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Environment: Pollution

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THE TWENTY-FIRST CENTURY, suggests renowned biologist E. O. Wilson, will be the age of the environment.[1] Despite the convenience of millennial accounting, this age started earlier—with the 1972 UN Conference on the Human Environment (UNCHE), when the international community first became aware of the widespread impact of human behavior on the natural environment. Before then, national leaders were by and large unfamiliar with environmental issues, scientific understanding was rudimentary; and there were few national or international institutions available for promoting environmental protection. Over the last thirty years, however, the environment has become firmly established on the international diplomatic agenda, and, through regime formation, binding rules have been developed for most human activities affecting environmental quality. Almost all areas of human economic activity are now subject to at least one international environmental accord, and most countries are bound by a number of international environmental commitments. One feature of international environmental governance is particularly striking: national governments have become increasingly aware of the complexity of the threats to the world's ecosystems and of the need for more comprehensive and collective responses. Accordingly, the substance of regional and international legal arrangements on the environment has begun to reflect this awareness. Environmental governance—the ever-expanding network of legal obligations and formal institutions influencing states' environmental policies—has evolved principally through the development of better scientific understanding about the behavior of the physical environment combined with a growing appreciation of the role that international institutions can play. These regulations and institutions have contributed to a structural change in the world economy and to the development of markets for clean technology.

UNCHE provides the benchmark against which progress in international environmental governance has occurred. UNCHE, which took place in Stockholm in

1972, was the first global governmental conference on the environment. It popularized the environment, putting the environment firmly on the international agenda, as well as triggering administrative reforms in most governments of the world that had to designate environmental bodies to be responsible for producing reports on national environmental problems. UNCHE provoked states to take initial positions on the environment that revealed deep cleavages that have persisted throughout subsequent negotiations. Industrialized countries expressed principal concern about matters of industrial pollution, whereas developing countries were primarily concerned with natural resource usage and that they would have to forgo economic development to protect the environment. In addition, UNCHE was the first UN conference to have a parallel nongovernmental organization (NGO) forum, marking the beginning of the formal involvement of NGOs and civil society in international conference diplomacy. UNCHE adopted both the Stockholm Declaration establishing twenty-six principles of behavior and responsibility to serve as the basis for future legally binding multilateral accords and the Action Plan for the Human Environment that specified 109 recommendations in the areas of environmental assessment, environmental management, and supportive institutional measures.

The conference also created the UN Environment Program (UNEP). Based in Nairobi, Kenya—the first UN agency to have headquarters in a developing country—UNEP served as the environmental conscience of the UN system for over twenty years. UNEP urged other UN agencies to internalize environmental concerns into their programmatic activities, engaged in public environmental education, helped draft dozens of international environmental treaties, trained developing country officials in environmentally sensitive natural resource management techniques, helped monitor the environment, and tried to empower environmental NGOs in many countries.

The UN Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, marked the twentieth anniversary of UNCHE. UNCED adopted the Rio Declaration with 27 principles for guiding environmental policy and a sweeping action plan to promote sustainability. The action plan was called Agenda 21 and provided 2,509 specific recommendations with elements applying to states, international institutions, and members of civil society.[2] UNCED created the UN Commission on Sustainable Development (UNCSD) and cemented the tacit North-South compromise that environment and development were complementary in the long term, so long as the North contributed financial assistance to developing countries to pay for much of their pollution control that would affect conditions elsewhere in the world. In 2002 there will be a Rio Plus 10 Conference held in Johannesburg, South Africa, to continue the efforts by the international community to protect the global environment and to encourage sustainable development.

This chapter looks at the creation and evolution of multilateral regimes that address transboundary and global pollution threats—what the UNEP calls multilateral

environmental agreements (MEAs). It seeks to describe the major trends in international environmental policy since the 1970s and explain the principal policy factors that account for the dramatic increase in concern about and commitment to improving the quality of the Earth's environment. Multilateral regimes help to coordinate and influence state actions, and although they do not directly stop human activities that degrade the environment, they do offer a set of institutional expectations and pressures on states to develop and enforce policies toward that end.

Ecological ideas introduced by environmental scientists, NGOs, and international institutions over the last thirty years have evolved against a backdrop of new trends in international politics.[3] Transnational networks of environmental scientists grew influential in the 1970s in the aftermath of the UNCHE. Until the end of the Cold War, dominant attitudes toward international institutions remained burdened with dominant calculations about national security and geopolitics, to which environmental concerns were subordinated. However, with the end of the Cold War, interest in developing more powerful international institutions has increased worldwide, as people have become more comfortable with the notion of globalization, and geopolitical calculations no longer dominate the mind-sets of elite policy makers in the West. Popular interest in environmental quality issues has also grown in this period as the emergence of green parties in most advanced industrial societies would attest. To some extent, the decline of profound North-South cleavages in the 1980s facilitated consensus on sustainable development as a policy goal. Lastly, the spread of civil society and democratization since the early 1990s has increased the influence of environmental voices both at home and abroad through complex networks of transnational influence that are beginning to make governments accountable not only to their own citizens but also to citizens from other countries and to international institutions. Still, the majority of these background changes, which surely contributed to an acceleration of environmental governance, only occurred in the early 1990s, following twenty years of real progress in the development of environmental regimes. Many of the ideas and actors were already present, but UNCED focused attention on them.

NATURE OF GLOBAL ENVIRONMENTAL THREATS

Global environmental problems should be of great concern not only because of nature's intrinsic value or because of ethical concerns for future generations. They also matter because environmental problems can harm human health and well-being, impose disruptive costs on national economies, and even fuel political instability and violent conflict by exacerbating inequalities and tensions in resource-poor areas.[4]

Environmental degradation is the collateral damage of modern economic growth based on fossil fuel consumption and industrial production. Most industrial and

other human activities generate contaminants that accumulate in the physical environment, leading to unanticipated environmental risks and often irreversible consequences. Ironically, environmental threats can be the unanticipated result of well-intentioned efforts at improving prosperity.

Ecosystems transfer pollutants geographically. Thus contaminants from emissions in one area may eventually appear elsewhere. Contaminants that accumulate in ecosystems may have nonlinear effects on environmental quality, so that even in small quantities they could have unanticipated and sometimes disastrous results. For instance, in 1972 many were shocked to learn that DDT, a chemical pesticide widely used for the elimination of malaria-transmitting mosquitoes, had been detected in Antarctica. Scientists determined that the pesticide caused penguin eggshells to become more fragile, which ultimately meant that fewer penguins were born alive. Chlorofluorocarbons (CFCs), industrial coolants that have been widely used since the 1930s for refrigeration and insulation, were found to accumulate in the stratospheric ozone layer. Not only do CFCs contribute to seasonal thinning of the ozone layer, but also to the increase of ultraviolet rays reaching the surface of the earth. According to some, these rays are responsible for the increase in the skin cancer rate in humans and declines in fisheries and agricultural productivity.

Climate change is humankind's most recent global environmental problem and its most politically challenging. Recent scientific consensus suggests that the use of fossil fuels will lead to the warming of the Earth's climate by 2050 to an extent that may lead to widespread interference with vital ecosystems. The Intergovernmental Panel on Climate Change (IPCC) is a body of government-nominated scientists, created in 1988, responsible for ascertaining the state of scientific consensus on climate change. In 1996, it concluded that "the balance of evidence suggests a discernible human influence on the global climate." The IPCC now predicts that if current emissions rates continue, the average temperature on the planet will rise by 2.5-10.4 degrees Fahrenheit over the next 100 years—the most rapid change in ten millennia and 60 percent higher than the IPCC predicted six years ago—leading to widespread coastal flooding and submersion of small islands and deltas, changes in growing seasons and agricultural productivity, more acute weather patterns, widespread loss of biodiversity, and the spread of tropical diseases, although estimates of the full magnitude or timing of the impacts of human-induced climate change remain unclear.

Political Problems Impeding Effective Environmental Governance

Transboundary and global environmental risks have been politically difficult to manage at the international level for several reasons. Technically, efforts to cope with environmental threats must be comprehensive if they are to address the complex array of causal factors associated with them. Yet comprehensiveness is difficult to achieve,

because few governments or international institutions are organized to cope with the multiple dimensions of environmental problems, and many states lack the technical resources to develop and apply such efforts.[5]

Many tools of international environmental governance can help to address these political problems. For instance, through providing new information to all actors and by empowering NGOs, imaginative efforts at environmental governance by international organizations may improve national abilities to anticipate environmental threats. They also create domestic constituencies for dealing with them and for verifying or overseeing compliance with environmental regulations. Building national scientific competence and educating the public and elites about the behavior of complex ecosystems can also transform states' notions of their national interests when negotiating international environmental regimes. This, in turn, can make them more likely to accept voluntary constraints on economic growth and on state authority to preserve international environmental resources.

Many neorealist and institutionalist analysts characterize international environmental politics principally in terms of problems of collective choices.[6] Although collective action may be desirable to address shared problems, neorealists and realists believe that the international system is institutionally and administratively too weak to leverage sufficient political pressure on states to act. As such, the ability of states to manage shared problems is inadequate to the task of protecting the environment.

Most environmental problems require joint action because they are typically created by large numbers of countries, and because many of their consequences extend beyond the jurisdiction of any one country (including the atmosphere and open oceans). Individual countries accurately assume that their environmental policies will not yield significant benefits unless most states agree to cooperate. Some observers assign principal blame for this to the persistence of state sovereignty. This view may be overstated, however, given that much effective environmental governance has been successful despite continuing claims of national sovereignty.[7]

Governments frequently have different experiences with environmental problems and thus do not share common preferences about which problems should be addressed or the importance accorded to various environmental protection efforts. For instance, developed countries typically express concern with transboundary and global pollution threats, whereas developing countries voice greater concern about national problems associated with resource use and environmental degradation. Moreover, most developing countries stress the urgency of economic development and are leery of the short-term opportunity costs associated with environmental protection.

