.9 Amendment and Adjustment to New Scientific Knowledge

Like other recent international environmental agreements (Brown Weiss 1993, 688–689), the FCCC provides for periodic reviews of the adequacy of its provisions in light of new scientific findings (FCCC 1992, Article 4(2)(d)). COP-1 undertook the first such review and concluded that the

FCCC's specific commitments for industrialized countries are inadequate, beginning the process leading to the Kyoto Protocol. The Kyoto Protocol further provides that, no later than 2005, the parties should consider developing commitments for the period after 2012. Unlike the Montreal Protocol, however, which authorizes its parties to "adjust" control measures through qualified majority voting, the FCCC does not delegate any lawmaking authority to the COP. Consequently, amendments and protocols to the FCCC will apply only to those parties that accept them.

2.10 Dispute Resolution

The FCCC contains the boilerplate dispute-resolution provisions found in other international environmental agreements, which in practice are never invoked. Global-commons problems—like climate change—do not raise the type of bilateral disputes for which traditional dispute-settlement procedures were designed; violations of the Convention would implicate community interests, rather than injure a particular state. For this reason, several environmental conventions—including the Montreal Protocol—have developed multilateral noncompliance procedures, involving collective review by the parties, to supplement traditional bilateral dispute settlement by third-party decision makers. The FCCC calls on the parties to consider developing a "multilateral consultative process" to address implementation questions (FCCC 1992, Article 13), and COP-1 created an open-ended working group of technical and legal experts to study the relevant issues (see Victor 1994).

After four years of work, the experts group reached agreement on a procedure modeled on the Montreal Protocol's noncompliance procedure (although the FCCC procedure uses the more neutral language of "resolving questions regarding implementation" [FCCC 1992, Article 13] to describe its function, rather than focusing explicitly on "noncompliance"). The proposed process would be administered by a multilateral consultative committee, the composition of which remains to be decided.

2.11 Noncompliance and Sanctions

The FCCC contains no provisions specifying sanctions for noncompliance. Indeed, although it does not specifically exclude the possibility of trade measures like those allowed by the Montreal Protocol, the FCCC

lays down a marker for the future, by stating that measures to combat climate change should not arbitrarily or unjustifiably discriminate against international trade (FCCC 1992, Article 3(6)). Given developments in the GATT and WTO, where the use of trade measures to promote environmental objectives is strongly disfavored, the likelihood that trade sanctions will be used to enforce the FCCC appears very low (see also chapter 13).

Because of the Kyoto Protocol's stricter commitments, the need for a noncompliance procedure is more pressing (see also chapter 11), and the Kyoto Protocols calls on its parties, at their first meeting, to consider the question of compliance (Kyoto Protocol 1997, Article 18). At COP-4 in Buenos Aires, states agreed to begin a process to develop a noncompliance system for the Protocol. Possible elements might include:

- Reviews of the accuracy of national inventories and reports
- A "compliance reserve" of ERUs and CERS that could be used to cover excess emissions
- Limitations on the ability of noncomplying states to use the flexibility mechanisms
- Subtraction of any emissions overage from the next commitment period targets

2.12 Liability

Although the FCCC is officially neutral between possible response strategies, the focus during the negotiations was on abatement rather than adaptation. Despite the urging of island states, represented by the Alliance of Small Island States (AOSIS), the FCCC does not establish an insurance or liability scheme for damage resulting from climate change.[7] Historically, states have been able to agree on liability schemes only for discrete, acute pollution incidents, such as oil spills or nuclear accidents. They have generally been unwilling to undertake liability for more distant and open-ended damages resulting from long-term problems such as stratospheric ozone depletion and global warming, where the potential liability exposure is extremely high and the task of establishing causation a virtual impossibility. However, the Kyoto Protocol does provide that a portion of the proceeds from CDM shall be used to help developing countries with their adaptation costs (Kyoto Protocol 1997, Article 12(8)).

At the insistence of OPEC, the FCCC calls attention to the situation not only of parties vulnerable to the adverse effects of climate change itself (FCCC 1992, Article 4(8)), but also of those whose economies may be hurt by climate change response measures (FCCC 1992, Articles 4(8)(h), (10)). The oil-producing states have continued to press for "compensation" for the adverse economic effects of mitigation measures, although the Kyoto Protocol does not include any specific provisions on this subject.

3 Conclusions

Despite its designation as a "framework" convention, the FCCC goes well beyond earlier framework conventions. It establishes more extensive commitments than those contained in LRTAP or the Vienna Ozone Convention, but falls short of the specific targets and timetables contained in regulatory agreements such as the 1987 Montreal Protocol. It establishes a relatively rich institutional structure, though with limited explicit powers. And it provides for financial assistance and technology transfer for developing countries, though without setting any specific amounts. The Kyoto Protocol marks the first step in moving beyond the FCCC by developing stronger commitments to abate greenhouse gas emissions.

The future trajectory of the climate change regime remains hard to predict. If the LRTAP and ozone regimes are any guide, the FCCC will be followed by additional protocols, addressing particular causes of climate change. But the greater uncertainties and stakes involved in the climate change context mean that reaching agreement on specific control measures will be more difficult. In the medium term, progress will likely be made in elaborating and implementing the reporting and review mechanism, conducting inventories and developing national plans, channeling assistance to developing countries, and developing the rules of the Kyoto Protocol's flexibility mechanisms. But long-term progress in developing more stringent abatement measures will depend primarily on extralegal factors—the resolution of scientific and economic uncertainties; the development of technological and policy solutions; and, ultimately, the crystallization of popular and political will at the national and international levels.

After reviewing the legal aspects of the present climate regime, it is important to look at the strategic possibilities for enforcing and implementing the Framework Convention and the Kyoto Protocol. Which are the core problems in implementing the FCCC and the Kyoto Protocol? Will they actually contribute to solving the problems that led to their creation? And how should the institutions be designed to accomplish this goal? These are some of the questions that will be addressed in the next chapter.

Notes

1. See generally Barratt-Brown, Hajost, and Sterne 1993; Bodansky 1993; Goldberg 1993; Grubb et al. 1993; Sands 1992.

2. See generally Breidenich et al. 1998 and Davies 1998.

3. The FCCC, however, does not specify what level of information justifies action, or how much action is warranted, other than to note that action to combat climate change should be "cost-effective" (FCCC 1992, Article 3(3)).

4. The principle of differentiated responsibilities is also reflected in the Montreal Protocol, which gives developing countries a ten-year grace period to comply with its control measures (Montreal Protocol 1987, Article 5). See also chapter 12 in this volume.

5. The Protocol allows parties to choose a 1995 baseline year for three trace greenhouse gases (Kyoto Protocol 1997, Article 3(8)). In addition, Eastern European countries may choose an earlier baseline year (Kyoto Protocol 1997, Article 3(5)).

6. International review teams have visited each developed-country party as part of the process of in-depth review of national reports.

7. Article 4(8) of the FCCC merely provides that the parties shall give "full consideration to . . . actions related to funding, insurance and the transfer of technologies," in considering what actions are necessary to meet developing-country needs arising from the adverse effects of climate change.

This page intentionally left blank

11

Institutional Aspects of Implementation, Compliance, and Effectiveness

Ronald B. Mitchell

In the Framework Convention on Climate Change (FCCC), the world's nations aspired to stabilizing "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (FCCC 1992, Article 2). Central to evaluating this regime lies the question of effectiveness—that is, will the regime achieve that ambitious objective? Concerns regarding effectiveness raise two institutional design questions for any regime. First, how should international institutions be designed to maximize the chances that the regime will achieve agreed-on goals? Second, how should institutions be designed to allow the regime to assess its progress toward those goals? In the years ahead, the climate change regime will seek to accomplish these interrelated tasks of assessing and maximizing effectiveness. The nature of the FCCC regime highlights several obstacles common to other international regimes but also poses several novel institutional challenges. The following section clarifies those obstacles and identifies institutional responses that will help the regime surmount them.

1 Defining Compliance and Effectiveness

Questions about regime effectiveness and compliance have received increasing scholarly attention over the past decade (Bernauer 1995; Brown Weiss and Jacobson 1998; Chayes and Chayes 1995; Mitchell 1996; Victor, Raustiala, and Skolnikoff 1998; Wettestad 1995). Scholars and practitioners use the term *effectiveness* in quite different ways, ranging from something akin to compliance, to economic efficiency, to benefits exceeding costs, to achieving the sought-for environmental improvement

(Young 1992a, 1994a). The question "Is this regime effective?" is often simply a shorthand for "Did this regime accomplish certain goals?" Answering the question, therefore, requires the analyst to define, implicitly or explicitly, the goals against which she will evaluate the regime's performance. The FCCC eventually will be evaluated against a range of normative and empirical criteria. One common, if ambitious, standard for success asks whether the regime achieved "problem-solving effectiveness,"—that is, whether climate change was averted successfully and whether the FCCC caused, or how much it contributed to, that outcome (Andresen and Wettestad 1995). Less stringently and related to this problem-solving standard, a counterfactual standard asks whether the treaty caused environmental improvements that would not have happened otherwise, even if they fall short of completely solving the problem (Helm and Sprinz 2000; Sprinz and Helm 1999; Underdal 1998b; Young 1992a). For example, some may consider reducing the extent of climate change or delaying it by several decades a success even if eventual arrival is not averted. This latter standard suggests that the Convention, especially initially, may only be "somewhat effective" in solving the problem, but may thereby gain insights that facilitate its own improvement (Levy, Young, and Zürn 1995; Underdal 1992). In this chapter, unless otherwise noted, I use the term *effectiveness* to refer to the regime's degree of success in addressing the problem that motivated its creation, or what Oran Young has called *problem-solving effectiveness* (Young 1994a).

A regime's problem-solving effectiveness depends on several factors (Bernauer 1995; Jacobson and Brown Weiss 1995; Victor, Raustiala, and Skolnikoff 1998; Wettestad 1995). Any environmental regime can prove ineffective—that is, fail to accomplish its objective, because of failures of political will, failures of knowledge, or failures of implementation. When confronting the shortcomings of any regime, one should always consider whether the regime was "designed to fail." Many regimes fail or fall short of their potential simply because member states want to resolve a problem but are unwilling to take the steps and incur the costs necessary to do so. Others fail because governments want to extract whatever political benefits can be gained by negotiating and signing an environmental agreement without expending the resources required to fulfill

the corresponding commitments. These and similar factors often introduce a large gap between the goals laid out in a treaty's preamble and the actual intentions of the member states. Such insincerity often is evident in the far less ambitious "goals in practice" implicit in the operational rules and requirements that the parties adopt. Explaining ineffectiveness in these cases involves considerable attention to the political constraints of low levels of environmental concern and political will, the exigencies of multilateral negotiation, and related factors. If states adopt inherently limited rules—that is, rules that, *even if perfectly complied with,* would not achieve the regime's nominal goals, it raises the question "Why were states unwilling to require actions that could have achieved more?" Such factors constitute important elements in an overall assessment of regime effectiveness but involve problems rather different in nature from the implementation and compliance problems that are the focus of this section.

A regime whose member states sincerely want to resolve an environmental problem may also fail because of ignorance and uncertainty about what rules will move the regime toward the intended goal. Most environmental regimes ultimately seek to improve environmental quality by altering human behavior. But our understanding of the relationship of human behavior to environmental quality varies considerably across issue areas and over time. Unlike arms control, trade, or human rights treaties in which the ultimate goal of international cooperation is to alter human behavior, environmental regimes must choose rules regulating human behavior as an instrumental means to the ultimate goal of environmental improvement. States that genuinely desire to create rules that will accomplish a regime's objectives may adopt rules that fail simply because they reflect then-current but mistaken understandings of the sources of environmental damage and available means of environmental remedial action. The influence of these first two potential sources of regime ineffectiveness can be highlighted by asking, "If all actors fulfilled their regime obligations perfectly, would the regime's objectives be achieved?" Insincerity and ignorance of members place upper bounds on a regime's ability to achieve its goals. In most cases, it seems unlikely that a regime will accomplish (and unreasonable to expect it to reach) more than its member states want to achieve or know how to achieve.

Yet, regimes often fall short of even this standard. A wide range of *implementational* factors create additional obstacles to regime effectiveness. Even a regime whose members adopt the "right" rules may prove less than perfectly effective if those rules are not implemented well. Evaluating implementational failures involves asking, "How far short of their regime obligations did actors' accomplishments fall?" This corresponds more closely to questions of behavior-changing effectiveness or compliance (Brown Weiss and Jacobson 1998; Young 1994a). People often consider compliance as binary—a state's behavior either did or did not conform to regime rules. Young's definition of *behavior-changing effectiveness,* however, urges us to consider not only treaty implementation and compliance, but also situations in which actors:

- Undertake positive behavioral change but fall short of full compliance
- Comply with the spirit but not the letter of the treaty
- Undertake positive behavioral change that exceeds treaty-mandated standards

In short, we should consider regimes effective if they induce positive behavioral changes, even if those changes fall short of, exceed, or differ from the strict legal definitions of compliance (Mitchell 1996; Young 1994a).

The climate change regime, like several other environmental regimes, specifies both behavioral standards for compliance (what acts must or must not be performed) and environmental standards for compliance (what environmental outcomes must be produced). In this section, I use *compliance* to correspond to Young's notion of behavior change that is consistent with the goals of the regime and to refer to the extent to which an actor's behavior or the environmental outcomes of that behavior conform to the standards laid out in the treaty. The voluntary nature of the treaty-making process creates expectations that states should fulfill their treaty commitments and comply with treaty obligations (Chayes and Chayes 1995). When behavioral and environmental outcomes fall short of what member states agreed to accomplish, we seek out explanations in terms of failures of institutional design as well as of political will and knowledge. The question of "Why did states fail to even achieve what they sought to achieve?" focuses our attention on issues of institutional design.

2 Obligations under the FCCC

Parties' obligations under the FCCC raise implementational difficulties common to many regimes as well as novel challenges that reflect the innovative character of some obligations and the flexibility allowed to parties in fulfilling them. The 1992 Convention distinguished between industrialized countries and economies in transition, listed in Annex I of the FCCC, and the largely developing non–Annex I countries. In the 1997 Kyoto Protocol, thirty-nine Annex I countries committed themselves to achieving specific limits on their greenhouse gas emissions by the period 2008–2012. The Protocol's Annex B delineates these "quantified emission limitation or reduction commitments" (QELRCs), ranging from 92 percent to 110 percent of 1990 emissions, and aimed at reducing these countries' aggregate emissions to about 95 percent of their 1990 emissions. The Protocol left many implementational aspects for further elaboration, a process begun in 1998 in the Buenos Aires negotiations (see chapter 10). The Annex B commitments constitute only an initial step that fell far short of what most scientists considered necessary to achieve the stabilization called for in the FCCC.

Even achieving these "inadequate" goals, however, requires major behavioral change and enormous resources. To minimize the associated costs, the agreement allows states unprecedented flexibility in how they meet their commitments. The Protocol provides states with four forms of flexibility in meeting their QELRCs by the 2008–2012 commitment period (and making "demonstrable progress" toward that goal by 2005) (FCCC/CP/1997/L.7/Add.1 1997, Article 3). Countries can meet their QELRCs through "trading" of emissions reduction units with other Annex B countries (Kyoto Protocol 1997, Articles 3, 17), "joint implementation (JI)" involving acquiring emissions reductions produced by projects in other Annex I countries (Kyoto Protocol 1997, Article 6), or the "Clean Development Mechanism (CDM)" involving acquiring emissions-reductions units produced by projects in non–Annex I countries that have not accepted emissions-reduction targets (Kyoto Protocol 1997, Article 12). In addition, the "economies in transition" countries are provided "a certain degree of flexibility" in implementing their Annex B commitments (Kyoto Protocol 1997, Article 3(6)). The combination of

Annex B commitments and the flexible approaches to compliance of these Kyoto Mechanisms create a context in which states have committed to ensuring that the aggregate emissions of Annex B countries are reduced by an amount corresponding to a given percentage of their 1990 emissions levels rather than ensuring that each country's individual national emissions are reduced by that percentage. The gains in economic efficiency offered by this flexibility were the major reason for incorporating them into the Convention (see also chapter 13). Yet, the flexibility also introduces unique challenges into the implementation, compliance, and effectiveness of the Convention.

2.1 The Challenge of Dynamic, Differentiated Obligations

The FCCC's rules differ in several respects from traditional treaty rules that require all states to meet a common standard defined in terms of either specified actions or specified outcomes. First, the FCCC creates differentiated and dynamic obligations. Many treaties, particularly recent ones, have adopted "differentiated obligations" that apply different compliance standards to states considered to be in different situations. The FCCC, like the Montreal Protocol regime aimed at reducing ozone loss, differentiates between developed and developing states. In the FCCC case, the former face QELRCs while the latter do not (with the exception of the voluntary commitments of Argentina and Kazakhstan made in Buenos Aires). The commitments in Annex B introduce further variance in commitments, with eight different levels of emissions reductions delineated. The provisions allowing flexibility introduce a novel, dynamic component to the standards each state must meet. Although each Annex B commitment is clear, it is less clear how countries will employ the Kyoto Mechanisms to achieve compliance and what problems they will encounter in doing so. Allowing emissions trading, for example, complicates the process of identifying the level of emissions reductions for which a country is responsible, since each trade effectively increases the reductions required of the state selling the reductions and decreases the reductions required of the state buying them. Thus, a state's required reductions will not be its simple Annex B commitment, but rather that commitment adjusted by its sales and purchases of emissions from other countries.

2.2 The Problem of Establishing Project Baselines

The joint implementation (JI) and Clean Development Mechanism (CDM) provisions of the Kyoto Protocol (see chapter 10) allow a country to fund projects that reduce emissions in other countries (Annex I and non–Annex I, respectively) and use those reductions to offset emissions on its own territory. A difficult analytic obstacle to evaluating such projects is accurate "project baselining." Assessing the number of emissions reduction credits a country should receive for funding a project requires comparing the actual emissions that the project produced (or carbon equivalents sequestered) to the estimated emissions (or sequestration) that would have occurred had the project not been undertaken.

How much should Germany's required reductions be changed if the German government finances a fifty-acre Brazilian tree farm that sequesters 1000 tons of carbon per year? Consider three scenarios: the fifty acres would have remained barren without German financing; the fifty acres would not have been replanted but would have had some unknown (and unknowable) amount of natural regrowth without the German financing; and the Brazilian tree farmer would have replanted the fifty acres the same way even if he had not received the financing. On the one hand, we cannot exactly estimate what would have happened without the project and, hence, how many credits Germany should receive for financing the project. On the other hand, both overestimating and underestimating credit levels pose problems. The success of the regime depends on providing governments and private actors with incentives to finance such JI and CDM projects, incentives that stem from the ability to receive credit for a certain amount of emissions reductions that would have been more costly if they had to be produced at home. Systematically underestimating the credits to be earned compared to the "true" emissions reductions reduces these incentives and reduces the effectiveness of the regime. Yet, overestimating true emissions reductions runs the risk of reducing Germany's target by more than the amount actually achieved by the project, thereby making Germany's Annex B QELRC less stringent.

Considerable efforts are being made to design ways to resolve these problems and create accurate, credible, and consistent methodologies for estimating such project counterfactual baselines. For many projects, these logical obstacles do not preclude estimating baseline scenarios. For

example, if a utility company was planning on keeping an inefficient power plant in service for ten more years but was financed by an Annex B country to replace it, one might readily calculate the difference in emissions per kilowatt from the existing plant and from the new plant and identify a number of credits that, even if not the "perfect" estimate, would nonetheless be acceptable to all actors involved in the project, to the regime secretariat, and to other Contracting Parties. But establishing a baseline for other projects will prove far more difficult. Indeed, these practical difficulties of forecasting are exacerbated by the possibility for strategic behavior. Actors involved in projects have incentives to *inflate* or overestimate these baseline levels of emissions in order to maximize the emissions reductions the project is credited with producing. Thus, assessing whether a country has met its emissions reduction target depends, at least in some cases, on inherently uncertain estimates of counterfactual project baselines.

2.3 Inducing Compliance through Obligational Clarity, Performance Clarity, and Response Clarity

A regime's ability to induce behavioral change and compliance by member states depends on several features of the "compliance system" (Mitchell 1996). The regime's success depends on recognizing when actors conform or fail to conform with their obligations and on responding to conformance and nonconformance in ways that encourage the former and discourage the latter. Although analysts often claim that "a regime's success depends on monitoring, verification, and enforcement," such shorthand assumes a largely legal and adversarial model of compliance management that would ignore the many innovative facilitative and market-based elements that are the FCCC's most unique features (Chayes and Chayes 1995; Downs, Rocke, and Barsoom 1996; Mitchell 1998a).

Compliance problems arise from failures of three types. The first type is a failure of obligational clarity. The regime needs to provide clarity with respect to "who must do what." This requires the regime to minimize ambiguities about what behaviors must be undertaken and what outcomes must be achieved, as well as about who is responsible for undertaking or achieving those standards and who is responsible if they are not achieved. A second type of failure involves performance clarity. The re-

gime needs transparency—that is, knowledge about what behaviors relevant actors actually undertook and what environmental outcomes resulted. Reporting, monitoring, and verification provisions seek to address this potential source of implementational failure. A third type of failure involves response clarity. A regime's success depends on the expectations actors have about how other actors, both within and outside the regime, will respond if it fulfills or fails to fulfill the regime's rules.

Consider the obstacles faced by the climate change regime's substantive obligations. The Kyoto Mechanisms (see also chapters 10 and 13) introduce problems of obligational clarity. Emissions trading introduces some problems for the climate secretariat of tracking the new Annex B obligations of buyers and sellers that result from each trade. Far more obligational ambiguity is introduced, however, by the flexibility of JI and CDM projects. The obstacles to accurate baselining delineated above need not introduce obligational ambiguity if baselines are specified at the time of project initiation. However, strong pressures to renegotiate baselines will emerge whenever new evidence demonstrates that baseline assumptions were overly optimistic. In addition, the Kyoto Protocol requires verification that JI and CDM projects produce emissions reductions "additional to any that would otherwise occur" before being used to fulfill the buyer's obligations under Annex B. This verification can, by definition, only be conducted after project completion. Since a state cannot be sure of how many units a project will be deemed to have produced, a state relying on a project must choose to engage in costly "overcompliance" to ensure it fulfills its Annex B obligations in the event of project shortfall, engage only in projects whose emission reductions can be verified in sufficient time for the state to take additional action to achieve compliance in the event of project shortfall, or risk being charged with noncompliance. Indeed, because guidelines for the distribution of responsibility between buyers and sellers in the event of project failure have yet to be developed, it is still unclear whether a state acquiring emissions reductions from a project that had a shortfall (for which the acquiring state was not responsible) would be allowed to count those reductions toward compliance with its Annex B commitments.

With respect to performance clarity, the wide range of behaviors that emit or sequester greenhouse gases make general claims about the ease

of monitoring relevant behaviors or environmental indicators impossible to formulate (Morlot 1998). In some cases, such as power plant emissions, both relevant activities (e.g., amount of coal or oil burned) and their environmental outputs (e.g., amount of CO_2 emitted) will be relatively easy to monitor. In others, such as deforestation or afforestation, relevant behaviors may prove relatively easy to monitor (e.g., satellite surveillance of net changes in forest cover), but the corresponding impact on emissions may be difficult to ascertain because of the problems in modeling the carbon sequestered or released by particular activities. In yet other cases, even relevant behaviors may be difficult to monitor, as with determining the number of methane-producing livestock being grazed or the levels of greenhouse gas–emitting military activities that governments have strong incentives to keep secret.

Response clarity may be compromised in the climate change context because no one-to-one correspondence exists between behaviors and environmental outcomes. Actors may be uncertain how the secretariat and member states will respond to compliance and violation. Annex B defines compliance in terms of environmental outcomes (emissions levels), and most analysts assume that many contracts for JI and CDM projects will be defined in similar environmental-outcome terms. On paper, this implies that actual behaviors are less important, if not irrelevant, to assessments of compliance. In practice, however, states and substate actors who took actions and expended resources that could reasonably have been expected to reduce emissions by a given amount will argue that they should be treated as if they complied even if emissions exceed those specified. For example, a state could adopt costly programs to upgrade power plants or tax gasoline that they, in good faith, expected to produce particular emissions reductions—but did not. Likewise, unpredictable exogenous shocks (from economic downturns to natural disasters) will lead at least some projects and programs to come up short through no fault of the actors involved. And other states and the expert compliance-review teams envisioned under Article 8 of the Kyoto Protocol are likely to find such arguments compelling, at least in some cases. The fact that such assessments can only be conducted after project completion introduces additional uncertainty about whether resources invested into cut-

ting emissions will "pay off" in terms of credit toward fulfilling treaty obligations.

3 Institutional Design Features to Foster Behavioral Change

The climate change regime will face several types of noncompliance by member states and substate actors. Although some instances of noncompliance will involve intentional efforts to cheat on the agreement, other instances will arise from incapacity or inadvertence. The regime's effectiveness will depend on its ability to distinguish these different sources of noncompliance and respond in ways that maintain and enhance the commitment of those supportive of the regime's goals while inducing compliance by more recalcitrant actors opposed to those goals.

Several factors will lead some states and nonstate actors to comply with the FCCC (Mitchell 1994, 32–46). In some cases, complying with regime requirements will coincide with an actor's self-interest or will not require any behavioral changes. Some countries have sufficiently strong environmental constituencies that they will reduce greenhouse gas emissions regardless of FCCC requirements or the actions of other states. These "unilateral compliers" will be joined by some "contingent compliers," who will comply once they are assured that enough others will comply and that doing so themselves will not put them at a significant economic or environmental disadvantage.

Despite compliance by some actors, many are likely to violate regime rules (Koskenniemi 1992; Mitchell 1994; Mitchell and Chayes 1995). Some states, particularly developing states, are likely to view preventing climate change as a worthwhile goal that is simply less pressing than other economic or social goals. Others may view the present and real costs of reducing emissions as greater than the future and uncertain benefits. Some regime opponents may explicitly refuse to sign and ratify the agreement. Others, however, may join but seek to violate the regime without being detected. Some states, and some of the substate actors that propose JI or CDM projects, will seek to benefit by undertaking commitments that they do not intend to fulfill. Strong international political pressure to commit to emissions reductions may lead states unconvinced of the dangers of

climate change (or that the benefits of action outweigh its costs) to view it as politically less costly to make such commitments while looking for clandestine ways to violate them than to reject such commitments outright.

Although the climate regime will certainly experience some intentional efforts to cheat or to free-ride on the efforts of others, noncompliance cannot be assumed to reflect these factors. Noncompliance will also arise from incapacity and inadvertence (Chayes and Chayes 1995). "Good faith noncompliance" will certainly occur among those sincerely committed to reducing emissions who fail to comply because of financial, administrative, or technological incapacities (Chayes and Chayes 1993; Greene and Salt 1994; Kimball 1992, 43). The flexibility of the Kyoto Mechanisms introduces considerable uncertainty about what financial, administrative, and technological resources will be needed to achieve a particular level of emissions reductions. The amounts and types of resources required to achieve a given emissions target will vary considerably depending on the policy or project used to achieve them. Particularly since much of the relevant policy, knowledge, and technology is still under development, actors may adopt approaches that require far more resources than they expect or have available. To give but one example, a windmill farm built to replace a coal-fired power plant may cost more to build than expected and provide less energy than planned if the technology proves less efficient than forecast. These problems are exacerbated by the incentives of proponents of action to be overly optimistic and hence underestimate the amount of—and uncertainty regarding—the resources needed to accomplish target reductions. Even fully capable actors may adopt policies or take actions sincerely intended to achieve certain reductions that inadvertently fail to do so. A carbon tax chosen to produce a given reduction in carbon emissions may come up short due to inaccuracies in the underlying economic model unknown at the time, misestimation of model inputs, or many other factors (Epstein and Gupta 1990; Victor and Salt 1994, 8). The desire to promote innovative approaches to emissions reductions makes these types of noncompliance particularly likely.