Political factors often influence states' environmental policies. National governments, for example, find that most international environmental issues are politically difficult to address because they are Olsonian public goods problems: that is, the costs of solving them are concentrated, whereas the benefits are diffuse. This means generally that those responsible for paying for the short-term costs of pollution con-

trol are usually more politically organized than those who benefit from environmental protection.

Domestic and international political systems are typically ill-equipped to create and implement environmental policy. Problems of both information availability and of political power and practice inhibit their rapid and effective application. Governments vary broadly in their administrative ability to develop and enforce environmental policies. Most governmental agencies and international organizations are designed to address disjointed problems and thus lack the knowledge base or administrative influence needed to address the full range of complex interactions that characterize environmental issues. For instance, agricultural ministries are responsible for increasing food production, typically through intensive agriculture, but they do not heed the social or environmental consequences of increasing reliance on chemical inputs. National regulatory bodies are usually organized to consider and apply management styles designed for discrete problems rather than cross-cutting ones; timely environmental quality data are often absent; and the relevant holistic or ecological models, when they exist, tend to remain restricted to the scientific community. In addition, environmental experts must contend with a government administration that at times can appear either ignorant or indifferent.[8] The institutional barriers are the consequences of long-held public administration orthodoxy, developed at the turn of the century for military and civilian organizations. They established iron triangles and patronage relationships between the government and society and weakened transmission channels connecting universities and environmental research institutions with relevant government agencies.

Lack of knowledge about the environment compromises effective management. Ecologists stress the need for comprehensive models of ecosystems, ecosystem health, and the human activities that influence ecosystems and are affected by them. Yet governments and modern institutions—as well as specialized modern scientific disciplines—are organized functionally to address only parts of such a broad problematique. Fragmented and incomplete scientific understanding of environmental threats and the behavior of ecosystems also inhibits the formulation of sweeping environmental measures. Moreover, the scientific myopia is reinforced by research funding imperatives from government sources that often stress narrow mission-based research rather than broader ecological studies. Consequently, most national and international efforts have sought to address specific environmental threats rather than work toward the protection of broad transboundary or global ecosystems.

Government officials' unfamiliarity with environmental problems has often hindered their ability to appreciate how their states' national interests can be harmed by environmental degradation. Further, it has retarded the development of effective environmental quality. For instance, in the early 1970s, Mediterranean governments responded to alarms about the decline of the sea's health and created the robust Mediterranean Action Plan, which has reversed much of the decline of the Mediter-

ranean Sea. Officials in the Mediterranean were genuinely unaware of the pollutants their countries were emitting, the concentrations of these pollutants in the sea, the human health and long-term consequences of these activities, and what to do about them. Such uncertainty in fact opened up political opportunities. Because the political leaders were uncertain about how their state interests would be affected by pollution, they turned to scientists for advice. Politicians, uncertain of the domestic coalitions likely to support or oppose environmental protection—although the tourism industry was vigorously opposed to any public admissions of environmental risk—could afford to take political gambles that they would not have likely taken if they had better anticipated the degree of domestic opposition by industry.

Most states now have national agencies for environmental protection, as well as sustainable development agencies. Governments have experimented with various institutional designs to make their agencies more effective. Some have focused on making their environmental agencies highly centralized, which proved useful for devising and enforcing environmental policies. Others have tried interagency coordination as a way to ensure that environmental concerns are reflected in the policies of other agencies responsible for managing activities that have an environmental impact. The most effective environmental agencies are found in states party to the Organization for Economic Cooperation and Development (OECD). In Eastern Europe and in most developing countries, however, such bodies still suffer from a lack of budgetary resources, political authority, popular support, and competent technical staff.

TRACK RECORD

International efforts to protect the environment have taken off since the creation of UNCHE. The number of multilateral treaties has more than doubled, a variety of new regimes have been established, and many innovative institutional support arrangements have been introduced. More than half of the 140-plus multilateral environmental treaties signed since 1920 have been adopted since 1973.[9] Since UNCHE, the catalyzing event of 1972, the international focus has shifted to a new set of environmental threats—from oil pollution of the seas and endangerment of whole species to atmospheric and marine pollution caused by, among other things, politically and economically costly industrial manufacturing (see table 8-1).

In the last thirty years, the adoption of treaties dealing with the environmental effects of economic activities, and framework treaties laying out agendas of interrelated issues for subsequent collective action, has greatly increased. This change signals a move away from trying to conserve individual species to controlling the negative consequences of economic activities that have traditionally been dealt with in isolation.

Table 8-1. *Changing Substantive Focus of Environmental Treaties*

Substantive area of coverage	*Percent of treaties signed pre-1973*	*Percent of treaties signed post-1973*
Species conservation	37	25
Plant disease and pest control	14	0
Framework treaties	3	19
Air pollution	0	9
Land-based sources of marine pollution	5	7
Marine oil pollution	11	16
Marine dumping	6	4
Worker protection from environmental hazards	5	7
Nuclear regulation and safety	6	6
Other	19	6

Note: Totals may not add to 100 because of rounding.

The substance of global environmental governance has expanded to capture the broad scale and functional scope of environmental threats. Global action has been taken to confront threats to the atmosphere. Marine treaties for global commons problems (such as pollution from shipping) have also acquired a global scope. Meanwhile efforts to confront problems with regional characteristics (such as coastal marine management) remain regional, although efforts are under way to develop global guidelines for managing land-based sources of marine pollution and for creating integrated coastal management. Before the 1970s, marine environmental law focused almost exclusively on preventing oil spills from tanker-related emergencies and operational activities. Recently, however, marine pollution control moved from controlling tanker-based sources of pollution to controlling marine dumping and the politically more difficult and economically costly land-based sources of pollution and air pollution, and to protecting ecosystems in which valued species dwell.

Attention has also shifted more generally from local and regional risks to global ones. For example, the conservation of localized bird species (as characterized by environmental law through the 1950s) has given way to efforts, starting in the 1970s, to protect migratory birds' habitats. Negotiations have also moved away from global regional approaches to issues (such as acid rain) in the 1970s and 1980s to global atmospheric issues such as stratospheric ozone protection and climate change in the 1980s and 1990s.

Substantively, environmental governance arrangements have become increasingly ecological in form, heeding the ecological laws espoused by environmental scientists and focusing on the sustainable management of ecosystems rather than containing threats to environmental quality. The laws of man are increasingly based on under-

standings of the laws of nature. Species management is cast in terms of a habitat's ability to support multiple species rather than in terms of protecting individual populations living in the area. Environmental impact assessments are now widely required by governments and international organizations so that they may weigh the environmental consequences of economic or development decisions. International debates now regularly consider new concepts such as "ecological sensitivity values" to bound the rates of economic growth. Richard Gardner notes that the preamble to the UN Framework Convention on Climate Change (FCCC) commits signatory states "to the goal of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the earth's climate, and to do so in a time frame that will permit ecosystems to adapt."[10] The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Ozone Protocol), with 168 parties, has a design that reflects a growing willingness to accept scientific uncertainty when applying science to environmental management. Mandated reductions in CFC use are scheduled to take effect unless scientific consensus determines that such reductions are unnecessary, thereby indicating a readiness to stop using scientific uncertainty to avoid action. Such provisions shift the burden of proof from those pressing for environmental action to those urging delay.[11]

A number of national and international organizational innovations have been introduced since 1972. In addition, most governments have created national environmental authorities, and, since 1992, sustainable development bodies as well. Countries have experimented with various forms of institutional design, with some opting for centralized bodies capable of creating and enforcing environmental policy. Often, however, these bodies have little or no influence over other important governmental agencies responsible for making policy affecting the generation of environmental stresses. Others have chosen more coordinated arrangements that encourage other agencies to internalize environmental considerations. Some of these, however, lack the resources to monitor compliance. Many national pollution control and environmental protection programs have become more comprehensive during this period as well. For example, by the mid-1990s, 150 integrated coastal zone management efforts were in place in sixty-five countries.[12]

International institutional innovations occurred as well. UNEP was established in 1973, with a mandate to spur environmental action within the UN system. Other UN agencies developed new institutional resources to monitor environmental quality, foster policy research, create international laws, and verify state compliance. They have sought to do this by building national concern, transferring technology, training, and institutional lessons to governments to improve state capacity, and reaching out to NGOs and civil society. Since 1986 the World Bank has taken increased account of the consequences of its development projects, seeking, in particular, to minimize environmental damage. In addition, it has spent more money on environmental remediation and in helping governments develop national environmental plans.

Gaps remain, however, in the institutional structure for environmental governance. Better early warning systems are needed; compliance mechanisms are weak and increasingly vulnerable to challenge when they infringe on free trade; more research is necessary for what is now widely called sustainability; and verification of state compliance is often weak. Substantively, few institutional efforts exist in the areas of soils protection, toxic waste management in developing countries, and freshwater pollution control.

Major international conferences have only had limited impacts on international environmental diplomacy. The UNCHE, the UNCED and its follow-up conferences, and the European Conferences on the European Environment have generated momentary public attention to the environment, but they have not been able to mobilize longer-term resources or induce governments to change their policies. Such conferences are better at stimulating public concern and galvanizing administrative reforms (member states must designate responsible national agencies) than they are at sustaining momentum in international environmental protection.

Some regimes have been highly effective in protecting the quality of the environment. The ozone regime is credited with virtually eliminating CFCs that once threatened the stratospheric ozone layer. The rate of environmental decline caused by organic and inorganic contaminants has been slowed in the Mediterranean, North Sea, and Baltic. The quality of the marine environment may have stabilized in the South Pacific and Southeast Pacific regions, although the data are much scantier for those areas. Airborne emissions of sulfur in Europe declined by 35 percent from 1980 to 1991, and a slight reduction in nitrogen emission from 1987 to 1991 has been recorded.[13] These achievements are all consequences of regime influences over state actions because the political pressures and information generated by relevant regimes influenced states to enforce their environmental commitments.[14]

More general assessments about environmental conditions are limited by data availability. Seldom are high-quality time series environmental data available to determine real changes in the quality of the environment (or even to measure changes in the activities giving rise to environmental stresses). Analysts are often forced to make proxy judgments by looking at states' activities (such as political or administrative reforms) that are likely to result in better environmental policy making and thus improve environmental quality.

Other improvements in environmental conditions have been documented, but they are not causally attributable to the multilateral governance efforts discussed in this chapter. Ronald Mitchell calls these "spurious accomplishments." The intensity of materials usage in modern industrial economies has declined, as has the energy intensity of modern advanced industrial societies. Energy and materials usage is growing disconnected from economic growth. The spread of wastewater treatment plants, and thus the reductions in contamination of many freshwater resources, is attributable to broader growth of economic prosperity in many developing countries.

LESSONS LEARNED ABOUT ENVIRONMENTAL GOVERNANCE

International relations studies of international environmental politics have proliferated since the early 1970s.[15] The literature began by documenting global environmental harm and trying to explain the various reasons for such widespread unanticipated consequences from actions that were not ill intentioned. More recently, international relations scholarship has begun to look at explanations of collective responses to shared environmental threats. Most explanations of international environmental governance study the five groups of actors involved in environmental governance and their interactions: national leadership, international institutions, NGOs and civil society, consensual knowledge, domestic politics, and multinational corporations (MNCs). Most work has focused on the interplay of institutions and knowledge. Domestic pressure, NGOs and civil society, and MNCs have only recently come to play significant roles. This section first explores the roles of each of these actors in environmental governance. It then examines environmental governance within the framework of this book—agenda setting, negotiations, compliance, and reactions to noncompliance—while noting the imaginative and novel practices that may result from different stages of international governance.

Role of the Main Actors in Environmental Governance

National Leadership. States are the legal authorities responsible for adopting treaties, and they are increasingly subject to influence from a variety of other actors. However, state leadership has not played an especially important role in international environmental politics. In fact, much successful cooperation actually has occurred in the absence of strong state leadership, and the United States—the presumptive international hegemon—has not demonstrated any systematic pattern of behavior across environmental regimes in which it has been involved.[16] The United States has vigorously promoted strong environmental regimes for stratospheric ozone protection, vigorously opposed strong environmental regimes for biodiversity, and straddled the fence on climate change and many regional seas arrangements. Congress has held only a few hearings on issues other than climate change and these only after 1989. At times the United States has been a unilateral leader, for example, in trying to stem operational oil pollution and pushing for the passage of requirements for double-hull tankers—even in the absence of harmonized policies by other states. The United States has been highly selective, however, in its attention to UNEP activities, of which it is the largest funder.

Robert Paarlberg attributes this inconsistency in U.S. foreign environmental policy to the separation of powers and the pluralist nature of the American state.[17] Congress is responsive to domestic groups, and domestic interests are highly issue-specific.

Thus, in the case of ozone depletion, where domestic environmental coalitions have been dominant, the United States has taken a leadership role. In other cases, such as biodiversity and climate change, where environmental groups have been weaker than their industry counterparts, the United States has opposed international environmental efforts.

International Institutions. Formal international institutions, when permitted by their member states, can play an important role in promoting environmental governance and sustainable development. They can help to build more comprehensive regimes and encourage compliance by providing a venue for international cooperation, building national capacity, and strengthening political will. In particular, this means providing politically tractable instruments to groups within countries that are interested in, for example, supporting sustainable development and marine protection, and building stable political coalitions that can press their governments and others to support such issues.

Major research by international relations scholars conducted in the 1980s and 1990s identified a variety of properties that helped international organizations to effectively steer environmental governance.[18] Influential institutions were able to provide a forum for international negotiations. Their members met often to maintain the political saliency of certain issues. It also helped to convene periodic high-level meetings, so that parliamentary environmental ministers could garner the domestic political benefits of being seen as environmental leaders by their constituencies. For instance, the North Sea ministerial conferences are convened roughly every three years, although annual lower-level meetings are held within the Paris and Oslo Commissions. UNCED negotiations were held for nearly two weeks, capped by a three-day ministerial session. Linkages among institutions—such as the partially overlapping memberships of the European Union, the Oslo and Paris Commissions for the North Sea, and the Baltic Commission—amplify the influence of any one institution and regional decision by providing a political mechanism for having the policies endorsed in other institutions as well, and thus spread the number of countries and environmental media subject to environmental controls. Links between the UN Economic Commission for Europe (UNECE) and the European Union (EU) have a similar salutary effect on air pollution regulations for Europe.

Oran Young and Robert Keohane have suggested that institutions with small numbers of members, at least under seven, are likely to be more effective than those with larger memberships, because diplomacy is easier and not as many countries' activities will have to be monitored for compliance. This would suggest that in negotiations regional bodies are preferable to global, universal bodies, or that some form of weighted or bloc voting should be developed to streamline negotiations. In practice, though, the most influential institutions have been of intermediate size: UNEP has a governing council of fifty-four members, the UNECE has fifty-five members, and strong

regimes have emerged from regions with as many as sixteen participants in the Mediterranean Action Plan.

Institutions that can build national environmental concern are also more likely to exercise influence in international environmental governance. The key activities in this effort include: popularizing issues, setting agendas, generating new information, encouraging public participation, public education, and engaging in training programs, involving new actors (including NGOs), requiring national reporting, environmental monitoring, and conducting policy verification of states' compliance activities.

Influential international institutions also have the ability to build member states' administrative and political national capacity for environmental protection. National capacity can be improved by the provision of environmental information, as well as through environmental monitoring activities, training programs for government officials, the transfer of technology, and the supply of financial assistance. Through public education and the dissemination of information, the capacity of the public to engage effectively in national environmental discussions can also be improved.

Not all international organizations have these properties. The UNCSD, for example, lacks resources to advance the sustainable development agenda. In the environmental realm, the most influential international organizations have been the World Bank, the UNEP, and the UNECE. These are organizations whose members have endowed them with sufficient resources to play an important role in international environmental politics, and they operate as autonomous actors and "provide independent inputs into the policy process, or somehow amplify the outputs of the process."[19] In UNEP's case, this autonomy was the result of widespread popular concern with the environment at the time of its creation, and the absence of profound geopolitical schisms associated with its mission. Established in 1972 during a period of détente, the UNEP was spared the geopolitical calculations that informed the creation of most UN bodies after World War II. Similarly, the UNECE is a détente body, and the World Bank became environmentally constructive after 1986, when concern in the United States led to profound institutional reforms in the organization.

These institutions have been able to play a role independent from the interests of their member states because their missions command widespread support, their governing bodies are devoid of deep political schisms, they have been led by deft executive heads, they command sufficient financial resources, they have maintained relationships with outside policy networks, and their staffs have been recruited based on merit. In addition, institutionalized science leads to regimes that are more comprehensive, more judicious, and slower to negotiate than regimes that are negotiated through institutions in which science is not allowed to play a significant role, or where scientific consensus does not exist.

UNEP has played a powerful role in environmental protection the last thirty years. It has successfully maintained political support for its activities from the Group of Seventy-Seven (G-77). With a staff of less than 200 professionals and a budget now on the order of $100 million a year, UNEP has led global environmental monitoring efforts, catalyzed environmental protection activities in other UN bodies, served as the environmental conscience of the UN system, and sponsored the conclusion of dozens of international environmental treaties.

Despite these successes in the 1990s, the United States grew disillusioned with UNEP's influence and its ability to drive negotiations beyond what the United States was willing to tolerate in both climate change and biodiversity. Indeed, the United States has supported the World Bank in its endeavors and tried to create organizational structures from scratch for climate change negotiations that did not involve UNEP. More recently, the United States has become more willing again to rely on UNEP for regime creation, as seen by the recent development of a Persistent Organic Pollutants Protocol and global guidelines on land-based sources of pollution. Given the proliferation of international institutions with environmental competencies, the United States no longer has to rely on UNEP for developing all international environmental regimes and thus only defers to UNEP when the United States already supports strong environmental controls on a particular issue.

NGOs and Civil Society. Analysts have often stressed the importance of NGOs and civil society in international environmental politics.[20] They highlight, in particular, that NGOs can shape public perceptions and values about the environment and press governments to adopt and comply with more vigorous environmental positions. UNCED was a transformational international conference at which NGOs exercised a strong presence.