Obviously, the regime must have compliance institutions that maximize total emissions reductions. Achieving that goal, however, cannot

be assumed as synonymous with maximizing the likelihood of detecting and punishing intentional violators. Policies that deter those who seek to cheat or otherwise undercut the agreement may be counterproductive in response to actors who sincerely seek to comply and further regime goals. Economic sanctions intended to alter a state's policy often induce a strengthened commitment to that policy (Galtung 1967). Even worse, policies that assume that noncompliance reflects intentional efforts to cheat may be wrong when first implemented, but they may initiate dynamics that worsen relations among states and decrease commitments to regime norms over time. A more effective strategy will consider the full range of reasons for noncompliance and design institutional policies that identify when noncompliance occurs, discriminate among the different causes of noncompliance, and respond to each in ways likely to increase positive behavioral change in the future. Designing such a compliance system can be thought of as involving a primary rule system that provides obligational clarity, a compliance information system that provides performance clarity, and a noncompliance response system that provides response clarity (Mitchell 1994).

3.1 A Rule System That Provides Obligational Clarity

As already noted, the Kyoto Mechanisms create a context in which the obligations of state and substate actors may change over time and, in some cases, may be uncertain. The secretariat will need to maintain a list of each Annex B country's "adjusted emission limit" based on its initial Annex B commitment and any emissions trades (Tietenberg and Victor 1994). Even if an active emissions-trading market develops, tracking all trades and updating each state's total emissions reduction target should not pose particularly serious problems, although it does diverge from the traditional model of simply referring to the treaty text. The system also will need to track the number of units and identity of the participants in each trade to deal with noncompliance problems that may arise later. Designing an adequate obligation-tracking system does not appear to be a particularly demanding task.

The Kyoto Mechanisms will introduce obligational ambiguity, however, to the extent that any actors' obligations are contingent (by law or in practice) on the full performance of other actors. Emissions trading

among governments and JI and CDM projects by substate actors involves agreements in which an actor with an emissions-reduction obligation contracts with another actor to take the actions needed to fulfill that obligation. Such contracts introduce potential ambiguity about the responsibility for fulfilling the obligation. Legal obligations in most international regimes cannot be transferred from one actor to another. By allowing such transfers, the Kyoto Mechanisms raise the question of whether the "original obligatee" or the "proxy obligatee" is responsible if the agreed-on reductions are not achieved. Contrast the provisions for JI and CDM projects. The ability of a country to apply emissions reductions acquired from a JI project to its QELRC depends on all countries involved in the project being in compliance with the terms of the project agreement. The CDM provisions and emissions-trading provisions, by contrast, leave questions of accountability up to subsequent elaboration by the Conference of the Parties. Thus, it is not yet clear whether the obligations of a state otherwise in compliance are contingent on the actual behavior of other parties to a CDM project or trade or merely on the agreed behavior of those parties. Particularly since assessing which parties' actions caused a project to fail can only occur at the time of project completion, considerable uncertainty will exist regarding what obligations various actors have. These problems can be mitigated if negotiations eventually clarify what obligations parties to CDM projects and emissions trades have in the case of project failure. But even exceptional legal clarity will not prevent a host of political considerations from leaving uncertainty in the minds of many actors as to who will be held responsible for certain obligations if noncompliance occurs. As the regime develops procedures for allocating responsibility for noncompliance, it will need to consider how those procedures influence not only the actors involved in the particular case but also the willingness of other actors to undertake such projects and trades in the future.

3.2 An Information System That Provides Performance Clarity

Flexibility mechanisms create more difficulties with respect to performance clarity than obligational clarity. Assuming an actor's obligations are clear, the regime's compliance institutions must ensure that evidence of the actor's behavior is equally clear so that the two can be compared

as a basis for a response. Obstacles to transparency about actor performance arise from problems common to many other international regimes as well as from problems particular to the regulatory approaches adopted in Kyoto (Mitchell 1998b). What aspects of an actor's performance must be observed depends on how compliance and performance are defined under the Protocol and under any related trade or project agreements. Behavioral standards and environmental standards present distinct types of performance criteria that introduce different monitoring and transparency problems.

The logic of fostering economic efficiency argues for the superiority of environmental outcome standards since they allow actors maximum flexibility in the behaviors they undertake to achieve a desired environmental goal. At first glance, this seems to imply that behavior need not be monitored—environmental monitoring alone would provide the evidence needed to evaluate performance and assess compliance. However, as the JI and CDM provisions explicitly state, emissions reductions must result from project activity and be "additional" if they are to count toward national obligations. That is, compliance involves not merely observing an environmental outcome but assessing that outcome relative to a baseline defined as what would have happened "in the absence of the . . . project activity." Thus, demonstrating additionality by way of the counterfactual baseline assessment requires reference to relevant actors' behaviors as well as environmental outcomes to determine whether the former caused any observed change in the latter. In some cases, a project's environmental impact will be assessed simply by estimating it from the change in behavior relative to the behavior expected otherwise. In others, where direct environmental monitoring is used, it will be difficult to determine whether the project activity was the cause of any environmental change for two reasons. First, changes in ambient atmospheric environmental conditions, even if limited to an area exactly coincident with the project, will reflect the influences of numerous other activities. Thus, determining whether the project caused those changes will be difficult at best and will, at least, require monitoring of behavior as well as environmental conditions. Second, most environmental indicators of aggregate greenhouse gas levels (even in limited areas) are likely to be increasing. The impact of most projects, therefore, will be evident is a slower rise in

greenhouse gases rather than an actual reduction. More broadly speaking, any baseline assessment requires determining whether a project caused observed environmental changes (and therefore deserves to have those reductions counted toward project or national obligations). Such counterfactual assessments are complicated both by uncertainty regarding whether a reduction actually occurred and, if so, whether that reduction was caused by the project.

In addition, the regime needs information on both behavior and environmental indicators to identify which actor was responsible for noncompliance and whether the noncompliance was intentional or was due to incapacity or inadvertence. Given these tasks, the regime will need to gather information on behavior even when compliance is defined exclusively in terms of environmental quality. Indeed, precluding irresponsible actors from shifting the blame for project failure onto others or from taking undeserved credit for project success while avoiding blaming responsible actors for project failure caused by factors outside their control requires that the compliance system monitor any relevant behaviors that influence the environmental indicator of interest. For example, a factory that contracted to upgrade its equipment to reduce emissions by 20 percent might fail to upgrade any equipment but nonetheless reduce its emissions by 20 percent due to a drop in sales and a corresponding drop in production. In this case, the factory met the environmental standard but not the criteria that reductions be "additional" and "result from" the project. In contrast, a developing-country corporation carrying out a CDM reforestation project that planted and nurtured a more-than-adequate number of trees to sequester the contracted amount of carbon might have its grove wiped out by a flood or hurricane. In this case, the environmental standard was not met due to factors outside the responsible party's control. The ability of the regime's compliance system to discourage projects like the former and encourage those like the latter, despite its failure, will depend on monitoring both behavior and environmental impacts. Unfortunately, few other regimes use such a project-based approach and so development of such an evaluation system will have few empirical examples from which to learn.

Even if it were possible to adequately define and monitor compliance based on environmental indicators alone, the long-term success of the

regime depends on fostering innovative programs and then assessing which ones most effectively reduce or sequester emissions. Such assessments require analysis of the relationship between, and hence collection of information on, human behaviors and environmental impacts. The climate change regime's long-term success depends on being able to determine, for example, how and why one reforestation project was able to sequester more carbon with fewer resources than a contractually similar project. Only by examining both human behaviors and environmental outcomes can the regime encourage projects and policies that transform human resources and action into greenhouse gas reductions efficiently while discouraging those that do so less efficiently (or not at all).

Gathering regular, accurate information on behavior and environmental outputs has proved quite difficult in a range of environmental treaties (Mitchell 1998b). Although some countries required to report under the FCCC have provided full reports on time, many other reports have been late, incomplete, or nonexistent (FCCC/1995/Inf.3 1995; FCCC/A/AC.237/81 1994; Morlot 1998, 29). These problems will increase as new protocols add more extensive reporting requirements, and "independent verification" becomes of "crucial importance" in the JI and CDM mechanisms (Anderson 1995, 16; Luhmann et al. 1995, 10; Michaelowa 1995, 13). Addressing these and related problems suggests adopting several institutional procedures that have proved successful in other international environmental regimes (Mitchell 1994, 318–322). In terms of self-reporting, required data must be made easy to collect and report, must be based on clear formats, and must facilitate subsequent evaluation. The secretariat needs to process and disseminate this information in ways that further the goals of entities responsible for reporting. The compliance information system should include such self-reporting by states and substate actors but should also include independent reporting, monitoring, verification, and on-site inspection (di Primio and Stein 1992; Fischer 1991; Sachariew 1991). Gathering compliance information will be facilitated by involving environmental NGOs and corporations that have independent incentives to serve as watchdogs, monitoring policies, behaviors, and environmental quality (Mitchell 1994, chap. 9; Morlot 1998, 38; Tietenberg and Victor 1994, 28–29). The FCCC also will have to resolve the tension between the need to verify treaty-related information through

independent and sometimes intrusive measures such as satellite monitoring, atmospheric sampling, and on-site inspections, and the significant political resistance to such procedures (Honsch 1992; Lewis 1992). Finally, once such information is collected, the secretariat will need procedures to review and assess the information (Avenhaus and Canty 1992; Grubb and Steen 1991; Victor and Salt 1995). Models for the types of problems the FCCC will face, and the solutions to them, exist in the systems used by the whaling regime to collect self-reports on whale catch, by various International Maritime Organization regimes to collect information from government surveillance and inspection agencies as well as directly from ship captains on pollutants discharged at sea, and by the European acid rain regime's efforts to catalog and analyze emissions and transborder fluxes of various emissions. The quality of the reporting and assessment mechanisms developed will prove crucial to the regime's ability to induce behavioral changes that protect the global climate as well as to its ability to know whether such changes are occurring.

3.3 A Response System That Provides Response Clarity and Differentiated Responses

The climate change regime also will need to develop a compliance response system—that is, a set of institutions and processes for evaluating the relationship of a state or substate actor's actual behavioral or environmental performance against its obligations under the treaty or a treaty-related agreement or contract (Mitchell 1996). Many international relations theorists assume this requires credible and potent sanctions (Downs, Rocke, and Barsoom 1996). Indeed, FCCC negotiators face numerous pressures to adopt traditional deterrent-based approaches to enforcement, such as economic sanctions, legal penalties, and private enforcement, as the best way to enhance conformance with FCCC obligations (Dudek and Tietenberg 1992, 241–245; Tietenberg and Victor 1994, 32; Werksman 1998).

The FCCC is likely to be most effective, however, if it maintains a range of response options, using them strategically within a model of active compliance management that responds to a given type of noncompliance in the way most likely to induce future compliance (Chayes and Chayes 1995; Chayes, Chayes, and Mitchell 1995). One type of response is unlikely to

fit all types of noncompliance. The international and national components of a compliance response system will need to determine why a given state or substate actor failed to meet its commitments. Doing so requires developing procedures for authoritatively determining different causes of noncompliance and providing relevant actors with clear expectations about how the system as a whole is likely to respond to compliance, noncompliance due to inadvertence or incapacity, and intentional violation. Thus, the system might develop a "schedule" of responses in which behavior and environmental impacts were assessed and then intentional violations were sanctioned, noncompliance due to incapacity received technical or financial assistance, noncompliance due to inadvertence was given an opportunity to make good on its commitments, and compliance was rewarded. Of course, the effectiveness of such an approach depends on the credibility that actors associate with the schedule of responses.

Such a system must begin, of course, with a system to carefully assess available information to determine the causes of noncompliance and the appropriate response to it. Particularly vis-à-vis developing states, the FCCC has adopted a system "to avoid confrontation, to be transparent" and eschew sanctions in favor of cooperative measures for "assisting Parties to comply with the Protocol" (FCCC/CP/1995/Misc.2 1995, 6). This approach assumes that most non–Annex I party noncompliance will arise from incapacity, not intention. However, a more discriminating system is likely to be more effective, since reward-based strategies provide actors with incentives to disguise intentional violations as incapacity in order to extract resources from other states (Darst 1997). Evidence from several cases of exchanging financial aid for environmental performance suggest that reward-based systems do, indeed, risk moral-hazard problems (Keohane and Levy 1996). As the Kyoto Protocol makes particularly clear in the CDM provisions, emissions reductions will need to be independently certified by experts in the appropriate fields. Likewise, the efficiency promised by a market in emissions reduction units depends on independent verification of trades to ensure their value and credibility (Tietenberg and Victor 1994, 17–18). Besides determining what reductions occurred, the regime will need to assess which parties to JI and CDM projects or emissions trades should receive credit for success or be liable for failure. The regime will need to evaluate claims of states and substate actors that

have sold emissions rights but claim their noncompliance with their adjusted emissions target is due to inadvertence or incapacity.

Once the system determines the causes of any observed noncompliance and assesses which actors, if any, should be liable for such noncompliance, the system must determine how to respond most effectively. The goal of the system should be to respond in ways that target the source of noncompliance and promote future compliance. As a first approximation, this could involve providing the financial, administrative, or technical resources deemed lacking in cases of incapacity; providing technical advice and new, extended, but specific compliance deadlines in cases of inadvertent policy or program failure; and adopting sanctions in cases of intentional violation (Goldberg et al. 1998). Effectiveness is also likely to be fostered by rewarding compliance. Providing positive incentives for compliance and for positive behaviors that produce emissions reductions larger or sooner than required could help the regime achieve aggregate environmental improvements that exceed rather than merely meet the goals established. In short, the response system must be able to differentiate compliance from noncompliance; furthermore, to differentiate noncompliance due to inadvertence, incapacities, and intentionality; and induce differentiated responses to behaviors and outcomes that make goal-promoting behaviors more likely in the future than at present.

Sanctioning those assessed as having intentionally violated their commitments provides those actors with incentives to bring themselves into compliance while simultaneously deterring others who might be tempted to intentionally violate in the future. Considerable evidence suggests that sanctions can be effective at influencing behavior, at least under some conditions (Hufbauer, Schott, and Elliott 1990; Pape 1997). Unfortunately, governments often prove reluctant to impose trade sanctions or other penalties on other states, because of collective action problems and the costs to the sanctioner of sanctioning. Nor are governments likely to empower some centralized FCCC enforcement authority to do the job (Sands 1993, 389). The FCCC could facilitate sanctioning by removing legal barriers that inhibit those predisposed to enforce the agreement—for example, altering World Trade Organization rules to permit trade sanctions in response to FCCC noncompliance (Mitchell 1994, 322; see also chapter 13 of this volume). And governments may engage in various

forms of collective opprobrium, such as diplomatic shaming and jawboning, that may induce compliance (Chayes and Chayes 1993, 1995; Mitchell 1994). Unfortunately, experience suggests that sanctioning is unlikely to be sufficiently frequent or severe to alter the noncomplier's behavior in many cases.

These obstacles to an effective sanction-based system and the recognition that sanctions are not appropriate when noncompliance is not intentional has prompted interest in alternative approaches. The best response to noncompliance that stems from incapacity, of course, is to provide the financial, administrative, or technical resources needed to remedy the incapacity. Financial and technology transfers and training may prove most helpful when capacity rather than will is the source of the problem. The international wetlands convention has sought to prevent wetlands degradation by providing technical advisors to countries experiencing difficulty doing so on their own while also publishing a list of wetlands at risk that provides a basis for mobilizing either assistance or shaming. Unfortunately, such programs require funding from governments and/or NGOs, and experience with the Global Environment Facility and technology transfer programs demonstrates that governments often prove as reluctant to fund such programs as they do to impose sanctions (French 1994, 96; Keohane and Levy 1996; Victor and Salt 1994, 15). Indeed, governments have yet to develop mechanisms to induce developed countries to provide the funds needed by developing countries to contribute to the goals of the Convention. When noncompliance stems from inadvertence, the best approach for the regime may be to provide various avenues for the noncompliant party to bring itself into compliance. These avenues could include a specified but extended deadline for compliance, allowing the post hoc purchase of emissions credits from parties that have reduced below their QELRC, or contributing to the Convention's financial mechanism in an amount sufficient to fund the quantity of reductions needed to bring it into compliance (Goldberg et al. 1998, 22–23).

Finally, provisions should be made to reward overcompliance and innovation. Precisely because current emissions reduction targets fall far short of what most scientists consider necessary to avert climate change, significant progress requires incentives for going beyond what is required and for undertaking risky projects that provide uncertain, but potentially

large, reductions at low cost. Countries, corporations, and NGOs that exceed their required emissions reductions should be rewarded by creating awards and a "white list," by providing access to the Convention's financial mechanism if appropriate, by reducing the verification requirements imposed, or by other similar incentives. Over the long term, such rewards will be crucial to reducing greenhouse gas emissions at rates above those delineated in the FCCC.

3.4 An Evaluation System That Learns from Experience

The FCCC is unlikely to "get it exactly right" at first. The novelty of the policy approaches and the uncertainty of the science and technology involved mean that the FCCC should constantly seek to improve its effectiveness over time rather than to achieve effectiveness. This requires looking at the overall performance of the system, rather than the success or failure of individual JI or CDM projects, or the compliance or noncompliance of individual states. The regime must self-consciously evaluate and refine the overall compliance system to maximize the emissions reductions achieved over time. The regime should conduct its own regular self-evaluations but should also encourage NGOs and other interested actors to evaluate the system against the FCCC's goals.

The FCCC must manage a complex portfolio of different Annex B commitments, JI and CDM projects, and emissions trades to maximize aggregate emissions reductions. The best mix of such programs is likely to include considerable innovation with attendant risks of failure. As with individual stocks in an aggressive mutual fund, individual project or program failures need not threaten the overall goals of the system. Relevant lessons may be drawn from individual projects, and from patterns across projects and programs. For example, evaluating whether reforestation projects consistently outperform (or underperform) equal-cost energy-efficiency projects would allow efforts to be channeled into projects that produce the largest reductions at a set cost. Similarly, large, cross-project analyses will allow the discovery of ways to improve baseline estimation techniques. The real success of the regime requires determining the causes of large trends across projects and states as well as the causes of success and failure of individual projects or of compliance and noncompliance by particular states. Such project assessments, analyses, and lessons

should be made widely available so state and nonstate actors can use the lessons in designing and implementing subsequent projects and programs. Establishing and maintaining open lines of communication among project participants, between participants and the secretariat, and with all interested parties will allow all those interested in fostering the regime's success to have the best possibility of doing so.

4 Conclusion

Will the nations of the world achieve the goals they set for themselves in the FCCC? Many years will need to pass before any serious assessment can be made of that question. Indeed, the treaty will never solve the problem of climate change but will, at best, find ways to manage the problem over time. Successfully accomplishing even that more limited goal requires the regime and its member states to establish primary rules, compliance information systems, noncompliance response systems, and a program evaluation system that provide clear expectations about what is required, distinguish intentional from unintentional noncompliance, and encourage compliance while discouraging noncompliance. These represent considerable demands for a secretariat and associated institutions that are likely to be consistently underfunded, understaffed, and overworked (Mitchell and Chayes 1995). Even with the best-designed compliance system imaginable, the effectiveness of the regime at inducing the economic, social, and political changes necessary to avert climate change will depend on nations, corporations, NGOs, and individuals dedicating significantly greater resources to the task of preventing climate change than they have dedicated to any previous environmental problem.

Having discussed the political implications of the climate change regime and the challenges of compliance and implementation of the climate policies of the FCCC and the Kyoto Protocol, it is important to assess the place of the climate change regime within the general framework of international environmental accords. What are the common aspects and what are the differences? Can one draw some inferences for the climate change regime from the experiences of other environmental accords? These issues are addressed in the following chapter.

Note

This chapter is dedicated to the memory of Abram Chayes. My thinking on the issues discussed here has been influenced by my work with Professor Chayes and Antonia Handler Chayes (see Chayes and Chayes 1995; Chayes, Chayes, and Mitchell 1998; Mitchell and Chayes 1995), with Oran Young's regime effectiveness project (Young 1999), and with Edward Parson (Mitchell and Parson 1999). I wish to express my appreciation to all four scholars for their insights on these issues. The chapter has also benefited from comments by the editors and other contributors to this volume.

V

The Global Climate Change Regime in the International Regulatory Domain: Comparisons and Conclusions

This page intentionally left blank

12

Comparing the Global Climate Regime with Other Global Environmental Accords

Detlef F. Sprinz

International environmental agreements have a long history. Many regional agreements were concluded in the early twentieth century, and a broad range of treaties followed the establishment of the United Nations in 1945 and the rebuilding of the industrialized economies after World War II. This growth in international environmental agreements is closely linked to two key international events: the 1972 United Nations Conference on the Human Environment at Stockholm and the 1992 United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro (see also chapter 2). The 1972 Stockholm Conference can be seen as the culmination of efforts to foster global attention and political momentum for the environment, leading to the creation of the United Nations Environment Programme (UNEP). Many international environmental agreements were concluded thereafter, inter alia, on the protection of flora and fauna, regions (such as the Antarctic or Amazon areas), types of habitats (such as wetlands), international rivers, the regional seas (e.g., to control land-based discharges into the seas), oil pollution from ships, international transport of hazardous waste, and transboundary air pollution (see Caldwell 1996, 380–383). A new set of environmental problems calling for a global regulatory approach have gained prominence since the late 1980s. This recent wave of global accords—to which the global climate regime belongs—has its roots in the growing awareness that *global* environmental change is becoming a major force in reshaping planet Earth. The discovery and scientific disputes about the thinning of the stratospheric ozone layer and potential climate changes were soon followed by concerns about a range of contemporary global environmental issues, including maintaining the Earth's biological diversity, the

future of forests, limiting desertification, and the effect of persistent organic pollutants. To regain global momentum twenty years after Stockholm, the 1992 UNCED conference at Rio de Janeiro combined the developmental and environmental political agendas. This chapter puts the global climate change regime into the larger context of major global environmental regimes largely created in the 1990s by comparing their origins, institutional structures and development, as well as their contribution so far toward the solution of global environmental problems.

1 Two Types of Global Environmental Problems

Environmental change may be either natural or anthropogenic. *Natural* change may occur, for example, as a result of changed solar activity, natural acidification of lakes over a millennium, or a sea-level rise independent of the enhanced greenhouse effect. Many of these changes normally occur on very long time scales ranging from centuries to millennia and are difficult to cope with by humans working on much shorter time intervals ranging from a few years to a few decades. Besides such natural changes, environmental change may result from *human activities* in the production and consumption sphere (Turner et al. 1990). These activities, on the one hand, often generate desirable outputs such as goods and services that improve the human condition; on the other hand, many of these activities also have adverse side effects such as pollution released to air, land, or water, or they transform the natural landscape. Once pollutant emissions exceed the environment's ability to cope with them, we may face environmental impacts on humans and the rest of nature, such as human-induced sea-level rise, reductions of biodiversity as a result of cutting down tropical rainforests on a large scale, or desertification of land as a result of inadequate land management techniques. Accepting the challenge of global environmental changes, humans may either try to control the causes of such changes (mitigation) or counteract the effects of global environmental changes (adaptation). While we will mostly consider the efforts at mitigating global environmental changes in this chapter, we will attend to the adaptation option in the concluding section.

This chapter deals with two types of global environmental change, namely, a "global force mechanism" and a "widespread similarity pat-

tern." The "global force" version of global environmental change is the result of a global aggregation process of the (often) adverse side effects of human activities. For example, increased global emissions of greenhouse gases transform the earth's atmosphere and lead to region-specific effects, such as increased droughts in some areas and prolonged growing seasons in other areas. Both outcomes result from a global cause-effect relationship and are best captured by the examples of the thinning of the stratospheric ozone layer, global climate change, and the polar migration of the releases of persistent organic pollutants (see below). By contrast, other global environmental changes are not mainly the result of a global force mechanism but have mainly regional-scale origins and regional-scale effects—and generally lack a global force mechanism. They do, however, occur in many areas of the world in a similar way and are, therefore, often candidates for international environmental regulation. We will refer to this phenomenon as the "widespread similarity pattern" type of global environmental change. Deforestation, desertification of land, and, to some degree, the protection of the world's biodiversity fall into this category.

Most "widespread similarity pattern" problems also share some "global force" characteristics. Global climate change has an effect on the future of the world's forests—for instance, on their species' composition as well as their location—and on desertification due to expected changes in precipitation patterns. For example, once a species is irrevocably removed from the world's gene pool, it is not available for future use or enjoyment worldwide and therefore has a potentially adverse global effect—although the cause and effect may be more localized. Similarly, much of the origin of desertification is not globally caused but occurs in many places around the world. In conclusion, the two types of global environmental problems should be seen as *ideal* types.

UNCED in 1992 and its preparatory process led to international efforts to manage this broad set of global environmental change issues (see also chapter 2). Some of these efforts have resulted in international environmental treaties (climate, stratospheric ozone depletion, biodiversity, desertification), others have resulted in a draft convention text (persistent organic compounds), while a third group resulted in a recommendation to develop a legally binding instrument within the next five years (forests).

We will review these various efforts, compare their institutional setup, and draw some tentative conclusions by comparing this set of contemporary global environmental agreements.