Although potentially contributing to effective regional governance, domestic pressure and NGOs have not played a strong role in environmental governance to date.[21] In Europe, concern about the environment was very modest until the late 1980s and only took off in the rest of the world in the early 1990s. A Gallup poll prepared for UNCED in 1992 noted increased worldwide concern for the environment, but it also suggested very little interest on transboundary and global issues. Public opinion seemed highly issue specific, such as the sites for individual factories rather than developing regional plans.[22]

In general, NGOs, when involved in environmental regimes, have expressed preference for pursuing principled norms and pressing for strong commitments of principles to which governments may subsequently be held accountable. Most NGOs avoid recourse to precise formulations of regime rules, because they often lack the resources to carefully observe compliance. NGOs' own abilities to garner financial resources from public contributions often rest on their ability to put forward prin-

cipled positions and to embarrass governments and firms found in violation of their commitments. NGOs prefer regimes based on the prohibition of certain activities, rather than efforts to shape tolerable ranges of action (there is a parallel here between disarmament and arms control) or other doctrinal approaches such as the precautionary principle, which urges firms and governments to exercise environmental caution even in the absence of scientific consensus that specific activities may cause environmental damage.[23]

For instance, Greenpeace has been seeking to establish a moratorium on whaling—in the face of more nuanced schedules of tolerable whaling harvests suggested by cetologists, estimates of the population dynamics, and degree of threat to individual whale species—and the creation of a marine sanctuary in the Southern Ocean. In the North Sea, Greenpeace's Brent Spar campaign successfully induced Shell Oil to dispose of obsolete oil drilling platforms on shore, rather than at sea, with higher economic costs but with clearly higher environmental benefits. With regard to the Convention on Trade in Endangered Species (CITES), Greenpeace has pushed to ban poaching of endangered species, rather than set tolerable limits on takings.

Knowledge and Epistemic Communities. Transnational networks of policy professionals who share common values and causal understandings, called epistemic communities, are the principle developers and disseminators of new scientific understandings for public policy. When they become involved in national policy making, epistemic community members inform national preferences and policy agendas with their own preferred visions. Epistemic community members have typically served as consultants to national governments engaged in environmental negotiations and as officials at international institutions engaged in environmental politics (most notably UNEP, UNECE, and the World Bank). Epistemic communities often work in conjunction with broader policy networks, functional bureaucrats, transnational scientists, NGOs, and international civil servants.[24]

Members of epistemic communities seek to introduce national measures consistent with their beliefs and utilize the enforcement mechanisms of the bureaucratic units in which they operate. Patterns of regime support and compliance are thus based on the extent to which these members are able to acquire influential positions in national administrations and international institutions.

The epistemic community pattern may have differential impacts on advanced industrialized and developing countries. Advanced industrial countries, given their greater resources and ability to evaluate new information, are more likely to defer to transnational scientific advice. Epistemic communities are most likely to gain prompt entrée in democratic states that have a high degree of technical competency in the substantive area in question. Conversely, many developing countries are highly suspicious of foreign technical advice and will only heed scientific advice provided through

domestic channels. The development of indigenous scientific capability reinforces the authority of those scientists giving advice to decision makers.

In the environmental realm, epistemic communities have been active in negotiating and implementing a number of regimes on specific topics. Epistemic community members have a shared understanding of complex systems requiring management subject to consensus about the tolerable concentrations of contaminants that individual ecosystems can sustain. For instance, when involved in negotiating the Montreal Ozone Protocol, atmospheric chemists identified substances to control that had the highest ozone-depleting potential and set reduction targets to achieve environmentally sustainable goals. In the Mediterranean, oceanographers, marine biologists, engineers, and environmental planners helped to establish emission and ambient standards for individual substances that reflected the scientists' understanding of the Mediterranean's ability to recycle wastes. They also helped to design national policy programs to reduce coastal zone stresses. Scientists involved in making multilateral environmental policy agree that the environment must be preserved, but that emissions need not be reduced to zero. Rather, they argue, emissions should be controlled subject to the scientific consensus about the behavior of the particular ecosystems with which policy makers are concerned. The "critical loads" concept that underlies efforts to reduce European acid rain uses a similar approach.

Finally, epistemic communities seek to develop common national policies that will ultimately reduce environmental stresses, rather than merely stipulate uniform environmental standards for governments. In the Mediterranean, for example, treaty negotiations on pollution control standards have been conducted in parallel with policy research on demographic patterns, land-use planning, and broader coastal zone management, so that governments would be able to make more macroeconomic policy changes that would be environmentally beneficial as well as focusing narrowly on drafting pollution control standards.

Multinational Corporations. MNCs were largely absent from international environmental politics until the creation of UNCED. Initially, most firms seemed to misjudge the depth of environmental concern and the potential influence of scientists and international institutions. Analysts suggest that MNCs are important forces for environmental improvement if they choose to use green and efficient technology and to develop new cleaner products and production techniques. Institutionally, MNCs they have helped to provide information exchange about timely and valuable technologies.

Many MNCs have guidelines and codes of conduct for environmental practices, ecological accounting procedures, and public environmental accounting, either through the International Standards Organization's ISO 14000 procedures for conducting environmental audits or through voluntary sectoral guidelines developed by

industry groups.[25] Some of the world's largest MNCs associated with the Business Council for Sustainable Development, an industry forum created before UNCED to facilitate input from MNCs, have called for global uniform environmental standards based on some of the most stringent national measures currently in force. For obvious reasons, the private sector prefers voluntary standards over regulation. Further, MNCs argue that they are more dynamic over the long run when they can avoid locking in premature or obsolete technologies into command-and-control–based policies.

International Relations of the Environment. Analysts of international environmental politics fall into one of two schools of thought: the transformative school and the neoliberal institutionalist school.[26] Members of both schools aspire to make treaties that can be negotiated promptly, quickly enter into force, enjoy widespread compliance, are designed to address the key environmental threats confronting the parties, and are likely to yield significant improvements in the quality of the environmental medium in question. All agree that most regime dynamics are principally the consequence of the interplay of knowledge and institutional forces, with some reinforcing action from NGOs and possibly amplification by domestic politics in democratic societies.

On the one hand, a transformative view sees regimes as dynamic, open-ended social forces that evolve over time and may help to transform national calculations of self-interest as well as redistribute material capabilities among countries.[27] Peter Sand in 1990 listed a number of potentially transformative institutional activities.[28] This school sees uniform patterns across the stages of regime development, depending on the configuration of actors and influences at early stages of regime development. In this perspective, strong institutions capable of mobilizing and deploying ecological epistemic communities may be able to introduce new ecological perspectives on environmental policy making. Not all regimes are evolving, open processes. Transformative regimes are only likely to occur with particular configurations of institutional properties (strong institutions) combined with the presence of an epistemic community.

On the other hand, a more static view, associated with most neoliberal institutionalists, sees institutions as serving a more mechanical role—one that allows states to achieve preexisting goals. Institutions thus serve principally as formal arrangements to reduce transactions costs and increase the availability of useful information to state actors.

Of the two views, the dynamic school has been superior at accounting for changes over time in environmental governance because it has been better able to account for the mechanisms by which states' notions of the national environmental interest have changed as a consequence of their involvement in international environmental regimes and their exposure to international institutions.

Agenda Setting

Agendas are typically set by a highly publicized galvanizing event. For instance, the establishment of UNCHE followed in the wake of widespread concern about limits to growth, alarms about oil spills, and the unknown long residency times of inorganic chemicals in the environment. Mediterranean pollution control was spurred by Jacques Cousteau's widely publicized proclamations that the ocean was dying. The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal was catalyzed by the publicity accorded to the voyage of the toxic-waste-carrying barge Khia Khan that was denied dumping permission around the world. North Sea pollution control was similarly catalyzed by a similar waste-dumping episode, and the ozone regime has sparked alarms of seasonal Antarctic stratospheric ozone thinning.

Scientists, credible NGOs, and international institutions typically sound these alarms in high-level conferences. In the absence of such events, actors have used lower-profile meetings or even the media to launch a call for action. Once the alarm has been sounded, transnational policy networks try to keep the issue politically salient by convening workshops, publishing, and speaking out. Few national environmental agencies have sufficient international standing or conduct monitoring of truly global or transboundary ecosystems to sound the alarm. Some international organizations and regime secretariats have been created to perform selective environmental monitoring of the ecosystems within their regulatory purview, although they are seldom prompt or particularly accurate.

Agenda setting has two dimensions. The first is to get the issue onto the international agenda and into negotiations. More subtle and important in the long term is the framing of the issue that can greatly influence the final outcome or predispose the subsequent field of possible outcomes. If an authoritative actor sets the agenda, then the particular presentation and institutional venue in which the agenda is set will have lasting influence over subsequent negotiations. The rhetoric associated with an issue will establish a baseline against which national positions must be couched (for example, environmental threats versus economic costs). The international institution in which the issue has been submitted will influence the array of actors likely to participate, the form of discourse, and the voting rules by which decisions will be reached (consider the consequence if GATT rather than UNEP had been made the principal international organization after UNCHE).

A consequence of agenda setting is to privilege subsequent types of collective responses. For instance, North Sea environmental threats were initially viewed as marine pollution problems that required the banning or control of certain contaminants. Thus, at later stages of the regime states banned offshore incineration, even though scientists did not widely regard this as a major source of marine pollution and it was considered a superior mode of waste disposal compared to storage on

land. But if the frame had been one of waste reduction, then offshore incineration would have been encouraged as a more efficient means of disposal leading to less waste accumulation in Europe.

UNEP helped to set the international agenda for a variety of environmental issues and has helped to frame the way in which the issues were addressed. In 1981, for example, UNEP identified land-based sources of marine pollution, damage to the ozone layer, and the transport, handling, and disposal of toxic and hazardous waste as serious environmental concerns. Less urgent but still serious were lack of international cooperation in coastal zone management, soil erosion, transboundary air pollution, pollution of inland waterways, the absence of legal and administrative mechanisms for prevention or redress of pollution damage, as well as the methods of environmental impact assessment.[29]

At best, agenda setting has been haphazard. It has relied on prompt publicity recast about environmental disruptions. Not all alarms are heard by the media, however, and not all disasters generate policy responses. Conducting widespread environmental monitoring and publication of the results in, for example, the UNEP annual *State of the World Environment* reports and triennial *Global Environment Outlook* assessments, could improve ongoing monitoring of global ecosystems by among other things signaling early warnings for disruptions. If necessary, new regimes could be created or modifications made in existing regimes that are performing poorly. Appraisals of the environment are offered at annual meetings of regimes by secretariats, secretariats' networks, and the conferences of parties.

Standing monitoring bodies could also generate the information for triggering prompt responses to newly identified problems. The UN system is currently underinstitutionalized to perform this function, however, and there is also a need for a regularized early warning system. Creating standing bodies of environmental scientists—akin to the Group of Experts on Scientific Aspects of Marine Environment Protection (GESAMP) for marine issues or the IPCC for climate change—would make possible prompt environmental assessments and announcements of warnings, thus accelerating the agenda-setting process in environmental governance.

Negotiations and Regime Formation

International law can take one of two forms: "hard law" or "soft law." The overwhelming majority of international environmental obligations are granted in hard law as are environmental regimes, which are established by treaties. Soft-law commitments are expressed in, for example, conference declarations, UN resolutions, and the UNEP nonbinding guidelines drawn up between 1978 and 1987 covering ten areas of environmental management: managing shared natural resources (1978), weather modification (1980), offshore mining and drilling (1982), a World Charter

for Nature (1982), banned and severely restricted chemicals (1984), marine pollution from land-based sources (1985), environmentally sound management of hazardous wastes (1987), environmental impact assessment (1987), and the exchange of information about chemicals in international trade (1987).

Soft law can also be used as a precursor to hard-law instruments. Soft-law instruments can establish norms and habits. UNCHE adopted the Stockholm Declaration, establishing twenty-six principles of behavior and responsibility to serve as the basis for future legally binding multilateral accords. The Action Plan for the Human Environment specified 109 recommendations in the areas of environmental assessment, environmental management, and supporting institutional measures. UNCED adopted the 1992 Rio Declaration with 27 principles guiding environmental action and a sweeping environmental policy to promote sustainability (Agenda 21), with 2,509 specific recommendations applying to states, international institutions, and members of civil society.[30]

In the environmental area, diplomats generally fall back on soft law when there is insufficient political support for anything stronger or as an initial step to achieve more significant commitments in the future. For instance, UNEP's voluntary guidelines on hazardous waste and toxic chemical management, which were initially developed by expert groups and endorsed by the governing council, served as the foundation for later treaties on the transport of hazardous wastes and persistent organic pollutants. In adopting a soft-law principle, diplomats also do not have to worry about a contentious ratification process or an unfriendly reception by Congress or parliament.

There are three types of environmental treaties and regimes: social learning, institutional bargaining, and least-common-denominator results.[31] Each is characterized by a distinctive set of discrete political patterns of participation, agenda setting, interest formulation, compromise, and resilience, and each is associated with discrete configurations of actors and influence.

Most environmental regimes have a strong command-and-control orientation, rather than market-based instruments or the precautionary principle. Despite current policy debates in climate change discussions about the efficiency gains from the use of market instruments in environmental regimes, for example, or the NGO arguments about the desirability of the precautionary principle, regimes retain a presumptive approach based on uniform cuts or scientifically derived differential obligations. The absence of economic frames is largely due to control of negotiations by international institutions staffed principally by environmental scientists rather than by economists. The Bretton Woods institutions, which are dominated by economic styles of policy making, were not active in international environmental negotiations until the 1990s, so that the vast majority of treaties concluded before the 1990s reflected an environmentalist approach to command-and-control-type environmental policy making.

When regimes are negotiated with the involvement of epistemic communities and strong international institutions, they develop through a process of "social learning." Negotiations occur within a scientific discourse, in which political debate and compromise reflect expert consensus on the behavior of ecosystems and their ability to sustain stress. The substance of regimes reflects scientific consensus about the most important environmental threats, and negotiated standards reflect consensus about the degree of environmental stress the target environment can sustain. Social learning generates treaties with differentiated national obligations and substantive commitments, based on expert consensus on causes and environmental effects. For instance, the 1980 Land-Based Sources Protocol for the Mediterranean requires more stringent emission controls on the industrialized countries than on the developing countries, because the magnitude of degradation of the northern coast of the Mediterranean was much more severe than it was on the southern coast.

The most effective regimes are those in which strong norms, institutions, and science have all been brought to bear. Enduring organizations are built around clear normative references supported by a body of knowledge. Institutionalized science leads to regimes that are more comprehensive and judicious than regimes negotiated through institutions in which science is not allowed to play a significant role or for issues for which scientific consensus does not exist. Regimes developed through social learning include the stratospheric ozone protection regime, the 1979 Geneva Convention on Long-Range Transboundary Air Pollution (LRTAP), subsequent treaties addressing European acid rain, and pollution control efforts for the Mediterranean, Persian Gulf, South Pacific, and South East Pacific.

Maurice Strong, Secretary-General of UNCHE and UNCED and UNEP's first executive director, helped design the outlines of this process of social learning. Strong believed that "the policy is the process": that is, by generating an open political process in which states are exposed to consensual science, government officials may be persuaded to adopt more sustainable policies, and individual scientists may gain heightened political profiles at home that may ultimately increase their effectiveness as well. Most social learning treaties have standing environmental monitoring and research committees, to provide timely warnings of new problems, monitor achievements of regime goals, and educate politicians and policy makers on environmental issues.

However, social learning takes time. Comprehensive treaties are slower to negotiate than are others, because they require persuasion and consensus rather than mere compromise. From a policy perspective, though, comprehensive regimes are likely to be superior in their ability to protect the environment in a cost-effective and politically acceptable manner.[32] Moreover, treaties developed with help from the scientific community typically enter into force more rapidly than without it, presumably because of the weight that involvement of scientists carries in the ratification process.[33]

Strong institutions alone yield regimes concluded through institutional bargaining. Goals are reached through political compromise and thus are less likely to gener-

ate technical results at an optimal economic cost than are arrangements worked out in conjunction with experts. Environmental regimes developed through institutional bargaining contain legal efforts that are uniform and commitments that tend to entail across-the-board emission cuts. A typical example of institutional bargaining is the 1990 North Sea Ministerial Declaration calling for 50 percent reductions for thirty-seven pollutants and 70 percent reductions for emissions of dioxins, mercury, cadmium, and lead. The coastal states adopted 30 and 50 percent cuts on emissions of more than thirty chemicals into the sea. The percentages were chosen based on their political appeal, not on scientific conclusion. Interestingly, it is not clear if the thirty chemicals identified in the agreement are in fact the most important contaminants. It is also unclear what the environmental effects will be of achieving the mandated cuts.

Limiting negotiations to small groups or bargaining blocs accelerates negotiations because logistically these are more efficient, and there are usually fewer naysayers.[34] This method was useful in attaining agreement in European acid rain negotiations and is consistent with bargaining theorists' focus on "k-groups."[35] If not carefully designed, however, limited negotiations may alienate developing countries if they are not members of the bargaining bloc. Because developing countries control so many votes in UN-sponsored negotiations, their opposition may scuttle any talks.

Horizontal linkage between institutions, both functionally and geographically, has allowed environmentally progressive states to "forum shop" (that is, to find institutions likely to be receptive to their ideas). For instance, a decision by a group of states to control the emission of certain contaminants into the North Sea could spur another group of perhaps some of the same states to push for similar control in the Black Sea. Similarly, the EU and UNECE agreed on setting standards on sulfur emissions in Europe. Attention to equity concerns did not permeate regime rules, although they were widely expressed by developing countries.

Finally, with only thin institutional contexts and no epistemic communities, states create regimes based on a least-common-denominator pattern. Regimes in this category are grounded in weak treaties with only limited national obligations. They are unlikely to have a strong impact on environmental quality. In the absence of any compelling external political pressure to induce states to adopt strong environmental treaties, the most vocal and reluctant party will exercise the most influence in seeking compromise. Consequently, in the absence of strong institutions or persuasive scientific consensus, negotiations will be driven by a race to the bottom because collective agreement must be acceptable to the least willing (and dirtiest) participant. Most multilateral fisheries agreements have been of this type, as have efforts to protect the Caribbean, West African seas, and East African seas. Similar difficulties also marred talk on the North Sea until 1987, when the negotiations were transferred from low-profile bureaucratic forums to higher profile ministerial meetings at which environmental ministers had an incentive to reach an understanding—and in the process

distinguish themselves to be environmentally progressive to their increasingly green domestic constituencies.

Social learning is becoming increasingly common, as a result of the growing institutionalization of ecological understanding, and a greater willingness among states to defer to key institutions that are to some extent beyond the immediate control of major states. As the scientific understanding of different ecosystems has improved, ecological epistemic communities have grown more vocal. Regime dynamics are thus increasingly driven by the spread of consensual knowledge about the environment and in turn have helped to increase the number of epistemic communities across issue areas.

UNEP has developed a growing confidence in exercising leadership in a wide variety of environmental negotiations, including those focused on pollution, ozone protection, and the preservation of natural habitats. The UNECE has been a leader in European acid rain, using many of the same techniques to institutionalize the role of science. Some of the key secretariat members in UNECE once worked in UNEP and with UNEP "administered regimes." The principal resources that helped these institutions to institutionalize knowledge included their access to and control over technology transfer, training, and public education. In addition, high-tech, high-profile diplomatic meetings exposed political leaders to new ideas and to networks of experts. With the growth of domestic environmental consciousness and the end of the Cold War, governments have been increasingly willing to grant a greater autonomy to international institutions that they believe would help improve the environment.