2 Environmental Problems and Major Global Environmental Agreements

Preceding the regulation of global climate change, *stratospheric ozone depletion* has attracted much international attention since the mid-1980s. Substances such as the long-lasting chlorofluorocarbons (CFCs) destroy stratospheric ozone at a rate that ultimately leads to a thinning of the stratospheric ozone layer. Fluorocarbons and related ozone-depleting substances are found in many contemporary applications, ranging from coolants for refrigerators to air conditioners and fire extinguishers. In fact, the history of CFCs is quite interesting. Early in the twentieth century, CFCs were used as hard-to-inflame and easy-to-use coolants replacing other substances then considered much more hazardous. The hypothesis relating CFC emissions to a thinning of the stratospheric ozone layer was brought forward in 1974 by Molina and Rowland (who later won the Nobel Prize for this discovery) and led to fears of increased human skin cancers as well as agricultural losses as a result of increased ultraviolet radiation. A 1994 Scientific Assessment (Benedick 1998, 224–225) suggested that the maximum ozone depletion should have occurred toward the end of the twentieth century. Most dramatic have been the animated displays of an "ozone hole" over Antarctica—which is equal to about twenty-five times the size of Egypt.[1]

While Molina and Rowland advanced the hypothesis in 1974 that CFCs will ultimately deplete the stratospheric ozone layer, it took a range of major activities within the U.S. National Academy of Sciences, the United Nations Environment Programme Council, and unilateral actions first by the United States to ban and later by the European Union to limit CFC use in aerosols before political attention could be mobilized more globally. Only during the year of the conclusion of the 1985 Vienna Convention for the Protection of the Ozone Layer (which entered into force in 1988) could the British Antarctic expedition actually demonstrate a seasonal "ozone hole"—that is, a very substantial thinning of the protec-

tive stratospheric ozone shield during the Antarctic winter. Still, even until the conclusion of the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987 (which entered into force in 1989) it remained unclear to what extent CFCs by themselves had accounted for the observed thinning of the stratospheric ozone layer.[2] While the Vienna Convention served as a framework agreement and created many of the political institutions necessary for the operation of a regulatory international regime, the Montreal Protocol and its amendments have introduced specific and substantive limitations on the use of fluorocarbons, halons, and methyl bromide (for details, see Oberthür 1998, 98–142). The major institutions created under the Vienna Convention and the Montreal Protocol include a Conference of the Parties (COP) as the supreme body governing the treaty regime, expert advisory bodies (mainly the Technological and Economic Assessment Panel, Scientific Assessment Panel, and Environmental Assessment Panel), an Implementation Committee, and a secretariat to support the work of the COP (see table 12.1). The Montreal Protocol controls specific chemical substances, starting with a smaller set in 1987 and enlarging the range of controlled substances and often accelerating the time frame for phasing them out. Since developing countries would potentially offset the advances made by industrialized countries in phasing out ozone-depleting substances (ODS), a Multilateral Fund (MLF) was created to channel financial assistance to developing countries. Decisions within the ozone regime are taken by two-third majorities and in the case of the MLF by a double qualified majority vote—that is, two-thirds of developing and two-thirds of developed countries have to agree to decisions. Furthermore, developing countries are generally granted a ten-year delay as compared to industrialized countries in implementing mitigation measures. To limit nonparticipant countries' chances of undermining the global treaty, trade in controlled substances with nonparties counts toward the consumption of the exporting country after an initial starting period. Further innovations include provisions that adjustments of already-controlled substances can be made by a two-thirds majority *plus* more than 50 percent of total consumption (Montreal Protocol, Art. 2(9)). This avoids a new round of national ratification, which could be very time consuming—in contrast to regulating hitherto unregulated substances, which have to undergo

Table 12.1
Overview of agreements and institutional design

	Environmental problem		
	Climate change	Stratospheric ozone depletion	Loss of biodiversity
Legally binding agreements	Framework Convention of Climate Change (1992), Kyoto Protocol (1997, did not yet enter into force)	Vienna Convention (1985), Montreal Protocol (1987) and amendments	Convention on Biological Diversity (CBD, 1992), Cartagena Protocol on Biosafety (2000, did not yet enter into force)
Major institutions	COP & MOP (Kyoto Protocol), Secretariat (Bonn, Germany), SBI, SBSTA, Financial Mechanism (GEF)	COP & MOP, Secretariat (UNEP, Nairobi), Multilateral Fund (MLF)	COP & MOP (Cartagena Protocol), Secretariat (Montreal, Canada), SBSTTA, Clearing House Mechanism, Financial Mechanism (GEF)

Note: COP = Conference of the Parties
GEF = Global Environmental Facility
IFAD = International Fund for Agricultural Development
INC = International Negotiating Committee
ITTA = International Tropical Timber Agreement
ITTO = International Tropical Timber Organization
LRTAP = Long-Range Transboundary Air Pollution

Table 12.1
(continued)

	Environmental problem		
	Deforestation	Desertification	Persistent organic pollutants
Legally binding agreements	International Tropical Timber Agreement (ITTA, 1993), Forest Principles (1992, not legally binding)	Convention to Combat Desertification, (CCD, 1994)	LRTAP Protocol on POPs (Europe and North America, 1998), global agreement agreed upon (2000)
Major institutions	Intergovernmental Forum on Forests (IFF), Intergovernmental Panel on Forests (IPF, abandoned in 1997), ITTO, TFAP	COP, Secretariat (Bonn, Germany), Committee on Science and Technology (CST), Global Mechanism (IFAD & GEF)	International Negotiating Committee (INC), Criteria Expert Group as subsidiary body to INC; global draft convention stipulates: COP, Secretariat, Subsidiary Body, POPs Review Committee, Interim Financial Mechanism (GEF)

MOP = Meeting of the Parties
SBI = Subsidiary Body for Implementation
SBSTA = Subsidiary Body for Scientific and Technological Assessment
SBSTTA = Subsidiary Body on Scientific, Technical, and Technological Advice
TFAP = Tropical Forestry Action Program

domestic ratification by signatory countries. Because the Montreal Protocol and its revisions lead to frequent changes in the time frames for phasing out ODS and for encompassing new substances over time, some parties fear "obligation overload." Therefore, the European Union suggested at the COP in Beijing in December 1999 the introduction of simpler ODS listing procedures to avoid too many formal amendments to the Montreal Protocol. By the Thirteenth Meeting of the Parties of the Montreal Protocol in the fall of 2001, progress in reaching the first set of developing country targets will be assessed.

Partially parallel to the negotiations on the Framework Convention on Climate Change (FCCC) the Convention on Biological Diversity (CBD) was negotiated and later signed at UNCED. The underlying environmental problem is the preservation of the richness in species of flora and fauna. In this environmental domain, estimates of the actual stock of species is difficult since many of them have not yet been identified and described. Until the mid-1990s, only 1.7 million species had been identified, although their expected total range is 3–117 million (!) with a conservative estimate being made of 14 million—with more than half of these expected to be insects (Heywood 1995). It has been estimated that between 1 and 11 percent of species have or will become extinct per decade during the period 1975–2015 (World Resources Institute 1996, 247–248), and the German Scientific Advisory Council on Global Environmental Change has estimated that 10 to 50 percent (!) of present species are at risk of extinction during the next fifty years—which is approximately 1000–10,000 times the natural rate of extinction (German Advisory Council on Global Change (WBGU) 1996). Species extinction itself results from, among other things, the destruction and fragmentation of natural habitat (e.g., pandas), pollution, introduction of nonindigenous species, or outright overuse of a resource. Why should one protect the world's gene pool? It has been suggested that having a broad variety of seeds for agricultural use stabilizes expected yields under varying conditions, but it is also a source for new medicines and plays an important part in an ecosystem's functioning and resilience, besides serving the ethical values of preservation and more immediate uses as food, cosmetics, fuel, and industrial products.

Attempts at regulating biodiversity on a global level arose from two broad strands of concern. Since the beginning of the twentieth century, only agreements covering particular species and/or regions have been concluded, and during the 1980s scientific consensus focused on the increase in the extinction of species as well as the challenge posed by modern biotechnology. Backed by the Reagan administration in 1987, the UNEP Governing Council created an ad hoc group of experts to explore the opportunities for a global framework (Victor and Raustiala 1996, 18).[3] Subsequently, as in the case of the FCCC, an Intergovernmental Negotiating Committee successfully prepared the Convention on Biological Diversity (CBD) after only five negotiating sessions during 1991 to 1992 and presented the CBD for signature to the UNCED conference in 1992. The three central objectives of the CBD are the "conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (CBD, Article 1).[4] This article captures some of the key points of controversy arising from the global regulation of biodiversity, namely, the question of sovereignty over biological resources and the question of how economic benefits should be shared. The first question has been solved in favor of national sovereignty over the use of newly acquired resources, whereas previous knowledge remains in the domain of current property right owners (CBD, Article 3) and the benefits are to be shared between those who explore new biological resources and those who provide them (CBD, Articles 15, 16, 19). This provision reflects the tension over intellectual property rights related to existing and future knowledge of biodiversity gained by mostly industrialized countries' firms and the availability of the natural sources of biological material in the (so-called) centers of diversity, mostly in developing countries. For example, it has been estimated that 95 percent of the global production of the twenty most commercially important agricultural products relies on the genetic resources originating in developing countries (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen 1995, 170). While developing countries have tried to gain a share of these proceeds, industrialized countries succeeded in excluding assets appropriated *prior* to the CBD by insisting that these fall under intellectual property rights

rather than under the rubric of "common heritage of mankind." The latter would require a benefit-sharing agreement with the countries of origin.

The CBD's institutional setup includes a Conference of the Parties, a Subsidiary Body on Scientific, Technical and Technological Advice, a secretariat, and a Clearing-House Mechanism for the dissemination of information and technological and scientific cooperation. Following its entry into force in December 1993, the second Conference of the Parties provided a mandate to negotiate a treaty to regulate the biosafety of living modified organisms—that is, the "safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity" (CBD, Article 19). Because biotechnology affects the core of commercial interests related to the utilization of biodiversity, countries with major companies trading mostly in genetically modified agricultural products sought to keep regulations at minimal levels. Many other countries stressed consumers' rights to know ("advanced informed agreement") and the possibility of excluding genetically modified products on precautionary grounds—both of which stress the rights of importing countries. This led to a diplomatic row particularly between the so-called Miami Group of agricultural producers of living modified organisms (comprising Argentina, Australia, Chile, the United States, and Uruguay) and the European Union, the latter supported by most developing countries ("Likeminded Group"). While it was not possible to resolve such issues at Cartagena, Colombia, in February 1999, the Biosafety Protocol was concluded in late January 2000 in Montreal, Canada. Among its provisions are stipulations ensuring "an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements" (CBD Biosafety Protocol, Article 1).[5]

The Biosafety Protocol to the CBD aims at balancing the commercial interests of agricultural countries with the rights of importing countries to receive advanced information about the risks of imported goods. It explicitly excludes pharmaceuticals for human use that are covered by

other international agreements or organizations (CBD Biosafety Protocol, Article 5).

These regulations reflect the antagonism concerning the evaluation of the benefits and dangers of modern biotechnology—for example, major fears by European importing countries of genetically modified soybean imports. Therefore, the introduction of the precautionary principle gives importing countries veto power to protect their population—but also the opportunity to create or maintain trade barriers in the agricultural sector. The advanced informed agreement procedure requires more detailed reporting for living modified organisms (LMOs) to be released intentionally into the environment (e.g., seeds), and less detailed reporting for organisms for direct use (e.g., food). Precise labeling strategies for LMOs used for food or feed have not yet been established. Furthermore, the regulation of biodiversity was not allowed to become subordinate to trade regulation and dispute settlement under the World Trade Organization. While the Biosafety Protocol has not yet entered into force, preparatory work continues regarding the creation of a Biosafety Clearing House and a compliance mechanism.

A special case of biodiversity is concern for the world's *forests*. Roughly 40 percent of the Earth's land is covered by forests and wooded land. While they are local or regional in scope, they also provide for especially species-rich habitats, and natural forests, like those of the Pacific Northwest of America or tropical forests, are at particular risk (World Resources Institute 1996, 203). In addition, forests are the basis for fuel wood and commercial forest-related products, but also serve social and cultural purposes of indigenous and local communities. In addition, they act as a sink for carbon dioxide emissions. Despite these manifold functions and to provide for export revenue of some developing countries, the world's forest coverage is in sharp decline. It has been estimated that by the early 1990s about 40 percent of the Earth's land surface has been converted from forests and grassland to cropland and permanent pasture (World Resources Institute 1996, 201). During the period from 1981 to 1990, Latin America, Asia, and Africa combined lost nearly 9 percent of their forest areas.[6] Since forest coverage also plays an important role in the nutrient cycles of soils and in the regulation of water tables, they play a vital role in arid areas (Chasek 1997). Including forests in the

biodiversity and desertification regimes appears desirable; however, it appears to have not been clearly included in either of the two regulatory domains.

Despite their importance, the preservation and sustainable use of the Earth's forests have not yet been globally regulated. Early Conferences of the Parties of the CBD did not launch a work program on forests partially due to pressure from timber-producing countries, which feared the impact of legally binding obligations, and for lack of clarity as to which UN institution is in charge of forests. Thus, the CBD did not become the global regime charged with including the preservation and sustainable use of forests by way of a specialized protocol (McNeely, Rojas, and Martinet 1995, 39),[7] although the CBD adopted a work program for forest biodiversity at the fourth Conference of the Parties. While there have been attempts to regulate the sustainable use of tropical forests within the International Tropical Timber Agreement (ITTA) and the International Tropical Timber Organization (ITTO) since the 1980s, disputes about whether to protect forests comprehensively or to regulate their economic use has led to a "Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forest"—or "Forest Principles"—on the occasion of UNCED in 1992. Since then, the diplomatic process bound up with attempts to arrive at a global regime on forests has been handed over to the Intergovernmental Panel on Forests (IPF) in 1995. Following lack of progress in solving the core issues of institutional options for regulating the degradation of the world's forests, the work of the IPF was continued by the Intergovernmental Forum on Forests (IFF). Relabeling organizational setups does not necessarily lead to success, and the degradation of the Earth's forests still lacks a global agreement. While the Fourth Session of the IFF in February 2000 recommended that negotiations on a legally binding instrument get underway within the next five years, it appears open to conflicting interpretations. Questions of funding and the commercial use of forest-related biodiversity have remained unresolved. An Interagency Task Force on Forests has been set up that has brought together the major IGOs of the UN system, its specialized agencies, and the World Bank. Since forests appear to fall in between the regulatory domains of the CBD (ecosystem function), the

FCCC (carbon sequestration), the UNCCD (land degradation), the WTO (trade), the ITTO and the Food and Agriculture Organization (FAO), authority on the forest issue has been dispersed. In view of the institutional history to promote sustainable forests, the United Nations Economic and Social Council has established the United Nations Forum on Forests to continue the work of the IPF and IFF at a politically elevated level. The new forum is also charged to consider the prospects for a legally binding document over the next five years (United Nations Press Release ECOSOC/5934, 18 October 2000). Instead of intergovernmental agreements, voluntary systems appear to thrive. The Forest Stewardship Council tries to promote certified sustainable forest management on a voluntary basis, and rival attempts by smaller forest owners within the Pan-European Forest Certification Scheme, particularly in Scandinavia, have yielded alternative certification based on less costly reporting procedures.

Among the contemporary wave of global environmental agreements, the challenge of *desertification* is most vividly characterized by the approximately 250,000 lives lost in West Africa in the early 1970s due to drought and famine. Desertification includes the degradation of vegetation, which subsequently degrades the soil (German Advisory Council on Global Change (WBGU) 1996, chap. C4; Mackenzie 1998, 283). More than half of the soil's degradation stems from water erosion, followed by wind, chemicals, and physical degradation. About 17 percent of total vegetated lands suffer from soil erosion, mostly due to overgrazing, deforestation, and agricultural practices. Drylands themselves make up one-third of the world's land area and are particularly vulnerable to overexploitation and inappropriate land use. The secretariat of the UN Convention to Combat Desertification in Those Countries Experiencing Serious Drought And/Or Desertification, particularly in Africa (CCD), estimates that 250 million people worldwide are directly affected by desertification, and a total of 1 billion are estimated to be at risk.[8] However, there is a lack of good indicators for this problem, although it is acknowledged that Africa's nutritional problems are the gravest worldwide, and indicators of "wasting" (weight-for-height ratio) and "stunting" (height-for-age ratio) among the youth point to problems not only in Africa but also in Central and South America as well as in some parts of Asia (World

Resources Institute 1996, 194–195). Desertification is partially related to other global environmental problems. Climate affects and is affected by desertification, because changes in land use and land cover alter the energy balance in the lower atmosphere through changes in radiation absorption, reflection, and emissions properties of soils (sources and sinks for greenhouse gases). Furthermore, changes in evaporation and rainfall retention potential have an impact on the water household in dry areas (Chasek 1997, 150), and dry areas are particularly vulnerable to climate change. But in contrast to the depletion of the stratospheric ozone layer and global climate change, desertification is, like much of the loss of biodiversity, a *locally* caused problem and mainly has local effects.

Early efforts were undertaken by the UN Conference on Desertification in Nairobi, Kenya, in 1977 to plan for an action program to combat desertification—which failed for conceptual and financial reasons. It took an African Initiative for a UN General Assembly decision on 1992 to provide a mandate for an Intergovernmental Negotiating Committee to negotiate the CCD between 1993 and 1994.[9] The CCD entered into force in 1996. The central obligations under the CCD include the development of national action programs (CCD, Article 10) that handle issues such as drought management, the development of water resources, maintenance of vegetation cover, and food and energy security in order to fight desertification, mitigate the effects of droughts, improve the productivity of land, and further sustainable management of land and water resources (CCD, Article 2). Region-specific annexes to the CCD highlight the role that these national action programs play, especially for Africa. In pursuing their policies, developing countries are to be supported by industrialized countries in terms of various types of resources, including private funds, official development assistance, and technology transfer. Although there have been various bilateral and multilateral agreements, a general scale for new North-South transfers to combat desertification could not be agreed on. As in the case of stratospheric ozone depletion, climate change, and biodiversity, the institutional setup of the CCD comprises a Conference of the Parties, a Committee on Science and Technology, a Global Mechanism for funding, and a Secretariat of the Convention. Industrialized countries belonging to the OECD seem to attach less impor-

tance to the CCD, as witnessed by the lack of high-level participation at various Conferences of the Parties.

More recently, persistent organic pollutants (POPs) have attracted global regulatory attention, although Rachel Carson's book *Silent Spring* (1962) brought these pollutants to the attention of the U.S. public as early as 1962. POPs belong to a group of chemicals that are difficult to degrade once released and that may have serious effects on human health—both positive and negative. Perhaps the best-known and most widely debated chemical belonging to the POP group is DDT. It is used as an insecticide to protect humans against the spread of malaria—which claims many lives in tropical developing countries. Because DDT is cheap to produce, it is still considered an appropriate insecticide in some developing countries, whereas it has been prohibited in industrialized countries because of its adverse side effects on human health. Alternatives are available at substantially higher costs. Since it does not degrade easily, DDT accumulates in the body fat of animals in the food chain, furthers the resistance of insects, impairs reproduction in animals, and leads to headaches and other ill-effects in humans. Since they are semivolatile and do not degrade, POPs more generally have local effects but also travel long distances to the polar regions of Antarctica and the Arctic, where they enter the food chain through the body fat of animals. POPs, which also include dioxins, furans, and PCBs, can impair the immune and nervous system as well as the reproductive capacity of Inuits (Selin 1997). Since POPs have both localized effects and share the characteristics of a "global force mechanism," they fall into both categories of global environmental change problems. They are also a transboundary environmental problem and have been regulated in Europe and North America since the 1990s.

The 1998 Aarhus Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants was signed in June 1998 and divides sixteen regulated POPs into three categories, namely, those to be eliminated, restricted, or voluntarily restricted. While this international agreement covers only Europe and North America, it served as a frontrunner for global efforts. In 1995, the UNEP Governing Council called for the assessment of twelve POPs and decided in 1997 to issue a mandate for an Intergovernmental Negotiating Committee to

negotiate a legally binding treaty. This committee was launched in 1998 in Montreal, Canada. The particular aim was to improve coordination among international agencies and regulate international trade of POPs by furthering prior informed consent—similar to the case of trade in biotechnology. Because industrialized countries have already regulated many POPs within their jurisdiction, a global accord will mostly affect the production and use in developing countries. By December 2000, the fifth session of the Intergovernmental Negotiating Committee succeeded in drafting a POP Convention, which is scheduled for signature at Stockholm in mid-2001.[10] Twelve POPs shall be regulated in three groups. The first group consists of POPs that shall be forbidden, the second group (currently consisting solely of DDT) shall be restricted in production and use, and the PCBs in use falling into the third group shall be phased out over the next twenty-five years. Perhaps the greatest innovation of the POP Convention lies in its aim to avoid the production and use of hitherto undiscovered POPs. The draft convention foresees the creation of a range of institutions, including a conference of the parties, a secretariat, a subsidiary body, the POPs review committee, and an interim financial mechanism, handled by the global environmental facility.

3 Comparing and Evaluating Global Environmental Agreements

Many of the international environmental agreements covered in this chapter have arrived at the stage of a framework convention (climate, ozone, biodiversity, desertification, and persistent organic compounds), some of which have also led to specialized protocols in addition (climate, ozone, and biodiversity). In all cases where binding international agreements have been reached, similar institutions have been built that comprise a Conference of the Parties, a Meeting of the Parties (in case of specialized protocols), one or several scientific and/or technological subsidiary bodies, and a secretariat. This section compares global environmental agreements across some important dimensions, including the decision-making procedures, the reporting and compliance system, the funding mechanism, the degree to which development goals play an important role, the effect of the particular treaty regime, and the interlinkage across the various treaty regimes. Given the absence of an international

treaty on forests, we will restrict ourselves to the cases just mentioned. (See table 12.2.)

3.1 Decision Making

Decision making in the various regimes follows a similar format. Quite often, close to unanimous support is preferred, but decisions and changes to conventions, protocols, and annexes can often be taken with a two-thirds majority of the votes. Under particular circumstances, double-majority requirements are put into place, especially once funding is effected. Because the global climate regime has failed to arrive at rules of procedure, it relies on unanimous voting by default. In most cases, decisions can be made if the number of opposing countries is small and does not include a major country. By contrast, in the case of stratospheric ozone depletion, explicit two-thirds majorities apply to all decisions (but purely procedural ones). In the case of decisions on the financial mechanism, two-thirds each of the developing and industrialized countries have to support a decision. The CBD prefers consensus and requires two-thirds majorities in its absence. The CCD requires consensus for most decisions since "Rule 47" on rules of the procedure, including simple majority and two-thirds majority on substantial matters, has not yet been adopted. The draft POP Convention relies on qualified majorities for decision making. Overall, it appears that the climate change regime is trailing the other global regimes in arriving at practical solutions to the challenge of formal decision making.

3.2 Reporting and Compliance

Central to many international agreements are *reporting mechanisms,* which are a necessary means of evaluating compliance and of potentially invoking a noncompliance mechanism. All of the global environmental agreements that have been concluded require participants to report regularly on their efforts to achieve the basic objectives of the agreement. Most often, industrialized countries have to move first in submitting reports, followed by developing countries. Furthermore, industrialized parties are often asked to contribute to funding the reports of developing countries by way of dedicated channels. In the case of climate change, industrialized countries have submitted their second national

Table 12.2
Comparing global environmental accords

Convention	FCCC and Kyoto Protocol	Vienna Convention and Montreal Protocol	Biodiversity (CBD)
Decision making	*Failed to arrive at rules of procedure:* unanimous voting in most cases; in practice: exceptions from consensus if number of opposing countries is small and does not include a major country	*Strong voting mechanism:* adjustments to already controlled substances (without need for national ratification); for the addition of new substances: two-thirds of the parties; decisions on financial mechanism: two-thirds majorities within each group of industrialized and developing countries	*Weak Voting mechanism:* amendments to the convention require consensus or two-thirds if consensus fails; annexes require two-thirds majority decisions
Reporting and compliance	Regular reporting on efforts to achieve the objectives of the convention; noncompliance procedure under development	Yearly reports on production, exports, and imports; strong implementation review; soft and hard noncompliance procedures, including sanctions for illegal trade and threat of terminating funding	Reports on measures to implement provisions of the convention; only general rules on arbitration, conciliation, and compliance (Cartagena Protocol); extensive information provision (Cartagena Protocol)
Funding mechanism	Global Environmental Facility	Multilateral Ozone Fund	Global Environmental Facility

Table 12.2
(continued)

Convention	Desertification (CCD)	Persistent Organic Compounds (POP Convention)[a]
Decision making	*Rules of the procedure still to be adopted (Rule 47):* unanimous voting in most cases; simple majority only for procedural decisions; amendments to the convention: two-thirds majority; parties that do not approve the amendment will not be affected by the amendment	*COP-decisions* require two-thirds majority; amendments to the convention require three-fourths majority
Reporting and compliance	Reports on measures to implement provisions of the convention; countries affected by desertification have to provide a detailed description of the implementation of the convention, including the implementation of national action programs (NAPs); only general rules on arbitration and conciliation	Reports on measures to implement provisions of the convention; COP shall decide on a noncompliance procedure
Funding mechanism	Global Mechanism hosted by the International Fund for Agricultural Development (IFAD)	Interim Financial Mechanism to be provided by the Global Environmental Facility

a. Scheduled for signature in mid-2001.

Table 12.2
(continued)

Convention	FCCC and Kyoto Protocol	Vienna Convention and Montreal Protocol	Biodiversity (CBD)
Development component	Common but differentiated responsibilities; no targets and timetables for developing countries within the first budget period of the Kyoto Protocol; CDM designed to reward developing countries for emission reductions and provide access to technology	Different reduction schedules for developing countries; MLF finances incremental project costs of developing countries; preservation of the ozone layer mainly perceived by developing countries as an interest of the North; considerable bargaining power of developing countries	Industrialized countries aim at protecting and preserving biodiversity; developing countries want to protect their right to exploit their own genetic resources; CBD intends to provide funding for implementation of the convention
Regime effectiveness	Some effect	Major effect	Minor effect

communication by the year 2000, whereas only some of the developing countries have yet submitted their first communications. These communications are undergoing a review process by other parties to the FCCC.

By contrast to climate change, parties to the Montreal Protocol have to submit annual reports to the secretariat. Since the Montreal Protocol penalizes exporting countries of ODS when such trade is conducted with nonparties by adding such exports to the consumption of producer countries (Montreal Protocol, Article 4, as amended by the London Amendments, June 1990), reporting fulfills not only statistical purposes but also lays the foundation for a noncompliance mechanism. Developing countries also report production, consumption, and trade data to the secretariat of the Multilateral Fund (MLF; see below), which is a prerequisite for external funding for the phaseout of ODS. Regrettably, questions seem

Table 12.2
(*continued*)

Convention	Desertification (CCD)	Persistent Organic Compounds (POP Convention)[a]
Development component	Scale of environmental problem mostly local but with global effects for climate change; developing countries demand financial assistance from industrialized countries; strongly connected with development goals due to socioeconomic causes of desertification	Developed countries shall provide new and additional financial resources to developing countries as well as economies in transition to meet the agreed full incremental costs of implementing measures; developing countries won the right to produce and use DDT to fight vector-borne diseases
Regime effectiveness	Minor effect	Not yet in force

a. Scheduled for signature in mid-2001.

to arise whether there is potential double counting when a country switches from nonmember status to membership status; sometimes the databases of the secretariat for the Montreal Protocol do not include all required types of data (Oberthür 1998, 20–23). The Montreal Protocol is also the only global environmental agreement covered in this chapter that has developed and actually used its noncompliance response system by creating an Implementation Committee.[11] In particular, Countries with Economies in Transition (CEIT), such as Belarus, Bulgaria, Russia, and Ukraine, as well as some developing countries, were not in full compliance with their emissions-reduction obligations during part of the 1990s, and Russia is still alleged to have created stockpiles of CFCs in anticipation of ending production by the end of 2000. In effect, noncompliance led to new phaseout plans approved by the Implementation Committee

and additional financial resources supplied by industrialized countries, the Global Environmental Facility, or the World Bank (Benedick 1998, 281; Greene 1998, 114–115; World Bank 1998, 8). Thus, the approach to noncompliance was facilitatory rather than retaliatory, although the Implementation Committee might conceivably disapprove of funding to noncompliant countries (Victor 1998). Despite the stringency of reporting and the existence of a noncompliance mechanism, there appears to be substantial illicit trade in ODS involving Russia, India, and China (Benedick 1998, 274; Breitmeier 1997, 42). Estimates point to illegal trade in the amount of 20 percent of the world's consumption in 1994. The trade in black-market CFCs at the Port of Miami and at the Mexican-U.S. border region in 1995 was said to be second in value only to illegal drugs (Benedick 1998, 274); this led to unilateral U.S. enforcement measures in its territory (Benedick 1998, 276).