Mostafa Tolba has identified several techniques that he argues helped UNEP move along negotiations of environmental agreements: the use of selective incentives in treaties, differential obligations, regionalization, and the promotion of overachievement of environmental goals by lead countries.[36] Tolba does not specify when such techniques are likely to be attractive or on which types of countries they may exercise an influence. Differential obligations will appeal to developing countries that are worried about equity considerations in treaties. The application of differential obligations is a signal that the treaties reflect their norms of equity. In general, these are techniques that can be applied only if the negotiators are willing to accept them (that is, that little substantive disagreement exists).

Environmental lawyers have developed a variety of legal innovations to accelerate the regime formation process and to make treaties more comprehensive. These include signing framework treaties that are tied to specific protocols, drafting black lists that ban highly toxic substances and gray lists that regulate less toxic substances, allowing modification of these lists by expert agreement without having to reconvene the political parties, pursuing an iterated negotiating process for each regime so that individual problems get addressed separately while the corpus of the regime grows over time, establishing trust funds so that regimes may be self-supporting, and creat-

ing committees for monitoring treaty compliance.[37] The Montreal Ozone Protocol, for example, has eliminated a number of ozone-depleting substances by allowing the Conference of Parties to approve environmental regulations without having to go through governmental ratification.

Any of these techniques are widely used and help to provide the institutional framework in which new perspectives and actors can participate in regime development and promote social learning. The social learning regimes have been concluded using these diplomatic techniques.

Other reviews of social learning efforts provide a complementary set of lessons about how to generate scientific consensus within environmental regimes. First, an epistemic community's most important political resource is its reputation for impartiality (coupled with its own socialized consensus process for truth). Members of the epistemic community are thus likely to give advice that will be relatively untainted politically, and decision makers, in turn, are likely to treat such advice with confidence. Consequently, epistemic communities are most influential when scientific consensus precedes the policy negotiations. In instances when consensus is being built concurrently with policy talks, the network must be protected from overt political influence.

Based on comparative studies of most of the social learning regimes, including UNEP's Regional Seas Program and UNECE's efforts for European acid rain control, the following lessons about how to build policy networks of scientific expertise for environmental governance can be drawn.[38]

Scientific policy networks are not self-organizing. International institutions had to provide the initiative to identify and organize people with shared beliefs and understandings. Once organized within the institutional framework provided by UNEP, these individuals were able to exchange information and operate as a policy network.

UNEP carefully surveyed the population of marine scientists in the Mediterranean to assure a commonality of views. In the Mediterranean, a UNEP consultant spent nine months visiting national laboratories around the region to inventory national capabilities and to build a scientific network before any meetings were convened. UNEP then carefully recruited individuals, paying particular attention to the scientific reputations of the national and regional institutions from which they recruited to help assure that those chosen would be able to contribute to collective monitoring, research, and policy. They based recruiting decisions on individuals' professional credentials and networking ability. UNEP avoided relying on any one national institution to provide research and training, out of a concern that this could compromise the political authority of the work and make longer-term financial support contingent on capricious national science budgets. UNEP provided professional outlets for members by organizing conferences and publications in refereed professional journals, which enhanced the domestic profile of individual scientists who could then be recruited to fill positions in national administrations.

UNEP now recognizes that it is necessary to maintain momentum within the scientific community by continuing to sponsor projects and make research opportunities available so those members do not drift away. In the Mediterranean, collective efforts have slowed tremendously because the first generation of epistemic community members have retired or moved on to other projects and have not been replaced within the UNEP network. Maintaining a vital scientific enterprise prevents the need of having to reconstitute the community every time a new problem emerges. In the Regional Seas Program, UNEP provided opportunities for exchanges of experts among institutions, countries, and even regimes to encourage the dissemination of knowledge and experiences and to strengthen environmental networks. At the same time, however, UNEP had to strive, however, to avoid spreading the network too thin and overloading key individuals with networking and administrative responsibilities.

UNEP and other institutions have taken care to create international interdisciplinary panels for environmental risk assessment. This is vital to ensure a network of experts free of state influence. They selected individuals for both their areas of expertise and their ability to work with experts from other field. Institutions sought to ensure the participation of individuals from multiple scientific disciplines to avoid capture of the network by any one scientific discipline or school of analysis, because this would limit the ability of the policy advice to capture externalities. It would also undermine the political authority of the experts if they were not seen as impartial. UNEP avoided government-nominated scientists, choosing instead to designate experts itself. That governments have sometimes appointed scientists has compromised the authority of the policy panels they sit on—including those of the IPCC. International institutions arranged for focused interactions among scientists, diplomats, and policy makers to discuss the technical substance of the issues. In European discussions on acid rain, this proved an effective technique for educating diplomats about the technical aspects of sulfur emissions, and for familiarizing them with the critical loads approach to policy making. By encouraging environmental ministry officials to attend international meetings, UNECE and the International Institute for Applied Systems Analysis (IIASA) were able to expand and reinforce membership in transnational policy networks. IIASA was responsible for modeling transport patterns and the environmental efforts of acidic depositions in different ecosystems, and IIASA modelers were able to explain their findings to diplomats.

A comparison of cases and the lessons above yield some guidelines for building social learning dynamics into international environmental negotiations. Relying on thick international institutions provides the basis for independent political planning and deploying sufficient institutional resources to be able to influence the environmental positions of many governments. The lessons about the care and feeding of scientific networks provide some ideas for how to design and organize a scientific network for use in multilateral environmental regime making. It must be remembered that scientific consensus and the existence of a transnational epistemic com-

munity are not always present. In their absence, institutional bargaining is the best prospect for regime development.

Compliance

Discussions about the determinants of compliance with environmental regimes have been extensive.[39] This is a particularly important theme, because not all MEAs are in effect. Most still require the participation and ratification of one major polluting party, and the entry into force after ratification is often disappointingly slow. For example, the United States is not a party to the Kyoto Protocol, and the EU Commission often finds that as many as half of its members are not carrying out their obligations under some EU environmental directives.

In fact, information on compliance and effectiveness is available for only a small number of the seventy major international environmental treaties that were concluded after UNCHE and are currently in force. The results are highly mixed across the nineteen treaties for which there is evidence. It seems that if there were widespread state compliance with international environmental treaties, then international relations scholars would have more data about the subject, and analysts would know more about patterns and determinants of compliance. The relative ignorance about the topic, seen politically, is caused by an absence of information or reluctance on the parts of states to reveal information on noncompliance because it may be embarrassing before domestic or foreign audiences.

Consequently, most studies of compliance proceed from more general insights about compliance with international law in other functional areas. Recent studies by Harold Jacobson and Edith Brown Weiss, and by David Victor, Kal Raustiala, and Eugene Skolnikoff develop a number of complementary hypotheses about factors that may influence state compliance with environmental commitments.[40] Both works proceed from more general insights about compliance with international law in other functional areas.

Most analysts agree that implementation requires states to enjoy the political will and bureaucratic or administrative capacity to enforce regimes.[41] Implementation with environmental commitments is usually a matter of calculation because compliance entails economic costs. Many industrialized societies have the capacity to comply, but the political will is less predictable. In developing countries and economies in transition, states lack the institutional capacity—and often the political will—to carry out their obligations. In many newly industrialized countries, political will is also absent, due to the national priority accorded to economic development, even if capacity exists.

Not all countries attach the same degree of importance to compliance. In the United States, diplomats like to talk of a culture of compliance: the United States

does not like to sign treaties with which it will not comply, or with which others will not comply. Diplomats are worried that Congress will not ratify a treaty that will commit U.S. financial resources when others may not reciprocate. But in practice, the United States will often tolerate escape clauses or overlook noncompliance out of a recognition that other countries are less concerned about compliance or that other parties may be able to comply later on even if they cannot comply immediately. Most other countries are much less insistent on firm compliance provisions, and some countries may actually prefer not to have stringent compliance requirements as they wish to show environmental concern but are unable to enforce the law. For instance, Eastern European governments have signed treaties knowing they could not satisfy their requirements—such as European acid rain commitments—hoping that by signaling a desire to comply, they might receive financial support to help facilitate future compliance. They further hope that it will indicate their subscription to broader norms supported by other institutions they hope to join one day (such as the EU). In short, compliance decisions are often taken independently of decisions about joining a regime, and the United States should display greater tolerance of marginal noncompliance by nondemocratic countries in the hope of being able to improve the compliance process over the longer term.

Harold Jacobson and Edith Brown Weiss develop three factors that may influence the decision to comply with environmental regulations: characteristics of the activity involved, characteristics of the treaty or regime, and the international environment.[42] The major characteristics of the activity include a relatively small number of actors, so that supervision of compliance is easy; the availability of economic incentives for compliance; and the involvement of a small number of MNCs in the activity, so that few activities have to be controlled. In addition, because of concern for their global reputations, MNCs may be willing to eliminate environmentally unfriendly activities. Still, not all MNCs are equally concerned about their reputations. Those that are likely to help states comply with strong environmental obligations have exposure in markets where they are prone to consumer boycotts. Thus, Jacobson and Weiss add a fourth dimension to the characteristic of the activity: the environmentally degrading activity must be concentrated in major countries, where states are capable of exercising regulatory control, and citizens or NGOs have recourse to the legal system.

Jacobson and Weiss identify eight factors characteristic of the treaty or regime that may also influence compliance: perceived equity of the obligations, so that developing countries will be willing to commit scarce resources to compliance; clearly defined obligations, so that noncompliance may be readily identifiable and states would worry about their reputations if they did not comply; the availability of scientific and technical advice; reporting requirements on compliance; the provision of other forms of monitoring of state behavior; an independent and technically able

secretariat; informational, financial, and technological incentives; and sanctions for noncompliance.

They also specify six background factors that may encourage state compliance: major international conferences; worldwide media and public opinion; NGOs; a critical mass of countries already adhering to the treaty; the involvement of international organizations; and international financial institutions that provide monetary incentives. Further discussion of each factor and the cluster of factors is not necessary because all the analysis by Jacobson and Weiss and by Victor, Raustiala, and Skolnikoff is explicit that each factor is indeterminate. Jacobson and Weiss argue that "each factor interacts with the others to produce a combined effect on implementation, compliance, and effectiveness."[43] Victor, Raustiala, and Skolnikoff conclude that the influence of each factor varies by case and by target country.[44] They argue that "different national circumstances have led countries to take different approaches," but that compliance more generally is positively affected by a system of interacting influences. In short, more is better, and it is difficult to differentiate the tangible impacts of each factor.

Rather, lessons about compliance focus on the aggregation of factors, subject to the application of some background innovations involved with international society, such as the influence of soft law, a culture of compliance, and the interaction of institutions and policy networks to induce states to comply with commitments out of broader notions of national interest rather than any particular concern about environmental protection. The current array of compliance-related factors remains weak and requires strengthening if it is to truly affect state compliance decisions.

Weiss offers some propositions about general lessons for facilitating or permissive factors that may contribute to compliance.[45] She stresses the influence of dense linkages between treaties, so that commitments in one area are substantively connected with those in others. When international relations are based on a tight network of interactions with other actors, concerns about reputation and concessions in linked negotiations may encourage states to live up to their obligations. Related to this is the notion of an ongoing relationship among the participants, which is likely to have similar effects. In addition, norms of compliance may shape states' decisions. Institutional structures that encourage transparency and accountability may reinforce a culture of compliance. Threats of sanctions for noncompliance may also induce states to fulfill their obligations. Finally, if states believe that their public welfare and ecological survival will be satisfied by compliance, then they are also more likely to comply.

In the following section, some of the more powerful propositions about compliance are discussed. These propositions come from the works previously discussed as well as from the broader international relations literature on international institutions.

Soft law may be more politically effective than hard law, although less environmentally beneficial. Weiss also suggests, along with Victor, that compliance with soft law may be easier than compliance with hard law and thus may be more effective. The appeal of this idea is that soft-law commitments may be established without a formal, difficult ratification process, yet states will choose to comply with those commitments through an array of domestic and institutional incentives. Yet this does not appear to be borne out in practice. Few soft-law obligations have the precision of hard law, so it is difficult to ascertain if states are in compliance. Moreover, many soft-law commitments, such as Agenda 21, call for expanded political participation, rather than for substantive policy decisions by governments. To the extent that such commitments are complied with, then, they would be merely instrumental to institutional and political capacity for compliance. However, even this does not always appear to be true. For example, the 1992 Climate Change Convention commitments are in essence voluntary but have not led to significant reductions in greenhouse gas emissions in most of the world, nor have they significantly added to the political constituency behind such efforts.

A culture of international compliance can improve national compliance. Most neoliberal institutionalist analysts believe that if a set of aspirations and shared expectations about compliance exists, reinforced by a dense set of interlocking institutions, then states (and firms) may have incentives to comply with their international commitments. The problem for compliance in the environmental realm, compared to other areas of international relations, is that no real culture of compliance with international environmental law exists, and the density of relationships in the environmental realm remains fairly thin. Broader norms of environmental protection are not widely accepted by governments, in part because of the relatively recent entry of environmental issues onto the international agenda. The Stockholm Declaration, for instance, is singularly ambivalent in its assertion that states with an obligation to maintain resource quality can still enjoy full national sovereignty. The development of an Earth Charter and other normative instruments of soft law could help build the foundations for such a compliance culture.

Linkages between issues, between institutions, and between governments are not as dense in the environmental arena as they are in others, particularly those focused on economic issues. Although density of linkages between institutions and policy networks has contributed to regime formation, the hurdles to compliance are also higher. The effects of national environmental practices do link countries closely, but these links are not always well understood or recognized by decision makers or publics. Environmental regimes are not tightly linked together because their policy networks seldom overlap. Problems in different environmental media are addressed by different government agencies with only a weak environmental body coordinating them. There are no mechanisms either within or between governments to tie to-

gether the policy networks of various environmental regimes. In addition, no single environmental regime has a strong social or cultural identity. Consequently, the actors responsible for compliance in one environmental regime have no reason to consider seriously the nature of their broader involvement with international society.

The inclusion of target groups in environmental regimes may help to encourage compliance and effectiveness. The strongest finding of Victor, Raustiala, and Skolnikoff is that the participation of target groups in multilateral negotiations and institutions can improve compliance. An example of this is the design standards of the International Convention for the Prevention of Pollution from Ships (MARPOL), which seek to reduce operational oil pollution from tankers. Enforcement falls, in practice, to the insurance industry, because insurance providers do not want to be liable for oil spill cleanups or for paying for faulty tankers. Consequently shipyards and tanker owners have no choice but to comply with the state's written regime.[46] In climate change, Greenpeace has been trying to involve the insurance industry by publicizing the unusual frequency and expense of cleanups after major weather-related disasters (such as hurricanes) that Greenpeace argues are the consequence of global warming. Careful thought needs to be given to the potential role of the insurance industry in helping to improve compliance with other environmental regimes. Establishing key liability standards for pollution and ecosystem disruption in all environmental regimes would provide a strong motivating force for involving the insurance industry.

The involvement of key groups also helps to generate better information about policy options, technical feasibility, and environmental benefits, thus leading to more effective treaties and compliance. This is an interesting finding, because in the 1970s and 1980s most target groups opposed all international regimes and, when involved in the negotiations, would try to either dismiss the need for the regime or urge voluntary measures instead. For instance, in the Montreal Ozone Protocol, the initial response of the CFC manufacturers was to oppose any controls and to challenge the scientific authority behind calls for them. In MARPOL, tanker owners and shipyards opposed any tanker designs that would introduce additional production costs. Moreover, not all target groups contribute to compliance. So a tension is involved at the moment appropriate for including target groups in environmental governance: if they help design the regime they may develop weak measures that do not significantly contribute to improvements in environmental quality, yet it is difficult to involve them just at the compliance stage without having them involved in the drafting. Jacobson and Weiss note that timber companies actively oppose efforts for sustainable forestry within the International Tropical Timber Organization. There has to be an affinity between the potential for market gains for the target groups and compliance: the net benefits of pollution control must offset the additional costs of such control, which means that there have to be penalties for continuing to pollute and market opportunities for new product development. These conditions are likely

only for highly profitable firms in countries where they justly anticipate regulatory costs or loss of reputation for noncompliance.

However, with the increase in domestic environmental consciousness, the heightened willingness in the industrialized societies to pay for green products, and the growth of demand for environmental cleanup technology, more firms may be interested in contributing to environmental negotiations and adhering to their commitments than in the past.

Compliance is most successful when it is within a system for implementation review. Compliance is the consequence of multiple interacting forces. For key groups to engage in compliance, they must be subject to accountability, review, and surveillance pressures. Victor, Raustiala, and Skolnikoff term the institutionalized arrangements through which parties share information, review performance, handle noncompliance, and adjust commitments a system for implementation review (SIR). Thus, they accurately conclude, actor groups and states must be bound together in a synergetic set of institutional forces that combine policy verification with participation.

No single SIR for environmental regulation exists. In practice, however, the enforcement of multilateral environmental regimes has occurred against a backdrop of decentralized systems for implementation review. Most international governance schemes have had to rely on a small number of institutional- and knowledge-based incentives to spur state compliance. The most important activities for inducing compliance have been environmental monitoring, policy verification, and technological and financial assistance. In addition, international institutions and NGOs have engaged in bureaucratic training programs and public and elite education to instill norms of environmental protection, a culture of compliance, and notions of environmental self-interest, as well as to increase the density of relationships among environmental actors.

Environmental monitoring contributes to compliance by providing information about the quality of the environment, and thus indirectly about whether a state's efforts are worthwhile and whether other states are living up to their obligations. It may also mobilize public concern and stimulate pressure for compliance.

Monitoring efforts worldwide remain largely the domain of governments, although most treaties require the provision of periodic reports to international authorities. National reporting to secretariats on state environmental protection activities (which may include monitoring environmental quality or providing information on compliance efforts) is often poor, and many secretariats lack the resources or authority to check data submitted by governments. A 1991 U.S. General Accounting Office survey found that only about 60 percent of the parties to the 1972 London Dumping Convention were complying with reporting obligations; only 30 percent of the members of the MARPOL convention on oil pollution submitted reports; and many

reports under the Montreal Ozone Protocol and the Helsinki Sulfur Dioxide Protocol are incomplete and impossible to verify.[47] Reporting under the 1982 Memorandum of Understanding on Port State Control in Implementing Agreements on Maritime Safety and Protection of the Marine Environment is much better, suggesting that well-designed questionnaires may evoke higher response rates than poorly designed ones, and further research is necessary on optimal designs for reporting and verification questionnaires.

Many NGOs are now capable of monitoring environmental quality as well as national compliance and are becoming involved as a source of shadow verification of government obligations in the EU and elsewhere. Their activities help compensate for the dearth of reliable environmental quality data and also provide an independent quality check on data collected through other sources. Greenpeace International seeks to keep track of national compliance with many treaties, and the Natural Resources Defense Council collects data on national compliance with the FCCC. The World Conservation Union (IUCN) and Greenpeace also try to track national compliance with many of the species conservation treaties.