In contrast to climate change and ozone depletion, regular reporting within the CBD and the CCD are not yet as well advanced. Since the CBD does not clearly specify a precise operational goal in terms of targets or timetables to be implemented, biodiversity faces the challenge of a "catchall" concept. The first wave of reports was submitted by the end of 1997. They rely on self-reporting by parties to the CBD and lack a review mechanism as well as a noncompliance procedure. In the case of the CCD, members facing desertification in particular have reported their activities to combat desertification, while developed countries have to report on the *assistance* they provide to affected countries by 2000. There is no noncompliance mechanism for missing reports or substantive noncompliance, and the CCD also lacks precise targets and goals.

In conclusion, international environmental agreements provide for regular reporting, but only the Montreal Protocol affords a noncompliance mechanism for nonreporting and substantive noncompliance.

3.3 Funding Mechanism

Implementing global environmental agreements relies both on domestic and international sources of funding. In all four cases, some sort of global financial instrument has been created. The Multilateral Fund for the Implementation of the Montreal Protocol has provided assistance to developing countries since the early 1990s to phase out ozone-depleting

substances and to ensure the functioning of the Clearing House Mechanism; the Multilateral Fund has accomplished a reduction of 60 percent of developing countries' consumption so far.[12] By contrast, the climate change, biodiversity, and POP regimes all opted for the Global Environmental Facility (GEF) to host their financial mechanisms. The GEF uses the World Bank, UNEP, and the United Nations Development Programme (UNDP) as implementing agencies. While about 40 percent of GEF funding goes to climate change,[13] more than 80 percent of its projects cover biodiversity and climate change with a new program to be added for POPs.[14] In fact, the GEF provides assistance to East Central Europe and the successor countries of the former Soviet Union to phase out ozone-depleting substances. In principle, the GEF only provides funding for global *additional* benefits—that is, the component of a project that does not provide returns on purely commercial terms. As a consequence, the GEF is biased toward otherwise economically nonviable projects (Wells 1994, 71). In the case of the loss of biodiversity, criticism has arisen whether the GEF sufficiently attends to the causes, policy constraints, and local circumstances (Wells 1994, 79). While the Subsidiary Body for Scientific, Technical and Technological Advice of the CBD provides guidance for the selection of projects, the lack of focus of the CBD in effect undermines the efficiency of the financial resources used. As with ozone depletion, the CCD did not entrust the GEF with its financial mechanisms but chose the International Fund for Agricultural Development (IFAD) instead as its host. This solution mostly mobilizes and channels funds, but it is not independently endowed with its own funding. In effect, the GEF continues to provide major funding for operational measures to accomplish the implementation of the CCD.[15]

3.4 Development Component of Regimes

Underlying all five major global environmental regimes is a development component. While industrialized countries put environmental concerns on the agenda at UNCED, developing countries have always been more interested in development goals, including the economic use of their biodiversity. The weakest development component can be found in the ozone regime. While industrialized countries normally have to take emissions control measures ten years earlier than small emitters (i.e., emissions of

developing countries on a per capita basis) and financial assistance is provided via the Multilateral Fund to phase out ODS, the Vienna Convention and the Montreal Protocol concentrate on environmental problem solving rather than solving North-South problems. By contrast, the climate change regime can be seen as the prototypical global regime that tries to combine both environmental and developmental goals on the global scale. Developing countries succeeded in getting their different priorities recognized and (partially) financed. Specifically, the Clean Development Mechanism is designed to compensate developing countries for emissions reductions relative to their reference case and to provide developing countries with access to technology. Similarly, the future POP convention foresees the developed countries bearing the agreed full incremental costs of implementing measures of developing countries.

Negotiations on the CBD and the CCD most clearly reflect the varying expectations of industrialized and developing countries. In the negotiations of the CBD, the OECD countries wished to protect the global gene pool (which is expected to have substantial economic value), whereas the Group of 77 plus China stressed their local developmental goals as well as ways to receive a share of the revenues resulting from the use of their biodiversity resources. A quantitative analysis of the funds spent by GEF and USAID on the conservation of biodiversity indicates that developmental aspects played a minor role in accounting for financial resources disbursed (Steinberg 1998, 127). Until now, developing countries have not been able to receive major funding from industrialized countries, except for studies, reporting, and demonstration projects in the domains of climate change, biodiversity, and desertification. The CCD may reflect the development goals of the developing countries most clearly.

3.5 Regime Effectiveness

Do international treaty regimes actually improve the global environment? Often, compliance with the obligations of treaties is seen as a prerequisite to solving international environmental problems (see also chapter 11). In this section, we will only focus on regime effectiveness, defined as the degree to which an international regime reduces the causes of environmental problems (mitigation) or reduces environmental impacts directly (adaptation) relative to a counterfactual scenario without an interna-

tional treaty regime. Operational indicators of regime effectiveness (see Sprinz and Helm 1999; Helm and Sprinz 2000) have not yet been applied to these particular empirical domains.

As mentioned further above, several East-Central European countries and successor countries to the former Soviet Union have been experiencing delays in phasing out ODS. While the ozone regime has the best-developed noncompliance procedure, its Implementation Committee can, at best, threaten to cut off GEF funding (as it did in the case of Russia); it has no direct control over the policies of the Multilateral Fund (Victor 1998, 164). Nevertheless, the ozone regime was able to phase out nearly 80 percent of ODS by 1996 (Oberthür 1998, 88)—a very substantial achievement. Industrialized countries have gone further in reducing their ODS emission, whereas emissions from developing countries have sharply risen in some categories of ODS. It is feared that these developments are delaying the recovery of the ozone layer expected for 2045.

Did the ozone regime lead countries to actually change their emission trajectories over time? The United States used the threat of trade sanctions against the European Union and Japan during the negotiations on the Montreal Protocol to induce their support of the agreement. Unilaterally, the United States and Germany were prepared to phase out some ozone-depleting substances (Sprinz and Vaahtoranta 1994), but it is unlikely that the developing countries would have joined the regime without the promise of financial assistance. Furthermore, the provisions regulating the trade in ozone-depleting substances with nonparty members induced a range of major developing countries to join the regime (Benedick 1998, 242–244). In addition to these institutional factors, it is worth mentioning the outstanding role played by the executive director of UNEP, Mostafa Tolba, who acted as mediator and facilitator during the negotiations (Benedick 1998). Overall, it appears that the ozone regime had quite an effect on most countries.

While the FCCC only stipulates in very vague terms the emissions-related obligations of industrialized countries, the Kyoto Protocol has not yet come into force. It is, however, plausible that a range of industrialized countries will experience major difficulties in returning to their greenhouse gas emissions levels of 1990 by the year 2000. Nevertheless, many more countries now attend to their emissions trajectories than would be

the case in the absence of climate treaties, but currently few countries are prepared to go for the truly deep cuts of 50 to 80 percent reductions of greenhouse gas emissions that many natural scientists suggest are needed to prevent dangerous interference with the climate system. By contrast, the CBD and CCD do not stipulate very precise substantive obligations that countries can comply with, and the Biosafety Protocol and the POP Convention have not yet come into force. Therefore, it is difficult to assess their effectiveness. Both conventions are mostly programmatic in scope, and it remains to be seen whether the broad and ambitious goals can be accomplished over the next decades. On a preliminary basis it appears that the ozone regime had major effects, the climate regime some effects, and the CBD and CCD only very minor effects.

3.6 Interlinkage between Regimes

In many respects, the ozone, climate, biodiversity, and desertification regimes are linked, although not all of them are of the same type as global environmental problems (see section 4). The ozone regime actually controls some greenhouse gases, and the climate regime has consequently abstained from regulating these gases. In addition, climate changes may have direct effects on biodiversity (e.g., temperature increases in the oceans threaten coral reefs) and desertification (e.g., change in precipitation patterns). Conversely, land degradation alters the reflectivity of the land and thereby has an impact on climate, whereas changes in the species composition may actually have an impact on the degree to which climate change impacts can be adapted to. Recognizing this interdependence, these three conventions are engaging in a formalized dialogue, but given that each of the conventions has a tall order to deal with by itself, it would be surprising if this dialogue had any major consequences.

4 The Challenge of Global Environmental Governance

Since the late 1960s, Garrett Hardin's (1968) "Tragedy of the Commons" has influenced the debate on whether regional or international agreements can be concluded to solve environmental problems. His conclusions rest on the assumption that individually profitable strategies undermine the common good (see also chapter 8). Applied to the case of

stratospheric ozone depletion, it may be beneficial to many countries to produce and consume ODS as long as they are not affected by the thinning of the stratospheric ozone layer, especially around the polar regions. But if most countries continue to increase emitting ODS, it becomes likely that the areas effected by the thinning ozone layer will expand dramatically. In response to challenges to protect the global environment (as well as to other preferable outcomes), Hardin suggested that "mutually agreed upon coercion will have the best chances, even if disliked: taxes, allocation rules" (Hardin 1968, 11). While it has been shown that local and regional common pool resources can indeed be protected (Ostrom, Gardner, and Walker 1994), Hardin's remedy is partially borne out at the global level: international environmental agreements have created global agreements that aim at self-restraint—albeit to different degrees. To some extent, select international environmental agreements have been effective in helping solve environmental problems (Young 1999).

No global treaty has been concluded yet in the cases of forest protection and global POPs. This raises the question of under which conditions global environmental agreements are likely to emerge (see also chapter 8). In this section, it is suggested that the combination of the type of global environmental change problem with the choice of response strategy does not always mandate *global* environmental agreements as the most appropriate answer.

In section 1, we distinguished between global environmental problems that use a global force mechanism and those that display a widespread similarity pattern. The first type aggregates decentralized sources (e.g., emissions) and leads to region-specific impacts based on the aggregate (e.g., regional precipitation changes resulting from the same greenhouse gas concentration in the atmosphere). By contrast, the second type relies on the parallelisms of cause and effects by region with little interconnection between regions. As a first approximation, climate change, stratospheric ozone depletion, and global POPs fall into the category of global force mechanisms, whereas forests and desertification fall into the category of a widespread similarity pattern. Biodiversity holds an intermediate position, because the depletion of the world's gene pool mostly occurs regionally and most of its effect are regional. However, outright loss of parts of the gene pool will lessen opportunities for adaptation or eco-

Table 12.3
Congruence between problem and response scales

Response strategy	Type of global environmental change problem	
	Global force mechanism	Widespread similarity pattern
Mitigation	1. Challenge of achieving close to universal cooperation	3. National policy or small international group of countries needed
Adaptation	2. National policy or small international group of countries needed	4. Mostly national policy (and rarely small international group) needed

nomic use elsewhere—as many agricultural and pharmacological uses of biodiversity attest to—and international trade in LMOs is, by itself, a global issue to be reckoned with.

Besides the type of global environmental problem, it appears important to focus on the response strategy chosen. Solving an environmental problem by way of reducing the causes falls into the category of *mitigation,* whereas directly lowering or offsetting the consequences is called *adaptation.* Many of the present activities involving climate change, stratospheric ozone depletion, and global POPs fall predominantly under the rubric of mitigation, whereas in the cases of biodiversity, desertification, and forests, a mix of both mitigation and adaptation has been chosen. Once we combine the type of global environmental problem with the type of response strategy, we arrive at a fourfold set of conditions about the degree of global support needed to respond to environmental problems (see table 12.3).

In the first category, the environmental problem is a combination of a global-force mechanism and mitigation; close to universal cooperation among the countries of the world is needed—at least if the feared impacts are sufficiently damaging across many countries of the world and the sources are widely dispersed. Global environmental agreements may still concentrate on the countries contributing most to the causes of the environmental problem, but even in the cases of climate change and stratospheric ozone depletion, a set of about twenty countries around the world would be needed to tackle much of the problem. Disparities between the costs to be borne by countries undertaking mitigation and their expected

benefits may undermine broad support for global environmental agreements, as is expected by the interest-based explanation of international environmental policy (Sprinz and Vaahtoranta 1994; see also chapter 4 in this volume). Compensating countries that otherwise face high abatement costs—for example, the developing countries with the help of the Multilateral Fund in the ozone regime—will greatly increase the probability of forming such a global regime. In other words, the global political scale matches the scale of the environmental problem.

By contrast, the second category comprises cases where adaptation to an environmental problem is undertaken for an environmental problem falling into the category of a global-force mechanism. For adaptation, activities are undertaken on the local to regional scale and involve, at most, areas ranging across several countries, such as transboundary national parks. As a result, the benefits are rather concentrated in the areas where adaptation is undertaken,[16] and a small group of countries is expected to form international treaties.[17] Adapting low-lying countries to the dangers of potential sea-level rise falls into this category.

But even in cases falling into the third category, namely, a combination of mitigation with a widespread similarity-pattern problem, the same calculus would apply, because abatement costs and their resulting benefits are more local than global in scope. Aspects of deforestation and desertification fall into this category. Why do we not find demanding *global* environmental agreements in these fields? In effect, we should not really expect them to come about since they are not truly necessary. It appears as if the global political scale does not fit the scale of the environmental problem for the second and third categories. At best, global agreements would set reference standards, and regional or national plans would reflect the varying ambitions of different countries. The *regional* focus of the CCD provides partial support for this hypothesis.

The fourth category comprises widespread similarity-pattern problems that are dealt with by way of adaptation. In effect, both the causes and the effects are regionalized or localized. This points largely to national or subnational environmental problems; therefore, global environmental agreements are expected to establish at best some minimal standards. Because the variance in cause and effect is much greater in this case than for the other three categories, it should lead to the least demanding type of global environmental agreement. Indeed, here, the discrepancy

between the global political dimension and the very local environmental scale is the largest.

What are the implications for global environmental governance? A tentative answer points to the congruence between the scope of environmental problems and the scale of their regulation. Since current regulation of climate change, stratospheric ozone depletion, and global POPs favors the mitigation option, global-problem pressure requires truly global political approaches. The hypotheses advanced in this concluding section suggest that the case of the global regulation of forests as well as the case of desertification display a less-than-ideal fit. In effect, global regulations have not come about (forests) or are not very demanding (desertification). The case of biodiversity falls in between, because both international trade in products and outright loss of knowledge of parts of the gene pool are at issue as well as the benefits to species-rich developing countries. Thus, we suggest that the congruence of the global political and environmental scales falls in between those for climate and desertification. Some parts of the environmental movement have adopted the slogan "think globally, act locally." As this chapter has indicated, not every problem is best regulated at the global level—but some are! One size does not fit all—at least not in the environmental field.

The study of the place of the FCCC with respect to other global environmental agreements raises the more general question of the compatibility among international regimes of cooperation. Of particular interest is potential conflict between such regimes, since regulatory domains cannot always be insulated from each other. Compared to many other international regimes, one global regime has proved especially strong and effective in protecting nondiscrimination and intellectual property rights, namely, the international trade regime. The reasons this strength has evolved and the potential problems it may create for the application of the FCCC, in general, and the Kyoto Protocol, in particular, are discussed in the following chapter.

Notes

I am grateful to Andreas Lange and Martin Weiß for research assistance. Galina Churkina, Benno Pilardeaux, and Jessica Supplie kindly commented on an earlier version of this chapter.

1. See http://www.unep.ch/ozone/press-rel-122.htm (March 23, 1999).

2. An excellent treatment of the international diplomatic history of regulating stratospheric ozone depletion as well as the text of the Montreal Protocol can be found in Benedick 1998.

3. The Bush administration took a different stance on biodiversity by refusing to sign an agreement. As of November 2000, the United States has neither signed nor ratified the CBD.

4. The text of the CBD can be found at http://www.biodiv.org/chm/conv/art1.htm (July 7, 2000).

5. The text of the CBD Biosafety Protocol can be found at http://www.biodiv.org/biosafe/Protocol/Protocol.html/ (July 7, 2000).

6. Committee for the National Institute for the Environment, http://www.cnie.org/nle/for-4.html#CONTENTS (December 11, 1998).

7. The German Scientific Advisory Council on Global Change suggests that this option be pursued (German Advisory Council on Global Change (WBGU) 1996, 178–182).

8. See http://www.unccd.ch/leaflet.htm (November 24, 1998).

9. The text of the CCD can be found at http://www.unccd.int (July 7, 2000).

10. For the draft POP convention, see http://irptc.unep.ch/pops/POPs Inc/INC 5/inc5-5/en/inc5 5eb.pdf and http://irptc.unep.ch/pops/POPs Inc/INC 5/inc5-5/add1/en/add1.pdf (January 22, 2001).

11. For a general treatment of compliance and a noncompliance response mechanism, see chapter 11.

12. See http://www.unep.ch/ozone/press114.htm, http://www.unep.ch/ozone/press-rel-122.htm (December 12, 1998).

13. See http://www.worldbank.org/wbi/cleanair/newsevents/launching/agenda/newapproaches/feinsteinflora/sld008.htm (February 16, 2000).

14. See http://www.gefweb.org/intro/gefintro.pdf (February 16, 2000).

15. See http://www.gefweb.org/Land%20Degradation%20Brochure.pdf (February 16, 2000).

16. This argument excludes demonstration effects that may yield benefits elsewhere.

17. The strategic opportunities for forming international alliances relate to the theory of groups advanced by Olson (1971).

This page intentionally left blank

13

The Organization of World Trade and the Climate Regime

Urs Luterbacher and Carla Norrlöf

International trade in goods, services, and intellectual property was estimated at U.S. $5 trillion in 1995 (Hoekman and Kostecki 1995, 1) and these flows are continuously expanding. The capacity of economies to produce goods and services is an important prerequisite for international commerce, so that it is crucial to be mindful of this relation in order to grasp the extent to which linkages between trade and the environment permeate and impact human conditions. Viewed from the environmental perspective, resources are vital inputs for economic activity, and environmental waste will also constitute a by-product of any economy's output. In this fundamental sense, there is an immediate interrelationship between trade and the environment (UNEP and IISD 2000, 2). Furthermore, the signing and ratification of international environmental agreements such as the United Nations Framework Convention on Climate Change (FCCC) and the Kyoto Protocol and the new international rules of cooperation they imply raise the problem of their compatibility with other types of international cooperative arrangements. Since the climate regime has not yet been established, it is not possible to accurately predict how such a system once in place would clash with already-existing international institutions. It is, however, important at this point to consider possible ways the regime might collide with the institution established for the purpose of regulating international trade, since it contains environmental measures that implicitly affect trade.

In this respect, it is also important to stress that the FCCC includes a "GATT-compatible clause" (FCCC 1992, Article 3, (5)) stipulating that efforts to mitigate climate change should abide by trade principles, such as the nondiscrimination principle, and that they should not otherwise

impose disguised restrictions on international trade (Boisson de Chazournes 1996, 294). Furthermore, trade provisions of multilateral environmental agreements have not yet been the cause of interstate disputes (González 2000, 39). But despite the evidence suggesting that the risk of conflict is relatively low, there are two reasons that disputes about such cases are likely to get to the World Trade Organization (WTO) panels. First, the international trade regime includes a powerful quasi-judiciary dispute-settlement mechanism that has been strengthened by the Uruguay round. Many environmental cases with trade dimensions will therefore be brought to the WTO, even though that organization has repeatedly stated that as a matter of principle, it does not want to get involved in environmental disputes. Moreover, the WTO provides members with powerful retaliation and compliance mechanisms. Second, by targeting fossil fuel and methane as sources of greenhouse gases, the FCCC and specifically the Kyoto Protocol involve the great majority of current industrial and agricultural products. They also encompass such activities as transportation and aviation. Whereas other environmental agreements lack either its breadth or specific binding obligations (such as the Convention on Biological Diversity), the Kyoto Protocol aims directly or indirectly at a vast number of industrial and agricultural processes. The likelihood of decision making in the area of climate change by the WTO is thus indeed high.

The increased academic focus given to the links between trade and the environment and the equally sparse attention given to problems of consistency between different regimes combine to make this a particularly timely research puzzle. The growing literature on the possible links between trade and the environment often treats the interdependencies between trade and environmental policy and their welfare implications (see Anderson and Blackhurst 1992; Rauscher 1997). The growing body of international environmental law and trade law also attests to the interface between trade and the environment. In addition, there is a greater tendency of the former to regulate economic activity, and for the latter body of law to regulate government trade policy in a greater number of issue areas, inevitably also affecting the environment (UNEP and IISD 2000, 3). There also exists a predominantly legal literature on how internationally negotiated environmental agreements may come into conflict with

the enforceable trade rules laid down by the WTO. Our analysis is informed by these observations, and we are, by analogy, able to draw inferences about the potential areas of inconsistency between a possible global climate regime and the existing international trade regime. We also base our predictions on the evolution of GATT/WTO law, as evidenced by some particularly salient cases brought before the dispute panel. However, from a political economy point of view, international relations theory has been relatively silent on the subject of policy consistency between different institutional arrangements designed to resolve public good dilemmas. A study by Norrlöf and Sjöstedt (2000) on policy-consistency problems in the field of trade and security finds that although it constitutes an ongoing debate within international organizations, little academic attention has been given to this subject, with the notable exception of the analysis undertaken by Krueger (1998). We are thus trying to show that there are puzzles that derive from the creation of institutions established to overcome the "public good dilemma," because inconsistencies may arise that in and of themselves require institutional solutions.

In contrast to some cooperative regimes that are relatively insignificant because their mechanisms of compliance and especially their dispute-resolution mechanisms are rather weak, the WTO constitutes a definite application of the GATT and a set of new agreements, subject to enforceable arbitration. Other cooperative efforts—for instance, the international labor conventions or the international intellectual property rights rules—take costly country-internal court procedures to enforce. However, this is not so with the international trading regime that resulted from the Uruguay round and that was completed in Marrakech in 1994. A set of strong rules and institutional mechanisms give this particular regime a lot more enforcement power: under certain conditions, if rules are violated, states may retaliate against others by establishing discriminatory measures that the regime attempts to avoid and by closing their domestic markets to some foreign products. In what ways could such a system of trade cooperation clash with environmental principles in general and the FCCC and the Kyoto Protocol in particular? To investigate these issues, we will first state the rules contained in the GATT and its successor—the WTO—in a more precise manner. It is worth mentioning that we are only exploring the link between trade and the environment by

analyzing potential conflicts between trade rules and the emerging climate change regime in light of preexisting trade principles. It is further important to underline that the trade regime furnishes a Committee on Trade and Environment (CTE), established through the Marrakech Agreement in 1994; its earlier counterpart—the Group on Environmental Measures and International Trade—was already in place in 1971. However, the committee's mandate is not regulatory, since it has only been entrusted to identify linkages between trade and the environment and to make recommendations on the necessity to adjust trade rules in conformity with the nondiscriminatory principles of the trade regime (UNEP and IISD 2000, 24).

The organizing principle for our analysis is to first highlight the trading principles relevant in the context of possible conflicts between trade and the environment. We then discuss the implications of these trade rules in areas where environmental considerations could be raised at both the production and consumption levels. We then proceed to review how environmental agreements may be at variance with WTO trade provisions, emphasizing dimensions pertinent for global climate change. We conclude our chapter by discussing institutional implications.

1 Trade Rules

The new WTO regime is built on the foundations of the GATT established by the first Geneva round, which took place in 1947. The GATT was the successor organization to the International Trade Organization (ITO), which met resistance in the U.S. Congress. ITO constituted an integral component of the Bretton Woods Institutions that also included the International Monetary Fund (IMF) and International Bank of Reconstruction (IBRD), created in New Hampshire in the wake of the Second World War (Moon 1996, 71). Prior to the creation of the WTO through the Uruguay round (1986–1994), international trade agreements were concluded under successive multilateral trade negotiations. The GATT has produced eight such rounds with various success: two Geneva rounds (1947, 1956), the Annecy round (1949), the Torquay round (1951), the Dillon round (1960–1961), the Kennedy round (1964–1967), the Tokyo round (1973–1979), and finally the Uruguay round (Hoekman and Kos-

tecki 1995, 15). In this connection, and due to the expansion of the trade agenda, the WTO has replaced previous "GATT rounds" with ongoing negotiations to liberalize trade in specific areas. The trading principles established by GATT that serve to promote trade liberalization through reciprocity and nondiscrimination also remain the same under the WTO. The whole construction is, however, now buttressed by the existence of more powerful mechanisms such as the reinforced compliance mechanism for dispute settlement (DSB), the new system for trade policy review (TPRM), and the greater prominence of the Ministerial Meeting. At the same time, the buttressed regulation of international trade through compliance continues to be balanced against articles giving governments a certain amount of flexibility in trade policy, notably the provisions for safeguards and various exceptions. As will be highlighted below, the general-exception clause (Article XX) will be of particular interest for our purposes. Together, these developments constitute the most salient measures in the efforts to reform the GATT and thus enhance support for "free trade." These mechanisms are based on a set of specific rules, including a generalized nondiscrimination principle and recommendations that, whenever possible, quantitative trade restrictions—such as quotas—be replaced by the imposition of tariffs. The generalized nondiscrimination principle includes the most-favored-nation obligation to not discriminate among GATT/WTO member countries by using tariffs or tariff equivalents (Article I), or by using nontariff restrictions (Article XIII). In addition, provisions under Article III require, in particular, that like products be treated the same way; in other words, the same national treatment has to be applied to all goods, both foreign and domestic. The ways these principles might interfere with environmental principles are not obvious and now need to be specified.

2 Production and Consumption Issues

At the *consumption level,* few issues exist that could create conflicts between environmental and trade rules. Indeed, any state is free to set its own norms as long as they do not interfere with the principle of nondiscrimination. The particular examples of gasoline composition norms or phytosanitary measures can be invoked here. A country is free to impose

an environmental norm such as particular standards for the composition of gasoline if this norm is universally applied. The same is true for a phytosanitary measure such as fixing a minimum level of a pesticide or other reputedly dangerous products in food, provided its health effects are established. In the case that pitted the European Union and the United States against each other over the presence of growth hormones in beef products within the WTO, the decision by the panel in favor of the United States and other beef exporters was due to a lack of evidence concerning the adverse health effects of that particular substance. In other words, an environmental or a sanitary measure by a country is usually valid unless it appears excessively discriminatory—that is, if the health effects of the measure cannot be established in a significant way. The same reasoning applies to the contents of certain products. In a case that pitted the United States and Venezuela against each other, the United States was told it could not apply norms to Venezuelan producers and at the same time exempt U.S. producers from them.

At the *production level,* however, the GATT/WTO decisions appear to create much more controversy and could lead to clashes with environmental norms. The principle to be considered here is the one of identical national treatment of like-products. The question obviously centers around the definition of what a like-product is. In consumer-protection cases, it is easy to define types of gasoline with different chemical compositions as different products. Therefore, different products can be targeted by different measures. However, this rule does not extend to the different production methods that characterize otherwise similar goods. In other words, states cannot discriminate against goods even if they have been produced in a way that is unfavorable to environmental principles. This general rule has been sustained so far completely or partially in two important cases: the Tuna Dolphin case and the Shrimp Turtle case, reviewed by GATT and the WTO respectively. The only exceptions to this are either a consequence of the Trade-Related Intellectual Property Rights (TRIPS) accord, which is part of the Uruguay round package, or a general prohibition against the exchange of goods produced by prisoners. These two instances constitute unique examples of the opportunity to discriminate against goods as a consequence of the particular production method employed. According to the TRIPS agreement of 1995, goods that result

from a violation of intellectual property rights—such as fake-brand-name watches or pirated compact discs—can not only be stopped at the border but can even be seized and destroyed. Needless to say, the TRIPS accords have in this sense accomplished much more than several previous intellectual property agreements under the supervision of the World Intellectual Property Organization (WIPO). In general, the relative success rate of the TRIPS agreements can be attributed to its broad scope, not only as a consequence of the extensive application of the agreement to different areas of intellectual property rights, but also in terms of the specific elements of the agreement. Apart from standards, these elements include enforcement and dispute-settlement provisions. In this context, it can also be noted that the TRIPS accord incorporates provisions from previously negotiated agreements on intellectual property rights under the auspices of WIPO.

However, there are provisions in the GATT and WTO accords—the so-called safeguards or exceptions clause (Article XX)—that mention environmental concerns as possible guidelines for trade policies. What is then the situation of like-products within the GATT/WTO system, and how do they affect environmental questions? The Tuna Dolphin case was brought by Mexico and Venezuela against the United States, which wanted to ban the import of tuna from these two countries because the tuna was caught in nets harmful to dolphins, a protected species. The United States had imposed the dolphin-protecting nets on their own fishermen, who then clamored for equal treatment with foreign imports. The United States tried to argue that tuna caught with different methods amounted to different kinds of products, an argument that was finally rejected by the GATT panel in charge of the case. According to the panel, tuna is tuna, no matter how it is caught, so that it could not be subjected to a discriminatory treatment. The case sets a precedent for the treatment of like-products and the rejection of environmental norms as a constraint on the free exercise of international trade. These principles were basically reaffirmed in a first ruling of the WTO concerning a similar case, namely, a U.S. import ban, by the application of Section 609 of U.S. Law, on shrimp caught with nets that also killed sea turtles, an internationally protected species (Biggs 2000, 17).[1] The United States itself is requiring the use of special turtle escape nets that shrimp-fishing countries have to

adopt to export shrimp to the United States. On appeal, the case still went against the United States. The appellate panel recognized that Article XX could provide a justification for certain types of trade restrictions in this case but argued that the way the United States went about enforcing the use of turtle-friendly nets was arbitrary and did therefore not justify the ban. In this connection, one can also note that whereas the first Tuna Dolphin decision only considered exceptions to cover protection at the domestic level, the subsequent decision held that Article XX could be invoked to protect the environment beyond national bounds. But it rejected the idea that trade policies could be used to alter the (environmental) policies of other countries (Hudec 1996, 144). We should underscore that, in terms of economic efficiency, the application of particular environmental standards to other countries is only justified when environmental problems arise regardless of the production location. This requires concerted efforts to manage the deterioration of the global environment as a whole (Rauscher 1997, 273, 296). In this connection, Rauscher points out that developing countries are otherwise correct in referring to the imposition of uniform environmental standards as "green imperialism," since such equalization indeed eradicates some of the gains from trade.

In summary, we can characterize the trade principles included in the GATT/WTO as follows:

- Countries are mostly free to establish and enforce their own environmental or safety standards, provided that sufficient scientific evidence is available to support these standards.
- The enforcement of national environmentally justified production standards cannot be extended abroad through trade restrictions except under very specific circumstances.

3 Trade Rules and Environmental Accords: Are There Any Conflicts?

In what ways could these trade rules interfere with global environmental accords? For the moment, the Kyoto Protocol has not been ratified (in chapter 9, we talked both about obstacles to ratification and about the probable influence of divergent trade views on the formulation of the Kyoto flexible mechanisms), and the rest of the FCCC does not contain binding obligations that might interfere with trade rules. There are, how-

ever, trade rules in the other major environmental agreements—the treaty to protect the ozone layer and the provisions of the Montreal Protocol. The Montreal Protocol explicitly prohibits trade in ozone-depleting goods with nonparties. This particular provision was introduced at the request of the chemical industries producing substitutes for ozone-depleting substances, so they would not be undercut in price by cheap imports coming from nonparties to the Protocol. Since parties to the Montreal Protocol are more numerous than members of the WTO, this particular rule has never been challenged. It should be noted that particular refrigerants mentioned by the Montreal Protocol are part of the six greenhouse gases targeted by the Kyoto Protocol, so that there is also a minor contradiction between the two environmental agreements.

What are the characteristics of the FCCC in this respect? The Kyoto Protocol contains several provisions that could be seen as potential conflict domains with respect to the trade regime. To evoke these, we will first go through a general review and then discuss the characteristics of each flexible mechanism and the conflict potentials embedded in them.

In general, although it specifies several mechanisms through which its prescriptions might be achieved, the Kyoto Protocol does not impose any particular rules of compliance on the states that ratify it. Greenhouse gas reduction might take place through all kinds of means, be they voluntary measures on the part of industries, so-called carbon or CO_2 taxes, some form of command and control, or again through the use of the mechanisms enumerated in the Protocol. It is also theoretically possible for a state to use the flexible mechanisms toward the outside but to implement different domestic policies. Quite clearly, a state will influence its trade relations through the kinds of policies it promotes. A CO_2 or carbon tax will penalize its energy-intensive industries and possibly favor imports of energy-intensive goods from a country subject to fewer reduction obligations under Kyoto or possibly no obligations at all. Since the Kyoto rules could affect most industrial energy-intensive goods or goods that require heavy means of transportation in order to be produced, a domestic decrease in emissions could be more than compensated for by gray imported emissions (that is, energy/emissions intensive goods produced abroad). Of course, these considerations about tax policies are also applicable to command and control and to voluntary measures. Different kinds of taxation policies might also lead to trade distortions between countries, with

the country with the lowest taxes giving an indirect subsidy to its most energy-intensive industry. Moreover, as pointed out by Graciela Chichilnisky (1994), a tax that affects an environmental resource used as an input to produce energy-intensive goods from developing countries—such as oil—could actually favor an overproduction of the natural resource. It could also increase exports of the final good, if property rights concerning it are ill-defined. Hence, paradoxically, the desired effects of the carbon or energy tax increase are canceled as more extraction and more exports ensue with the tax.

Clearly, if such unintended effects of the Kyoto Protocol materialize, governments will be tempted, under the pressure of their domestic industries and interest groups, to restrict trade and justify such policies by arguing that they are unfairly treated with regard to countries (especially developing ones) not subject to the Kyoto obligations. Import policies based on production methods will flourish. Countervailing trade policies could also take the form of Border Tax Adjustments (BTA), which are allowed under Article III of GATT/WTO law. Under such a scheme, imported goods would be taxed at the border of a country with an amount equal to what they would have been subjected to had they been produced domestically. Exported, domestically produced goods would have this tax refunded through a procedure that bears some analogy with value-added tax refunds. Although there are precedents for such border taxes in the case of toxic waste or special dangerous chemicals, their application to a wide array of products could create a huge backlog of trade cases in front of the WTO. According to current GATT/WTO trade rules, it is not permissible to favor domestic products by imposing higher border taxes than the corresponding taxes on domestic like-products (Sampson 1999, 37). However, if border tax adjustments are not allowed to correct for environmentally related taxes and other such fees, domestic products could be rendered less competitive than their foreign counterparts. Since it is not possible to impose BTAs in order to offset environmentally motivated taxes for production inputs when such input taxes serve to discriminate between like-products, measures to adjust for environmental taxes may prove incompatible with GATT/WTO trade rules (Petersmann 1996, 176). BTA taxes could, in any case, only be permitted for direct taxes on a given product. Indirect taxation such as social security and

other transfer schemes could not be accounted for. The taxation problem could be particularly acute with regard to the current liberalization policies in the electricity domain. Under Kyoto, non–fossil fuel means of producing electricity should clearly be favored. However, both hydroelectricity, especially if produced from accumulation dams, and also to some extent nuclear installations, require heavy investments that have to be amortized over a long period. A major shift of electricity production could occur toward countries that are subject only to small Kyoto obligations and that generate electricity with coal, natural gas, or diesel fuel. Border adjustment taxes could be challenged as discriminatory, therefore undermining the effectiveness of the Protocol. In addition to these general problems, the flexibility mechanisms contained in the Kyoto Protocol raise some problems of their own.

The Kyoto Protocol includes three types of flexibility mechanisms: Joint Implementation between Annex I countries (Article 6), Emissions Trading between Annex I countries (Article 17), and the Clean Development Mechanism (CDM) in Article 12. Some of these measures could be considered discriminatory under WTO definitions.

For instance, if *Joint Implementation* leads to privileged exchanges between two Annex I countries, perhaps in wood trade or technology transfers, this could violate the most-favored-nation clause included in the GATT/WTO rules. Questions about possible government subsidies could also be raised for this particular issue.

Emissions trading does not affect trade very directly since there seems to be a consensus that emissions certificates would not be considered merchandise but financial instruments like securities or stocks (on this, see Cosbey 1999). According to Chichilnisky (1996), emissions trading could also alleviate some of the trade policy problems generated by other climate change instruments such as taxes. This is because emissions trading minimizes distortion and could in principle be carried out by firms buying and selling certificates with each other across borders. Financial instruments are not presently covered by any of the GATT/WTO rules. However, a General Agreement of Trade in Services that includes financial services is scheduled to be elaborated on in subsequent WTO negotiation rounds. Under such an agreement, providers of financial services from all countries (even those not party to the Protocol) would be allowed to broker trades

in emissions reductions. Other rules about investments might also be included in such an agreement. This part does not, however, represent a major obstacle to emissions trading. Another more serious problem lies in the way emissions-reduction rights are initially allocated by governments. Whereas some European proposals (Hourcade 1993) toy with the idea of auctioning them off, the current U.S. conception is simply to allocate them to industry on the basis of present use. This would amount to what is called "grandfathering"—that is, perpetuating the de facto present situation.[2] In this case, we would clearly have a subsidy from government to industry, which would then fall under the WTO's Agreement on Subsidies and Countervailing Measures (SCM). Subsidies of this kind are not necessarily illegal under GATT/WTO rules, nor can they automatically be attacked by another country before an official panel. Another state must show that the subsidies would either promote exports or harm a foreign competitor. Both situations are possible, although the second one is more likely. The WTO case in which the United States and the European Union were at odds on the use by U.S. industry of offshore tax havens to promote exports, which went against the United States, shows the hostility of WTO panels to subsidy schemes. Rights-allocation procedures are thus very important in promoting or preventing trade–environment regime conflicts.

The *Clean Development Mechanism* (CDM) constitutes in a way the most promising but also the most problematic of the Kyoto instruments. Since it is dedicated to promoting clean technology transfer between Annex I and also non–Annex I countries as a means of reducing greenhouse gas emissions, the way it is enforced will be crucial to its success. Since a non–Annex I country is not subject to any obligations, nothing could in principle prevent it from reinstalling, somewhere else, an obsolete high-emissions technological facility that would have been replaced by an up-to-date low-emissions device. Numerous trade distortions could emerge under such conditions. Depending on the nature of the technology being transferred, especially if it implies the exchange of merchandise, the most-favored-nation clause or the nondiscrimination principle of national treatment of goods could be violated. Some aspects of the CDM could then become actionable.

In addition to the flexible mechanisms, some other aspects of the Kyoto Protocol could be problematic. These include the possible adoption of

environmental standards (a form of command and control), of using government procurements or direct subsidies to achieve the Kyoto goals, and finally, the likely adoption for the Kyoto framework of compliance and enforcement measures (under Article XVIII).

As emphasized in the discussion of consumption aspects of trade and their environmental consequences, the GATT/WTO framework does not impose particular norms on specific countries. In this regard, we also noted that the second Tuna Dolphin ruling denied member countries the opportunity to invoke GATT/WTO trade rules, for instance when imposing trade sanctions, in order to change other countries' trade policies. However, states are in general free to impose such norms according to their national preferences, although states *cannot design such standards* with the explicit intention of harming foreign competitors, as exemplified by the ruling in favor of the United States in the growth hormone beef case. So here too, governments cannot excessively favor their own producers without acting against trade regime principles. Many states could also be tempted to use *government procurements* to achieve some of the goals of the Protocol. As indicated by Cosbey (1999), 10 to 25 percent of the gross domestic product in OECD countries is due to government purchases. Such purchases are not subject to the same rules as ordinary purchases and can therefore in principle discriminate on the basis of the way a product is manufactured. However, even here, the Agreement on Government Procurement in the WTO has attempted to open national-government buying procedures, in such a way that some extreme measures might be actionable. Specific subsidies to promote a particular greenhouse gas technology tilted in favor of certain procedures could also come into conflict with the Agreement on Subsidies and Countervailing Measures. By far the most serious problem here might come from Article XVIII of the Kyoto Protocol, which calls for the adoption of noncompliance measures. These have not been spelled out yet and are still subject to negotiation. They could take the form of a penalty for net tons emitted outside of the reduction quota and purchases of emissions rights. The compliance rules could, however, also include trade restrictions adopted by parties under the pretense of meeting their obligations or to force a noncomplying party or a nonparty to conform to the Protocol. In this context, the ambiguous status of the CDM could indeed lead to major conflicts with the trade regime.

4 The Future of the Trade and Environment Regimes and the FCCC

The traditional institutional constructions to promote international trade, GATT, and GATT's successor organization—the WTO—have sought to promote international trade liberalization and fight domestic special interests with the help of some broad rules. These efforts to liberalize trade have been largely successful, since they have been applied through successive trade negotiations and since, with time, the agreements concluded have been broader and broader in scope. Thus the Uruguay round ended up with the incorporation of agriculture and services into the GATT framework, as well as with the creation of the WTO.

The chief purpose behind the transformation of GATT into the WTO was to enhance the foundations for "free trade" contained in the international trade regime. This tendency has resulted, as we have pointed out, in the creation of very strong instruments within the WTO framework to enforce free trade principles and to fight protectionism. Environmental regimes might clash with these goals if they can be perceived as being used to promote traditional protectionist interests. Individual delegates have already hinted at the fact that countries adopting strong greenhouse gas emissions-reduction policies should be allowed to protect themselves against exports from countries with weak or nonexistent reduction measures.

Our analysis shows that policy consistency across regimes cannot be taken for granted and that further research to disentangle the theoretical foundations for maintaining compatibility across regimes is clearly warranted. What can be done to deal with the above-mentioned problems of potential conflict between WTO and climate regimes? Here we would like to stress that although we have suggested that the reform of the international trade regime should significantly enhance the prospects for further trade liberalization, continued agreement over how to evolve in this direction cannot be assumed. Whether further efforts will be taken to dismantle trade barriers internationally will in the end depend on the economic and political incentives of WTO member countries. The trade policies of actors with superior market power on the international trade scene—the United States, the European Union, and Japan—can to a great

extent be expected to determine the possibilities for continued trade liberalization (Luterbacher and Norrlöf 1999). The policy preferences of these actors, and their trade interactions, will thus have implications for the manner in which institutions evolve to manage the interface between trade and the environment. In this context, the question that needs to be posed is thus whether these pivotal actors, which could and probably will eventually include China when it accedes to the WTO, will try to adapt their domestic policies on climate change to such an extent that trade rules are not undermined. Given developments in this area and the difficulties faced by the upcoming rounds of WTO negotiations, such self-restraint is unlikely to prevail in all cases. This can be illustrated by the case of the United States, which initially gained a lot of market access through the GATT/WTO system in the post–World War II era. With augmented competition for international markets as a consequence of the integration of Europe and Southeast Asia, unconditional support of free trade principles on the part of the United States has declined.

There are several indications that unqualified U.S. support for "free trade" is waning. These indications include the unilateral enforcement of trade rights through domestic legislation, as with the controversial trade laws referred to as "Section 301," "Super 301," and "Special 301,"[3] as well as suggestions by the United States that conditional most-favored-nation rights and obligations be instituted in the wake of the Uruguay round. These policies illustrate that by virtue of its autonomy, a market power such as the United States is able to protect its own market, since the United States is relatively insensitive to trade-policy measures of other countries. On the other hand, the importance of its market shares makes it possible to force others to restrict their exports or increase their imports. Thus, even though the bilateral U.S. negotiation of quantitative restrictions such as Voluntary Export Restrictions (VER) and Voluntary Import Expansions (VIE) have been phased out, they are a manifestation of a market power's capacity to engage in such semiprotectionist policies.

The benefit calculation for the actor with superior relative market power is the maintenance of relatively higher prices on the domestic market, as well as an increase in exported quantities and thus acquisition of greater market shares (for a formal analysis of market power, see Luterbacher and Norrlöf 1999). The use of environmental arguments to

promote trade interests under these conditions is almost unavoidable, and therefore some major clashes between trade and environmental regimes are to be foreseen.

What are the possible solutions here? Three can be evoked: the creation of new institutions to resolve conflicts, the strengthening and redefinition of the roles of informal networks and committees, and the redefinition of the role of traditional institutions.

The creation of a new institution to resolve regime conflicts appears perhaps as a desirable but an unlikely proposition. Even though the evolution of the GATT into the WTO has shown that a new international organization can be effective without being too costly (out of twenty-one international economic organizations, the WTO has a budget that ranks it only in seventeenth place), negotiations to establish an entirely new body would be perceived as much too costly right now. The existing international agenda is already full and provides little room for the design of new entities. In this connection, Boisson de Chazournes (1996, 296–297) proposes the creation of a multilateral compliance regime based on Article 13 of the Climate Change Convention that would promote a rule-oriented system. Ongoing negotiated settlements would serve to advance adherence to the regime and only in the last resort withhold benefits to ensure compliance. The author further argues that possible inconsistencies between compliance provisions under this scheme and the need to honor WTO obligations would not be problematic from a legal point of view because the compliance measures would be the product of a decision agreed by the Parties to the Convention. Hence, from a legal perspective, their possible inconsistency with the WTO commitments should be considered as a legitimate derogation.

The strengthening of existing informal networks and committees is advocated by Aaron Cosbey (1999), who looks favorably on the creation of a working group that would attempt to influence future WTO negotiations toward better inclusion of sustainable development issues into the WTO agenda. A common FCCC-WTO working group could also be envisaged by analogy to a similar organ set up to reconcile the Kyoto and Montreal Protocols. However, such groups often have limited decision-making power. What has so far seemed to create the most problems in

terms of regime clashes are the quasi-judicial decisions of the WTO panels as well as narrowly conceived agendas.

The strengthening and redefinition of existing international bodies, such as the International Court of Justice (ICJ), which would then become competent to review WTO cases and take into account environmental considerations, could be a step in the right direction. In doing so, the ICJ would have to explicitly adopt an important part of the GATT/WTO jurisprudence; otherwise its legitimacy for trade cases would be denied. The ICJ, however, would have the moral authority and the seniority to impose itself as an arbitrator of last resort.

These considerations show that a resolution of the conflict areas in trade and the environment generated by some of the provisions of the Kyoto Protocol will not be easy. It is generally recognized that the Protocol will not be ratified unless the issues highlighted above are addressed. In particular, other chapters in this volume have emphasized the importance of the Kyoto flexible mechanisms for the final ratification of the whole protocol. Our analysis of the situation stresses the importance of a design of these mechanisms that also respects the constraints of the international trading system. If this fails to be the case, both environment and trade-policy areas are likely to suffer. The present tendency toward a more orderly conception of international relations could then be replaced by a more chaotic path.

Notes

1. In 1989, Section 609 was laid down in order for the U.S. government to negotiate international agreements to promote fishing methods compatible with the protection of sea turtles. The initiative was extended on a global basis in 1996 in the sense that the exporting country had to attest that the shrimps exported to the United States had been caught by using sea turtle–friendly methods (Biggs, 2000, 16).

2. This raises the issue of equity in designing instruments in particular new forms of property rights, such as emissions-reduction certificates. The equity questions have been discussed more thoroughly at the domestic, national, and international level in the chapters on equity.

3. Legislation under Section 301, Super 301 (for particularly "unfair" trade), and Special 301 (for intellectual property rights), authorizes the U.S. government to retaliate against countries engaging in "unfair" trade practices (Garten 1995).

This page intentionally left blank

14

Conclusions

Urs Luterbacher and Detlef F. Sprinz

Over the past two decades, global climate change has developed from a concern of the scientific community into a major agenda item for policy makers. Global climate change is perhaps a model case of global environmental problems, given that anthropogenic and natural emissions around the world, regardless of location, contribute to the alteration of the Earth's atmosphere. Therefore the response must also be global, even though the effects of such change vary by region. So far, despite the growing recognition of the importance of the problem, the international climate change regime is still under construction. It cannot compare in effectiveness with other more established environmental regimes, such as the Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol that followed it in 1987. Unlike the climate regime, the ozone regime contains binding obligations for most states and benefits from the support of an international consensus. Such a consensus has not yet been achieved with climate change.

For the moment, two factors make the establishment of an effective climate regime problematic. The first difficulty comes from powerful domestic forces, some of which, especially in the United States, oppose in principle any measure to mitigate climate change and do not recognize the scientific legitimacy of the problem. The fact that the most powerful country on Earth and also the largest emitter of greenhouse gases does not seem to be close to ratifying the Kyoto Protocol keeps others from taking major initiatives. Moreover, this reticence seems to bolster major developing countries such as China and India in their efforts to delay consideration of meaningful climate change prevention strategies. The present situation corresponds to a typical bargaining process in which

actors have an incentive to outwait each other. No one is willing to make initial commitments for fear that they might be stronger than those ultimately adopted in the final agreement.

The second factor complicating the climate change negotiations is the high level of uncertainty associated with the many provisions of the Kyoto Protocol. This is partly a result of the above-mentioned domestic pressures on the international bargaining process. As a result, negotiators have left essential elements of the agreement unsettled. In some obvious ways, the Kyoto Mechanisms have been designed in order to incite more countries and more specific groups and firms within countries to adhere to the process. Thus, the U.S. executive branch expects to attract groups ranging from farmers to industrialists and energy companies by showing them the advantages of the creation of new carbon sinks or the use of emissions trading and the Clean Development Mechanism (CDM). Moreover, the U.S. government also hopes that several developing countries will agree to subscribe to at least some obligations in terms of greenhouse gas emissions reductions through the substantial side payments or commercial incentives offered by some form of joint implementation or, especially, through the CDM. In this way, the U.S. domestic arguments against the agreement based on the unfairness of the absence of commitments from major developing countries such as China or India would be successfully countered. However, for this to happen first requires the development of a greater consensus on how to apply the Kyoto Mechanisms and how to develop adequate compliance and control procedures. Better agreements must also be found about how to implement the mechanisms at the practical level: Will full trading of emissions be allowed, or only partial trading? Who will monitor the trading? And, finally, who can trade? Will only countries be allowed to trade, or will individual firms also be included in the process? What happens when countries try to achieve some of their emissions-reduction commitments of the Kyoto Protocol through taxation schemes? Is this compatible with the Kyoto Protocol and with the international trade regime? All these questions remain unanswered. However, the establishment of a successful climate regime will largely depend on their resolution, because otherwise ratification by the United States and some other crucial players is unthinkable. The successful evolution of an international climate regime will also depend on

the way countries manage to define it within the existing framework of international norms and regulations. In this context, the existence of the set of limited but powerful rules of the international trade regime is instructive. This kind of international regulation is very effective, because it institutionalizes retaliatory moves by individual states if a party to the World Trade Organization (WTO) is found to be acting in violation of its rules. Trade sanctions instituted by the Uruguay round of negotiations have thus done more for intellectual property rights in a few years than the long-term existence of the World International Intellectual Property Organization. The Kyoto Protocol, by placing limits and restrictions on greenhouse gas emissions, could lead some countries to exploit divergences between such limitations and the international trade regime and thus to challenge aspects of the international climate regime in front of the WTO. So far, the Montreal Protocol on the Protection of the Ozone Layer has avoided such a confrontation, in all probability because its provisions deal with a limited aspect of industrial production. One cannot expect the same with the international climate regime. Moreover, individual countries could also resort to unilateral trade sanctions to punish cheaters and free-riders within the climate regime. The basic question of the appropriate design of the climate regime is therefore raised.

An important goal of this volume is to contribute to a better understanding of the conditions necessary to achieve an effective international agreement to address the causes and consequences of climate change. Most chapters raise two major sets of issues that guide this reflection. The first concerns the analysis of the difficulties that must be resolved in order to establish an effective climate change regime. These include aspects of fairness and equity, problems of interpreting the scientific evidence on climate change, especially its regional and local effects, and questions of institutional and instrumental design. The other common theme running throughout the volume is attention to possible paths out of present quandaries. Various policy proposals that have been put forward in the international negotiating area are analyzed in terms of their effectiveness in meeting the stated goals of mitigating climate change. Authors either refer to significant pieces of work done by others or present their own ideas about consequences for climate change and for the international system of various policy initiatives.

We have sought throughout this volume to show how theories of international relations and social science methodologies help us understand the reluctant response by various countries to the challenge of climate change. As a conclusion, we address this question by synthesizing some of the key findings and proposals that emerge from the individual chapters. Several cross-cutting themes are relevant in clarifying the issues surrounding the climate change debate. We have compiled six that seem particularly relevant:

1. Role of science and scientific evidence
2. International actors and their bargaining power
3. Role of equity or fairness
4. Kyoto Mechanisms and the institutional setup
5. Role of side payments
6. Place of the climate regime among other global regimes

In the following pages, we will highlight the way our contributors have taken these factors into account and how many of the issues themselves are closely interrelated. The synthesis itself illustrates the complexity of the issues and its comprehensive nature and therefore speaks to the necessity to develop and apply rigorous theories and methodologies to the process of negotiating and implementing a climate change regime.

1 Role of Science and Scientific Evidence

The historical evolution of the climate change regime described by Bodansky in chapter 2 shows that there is a parallel, as in other environmental regimes, between the accumulation of scientific evidence about climate change and the political will to act. To a great extent, the 1995 IPCC report led to the formulation and negotiation of the Kyoto Protocol. In a similar way, the 2001 report could also lead to more willingness on the part of the United States to ratify the Protocol and thus, in exchange, to advances in the specification of the Kyoto Mechanisms as well. Additional commitments from developing countries could result, too. Raustiala's contribution in chapter 5 also reinforces the conclusions of this historical analysis about the crucial role of the IPCC process.

2 International Actors and Their Bargaining Power

Chapter 3, by Rowlands, reviews theories about regime formation in the international relations literature. It emphasizes the simultaneous importance of big and powerful actors and of divergent interests, both within and among states. He thus shows how the interests of major powers in the developed and developing world, as well as the various pressure groups within them, play a major role in shaping the agenda of the climate change regime. Progress in the direction of a more effective regime will therefore imply more efforts to involve major international actors as well as to target specific interest groups. Nations and interest groups must come to understand that there are gains to be had by adopting the Kyoto Mechanisms.

Chapter 4, by Sprinz and Weiß, as well as chapter 5, by Raustiala, emphasize the importance of powerful state and nonstate actors at the national and international levels in constraining the set of feasible options available to respond to the challenge of climate change.

The United States serves as a prominent example. Shortly before the final round of the negotiations that led to the conclusion of the Kyoto Protocol, the U.S. Senate passed a resolution demanding that the regulations of the Kyoto Protocol not unduly harm the U.S. economy and that major emitters in developing countries also take on commitments. Nongovernmental actors also shape negotiating positions. The interplay between environmental groups and major polluting industrial actors also constrains whatever position a government can take internationally. Nonstate actors often set the international and national environmental agenda, maintain momentum during the negotiations, provide advice on specific solutions, and monitor the outcomes of national and international negotiations. As a result, they exert constraints on country positions. Not all countries are equally mobilized, and the particular interest configurations vary by country. These are, however, not unchangeable. Since different interest configurations in Europe and the United States may lead to unequal standards worldwide, lead industry groups seem interested in working within the framework of Kyoto Mechanisms so as to foster worldwide standards. Some of these conclusions are strengthened by a reading of the chapter by Raustiala on the role of nonstate actors in pushing forward the climate change agenda.

3 Role of Equity or Fairness

Questions about equity and justice have also emerged throughout this volume as central to the construction of an effective climate change regime. Both Paterson and Wiegandt insist on the fact that developing countries are very sensitive to this particular issue and will not be satisfied with a simple acknowledgment of the emissions situation in 1990, which is the basis of the Kyoto Protocol (and for this reason a form of "grandfathering"). Two basic conceptions are emphasized in the literature on justice and equity. One is the Schelling and Barrett perspective, which asserts that questions of equity will basically be resolved naturally around the bargaining table because "focal" negotiation points will emerge around which participants will converge. The other is the more persuasive argument by Müller and Shue that insists that points of equity must be addressed directly by designing allocation schemes that give poorer countries their due in the form greater initial allocation of the new types of property rights (the Kyoto Mechanisms) that the Kyoto Protocol envisages. Müller goes so far as to propose a specific allocation scheme based on a combination of different criteria in order to realize the greatest possible equity among countries. It is, however, difficult to imagine equity problems being resolved once and for all. For very poor countries, newly acquired property rights could be quickly sold or squandered in the hope of betterment of a difficult financial situation. The proposal by Chichilnisky to create a Bank of International Environmental Settlements goes far in answering the long-term questions related to property acquisition. From her perspective, the property rights would be managed by a bank and rented rather than sold from country to country, with the benefits accruing to the countries in need. The long-term notion of equity is thus best served by an international institution that takes the interests of needy countries into account and that adapts its conditions to the changing material situation of individual countries.

4 Kyoto Mechanisms and the Institutional Setup

It is evident from above that solving equity questions will be dependent on the institutional design of the climate agreement. In particular, the

Kyoto Mechanisms will play a crucial role. In chapter 10, Bodansky provides a legal review of the climate regime in general and the Kyoto Protocol in particular. He reminds us that, besides the establishment of tradable emissions permits between industrialized countries, emissions-reduction units will also be accounted for by joint implementation of carbon sinks between industrialized countries. In addition, certified emissions reductions will accompany the CDM to promote the use of carbon-reducing technologies in developing countries. However, decisions about the following have not been made: (1) Whether to let countries trade all their emissions—that is, whether or not to establish caps to trading; (2) whether to let countries trade certified emissions reductions or emissions-reduction units; (3) whether to let nonstate actors, be they international organizations or private firms, take part in the trading. Other undecided trading arrangements include which projects within CDMs to allow and how to audit and verify all the trading procedures. From our previous remarks, it is clear that the resolution of these issues will, to a great extent, condition the success or failure of the establishment of an effective climate regime.

In chapter 11, on implementation, compliance, and effectiveness, Mitchell reminds us that the success of the climate change regime will also depend on the dynamics of the whole treaty system and in particular of the institutions that it puts in place and the willingness of the parties to follow its obligations. In particular, weak institutions and inadequate program evaluation procedures or ineffective compliance mechanisms will rapidly undermine the climate change regime. Again, a satisfactory elaboration and completion of the points left open since Kyoto will prove crucial.

5 Role of Side Payments

Chapter 8, by Grundig, Ward, and Zorick, uses formal analysis to illustrate the challenges facing the resolution of some of these outstanding questions. They clearly show how bargaining processes, the position of developing countries, and therefore equity considerations, interact. Their analysis stresses the importance of veto power by crucial international or domestic actors over the whole negotiation or ratification process

(these two processes are obviously linked). The only way to overcome the veto problem, according to Grundig, Ward, and Zorick, is to distribute side payments at all levels. Clearly, the Kyoto Mechanisms fulfill that role, since they can first potentially satisfy domestic constituencies by either easing the burden of reduction from them or giving them a chance to make significant profits. They can also be favorable to countries as a whole, because it is possible to assure them revenues through the sale or rent of emissions-trading rights or to contribute to their industrial growth via the use of the CDM. To significantly alter preferences for exercising one's veto, side payments must be sufficiently large and must be offered to the relevant actors. The chapter on formal analysis, therefore, implicitly underlines the importance of a good design and implementation of the Kyoto Mechanisms.

In his comparisons, Sprinz also raises critical equity considerations by stressing that development issues are intimately related to global environmental questions. This is the case with the Montreal Protocol, which recognized the importance of side payments and differentiated commitments. These mechanisms are also part of the Framework Convention on Climate Change, and especially with the Kyoto Protocol's CDM. Keeping opportunities for economic growth open is vital to the well-being of developing countries. Therefore, the remarks made by Grundig, Ward, and Zorick about side payments to countries with veto powers (and China indirectly has some veto power) are even more appropriate. Certain scholars, like Thomas Schelling, for example, doubt that a transfer great enough from developed to developing countries will take place because of its magnitude. But if there are profits to be made both by developing-country and industrialized-country businesses, transfers with technological advances could occur.

Chapter 9, on simulation, generally leads to the same conclusions. It emphasizes the results of Nordhaus and Yang and of Eyckmans and Tulkens, who all indicate that some international actors might be better off in long-term income or consumption terms by pursuing their own national climate policy rather than settling for a cooperative international action. Simulation methods can evaluate such results quantitatively in a rather precise way. If one looks farther than these results, to the Kyoto Mech-

anisms themselves, it appears that simulation methodologies can give a precise assessment of the kinds of side payments necessary to overcome such tendencies. In other words, it becomes possible to ask what the gains from adherence to the Kyoto Protocol would have to be for the United States or China before they would be willing to join an international effort to mitigate climate change. Simulation methodology can therefore go far to provide reliable evaluations of the consequences of particular choices or institutional designs.

6 Place of the Climate Regime among Other Global Regimes

Sprinz argues in chapter 12 that the climate regime is trailing behind the highly successful ozone regime. This may be due in part to the limited number of major emitting industries and countries, the provision of side payments for developing countries, and the availability of substitutes for the chemicals to be regulated. Furthermore, the ozone regime has already developed and used a noncompliance system.

Reference to the Montreal Protocol raises the two fundamental considerations that that we have referred to earlier. These points are particularly relevant for understanding the slow progress of the climate change regime and for identifying features that will be essential to its success: equity considerations and development issues. Nevertheless, the climate regime is well advanced and more effective than the biodiversity and desertification regimes. This may be due to their stronger development components and their more regionally specific focus. In effect, one may argue that some of these problems are better suited for a regional rather than a global response.

Chapter 13, by Luterbacher and Norrlöf, emphasizes another significant obstacle to the implementation of a comprehensive climate change regime, which is the existence of the international trade regime. As they stress, the international trade regime, by permitting sanctions against countries that persist in not complying, has proved very effective. Any conditions of a climate change agreement that contravene existing trade rules would pose serious problems for international governance. Not only might the environmental regime be destabilized if it is in contradiction

with the trade regime, but the trade regime could itself be undermined by countries implementing sanctions against each other for allegedly not observing the environmental rules. The climate regime, as we observed earlier, is especially concerned about this question because of its comprehensiveness and its probable reliance on trade-based implementation mechanisms. Thus the effectiveness of a climate change agreement will be greatly enhanced from the outset if its design takes into account the need to be compatible with trade regimes. The necessity of elaborating dispute settlement mechanisms to deal with potential conflicts becomes particularly important in this regard.

In their different chapters adopting different perspectives and addressing different issues, our contributors show that an effective climate regime will depend on the successful resolution of the points left open by the Kyoto Protocol. We can also conclude that the complexities of the problem and its proposed solutions require careful attention to the design of the institutional mechanisms and, especially, the Kyoto Mechanisms. The existing world trade regime is proof that establishing a very effective set of rules is not necessarily costly. The WTO budget ranks seventeenth out of the budgets of the twenty-one most important international economic organizations. It is not clear, however, that the climate change regime will incur similarly low implementation costs. Moreover, the trade regime is already in place, which means the climate change regime must be designed around existing provisions. Further, the climate change debate raises serious scientific issues that do not exist for many other international regimes. It is also being called on to confront equity questions from the outset. Their importance is not to be neglected because, as the trade regime also shows us, they will emerge at a later date to threaten even an existing agreement.

Placing the study of the climate change negotiation process in the context of other international regimes, and linking it to fundamental problems of social interaction such as equity, negotiation, bargaining, and international governance, provides a comprehensive review of the climate change debate. It is therefore possible to highlight some of the major challenges that stand in the way of achieving international consensus but also some of the opportunities to address outstanding questions. Our broad perspective has allowed us to underscore the linkages among issues

and therefore open new avenues for discussion. We have presented a multitude of international-studies perspectives to demonstrate how and why the climate regime has come as far as it has and why it has not gone further. We suggest the conditions under which we might expect it to progress. In this respect, the book should make a useful contribution in the effort to shape a new world climate order and thus help ensure a better future for those who follow us.

This page intentionally left blank

Appendix

Web references for core documents

1. UNFCCC:
   http://www.unfccc.de/resource/conv/conv.html
   (January 15, 2001)
2. Berlin Mandate:
   http://www.unfccc.de/resource/docs/cop1/07a01.pdf
   (January 15, 2001)
3. Geneva Ministerial Declaration:
   http://www.unfccc.de/resource/docs/cop2/15a01.pdf
   (January 15, 2001)
4. Kyoto Protocol:
   http://www.unfccc.de/resource/docs/convkp/kpeng.html
   (January 15, 2001)
5. Buenos Aires Plan of Action:
   http://www.unfccc.de/resource/docs/cop4/16a01.pdf
   (January 15, 2001)

This page intentionally left blank

References

Agarwal, A., and S. Narain. 1990. *Global Warming in an Unequal World: A Case of Environmental Colonialism*. New Delhi: Centre for Science and Environment.

Agrawala, Shardul. 1997. *Explaining the Evolution of the IPCC Structure and Process*. ENRP Discussion Paper No. E-97-05. Boston: Kennedy School of Government, Harvard University.

Agrawala, Shardul, and Steinar Andresen. 1999, December. Evolution of the Negotiating Position of the United States in the Global Climate Change Regime. Lysaker: The Fridtjof Nansen Institute, FNI-Report No. 14/99.

Alcamo, J., ed. 1994. *Image 2.0: Integrated Modeling of Global Climate Change*. Dordrecht: Kluwer Academic Publishers.

Allais, Maurice. 1953. Le comportement de l'homme rationnel devant le risque: Critique des postulats et axiomes de l'école Américaine. *Econometrica* 21:503–546.

Amin, Samir, Giovanni Arrighi, Andre Gunder Frank, and Immanuel Wallerstein. 1982. *Dynamics of Global Crisis*. London: Macmillan.

Anderson, Kym, and Richard Blackhurst, eds. 1992. *The Greening of World Trade Issues*. London: Harvester Wheatsheaf.

Anderson, Robert J., Jr. 1995. *Joint Implementation of Climate Change Measures*. Climate Change Series No. 005. Washington, DC: World Bank Environment Department, Global Environment Coordination Division.

Andresen, Steinar, and Jørgen Wettestad. 1995. International Problem-Solving Effectiveness: The Oslo Project Story So Far. *International Environmental Affairs* 7 (2):127–149.

Arrhenius, Svante. 1896. On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground. *Philosophical Magazine,* 41:237–276.

Arrow, K. J., W. R. Cline, K-G. Mäler, M. Munasinghe, R. Squitieri, and J. E. Stiglitz. 1996. Intertemporal Equity, Discounting, and Economic Efficiency. In *Climate Change 1995: Economic and Social Dimensions of Climate Change,* edited by J. P. Bruce, H. Lee, and E. F. Haites. Cambridge, England: Cambridge University Press.

Attard, David J. 1991. UNEP Meeting of the Group of Legal Experts to Examine the Concept of the Common Concern of Mankind in Relation to the Global Environment 1990, Dec. 13015, Nairobi: United Nations Environment Programme.

Ausubel, Jesse. 1983. Historical Note. In *Changing Climate,* edited by N. R. Council. Washington, DC: National Academy Press.

Avenhaus, R., and M. J. Canty. 1992. On the Relevance of Reported Data in a Greenhouse Gas Verification Regime. In *A Regime to Control Greenhouse Gases: Issues of Verification, Monitoring, Institutions,* edited by J. C. di Primio and G. Stein. Jülich, Germany: Forschungszentrum Jülich GmbH.

Axelrod, Robert. 1984. *The Evolution of Cooperation.* New York: Basic Books.

Axelrod, Robert, and Robert O. Keohane. 1985. Achieving Cooperation under Anarchy: Strategies and Institutions. *International Organization* 25:866–874.

Banks, Michael. 1985. The Inter-Paradigm Debate. In *International Relations: A Handbook of Current Theory,* edited by M. Light and A.J.R. Groom. London: Pinter.

Banuri, T., Karl Göran Mäler, Michael Grubb, Harold K. Jacobson, and F. Yamin. 1996. Equity and Social Considerations. In *Climate Change 1995: Economic and Social Dimensions of Climate Change,* edited by J. P. Bruce, H. Lee, and E. F. Haites. Cambridge, England: Cambridge University Press.

Barratt-Brown, Elizabeth, Scott Hajost, and John H. Sterne. 1993. A Forum for Action on Global Warming: The UN Framework Convention on Climate Change. *Colorado Journal of International Environmental Law and Policy* 4 (1 (Winter)): 103–118.

Barrett, Scott. 1990. The Problem of Global Environmental Protection. *Oxford Review of Economic Policy* 6:68–79.

Barrett, Scott. 1992. "Acceptable" Allocation of Tradable Carbon Emission Entitlements in a Global Warming Treaty. In *Tradeable Endowments for Carbon Emission Abatement.* Geneva: United Nations Conference on Trade and Development.

Barry, Brian. 1989a. The Ethics of Resource Depletion. In *Democracy, Power and Justice,* edited by B. Barry. Oxford: Oxford University Press.

Barry, Brian. 1989b. Justice as Reciprocity. In *Democracy, Power and Justice,* edited by B. Barry. Oxford: Oxford University Press.

Benedick, Richard E. 1998. *Ozone Diplomacy: New Directions in Safeguarding the Planet.* Enlarged ed. Cambridge, MA: Harvard University Press.

Berkes, Fikret. 1989. *Common Property Resources: Ecology and Community-Based Sustainable Development.* London: Belhaven.

Bernauer, Thomas. 1995. The Effect of International Environmental Institutions: How We Might Learn More. *International Organization* 49 (2):351–377.

Bernow, Stephen, Karlynn Cory, William Dougherty, Max Duckworth, Sivan Kartha, and Michael Ruth. 1999. *America's Global Warming Solutions.* Study Prepared for World Wildlife Fund. Boston: Tellus Institute.

Bertram, Geoff. 1992. Tradeable Emission Permits and the Control of Greenhouse Gases. *Journal of Development Studies* 28 (3):423–446.

Beuermann, Christiane, and Jill Jäger. 1996. Climate Change Politics in Germany: How Long Will Any Double Dividend Last? In *Climate Change Policy: A European Perspective,* edited by T. O'Riordan and J. Jäger. London: Routledge.

Biggs, Gonzalo. 2000. Reflections on the WTO and Sustainable Development. In *Trade, Environment and Sustainable Development: Views from Sub-Saharan Africa and Latin America,* edited by Peider Könz. Tokyo and Geneva: United Nations University Institute of Advanced Studies and The International Centre for Trade and Sustainable Development, 3–21.

Biermann, Frank. 1999. *Big Science, Small Impacts—In the South? The Influence of International Environmental Information Institutions on Policy-Making in India.* ENRP Discussion Paper No. E-99-12. Boston: Kennedy School of Government, Harvard University.

Binmore, Kenneth, and Partha Dasgupta, eds. 1987. *The Economics of Bargaining.* Cambridge, MA: Blackwell.

Böckem, Alexandra. 1998. The Political Economy of Climate Policy-Making in the European Union. *Intereconomics* (Nov./Dec. 1998):260–273.

Bodansky, Daniel. 1992. Draft Convention on Climate Change. *Environmental Policy and Law* 22 (1 (February)):5–15.

Bodansky, Daniel. 1993. The United Nations Framework Convention on Climate Change: A Commentary. *Yale Journal of International Law* 18 (2 (Summer)): 451–558.

Bodansky, Daniel. 1994. Prologue to the Climate Change Convention. In *Negotiating Climate Change: The Inside Story of the Rio Convention,* edited by I. Mintzer and J. A. Leonard. Cambridge, England: Cambridge University Press.

Bodansky, Daniel M. 1995. The Emerging Climate Change Regime. *Annual Review of Energy and Environment* 20:425–461.

Boehmer-Christiansen, Sonja. 1996. The International Research Enterprise and Global Environmental Change: Climate-Change Policy as a Research Process. In *The Environment and International Relations,* edited by J. Vogler and M. F. Imber. New York: Routledge.

Boisson de Chazournes, Laurence. 1996. The United Nations Framework Convention on Climate Change: On the Road Towards Sustainable Development. In *Enforcing Environmental Standards: Economic Mechanisms as Viable Means?,* edited by Rüdiger Wolfrum. Berlin: Springer, 285–301.

Bolin, Bert. 1993. A Joint Scientific and Political Process for a Convention on Climate Change. In *International Environmental Negotiations,* edited by Gunnar Sjöstedt. Newbury Park: Sage.

Brams, Steven J., and Alan D. Taylor. 1996. *Fair Division: From Cake-Cutting to Dispute Resolution.* Cambridge, England: Cambridge University Press.

Breidenich, Clare, Daniel Magraw, Anne Rowley, and James W. Rubin. 1998. The Kyoto Protocol to the United Nations Framework Convention on Climate Change. *American Journal of International Law* 92:315–331.

Breitmeier, Helmut. 1997. Entstehung und Wandel des globalen Regimes zum Schutz der Ozonschicht [Creation and Evolution of the Global Regimes to Protect the Stratospheric Ozone Layer]. In *Internationale Umweltregime: Umweltschutz durch Verhandlungen und Verträge [International Environmental Regimes: Environmental Protection by Way of Bargaining and Agreements],* edited by T. Gehring and S. Oberthür. Opladen: Leske & Budrich.

Brenton, Tony. 1994. *The Greening of Machiavelli.* London: Royal Institute for International Affairs.

British Petroleum. 1998. *Statistical Review of World Energy 1998.* London: British Petroleum.

Bromley, Daniel W. 1992. The Commons, Property, and Common-Property Regimes. In *Making the Commons Work,* edited by D. W. Bromley. San Francisco: Institute for Contemporary Studies.

Brown, Chris. 1985. Development and Dependency. In *International Relations Theory: A Handbook of Current Theory,* edited by M. Light and A.J.R. Groom. London: Pinter.

Brown, Chris. 1992. *International Political Theory: New Normative Approaches.* Hemel Hempstead: Harvester Wheatsheaf.

Brown, Chris. 1994. Critical Theory and Postmodernism in International Relations. In *Contemporary International Relations: A Guide to Theory,* edited by A.J.R. Groom and M. Light. London: Pinter.

Brownlie, Ian. 1973. A Survey of International Customary Rules of Environmental Protection. *Natural Resources* 13:179–189.

Brown Weiss, Edith. 1989. Climate Change, International Equity, and International Law: An Introductory Note. *Climatic Change* 15 (1/2):327–335.

Brown Weiss, Edith. 1993. International Environmental Law: Contemporary Issues and the Emergence of a New World Order. *Georgetown Law Journal* 81: 675–710.

Brown Weiss, Edith, and Harold K. Jacobson, eds. 1998. *Engaging Countries: Strengthening Compliance with International Environmental Accords.* Cambridge, MA: MIT Press.

Bueno de Mesquita, Bruce, and David Lalman. 1992. *War and Reason: Domestic and International Imperatives.* New Haven: Yale University Press.

Bueno de Mesquita, Bruce J., David Newman, and Alvin Rabushka. 1996. *Red Flag over Hong Kong.* Chatham: Chatham House Publishers.

Bull, Hedley. 1977. *The Anarchical Society: A Study of Order in World Politics.* London: Macmillan.

Busch, Lawrence, and Quan Wen. 1995. Perfect Equilibria in a Negotiation Model. *Econometrica* 63:545–565.

Cain, Melinda L. 1983. Carbon Dioxide and the Climate: Monitoring and a Search for Understanding. In *Environmental Protection: The International Dimension,* edited by D. Kay and H. K. Jacobson. Totowa, NJ: Allanheld, Osmun & Co.

Caldwell, Lynton Keith. 1996. *International Environmental Policy: From the Twentieth to the Twenty-First Century*. 3rd ed. Durham: Duke University Press.

Carr, E. H. 1983. *The Twenty Year Crisis: 1919–1939*. London: Macmillan.

Carson, Rachel. 1962. *Silent Spring*. New York: Fawcett Crest.

Chasek, Pamela. 1997. The Convention to Combat Desertification: Lessons Learned for Sustainable Development. *Journal of Environment and Development* 6 (2):147–169.

Chasek, Pamela, David Leonard Downie, Kevin Baumert, Sean Clark, Joshua Tosteson, Les Bissell, Johanna Hjerthen, Balachandar Jayavainan, Elizabeth Karkus, John Leahy, and Gerald Mulder. 1998. *European Union Views on International Greenhouse Gas Emissions Trading*. Working Paper No. 3. New York: School of International and Public Affairs, Columbia University.

Chayes, Abram, and Antonia Handler Chayes. 1993. On Compliance. *International Organization* 47 (2):175–205.

Chayes, Abram, and Antonia Handler Chayes. 1995. *The New Sovereignty: Compliance with International Regulatory Agreements*. Cambridge, MA: Harvard University Press.

Chayes, Abram, Antonia Handler Chayes, and Ronald B. Mitchell. 1998. Managing Compliance: A Comparative Perspective. In *Engaging Countries: Strengthening Compliance with International Environmental Accords,* edited by E. Brown Weiss and H. K. Jacobson. Cambridge, MA: MIT Press.

Chayes, Abram, Eugene B. Skolnikoff, and David G. Victor. 1992, March. A Prompt Start: Implementing the Framework Convention on Climate Change. *A Report from the Bellagio Conference on Institutional Aspects of International Cooperation on Climate Change 28–30 January 1992*. Cambridge, MA.

Chayes, Antonia Handler, Abram Chayes, and Ronald B. Mitchell. 1995. Active Compliance Management in Environmental Treaties. In *Sustainable Development and International Law,* edited by W. Lang. London: Graham and Trotman.

Chichilnisky, Graciela. 1993. *Biodiversity and Property Rights in the Pharmaceutical Industry: Case Study*. New York: Columbia University Press.

Chichilnisky, Graciela. 1994. North-South Trade and the Global Environment. *American Economic Review* 84 (4):851–874.

Chichilnisky, Graciela. 1996. *Development and Global Finance: The Case for an International Bank for Environmental Settlements*. New York: United Nations Development Programme.

Chichilnisky, Graciela, and G. Heal. 1994. Who Should Abate Carbon Emission? An International Viewpoint. *Economic Letters* 44:443–449.

Chichilnisky, Graciela, G. Heal, and D. Starrett. 1993. *International Markets with Emission Rights: Equity and Efficiency*. Publication No. 81: Center for Economic Policy Research, Stanford University.

Clark, William C. 1989. Managing Planet Earth. *Scientific American* 261 (3 (September)):47–54.

Climate Network Europe. 1994. *Joint Implementation from a European NGO Perspective*. Brussels: Climate Network Europe.

Cline, William R. 1992. *The Economics of Global Warming*. Washington, DC: Institute for International Economics.

Coase, Ronald. 1960. The Problem of Social Costs. *Journal of Law and Economics* 3:1–44.

Connybeare, John. 1980. International Organization and Property Rights. *International Organization* 34 (3):307–334.

Convention on Long-Range Transboundary Air Pollution (LRTAP), adopted Nov. 13, 1979. 1979. *International Legal Materials* 18 (1442).

Cosbey, Aron. 1999. *The Kyoto Protocol and the International Trading System*. Seminar Paper. London: Royal Institute of International Affairs.

Cox, Robert W. 1977. Labour and Hegemony. *International Organization* 31 (3):385–424.

Craumer, Peter R. 1992. Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia. In *Geographic Perspectives on Soviet Central Asia,* edited by R. A. Lewis. London: Routledge.

Danielsen, Albert L. 1982. *The Evolution of OPEC*. New York: Harcourt Brace Jovanovich.

Darst, Robert G. 1997. Bribery and Blackmail in East-West Environmental Politics. *Post-Soviet Affairs* 13 (1):42–77.

Dasgupta, Partha. 1982. *The Control of Resources*. Cambridge, MA: Harvard University Press.

Dasgupta, Partha, and Geoffrey Heal. 1979. *Economic Theory and Exhaustible Resources*. Cambridge, England: James Nisbet and Cambridge University Press.

Davies, Peter G. G. 1998. Note: Global Warming and the Kyoto Protocol. *International Comparative Law Quarterly* 47:446–461.

Demsetz, H. 1967. Toward a Theory of Property Rights. *American Economic Review* 57:347–359.

Deutsch, Karl W. 1966. *The Nerves of Government: Models of Political Communication and Control*. New York: Free Press.

Developments in the Law—International Environmental Law. 1991. *Harvard Law Review* 104 (7):1484–1639.

di Primio, Juan Carlos, and Gotthard Stein, eds. 1992. *A Regime to Control Greenhouse Gases: Issues of Verification, Monitoring, Institutions*. Jülich, Germany: Forschungszentrum Jülich GmbH.

Downs, George W., David M. Rocke, and Peter N. Barsoom. 1996. Is the Good News about Compliance Good News about Cooperation? *International Organization* 50 (3):379–406.

Dudek, Daniel J., and Tom Tietenberg. 1992. Monitoring and Enforcing Greenhouse Gas Trading. In *Climate Change: Designing a Tradeable Permit System.* Paris: Organization for Economic Cooperation and Development.

Dupont, Céderic. 1994. Domestic Politics and International Negotiations: A Sequential Bargaining Model. In *Game Theory and International Relations: Preferences, Information, and Empirical Evidence,* edited by P. Allan and C. Schmidt. Aldershot: Edward Elgar.

Edmonds, J., and D. Reilly. 1983. A Long-Term Global Energy-Economic Model of CO_2 Release from Fossil Fuel Use. *Energy Economics* 5 (2):74–88.

Efinger, Manfred, Peter Mayer, and Gudrun Schwarzer. 1993. Integrating and Contextualizing Hypotheses: Alternative Paths to Better Explanations of Regime Formation? In *Regime Theory and International Relations,* edited by V. Rittberger. Oxford: Clarendon Press.

Elliott, Lorraine. 1998. *The Global Politics of the Environment.* Basingstoke: Macmillan.

Enelow, James M., and Melvin J. Hinich, eds. 1990. *Advances in the Spatial Theory of Voting.* Cambridge, England: Cambridge University Press.

Epstein, Joshua M., and Raj Gupta. 1990. *Controlling the Greenhouse Effect: Five Global Regimes Compared.* Washington, DC: Brookings Institution.

Evans, Peter, Harold K. Jacobson, and Robert Putnam, eds. 1993. *Double-Edged Diplomacy: International Bargaining and Domestic Politics.* Berkeley: University of California Press.

Eyckmans, Johan, and Henry Tulkens. 1999. *Simulating with RICE Coalitionally Stable Burden Sharing Agreements for the Climate Change Problem.* Working Paper No. 18. Louvain-la-Neuve: Université Catholique de Louvain, CLIMNEG.

FCCC 1992. United Nations Framework Convention on Climate Change. http://www.unfccc.de/resource/conv/conv.html (January 15, 2001).

FCCC/1995/Inf.3, UN Doc. 1995. *Matters Relating to Commitments: Review of Information Communicated by Each Party Included in Annex I to the Convention.*

FCCC/A/AC.237/81, UN Doc. 1994. *First Review of Information Communicated by Each Party Included in Annex I to the Convention.*

FCCC/CP/1995/Misc.2, UN Doc. 1995. Consideration of the Establishment of a Multilateral Consultative Process for the Resolution of Questions Regarding Implementation (Article 13).

FCCC/CP/1997/L.7/Add.1, UN Doc. 1997. *Kyoto Protocol to the UN Framework Convention on Climate Change.* Kyoto.

Fierman, William. 1991. The Soviet "Transformation" of Central Asia. In *Soviet Central Asia. The Failed Transformation,* edited by W. Fierman. Boulder: Westview Press.

Fischer, Günther. 1992. *Klimaschutz und internationale Politik: Die Konferenz von Rio zwischen globaler Verantwortung und nationalen Interessen.* Aachen: Shaker.

Fischer, Wolfgang. 1991. The Verification of a Greenhouse Gas Convention—A New Task for International Politics? In *Verification Report—1991,* edited by J. B. Poole. London: VERTIC.

Fish, Arthur L., Jr., and David W. South. 1994. Industrialized Countries and Greenhouse Gas Emissions. *International Environmental Affairs* 6 (1 (Winter)): 14–44.

Franz, Wendy. 1998. Climate Change and Non-state Actors: Science and Industry in the Greenhouse. Paper presented at the Annual Conference of the American Political Science Association, September 2–6, Boston.

French, Hilary F. 1994. Making Environmental Treaties Work. *Scientific American* 271 (6):94–97.

Fudenberg, Drew, and Jean Tirole. 1991. *Game Theory.* Cambridge, MA: MIT Press.

Galtung, Johann. 1967. On the Effects of International Economic Sanctions: With Examples from the Case of Rhodesia. *World Politics* 19 (3):378–416.

Garten, Jeffrey E. 1995. American Trade Law in a Changing World Economy. *International Lawyer* 29 (1):15–41.

Gehring, Thomas. 1992. International Environmental Regimes: Dynamic Sectoral Legal Systems. In *Yearbook of International Environmental Law—1991.* London: Graham and Trotman.

Gelbspan, Ross. 1997. *The Heat Is On: The High Stakes Battle over Earth's Threatened Climate.* Reading, MA: Addison-Wesley.

Gerlach, Luther P. 1991. Global Thinking, Local Acting: Movements to Save the Planet. *Evaluation Review* 15 (1 (February)):120–148.

German Advisory Council on Global Change (WBGU). 1996. *World in Transition: Ways Towards Global Environmental Solutions (Annual Report 1995).* Berlin: Springer.

Gilpin, Robert G. 1975. *U.S. Power and the Multinational Corporation.* New York: Basic Books.

Gleick, Peter H. 1993. Water and Conflict. *International Security* 18 (1):79–112.

Glennon, Michael J., and Alison L. Stewart. 1998. The United States: Taking Environmental Treaties Seriously. In *Engaging Countries: Strengthening Compliance with International Environmental Accords,* edited by E. Brown Weiss and H. K. Jacobson. Cambridge, MA: MIT Press.

Goldberg, Donald M. 1993. As the World Burns: Negotiating the Framework Convention on Climate Change. *Georgetown International Environmental Law Review* 5 (2 (Spring)):239–275.

Goldberg, Donald M., Glenn Wiser, Stephen J. Porter, and Nuno LaCasta. 1998. *Building a Compliance Regime under the Kyoto Protocol.* CIEL and Euronatura

Working Paper. Washington, DC: Center for International Environmental Law and Euronatura.

González L., Ana Karina. 2000. Trade and Environment: Emerging Regimes. In *Trade, Environment and Sustainable Development: Views from Sub-Saharan Africa and Latin America,* edited by Peider Könz. Tokyo: United Nations University Institute of Advanced Studies and The International Centre for Trade and Sustainable Development, 37–53.

Greene, Owen. 1998. The System for Implementation Review in the Ozone Regime. In *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice,* edited by D. G. Victor, K. Raustiala, and E. B. Skolnikoff. Cambridge, MA: MIT Press.

Greene, Owen, and Julian E. Salt. 1994. Verification Issues in the Development of an Effective Climate Change Convention. *World Resources Review* 5 (3):271–285.

Grieco, Joseph M. 1988. Realist Theory and the Problem of International Cooperation. *Journal of Politics* 50:600–624.

Grieco, Joseph M. 1990. *Cooperation Among Nations: Europe, America, and Non-Tariff Barriers to Trade.* Ithaca, NY: Cornell University Press.

Grieco, Joseph M. 1993. Anarchy and the Limits of Cooperation. In *Neorealism and Neoliberalism: The Contemporary Debate,* edited by D. A. Baldwin. New York: Columbia University Press.

Grieco, Joseph M., Robert Powell, and Duncan Snidal. 1993. The Relative Gains Problem for International Cooperation. *American Political Science Review* 87: 729–743.

Grossman, Gene, and Elhanan Helpman. 1995. The Politics of Free Trade Agreements. *American Economic Review* 85 (4):667–690.

Grubb, Michael. 1989. *The Greenhouse Effect: Negotiating Targets.* London: Royal Institute of International Affairs.

Grubb, Michael. 1990. *Energy Policies and the Greenhouse Effect. Vol. 1.* London: Dartmouth/Royal Institute of International Affairs.

Grubb, Michael. 1995. Seeking Fair Weather: Ethics and the International Debate on Climate Change. *International Affairs* 71 (3):463–496.

Grubb, Michael, Matthias Koch, Abby Munson, Francis Sullivan, and Kay Thomson. 1993. *The Earth Summit Agreements: A Guide and Assessment.* London: Earthscan Publications.

Grubb, Michael, and James Sebenius. 1992. *Participation, Allocation, and Adaptability in International Tradeable Emission Permit Systems for Greenhouse Gas Control, in Climate Change: Designing a Tradeable Permit System.* Paris: Organisation for Economic Co-operation and Development.

Grubb, Michael, J. Sebenius, A. Magalhaes, and S. Subak. 1992. Sharing the Burden. In *Confronting Climate Change: Risks, Implications, and Responses,* edited by I. Mintzer. Cambridge, England: Cambridge University Press.

Grubb, Michael, and N. Steen. 1991. *Pledge and Review Processes: Possible Components of a Climate Convention.* London: Royal Institute of International Affairs.

Gruebler, A., and Y. Fujii. 1991. Intergenerational and Equity Issues of Carbon Accounting. *Energy* 16 (11/12):1397–1416.

Gruebler, A., and N. Nakicenovic. 1994. *International Burden-Sharing in Greenhouse Gas Reduction.* Research Report No. RR-94-009. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Grundig, Frank. 1995. *The Absolute versus Relative Gains Debate and Cooperation for Public Goods.* Unpublished manuscript, Department of Government, University of Essex.

Gutscher, H., and H-J. Mosler. 1995. *Why Analyze 10,000 Rather Than One? Simulating Interactions in Populations.* Paper presented at the First Open Meeting of the Human Dimensions of Global Environmental Change Community, Durham, NC.

Haas, Ernst B. 1958. *The Uniting of Europe: Political, Social, and Economical Forces, 1950–1957.* London: Stevens.

Haas, Peter. 1989. Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control. *International Organization* 43 (3):377–403.

Haas, Peter. 1990. *Saving the Mediterranean: The Politics of International Environmental Cooperation.* New York: Columbia University Press.

Haas, Peter M., ed. 1992. *Knowledge, Power, and International Policy Coordination.* Special issue of *International Organization,* 46 (1).

Haigh, Nigel. 1996. Climate Change Policies and Politics in the European Community. In *Climate Change Policy: A European Perspective,* edited by T. O'Riordan and J. Jäger. London: Routledge.

Hampson, Fen Osler. 1989–90. Climate Change: Building International Coalitions of the Like-Minded. *International Journal* 45 (1):36–74.

Hardin, Garrett. 1968. The Tragedy of the Commons. *Science* 162:1243–1248.

Harris, J. R., and M. P. Todaro. 1970. Migration, Unemployment, and Development: A Two Sector Analysis. *American Economic Review* 60:126–142.

Hecht, Alan D., and Dennis Tirpak. 1995. Framework Agreement on Climate Change: A Scientific and Policy History. *Climate Change* 29:371–402.

Helm, Carsten, and Detlef Sprinz. 1999. *Measuring the Effectiveness of International Environmental Regimes.* PIK Report No. 52. Potsdam: Potsdam Institute for Climate Impact Research (PIK).

Helm, Carsten, and Detlef F. Sprinz. 2000. Measuring the Effectiveness of International Environmental Regimes. *Journal of Conflict Resolution* 45 (5):630–652.

Heywood, Vernon H., ed. 1995. *Global Biodiversity Assessment.* Cambridge, UK: Cambridge University Press.

Herkströter, Cor. Reflections on Kyoto. 1998, February 2. Speech at the World Economic Forum, Davos. Available at http://195.12.29.164/shellspeech/article.cfm?id=177.

Hinich, Melvin J., and Michael C. Munger. 1997. *Analytical Politics*. New York: Cambridge University Press.

Hoekman, Bernard M., and Michel M. Kostecki. 1995. *The Political Economy of the World Trading System: from GATT to WTO*. Oxford: Oxford University Press.

Hoeller, Peter, Andrew Dean, and Jon Nicholaisen. 1990. *A Survey of Studies of the Costs of Reducing Greenhouse Gas Emissions*. OECD Working Papers No. 89. Paris: OECD.

Hofman, Mark A. 1998, January 5. Pushing Change Before Weather Does: Shifts in Global Climate Should Spur Insurers to Challenge Assumptions, Industry Leader Says. *Business Insurance*.

Homer-Dixon, T. F. 1991. On the Threshold: Environmental Changes as Causes of Acute Conflict. *International Security* 16 (2):76–116.

Homer-Dixon, T. F., J. H. Boutwell, and G. Rathjens. 1993. Environmental Change and Violent Conflict. *Scientific American* 268 (2):16–23.

Honsch, H. 1992. Remote Sensing Satellite Data as an Instrument to Verify a Greenhouse Gas Convention: A Case Study in the Brazilian Amazon. In *A Regime to Control Greenhouse Gases: Issues of Verification, Monitoring, Institutions,* edited by J. C. di Primio and G. Stein. Jülich, Germany: Forschungszentrum Jülich GmbH.

Hotelling, Harold. 1931. The Economics of Exhaustible Resources. *Journal of Political Economy* 39 (April):137–175.

Houghton, John. 1994. *Global Warming: The Complete Briefing*. Elgin, IL: Lion Publishing.

Hourcade, J-C. 1993. *Economic Issues and Negotiation on the Global Environment: Some Lessons from Recent Experience of the Greenhouse Effect*. Working Paper No. 24-93. Milan: Fondazione ENI Enrico Mattei.

Hourcade, Jean-Charles, and John Robinson. 1996. Mitigating Factors: Assessing the Costs of Reducing GHG Emissions. *Energy Policy* 24 (10/11, October/November):863–873.

Hudec, Robert E. 1996. The GATT/WTO Dispute Settlement Process: Can It Reconcile Trade Rules and Environmental Needs? In *Enforcing Environmental Standards: Economic Mechanisms as Viable Means?,* edited by R. Wolfrum. Berlin: Springer.

Hufbauer, Gary Clyde, Jeffrey J. Schott, and Kimberly Ann Elliott. 1990. *Economic Sanctions Reconsidered: History and Current Policy*. 2nd ed. Washington, DC: Institute for International Economics.

Hughes, Barry. 1993. *International Futures: Choices in the Creation of a New World Order*. Boulder, CO: Westview Press.

Hurrell, Andrew. 1994. A Crisis of Ecological Viability? Global Environmental Change and the Nation State. *Political Studies* 42:146–165.

Hyder, Tariq Osman. 1992. Climate Negotiations: The North-South Perspective. In *Confronting Climate Change: The North/South Perspective,* edited by I. M. Mintzer. Cambridge, England: Cambridge University Press.

Intergovernmental Panel on Climate Change. 1990. *Climate Change. The IPCC Scientific Assessment,* edited by J. T. Houghton, G. J. Jenkins, and J. J. Ephraums. Cambridge, England: Cambridge University Press.

Intergovernmental Panel on Climate Change. 1995. *IPCC Second Assessment: Climate Change 1995. A Report of the Intergovernmental Panel on Climate Change.* Cambridge, England: Cambridge University Press.

Intergovernmental Panel on Climate Change. 1996. *Climate Change 1995: The Science of Climate Change,* edited by J. T. Houghton, L. G. Meira Filho, B. A. Callander, N. Harris, A. Kattenberg, and K. Maskell. Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, England: Cambridge University Press.

International Council for Local Environmental Initiatives. 1995. *Press Release of the International Council for Local Environmental Initiatives.* Toronto, Canada.

Jacobson, Harold K., and Edith Brown Weiss. 1995. Improving Compliance with International Environmental Accords. *Global Governance* 1 (2):119–148.

Jäger, Jill, and Howard L. Ferguson, eds. 1991. *Climate Change: Science Impacts and Policy. Proceedings of the Second World Climate Conference.* Cambridge, England: Cambridge University Press.

Jakobsen, Susanne. 1998. *India's Position on Climate Change from Rio to Kyoto: A Policy Analysis.* Working Paper. Copenhagen: Centre for Development Research.

Jänicke, Martin. 1996. Erfolgsbedingungen von Umweltpolitik [Prerequisites of Successful Environmental Policy]. In *Umweltpolitik der Industrieländer [The Environmental Policy of Industrialized Countries],* edited by M. Jänicke. Berlin: Edition Sigma.

Jänicke, Martin, and Harald Mönch. 1988. *Ökologischer und wirtschaftlicher Wandel im Industrieländervergleich: Eine explorative Studie internationaler Wandlungsmuster.* Report No. FFU-rep-88-2. Berlin: Forschungsstelle für Umweltpolitik, Otto Suhr Institut, Free University of Berlin.

Jasanoff, Sheila, and Brian Wynne. 1998. Science and Decisionmaking. In *Human Choice and Climate Change, Vol. 1: The Societal Framework,* edited by S. Rayner and E. L. Malone. Columbus, OH: Battelle Press.

Jepma, Catrinus, and Mohan Munasinghe. 1998. *Climate Change Policy: Facts, Issues, and Analyses.* Cambridge, England: Cambridge University Press.

Jordan, Andrew. 1994. Paying the Incremental Costs of Global Environmental Protection: The Evolving Role of GEF. *Environment* 36 (6):12–20, 31–36.

Kahneman, D., P. Slovic, and A. Tversky. 1982. *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge, England: Cambridge University Press.

Kandlikar, Milind, and Ambuj Sagar. 1997. *Climate Change Science and Policy: Lessons from India*. ENRP Discussion Paper No. E-97-08. Boston: Kennedy School of Government, Harvard University.

Kassler, Peter, and Matthew Paterson. 1997. *Energy Exporters and Climate Change Politics*. London: Royal Institute of International Affairs.

Kawashima, Yasuko. 1997. A Comparative Analysis of the Decision-Making Process of Developed Countries toward CO_2 Emissions Reduction Targets. *International Environmental Affairs* 9 (2):95–126.

Keeling, Charles. 1960. The Concentration and Isotopic Abundances of Carbon Dioxide in the Atmosphere. *Tellus* 12:200–203.

Kellogg, William W. 1987. Mankind's Impact on Climate: The Evolution of an Awareness. *Climatic Change* 10:115–136.

Keohane, Robert O. 1980. The Theory of Hegemonic Stability and Changes in International Economic Regimes, 1967–1977. In *Change in the International System,* edited by O. R. Holsti, R. M. Siverson, and A. L. George. Boulder, CO: Westview Press.

Keohane, Robert O. 1984. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton: Princeton University Press.

Keohane, Robert O. 1993. Institutional Theory and the Realist Challenge After the Cold War. In *Neorealism and Neoliberalism,* edited by D. A. Baldwin. New York: Columbia University Press.

Keohane, Robert O., ed. 1986. *Neorealism and Its Critics*. New York: Columbia University Press.

Keohane, Robert O., and Marc A. Levy, eds. 1996. *Institutions for Environmental Aid: Pitfalls and Promise*. Cambridge, MA: MIT Press.

Keohane, Robert O., and Joseph S. Nye. 1977. *Power and Interdependence: World Politics in Transition*. Boston: Little, Brown.

Kimball, Lee A. 1992. *Forging International Agreement: Strengthening Inter-Governmental Institutions for Environment and Development*. Washington, DC: World Resources Institute.

Kindleberger, Charles. 1973. *The World in Depression*. Los Angeles: University of California Press.

Klötzli, Stephan. 1994. *The Water and Soil Crisis in Central Asia: A Source for Future Conflicts?* Zurich: Center for Security Studies and Conflict Research, Swiss Federal Institute of Technology.

Koskenniemi, Martti. 1992. Breach of Treaty or Non-Compliance? Reflections on the Enforcement of the Montreal Protocol. In *Yearbook of International Environmental Law,* edited by G. Handl. London: Graham and Trotman.

Krasner, Stephen D. 1982. Structural Causes and Regime Consequences: Regimes as Intervening Variables. *International Organization* 36 (2):185–205.

Krasner, Stephen D. 1983. Structural Causes and Regime Consequences: Regimes as Intervening Variables. In *International Regimes,* edited by S. D. Krasner. Ithaca: Cornell University Press.

Krause, Florentin, Jon Koomey, and Wilfrid Bach. 1989. From Warming Fate to Warming Limit. In *Energy Policy in the Greenhouse,* edited by F. Krause, J. Koomey, and W. Bach. El Cerrito, CA: International Project for Sustainable Energy Paths.

Krehbiel, Keith. 1988. Spatial Models of Legislative Choice. *Legislative Studies Quarterly* 13:259–319.

Krueger, Anne. 1998. Achieving Greater Coherence in Global Decision-Making. PSIO Occasional Paper. Geneva: The Graduate Institute of International Studies.

Kuhn, William, Ellen Wiegandt, and Urs Luterbacher. 1992. *Pathways of Understanding: The Interactions of Humanity and Global Environmental Change.* Saginaw, MI: Consortium for International Earth Science Information Network.

Kuik, O., P. Peters, and Nico Schrijver. 1994. *Joint Implementation to Curb Climate Change: Legal and Economic Aspects.* Dordrecht: Kluwer Academic Publishers.

Kyoto Protocol. 1997. Kyoto Protocol to the United Framework Convention on Climate Change. http://www.unfccc.de/resource/docs/couu/rp/kpeng.html (January 15, 2001).

Lake, David A. 1993. Leadership, Hegemony, and the International Economy: Naked Emperor or Tattered Monarch with Potential? *International Studies Quarterly* 37 (4):459–489.

Lang, Winfried. 1991. Is the Ozone Depletion Regime a Model for an Emerging Regime on Global Warming? *UCLA Journal of Environmental Law and Policy* 9 (2):161–174.

Leroy-Ladurie, Emmanuel. 1971. *Times of Feast, Times of Famine: A History of Climate Since the Year 1000.* London: Allen, Unwin.

Levy, David L., and Daniel Egan. 1998. Capital Contests: National and Transnational Channels of Corporate Influence on the Climate Change Negotiations. *Politics and Society* 26 (3 (September)):337–361.

Levy, Marc A., Robert O. Keohane, and Peter M. Haas. 1993. Improving the Effectiveness of International Environmental Institutions. In *Institutions for the Earth: Sources of Effective International Environmental Protection,* edited by P. M. Haas, R. O. Keohane, and M. A. Levy. Cambridge, MA: MIT Press.

Levy, Marc A., Oran R. Young, and Michael Zürn. 1995. The Study of International Regimes. *European Journal of International Relations* 1 (3):267–330.

Lewis, Patricia M. 1992. Experiences in Verification: What Can Be Learned from a Greenhouse Gas Convention? In *A Regime to Control Greenhouse Gases: Issues of Verification, Monitoring, Institutions,* edited by J. C. di Primio and G. Stein. Jülich, Germany: Forschungszentrum Jülich GmbH.

Lipietz, Alain. 1992. *Towards a New Economic Order: Postfordism, Ecology, and Democracy.* Cambridge, England: Polity.

Lipson, Charles. 1984. International Cooperation in Security and Economic Affairs. *World Politics* 37:1–23.

List, Martin, and Volker Rittberger. 1991. Regime Theory and International Environmental Management. In *The International Politics of the Environment,* edited by A. Hurrell and B. Kingsbury. Oxford: Oxford University Press.

Lowi, Miriam R. 1993. Bridging the Divide: Transboundary Resource Disputes and the Case of West Bank Water. *International Security* 18 (1):113–138.

Luhmann, Hans-Jochen, Christiane Beuermann, Manfred Fischedick, and Hermann Ott. 1995. *Making Joint Implementation Operational: Solutions for Some Technical and Operational Problems of JI in the Fossil Fuel Power Sector.* Wuppertal: Wuppertal Institute for Climate, Environment, and Energy.

Lunde, Leiv. 1991. *Science or Politics in the Global Greenhouse? The Developments Towards Scientific Consensus on Climate Change, Energy, Environment and Development.* Publication No. 8. Oslo: Fridtjof Nansen Institute.

Luterbacher, Urs. 1994. International Cooperation: The Problem of the Commons and the Special Case of the Antarctic Region. *Synthèse* 100:413–440.

Luterbacher, Urs, Michael Clarke, Nicolas Kessler, and Pierre Allan. 1987. Simulating the Response of a Small Open Politico-Economic System to International Crises. *Management Science* 33 (2):270–287.

Luterbacher, Urs, and Carla Norrlöf. 1999. The New Political Economy of Trading and Its Institutional Consequences. *International Political Science Review* 20 (4):341–358.

Luterbacher, Urs, H.-J. Schellnhuber, and Ellen Wiegandt. 1998. *Water Resource Conflicts: The Use of Formal Approaches.* Working Paper. Potsdam: Potsdam Institute for Climate Impact Research.

Luterbacher, Urs, and Ellen Wiegandt. 1991. *Modeling the Impact of Climate on Society.* Working Paper. Ann Arbor, MI: Consortium for International Earth Science Information Network.

Luterbacher, Urs, and Ellen Wiegandt. 1994. *Climate Change, Dynamics of Resource Use, and International Migration.* Working Paper. Geneva: Centre pour la recherche empirique en relations internationales.

Mabey, Nick, Stephen Hall, Clare Smith, and Sujata Gupta. 1997. *Argument in the Greenhouse.* London: Routledge.

Mackenzie, Fred T. 1998. *Our Changing Planet: An Introduction to Earth System Science and Global Environmental Change.* 2nd ed. Upper Saddle River, NJ: Prentice Hall.

Magraw, Daniel B. 1990a. Global Change and International Law. *Colorado Journal of International Environmental Law and Policy* 1 (1 (Summer)):1–10.

Magraw, Daniel B. 1990b. Legal Treatment of Developing Countries: Differential, Contextual, and Absolute Norms. *Colorado Journal of International Environmental Law and Policy* 1 (1 (Summer)):69–99.

Manne, A., and R. Richels. 1992. *Buying Greenhouse Insurance: The Economic Costs of CO_2 Emission Limits.* Cambridge, MA: MIT Press.

Marshall, William, and Barry Weingast. 1988. The Industrial Organization of Congress. *Journal of Political Economy* 96:132–163.

Mathews, Jessica Tuchman. 1997. Power Shift. *Foreign Affairs* 76 (1):50–66.

McCay, Bonnie, and James Acheson, eds. 1990. *The Question of the Commons.* Tuscon: University of Arizona Press.

McCorriston, J., and F. Hole. 1991. The Ecology of Seasonal Stress and the Origins of Agriculture in the Near East. *American Anthropologist* 93 (1):46–69.

McDonald, Gail. 1998, January 27. *Press Release by the Global Climate Coalition.* Available at http://www.worldcorp.com/dc-online/gcc/news/1-27-98.htm.

McNeely, Jeffrey A., Martha Rojas, and Caroline Martinet. 1995. The Convention on Biological Diversity: Promise and Frustration. *Journal of Environment and Development* 4 (2):33–53.

Mendelsohn, Robert, William D. Nordhaus, and Daigee Shaw. 1994. The Impact of Global Warming on Agriculture: A Ricardian Analysis. *The American Economic Review* 84 (4):753–771.

Meyer, Aubrey. 1994. The Unequal Use of the Global Commons. In *Proceedings of IPCC Workshop on Equity and Social Considerations.* Nairobi: United Nations Environment Programme.

Michaelowa, Axel. 1995. *Joint Implementation of Greenhouse Gas Reductions Under Consideration of Fiscal and Regulatory Incentives.* Report No. 153. Hamburg: HWWA—Institut für Wirtschaftsforschung.

Michaelowa, Axel. 1998. Übertragung des Demokratiemodells der Neuen Politischen Ökonomie auf die Klimapolitik. *Zeitschrift für Umweltpolitik und Umweltrecht* (No. 4, 1998):463–491.

Milner, Helen, and B. Peter Rosendorff. 1997a. Democratic Politics and International Trade Negotiations. *Journal of Conflict Resolution* 41 (1):117–146.

Milner, Helen, and B. Peter Rosendorff. 1997b. A Model of the Two-Level Game. In *Interests, Institutions, and Information: Domestic Politics and International Relations,* edited by H. V. Milner. Princeton: Princeton University Press.

Mintzer, Irving, and J. A. Leonard. 1994. *Negotiating Climate Change: The Inside Story of the Rio Convention.* Cambridge, England: Cambridge University Press.

Mitchell, Ronald B. 1994. *Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance.* Cambridge, MA: MIT Press.

Mitchell, Ronald B. 1996. Compliance Theory: An Overview. In *Improving Compliance with International Environmental Law,* edited by J. Cameron, J. Werksman, and P. Roderick. London: Earthscan.

Mitchell, Ronald B. 1998a. Adversarial and Facilitative Approaches to On Site Inspection in Arms Control and Environmental Regimes. Paper presented at the

Annual Conference of the American Political Science Association, September 2–6, Boston.

Mitchell, Ronald B. 1998b. Sources of Transparency: Information Systems in International Regimes. *International Studies Quarterly* 42 (1):109–130.

Mitchell, Ronald B., and Abram Chayes. 1995. Improving Compliance with the Climate Change Treaty. In *Shaping National Responses to Global Climate Change: A Post-Rio Guide,* edited by H. Lee. Washington, DC: Island Press.

Mitchell, Ronald B., and Edward Parson. 1999. Creating Opportunities, Not Obligations: Climate Change and the Clean Development Mechanism. Unpublished manuscript, Department of Political Science, University of Oregon, Eugene, Oregon, and Belfer Center for Science and International Affairs, Harvard University, Cambridge, MA.

Montreal Protocol on Substances that Deplete the Ozone Layer, adopted Sept. 16. 1987. *International Legal Materials* 26:1541–1561.

Moon, Bruce E. 1996. *Dilemmas of International Trade.* Boulder, CO: Westview Press.

Moravcsik, Andrew. 1993. Introduction: Integrating International and Domestic Theories of International Bargaining. In *Double-Edged Diplomacy: International Bargaining and Domestic Politics,* edited by P. B. Evans, H. K. Jacobson, and R. D. Putnam. Berkeley: University of California Press.

Morgan, Clifton. 1994. *Untying the Knot of War.* Ann Arbor: University of Michigan Press.

Morgenthau, Hans J. 1973. *Politics Among Nations: The Struggle for Power and Peace.* 5th ed. New York: Knopf.

Morlot, Jan Corfee. 1998. *Monitoring, Reporting, and Review of National Performance under the Kyoto Protocol.* Information Paper. Paris: Organisation for Economic Co-operation and Development.

Morrisette, Peter M. 1991. The Montreal Protocol: Lessons for Formulating Policies for Global Warming. *Policy Studies Journal* 19 (2 (Spring)):152–161.

Morrow, James D. 1994. *Game Theory for Political Scientists.* Princeton: Princeton University Press.

Morrow, James D. 1997. When Do "Relative Gains" Impede Trade? *Journal of Conflict Resolution* 41:12–37.

Moss, Richard H. 1995. Avoiding "Dangerous" Interference with the Climate System: The Roles of Values, Science, and Policy. *Global Environmental Change* 5 (1):3–6.

Müller, Benito. 1998. Justice in Global Warming Negotiations: How to Obtain a Procedurally Fair Compromise. Working Paper. Oxford Institute for Energy Studies, Oxford.

Nash, John F. 1953. The Bargaining Problem. *Econometrica* 21:128–140.

National Research Council. 1979. *Carbon Dioxide and Climate: A Scientific Assessment.* Washington, DC: National Academy Press.

Nilsson, Sten, and David Pitt. 1994. *Protecting the Atmosphere: The Climate Change Convention and Its Context*. London: Earthscan.

Nordhaus, William. 1991. The Cost of Slowing Climate Change: A Survey. *Energy Journal* 12:37–65.

Nordhaus, William. 1994. *Managing the Global Commons*. Cambridge, MA: MIT Press.

Nordhaus, William, and Zili Yang. 1996. A Regional Dynamic General-Equilibrium Model of Alternative Climate-Change Strategies. *American Economic Review* 86 (4):741–765.

Norrlöf, Carla, and Gunnar Sjöstedt. 2000. Colliding Public Goods: The Policy Consistency Dilemma in the Field of Trade and Security. Paper presented at Conference on a Multiperspective on Economy and Security 26–27 May 2000, Swedish Institute of International Affairs. Stockholm.

North, Douglas. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge, England: Cambridge University Press.

Oberthür, Sebastian. 1993. *Politik im Treibhaus: Die Entstehung des internationalen Klimaschutzregimes*. Berlin: Edition Sigma.

Oberthür, Sebastian. 1998. *Production and Consumption of Ozone Depleting Substances 1986–1996*. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).

Oberthür, Sebastian, and Hermann E. Ott. 1999. *The Kyoto Protocol*. Berlin: Springer.

OECD. 1993. *GREEN: The User Manual*. Paris: Organisation for Economic Cooperation and Development.

Olson, Mancur. 1971. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge, MA: Harvard University Press.

O'Neill, Onora. 1986. *Faces of Hunger*. London: Allen & Unwin.

O'Neill, Onora. 1991. Transnational Justice. In *Political Theory Today*, edited by D. Held. Oxford: Polity.

O'Riordan, Tim, and James Cameron. 1994. *Interpreting the Precautionary Principle*. London: Cameron & May.

O'Riordan, Timothy, Chester L. Cooper, Andrew Jordan, Steve Rayner, Kenneth R. Richards, Paul Runci, and Shira Yoffe. 1998. Institutional Frameworks for Political Action. In *Human Choice and Climate Change*, edited by S. Rayner and E. L. Malone. Columbus, OH: Battelle Press.

Osherenko, Gail, and Oran R. Young. 1993. The Formation of International Regimes: Hypotheses and Cases. In *Polar Politics: Creating International Environmental Regimes*, edited by O. R. Young and G. Osherenko. Ithaca: Cornell University Press.

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, England: Cambridge University Press.

Ostrom, Elinor, Roy Gardner, and James Walker. 1994. *Rules, Games, and Common-Pool Resources.* Ann Arbor: University of Michigan Press.

Ott, Hermann E. 1998. The Kyoto Protocol: Unfinished Business. *Environment* 40 (6 (July/August)):16–20, 41–45.

Owen, Guillermo. 1987. Application of Game Theoretic Analysis to a Problem in Demography. *Management Science* 33 (2):253–257.

Oye, Kenneth. 1986. Explaining Cooperation under Anarchy: Hypotheses and Strategies. In *Cooperation under Anarchy,* edited by K. Oye. Princeton: Princeton University Press.

Page, Ed. 1999. Intergenerational Justice and Climate Change. *Political Studies* 44 (1): 53–66.

Palmer, Geoffrey. 1992. An International Regime for Environmental Protection. *Journal of Urban and Contemporary Law* 42 (3):5–19.

Pape, Robert A. 1997. Why Economic Sanctions Do Not Work. *International Security* 22 (2):90–136.

Parry, Martin. 1990. *Climate Change and World Agriculture.* London: Earthscan.

Parry, Martin, Cynthia Rosenzweig, Ana Iglesias, Günther Fischer, and Matthew Livermore. 1999. Climate Change and World Food Security: A New Assessment. *Global Environmental Change* 9:S51–S67.

Paterson, Matthew. 1992. Global Warming: The Great Equaliser? *Journal für Entwicklungspolitik* 8 (3):217–228.

Paterson, Matthew. 1996a. *Global Warming and Global Politics.* London: Routledge.

Paterson, Matthew. 1996b. International Justice and Global Warming. In *The Ethical Dimensions of Global Change,* edited by B. Holden. London: Macmillan.

Paterson, Matthew, and Michael Grubb. 1992. The Politics of Climate. *International Affairs* 68:293–310.

Paterson, Matthew, and Michael Grubb, eds. 1996. *Sharing the Effort: Analysing Options for Differentiating Commitments under the Framework Convention on Climate Change.* London: Royal Institute for International Affairs.

Petersmann, Ernst-Ulrich. 1996. Trade and the Protection of the Environment After the Uruguay Round. In *Enforcing Environmental Standards: Economic Mechanisms as Viable Means?,* edited by R. Wolfrum. Berlin: Springer.

Peterson, John, and Hugh Ward. 1995. Coalitional Stability and the New Multidimensional Politics of Security: A Rational Choice Argument for US-EU Cooperation. *European Journal of International Relations* 1:131–156.

Physicians for Social Responsibility. 1997. *International Physicians' Letter on Global Climate Change and Human Health.*

Pomerance, Rafe. 1989. The Dangers from Climate Warming: A Public Awakening. In *The Challenge of Global Warming,* edited by D. E. Abrahamson. Washington, DC: Island Press.

Porter, Gareth, and Janet Welsh Brown. 1996. *Global Environmental Politics.* 2nd ed. Boulder, CO: Westview Press.

Powell, Robert. 1991. Absolute and Relative Gains in International Relations Theory. *American Political Science Review* 85:1303–1320.

Princen, Thomas, and Matthias Finger. 1994. *Environmental NGOs in World Politics.* London: Routledge.

Prittwitz, Volker von. 1984. *Umweltaußenpolitik: Grenzüberschreitende Luftverschmutzung in Europa [Foreign Environmental Policy: Transboundary Air Pollution in Europe].* Frankfurt a.M.: Campus.

Prittwitz, Volker von. 1990. *Das Katastrophenparadox: Elemente einer Theorie der Umweltpolitik [The Catastrophe Paradox: Elements of a Theory of Environmental Policy].* Opladen: Leske + Budrich.

Putnam, Robert D. 1988. Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization* 42 (3):427–460.

Ramsey, F. P. 1928. A Mathematical Theory of Saving. *Economic Journal* 138 (152):543–559.

Rauscher, Michael. 1997. *International Trade, Factor Movements, and the Environment.* Oxford: Clarendon Press.

Raustiala, Kal. 1997. Domestic Institutions and International Regulatory Cooperation: Comparative Responses to the Convention on Biological Diversity. *World Politics* 49 (4):482–509.

Rawls, John. 1973. *A Theory of Justice.* Oxford: Oxford University Press.

Raymond, Lee. 1998. *Regarding Global Climate Change* (June) [html]. Exxon Perspectives. Available at http://www.exxon.com/exxoncorp/main_frame_1.html.

Rayner, Steve. 1991. A Cultural Perspective on the Structure and Implementation of Global Environmental Agreements. *Evaluation Review* 15 (1 (February)):75–102.

Reid, Walter V., and José Goldemberg. 1997. Are Developing Countries Already Doing as Much as Industrialized Countries to Slow Climate Change? *WRI Climate Notes.* July.

Revelle, Roger. 1985. Introduction: The Scientific History of Carbon Dioxide. In *The Carbon Cycle and Atmospheric* CO_2, edited by E. T. Sundquist and W. S. Broecker. Washington, DC: American Geophysical Union.

Ringius, Lasse. 1999. *The European Community and Climate Protection.* Report 1999:8. Oslo: CICERO.

Rosenthal, Howard. 1990. The Setter Model. In *Advances in the Spatial Theory of Voting,* edited by J. M. Enelow and M. J. Hinich. Cambridge, England: Cambridge University Press.

Rosenzweig, Cynthia, and Martin Parry. 1994. Potential Impact of Climate Change on World Food Supply. *Nature* 367:133–138.

Rosenzweig, Cynthia, Martin L. Parry, Günther Fischer, and Klaus Frohberg. 1993. *Climate Change and World Food Supply*. Research Report 3. Oxford: Environmental Change Unit, University of Oxford.

Rowlands, Ian H. 1995a. Explaining National Climate Change Policies. *Global Environmental Change* 5 (3):235–249.

Rowlands, Ian H. 1995b. *The Politics of Global Atmospheric Change*. Manchester: Manchester University Press.

Rowlands, Ian H. 1997. International Fairness and Justice in Addressing Global Climate Change. *Environmental Politics* 6 (3 (Autumn)):1–30.

Rubenstein, Ariel. 1982. Perfect Equilibrium in a Bargaining Model. *Econometrica* 50:97–109.

Sachariew, Kamen. 1991. Promoting Compliance with International Environmental Legal Standards: Reflections on Monitoring and Reporting Mechanisms. In *Yearbook of International Environmental Law,* edited by G. Handl. London: Graham and Trotman.

Sachverständigenrat Umweltfragen. 2000. Umweltgutachten 2000, Schritte ins nächste Jahrtausend. Stuttgart: Metzler-Poeschel.

Sampson, Gary. 1999. WTO Rules and Climate Change: The Need for Policy Coherence. In *Global Climate Governance: Inter-Linkages between the Kyoto Protocol and other Multilateral Regimes,* edited by B. Chambers. Tokyo: Institute for Advanced Studies, United Nations University.

Samson, Paul. 1998. *Non-State Actors and Environmental Assessment: A Look at Acid Rain and Global Climate Change*. Cambridge, MA: Global Environmental Assessment Project, Center for Science and International Affairs, Harvard University.

Sand, Peter H. 1990. *Lessons Learned in Global Environmental Governance*. Publications Brief. Washington, DC: World Resources Institute.

Sandler, Todd. 1997. *Global Challenges: An Approach to Environmental Political and Economic Problems*. Cambridge, England: Cambridge University Press.

Sands, Phillippe. 1992. The United Nations Framework Convention on Climate Change. *Review of European Community and International Environmental Law* 1 (3):270–277.

Sands, Philippe. 1993. Enforcing Environmental Security: The Challenges of Compliance with International Obligations. *Journal of International Affairs* 46 (2):367–390.

Sands, Philippe. 1995. *Principles of International Environmental Law*. Manchester: Manchester University Press.

Schäffler, Harald, Daniel Owessny, and Gabriele Erlbede. 1999. *Die Umsetzung der Klimakonvention in Deutschland*. Bonn: Forum Umwelt & Entwicklung.

Schelling, Thomas. 1960. *The Strategy of Conflict*. Cambridge, MA: Harvard University Press.

Schneider, Gerald. 1994. Getting Closer at Different Speeds: Strategic Interaction in Widening European Integration. In *Game Theory and International Relations: Preferences, Information and Empirical Evidence,* edited by P. Allan and C. Schmidt. Aldershot: Edward Elgar.

Schneider, Gerald, and Lars-Erik Cederman. 1994. The Change of Tide in Political Cooperation: A Limited Information Model of European Integration. *International Organization* 48 (4):633–662.

Sebenius, James K. 1991. Designing Negotiations Towards a New Regime: The Case of Global Warming. *International Security* 15 (4):110–148.

Selin, Henrik. 1997. Protecting International Commons: Brief Comments on Current Attempts at Establishing New International Institutions on Persistent Organic Pollutants (POPs). In *Managing Common Resources in Local and Global Systems: Applying Theory Across Scales,* edited by S. Karlsson. Motala: Motala Grafiska.

Shaw, Martin. 1994. *Global Society and International Relations*. Cambridge, England: Polity Press.

Shepsle, Kenneth, Keith Krehbiel, and Barry Weingast. 1987. Why Are Congressional Committees Powerful? *American Political Science Review* 81:929–945.

Shepsle, Kenneth, and Barry Weingast. 1994. Positive Theories of Congressional Institutions. *Legislative Studies Quarterly* 19:149–179.

Shue, Henry. 1992. The Unavoidability of Justice. In *The International Politics of the Environment,* edited by A. Hurrell and B. Kingsbury. Oxford: Oxford University Press.

Shue, Henry. 1993. Subsistence Emissions and Luxury Emissions. *Law and Policy* 15 (1):39–59.

Shue, Henry. 1994. After You: May Action by the Rich Be Contingent on Action by the Poor? *Indiana Journal of Global Legal Studies* 1 (2):343–366.

Shue, Henry. 1996. Environmental Change and the Varieties of Justice. In *Earthly Goods: Environmental Change and Social Justice,* edited by F. O. Hampson and J. Reppy. Ithaca: Cornell University Press.

Shue, Henry. 1999. Global Environment and International Inequality. *International Affairs* 75 (3):531–546.

Shukla, P. R. 1999. Justice, Equity, and Efficiency in Climate Change: A Developing Country Perspective. In *Fair Weather? Equity Concerns in Climate Change,* edited by F. Toth. London: Earthscan.

Singer, Peter. 1972. Famine, Affluence, and Morality. *Philosophy and Public Affairs* 1 (3).

Sklair, Leslie. 1994. Global Sociology and Global Environmental Change. In *Social Theory and the Global Environment,* edited by M. Redclift and T. Benton. London: Routledge.

Skolnikoff, Eugene B. 1997. *Same Science, Different Policies: The Saga of Global Climate Change*. Report No. 22. Cambridge, MA: MIT Joint Program on Science and Policy of Global Change.

Smith, Alexander. 1997, November 10. Shell Says Time for Action in Climate Change. *Reuters*.

Smith, Hazel. 1994. Marxism and International Relations Theory. In *Contemporary International Relations: A Guide to the Theory*, edited by A.J.R. Groom and M. Light. London: Pinter.

Smith, K. R. 1993. The Basics of Greenhouse Gas Indices. In *The Global Greenhouse Regime: Who Pays?*, edited by P. Hayes and K. R. Smith. London: UNU Press/Earthscan.

Smith, S. J., and T. M. L. Wigley. 2000a. Global Warming Potentials: 1. Climatic Implications of Emissions Reductions. *Climatic Change* 44 (4):445–457.

Smith, S. J., and T. M. L. Wigley. 2000b. Global Warming Potentials: 2. Accuracy. *Climatic Change* 44 (4):459–469.

Snidal, Duncan. 1985a. Coordination vs Prisoner's Dilemma. *American Political Science Review* 79:923–942.

Snidal, Duncan. 1985b. The Limits of Hegemonic Stability Theory. *International Organization* 39 (4):579–614.

Snidal, Duncan. 1986. The Game Theory of Politics. In *Explaining Cooperation under Anarchy: Hypotheses and Strategies*, edited by K. A. Oye. Princeton: Princeton University Press.

Snidal, Duncan. 1991a. International Cooperation among Relative Gains Maximizers. *International Studies Quarterly* 35:387–402.

Snidal, Duncan. 1991b. Relative Gains and the Pattern of International Cooperation. *American Political Science Review* 85:701–727.

Spector, B. I., and A. R. Korula. 1993. Problems of Ratifying International Environmental Agreements: Overcoming Obstacles in the Post-Agreement Negotiation Process. *Global Environmental Change* 3 (4):369–381.

Sprinz, Detlef. 1992. Why Countries Support International Environmental Agreements: The Regulation of Acid Rain in Europe. Ph.D. dissertation. Ann Arbor: Department of Political Science, University of Michigan.

Sprinz, Detlef, and Carsten Helm. 1999. The Effect of Global Environmental Regimes: A Measurement Concept. *International Political Science Review* 20 (4 (October)):359–369.

Sprinz, Detlef, and Tapani Vaahtoranta. 1994. The Interest-Based Explanation of International Environmental Policy. *International Organization* 48 (1):77–105.

Sprinz, Detlef, and Tapani Vaahtoranta. Forthcoming. National Self-Interest: A Major Factor in International Environmental Policy Formulation. In *Responding to Global Environmental Change*, edited by M. Tolba. London: Wiley.

Stein, Arthur. 1982. Coordination and Collaboration: Regimes in an Anarchic World. *International Organisation* 36:304–324.

Steinberg, Paul F. 1998. Defining the Global Biodiversity Mandate—Implications for International Policy. *International Environmental Affairs* 10 (2):112–130.

Steinbruner, John D. 1974. *The Cybernetic Theory of Decision.* Princeton: Princeton University Press.

Steinhaus, H. 1948. The Problem of Fair Division. *Econometrica* 16:101–104.

Stewart, Richard B., and Jonathan B. Wiener. 1992. The Comprehensive Approach to Global Climate Policy: Issues of Design and Practicability. *Arizona Journal of International and Comparative Law* 9 (1):81–113.

Stokke, Olav Schram. 1997. Regimes as Governance Systems. In *Global Governance: Drawing Insights from the Environmental Experience,* edited by O. R. Young. Cambridge, MA: MIT Press.

Strange, Susan. 1996. *The Retreat of the State: The Diffusion of Power in the World Economy.* Cambridge, England: Cambridge University Press.

Tanzer, Michael. 1992. After Rio. *Monthly Review* 44 (6 (November)):1–11.

Thompson, Michael. 1993. Good Science for Public Policy. *Journal of International Development* 5 (6 (November-December)):669–678.

Tickell, Oliver, and Nicholas Hildyard. 1992. Green Dollars, Green Menace. *The Ecologist* 22 (3):82–83.

Tickner, J. Ann. 1992. *Gender in International Relations: Feminist Perspectives on Achieving Global Security.* New York: Columbia University Press.

Tietenberg, Tom. 1992. *Environmental and Natural Resource Economics.* 3rd ed. New York: HarperCollins.

Tietenberg, Thomas, and David G. Victor. 1994. Administrative Structures and Procedures for Implementing a Tradable Entitlement Approach to Controlling Global Warming. In *Paper Prepared for the UN Conference on Trade and Development.* Laxenburg, Austria: International Institute for Applied Systems Analysis.

Tolba, Mostafa. 1989. A Step-by-Step Approach to Protection of the Atmosphere. *International Environmental Affairs* 1 (4):304–308.

Tolbert, David. 1991. Global Climate Change and the Role of International Non-Governmental Organisation. In *International Law and Global Climate Change,* edited by R. Churchill and D. Freestone: Graham and Trotman.

Toth, Ferenc. 1999. Fairness Concerns in Climate Change. In *Fair Weather? Equity Concerns in Climate Change,* edited by F. Toth. London: Earthscan.

Turner, B. L., William C. Clark, Robert W. Kates, John F. Richards, Jessica T. Mathews, and William B. Meyer, eds. 1990. The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere Over the Past 300 Years. Cambridge, England: Cambridge University Press.

Underdal, Arild. 1992. The Concept of Regime "Effectiveness." *Cooperation and Conflict* 27 (3):227–240.

Underdal, Arild. 1998a. Explaining Compliance and Defection: Three Models. In *International Treaty Compliance,* edited by E. Brown Weiss. Washington, DC: Transnational Press.

Underdal, Arild. 1998b. Modelling International Negotiations: The Case of Global Cimate Change. Paper read at Third Pan-European International Rela-

tions Conference and Joint Meeting of the European Standing Group for International Relations (ECPR) with the International Studies Association (ISA), 16–19 September 1998, at Economics University of Vienna (WUW), Vienna, Austria.

UNEP and International Institute for Sustainable Development. 2000. Environment and Trade: A Handbook. Winnipeg, Manitoba, Canada: IISD.

United Nations. 1988. *Protection of Global Climate for Present and Future Generations of Mankind.* United Nations General Assembly Resolution, 43/53.

United Nations. 1990. *Protection of Global Climate for Present and Future Generations of Mankind.* United Nations General Assembly Resolution, 45/212.

United Nations Environment Programme. 1998. *The Economics of Greenhouse Gas Limitation: Technical Guidelines.* draft, February, Roskilde: UNEP Collaborating Centre on Energy and Environment.

Unsworth, Edwin. 1998, November 30. Cuts Mean Higher Rates Likely. *Business Insurance.*

Victor, David. 1994. Review Mechanisms in the Effective Implementation of International Environmental Agreements. In *Draft Paper,* edited by O. Greene, J. Lanchbery, J.C.D. Primio, and A. Korula. Laxenburg: International Institute for Applied Systems Analysis.

Victor, David G. 1998. The Operation and Effectiveness of the Montreal Protocol's Non-Compliance Procedure. In *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice,* edited by D. G. Victor, K. Raustiala, and E. B. Skolnikoff. Cambridge, MA: MIT Press.

Victor, David G., and Kal Raustiala. 1996. The Future of the Convention on Biological Diversity. *Environment* 38 (4):16–20, 37–45.

Victor, David G., Kal Raustiala, and Eugene B. Skolnikoff, eds. 1998. *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice.* Cambridge, MA: MIT Press.

Victor, David G., and Julian E. Salt. 1994. From Rio to Berlin: Managing Climate Change. *Environment* 36 (10):6–15, 25–32.

Victor, David G., and Julian E. Salt. 1995. Keeping the Climate Treaty Relevant. *Nature* 373: 280–282.

Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985. 1987. *International Legal Materials* 26: 1516–1540.

Waley, Arthur. 1963. *Three Ways of Thought in Ancient China.* London: Allen and Unwin.

Waltz, Kenneth N. 1979. *Theory of International Politics.* London: Addison-Wesley.

Wapner, Paul. 1995. The State and Environmental Challenges: A Critical Exploration of Alternatives to the State-System. *Environmental Politics* 4 (1 (Spring)): 44–69.

Wapner, Paul. 1996. *Environmental Activism and World Civic Politics.* Albany: SUNY Press.

Ward, Hugh. 1993. Game Theory and the Politics of the Global Commons. *Journal of Conflict Resolution* 37:203–235.

Ward, Hugh. 1996. Game Theory and the Politics of the Global Warming: The State and Beyond. *Political Studies* 44:850–871.

Weale, Albert. 1992. *The New Politics of Pollution*. Manchester: Manchester University Press.

Weber, Joseph. 1998, July 13. The Year of the Deal. *Business Week*, 52–53.

Weekly Compilation of Presidential Documents. 1997. Remarks at the National Geographic Society, October 22, 1997. 33 (43): October 27, 1629–1634.

Weiner, Jonathan. 1990. *The Next One Hundred Years: Shaping the Fate of Our Living Earth*. New York: Bantam Books.

Wells, Michael P. 1994. The Global Environment Facility and Prospects for Biodiversity Conservation. *International Environmental Affairs* 6 (1):69–97.

Werksman, Jacob. 1998. *Responding to Non-Compliance Under the Climate Change Regime*. Information Paper. Paris: Organisation for Economic Cooperation and Development.

Westing, Arthur H. 1986. *Global Resources and International Conflict*. Oxford: Oxford University Press.

Wettestad, Jørgen. 1991. Verification of Greenhouse Agreements: A Mismatch Between Technical and Political Feasibility. *International Challenges* 11 (1):41–47.

Wettestad, Jørgen. 1995. Science, Politics, and Institutional Design: Some Initial Notes on the Long-Range Transboundary Air Pollution Regime. *Journal of Environment and Development* 4 (2):165–183.

Whalley, J., and R. Wigle. 1991. The International Incidence of Carbon Taxes. In *Global Warming: Economic Policy Responses*, edited by R. Dornbusch and J. Poterba. Cambridge, MA: MIT Press.

Wirth, David A. 1996. Public Participation in International Processes: Environmental Case Studies at the National and International Levels. *Colorado Journal of International Environmental Law and Policy* 7 (1):1–38.

Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen. 1995. *Welt im Wandel: Wege zur Lösung globaler Umweltprobleme (WBGU-Jahresgutachten 1995)*. Berlin: Springer.

Wolinsky, Yael. 1994. International Bargaining Under the Shadow of the Electorate. Ph.D. dissertation, Department of Political Science: University of Chicago.

World Bank. 1998. *Environment Matters at the World Bank. Annual Review*, Washington, DC: World Bank.

World Commission on Environment and Development. 1987. *Our Common Future*. Oxford: Oxford University Press.

World Meteorological Organization. 1989. *Proceedings of the World Conference on the Changing Atmosphere: Implications for Global Security*. WMO Doc. 710. Toronto: Geneva: WMO.

World Resources Institute. 1996. *World Resources 1996–97—A Guide to the Global Environment*. Oxford: Oxford University Press. Also available at http://www.wri.org/wri/wr-96-97/.

World Resources Institute. 1998. *World Resources 1998–99*. Oxford: Oxford University Press.

Yearly, Steven. 1994. Social Movements and Environmental Change. In *Social Theory and the Global Environment*, edited by M. Redclift and T. Benton. London: Routledge.

Young, H. Peyton. 1991. *Sharing the Burden of Global Warming*. College Park: University of Maryland.

Young, H. Peyton. 1994. *Equity in Theory and Practice*. Princeton: Princeton University Press.

Young, Oran R. 1989. *International Cooperation: Building Regimes for Natural Resources and the Environment*. Ithaca: Cornell University Press.

Young, Oran R. 1992a. The Effectiveness of International Institutions: Hard Cases and Critical Variables. In *Governance without Government: Change and Order in World Politics*, edited by J. N. Rosenau and E.-O. Czempiel. New York: Cambridge University Press.

Young, Oran R. 1992b. Global Environmental Change and International Governance. In *Global Environmental Change and International Relations*, edited by I. H. Rowlands and M. Greene. Basingstoke: Macmillan.

Young, Oran R. 1993. Negotiating an International Climate Regime: The Institutional Bargaining for Environmental Governance. In *Global Accord: Environmental Challenges and International Responses*, edited by N. Choucri. Cambridge, MA: MIT Press.

Young, Oran R. 1994a. The Effectiveness of International Governance Systems. In *International Governance: Protecting the Environment in a Stateless Society*. Ithaca: Cornell University Press.

Young, Oran R. 1994b. *International Governance: Protecting the Environment in a Stateless Society*. Ithaca: Cornell University Press.

Young, Oran R. 1997a. Global Governance: Toward a Theory of Decentralized World Order. In *Global Governance: Drawing Insights from the Environmental Experience*, edited by O. R. Young. Cambridge, MA: MIT Press.

Young, Oran R. 1997b. Rights, Rules, and Resources in World Affairs. In *Global Governance: Drawing Insights from the Environmental Experience*, edited by O. R. Young. Cambridge, MA: MIT Press.

Young, Oran R., ed. 1999. *The Effectiveness of International Environmental Regimes: The Causal Connections and Behavioral Mechanisms*. Cambridge, MA: MIT Press.

Zaelke, Durwood, and James Cameron. 1990. Global Warming and Climate Change: An Overview of the International Legal Process. *American University Journal of International Law and Policy* 5 (2 (Winter)):249–290.

This page intentionally left blank

Index