The World Meteorological Organization (WMO) and UNEP routinely monitor of atmospheric quality. UNEP, the Food and Agricultural Organization (FAO), and the World Health Organization (WHO) conduct studies of freshwater quality in lakes and river basins. UNEP and the Intergovernmental Oceanographic Commission (IOC) monitor the oceans. These efforts provide background information on environmental quality.

Much of the environment can be monitored remotely from satellites and does not require the active collection and submission of data by governments, although not all environmental conditions are equally accessible to remote monitoring. Remote sensing and satellite monitoring can enhance verification of trends in natural resource use and pollution from organic sources and from oil. It is also useful in monitoring levels and production of greenhouse gases, although double checking from ground-based instruments and by human personnel is still necessary to confirm remote sensing data. Satellite- and airplane-based monitoring is less effective at monitoring inorganic marine contamination and urban air quality, for instance, which requires localized sampling and monitoring. Institutional problems still exist with the use and dissemination of such remote sensing data once they have been collected.[48] With the proliferation of private satellites, NGOs will find it increasingly easy to acquire tailor-made monitoring data.

Direct verification of state compliance may affect state choices to comply. Prompt access to information about other's actions not only enhances early detection of violations but also reduces concerns of free riding. Also, by making information available of one's own activities, verification may indirectly deter noncompliance by increasing the likelihood of detection. To seriously influence compliance, verification data must be timely and reliable. Verification may not be equally feasible in all cases

and is easier when the actions to be verified are large: that is, a few activities conducted by easy-to-identify actors.

Many actors are responsible for performing verification functions. Fifty-eight international environmental treaties stipulate some provisions for verification. Governments are required to produce verification reports in 72 percent of the treaties, although it is not specified to whom the reports are to be made available. Governments have to submit reports to international institutions in only 7 percent of the cases, and international institutions are held responsible for conducting verification studies in 3 percent. The remaining 18 percent are unspecified.

Policy verification may be most credible when not performed by states. Some international organizations conduct periodic verification assessments of national compliance with environmental standards. The OECD has been regarded as having successfully provided such assessments for a number of its members, publicizing infractions and identifying areas for improvement.

NGOs are also increasingly active in verifying state compliance with environmental accords, and the EU has sought to expand participation in its development of sectoral policies to include such alternate NGO submissions of information about compliance and noncompliance. In international regimes, Greenpeace now regularly monitors trade in hazardous wastes and in flora and fauna, and it publicizes shipments in violation of international treaties. TRAFFIC, the wildlife trade monitoring program of IUCN and the World Wildlife Fund, for instance, verifies compliance with the CITES regime on trade in endangered species. The publicity generated by these activities is often sufficient to pressure recipient governments to enforce their international commitments as well as to refuse entry of such products. Many NGOs have become virtual watchdogs over private activities in the field as well, replacing or supplementing the monitoring activities of national enforcement agencies. Because governments are often unwilling to cede the semblance of authority to NGOs, private monitoring of governments' actions and of the environment may best be accomplished through independent scientific panels that have access to a variety of sources of information. Surprise visits by independent inspectors are used in some regimes as a means of verification and have long been a part of the nuclear nonproliferation regime and the Antarctic Treaty System. The 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) provides for such visits, and the Helsinki Commission, in managing the Baltic Sea area, has also considered them. Eastern European and OECD countries accept the concept, but developing countries are suspicious that acceptance will lead to further forms of World Bank and International Monetary Fund conditionality.

Technology and financial transfers may also help states comply with their environmental obligations by providing new equipment with which to reduce emissions. Technology panels that parallel international regimes exist with government, MNC,

and mixed participation. Technologically advanced states and firms can serve a constructive role on technology panels by being invited to serve as lead countries, allowing them the opportunity to foster demand in export markets for environmentally clean technologies. Technology panels organized on this principle exist for the following regimes: European acid rain, Mediterranean, ozone, North Sea, and Baltic.

None of these factors are uniformly implicated in compliance decisions because not all governments face the same difficulties in fulfilling their obligations. Thus, they require different technical or political incentives to comply. For instance, democratic societies with strong national environmental administrations, such as the OECD countries, are likely to have their compliance decisions shaped by the provision of verification and monitoring provisions. Verification helps the state guard against free riding, and monitoring reinforces public demands for compliance. In nondemocratic strong states, including many newly industrialized countries, compliance decisions are driven largely by verification and monitoring activities, as these would influence states' expectations of the behavior of others but would not be tied in to domestic-level pressures on the government. Weak states are much more prone to the inducements provided by technology and financial transfers. States with significant science and technology resources are less likely to find the limited offerings of international institutions significant in their calculations of national policy.

Reactions to Noncompliance

Compliance mechanisms are fairly modest. Most analysts are unsure about the extent of state compliance with international commitments. Reliable data are lacking, and the institutions for verifying compliance remain haphazard. If there were more compliance, then international lawyers would likely have more data about the subject, and analysts would likely know more.

Few formal mechanisms exist for addressing noncompliance in the environmental realm. Most efforts rely on sanctions and dispute resolution panels. NGOs have successfully penalized noncompliant actors through public campaigns and may contribute to effectiveness well in excess of formal legal obligations. Similarly, consumer boycotts against endangered tropical hardwoods have led producers to engage in environmentally more sustainable forestry practices, and World Bank threats of green conditionality on financial flows if environmental guidelines were not met led Brazil to reform some of its unsustainable development policies in the Amazon. In each of these cases, NGOs did not launch their campaigns in the country they were trying to influence. Keck and Sikkink call these innovative NGO campaigns a "boomerang effect," as NGOs exercise their political influence on nonstate actors over whom they

enjoy some influence.[49] For instance, NGOs successfully launched a campaign against the dumping of the Shell Oil Brent Spar drilling platform in the North Sea by focusing a consumer boycott in Germany, where Shell had a large market presence, rather than in England, where Shell Oil headquarters were located. Consumer boycotts in Europe against imports of tropical timber grown with nonsustainable forestry practices led exporters in Southeast Asia to modify their practices. In the Brazilian case, U.S. NGOs lobbied Congress to exercise its influence over the World Bank to induce the World Bank to threaten to withhold loans to the Brazilian government until the Brazilian government reformed its policy in the Amazon.

Sanctioning noncompliance is seldom possible. A number of agreements contain provisions for trade sanction against violators (including the Montreal Protocol, CITES, the Basel Convention on Control of Transborder Movements of Hazardous Wastes and their Disposal, and ten species conservation treaties), but these have seldom been invoked and are increasingly losing legitimacy in the anticipated WTO legal battles against trade-restricting environmental regulations.[50] To the extent that they may actually be invoked, it would be more likely part of a conscious challenge of the WTO's authority by groups that were challenging the principles of unrestricted free trade.

Even though most treaties contain language providing for adjudication and the creation of dispute resolution panels, no countries have ever convened an arbitration panel to enforce a regime. This is probably because most regimes cover a number of different activities, and every government anticipates that it is not in compliance with some set of them. Consequently, no state wishes to launch proceedings against another party, when they may have to face a reciprocal challenge.

Two limited examples exist of arbitration proceedings that are not limited to state choices. The World Bank Inspection Panel solicits submissions from NGOs and has found favorably for NGO complaints against projects that were likely to be environmentally destructive. However, the Bank panel has no formal authority over the Bank, so its reports are merely advisory. The North American Free Trade Agreement (NAFTA) has a unique arrangement in which an NGO can submit protests about its own government's noncompliance with NAFTA environmental rules. Despite recent efforts by Mexican NGOs to use this mechanism to protest their government's environmental lapses, the panel operates by a majority vote of two of the three governments, which makes it difficult for NGO submissions to be upheld.

The Montreal Ozone Protocol has experimented with encouraging voluntary reporting of noncompliance. Yet in an extensive study of verification systems and compliance with the Montreal Ozone Protocol, David Victor found few examples of voluntary reporting and compliance. Those he did find related to self-reporting countries with hopes of attracting financial assistance to achieve compliance. Effective self-reporting requires additional institutional mechanisms for financial and technology transfers to reward the self-reporters.[51]

CONCLUSION AND IMPLICATIONS

Rio Plus 10 provides the next major opportunity for reforming and streamlining multilateral environmental governance. A delicate web of regimes and actors has developed over the last thirty years, creating a new global policy network of environmental actors. To date, agenda setting and regime development have been far more successful than compliance. NGOs are most active in agenda setting. States continue to be responsible for regime development and compliance. International institutions are involved in all three steps, as are scientists and epistemic communities. MNCs have remained largely involved with just compliance.

This chapter has focused principally on the activities of international institutions. Although these institutions perform a variety of functions, substantive gaps remain in the environmental realms subject to governance. Further inventory of governance activities performed by NGOs and the private sector is necessary.

The international environmental governance system has not been significantly overhauled in three decades. After UNCHE, UNEP was the only international institution responsible for environmental protection. Since then, however, most international institutions have assumed some environmental responsibilities. To some extent, UNEP's success has led to its own obsolescence because it is no longer equipped to conduct its activities or to serve as the UN system's conscience on environmental issues now that the system has become so robust and decentralized. Recent evaluations suggest that there are administrative overlaps in the system, as institutions have assumed new responsibilities for the environment, as well as inefficiencies in the system. There is also growing disenchantment with UNEP's remote location in Kenya and its lack of resources. Suggestions for improvements focus on reforming UNEP and on the creation of a Global Environmental Organization (GEO). These improvements seemed a more likely political agenda for a U.S. Democratic administration before the 2000 U.S. presidential election.[52]

At present, UNEP lacks the resources to perform all functions effectively and to pressure states to pursue environmentally sustainable policies. UNEP nonetheless has a comparative advantage in the UN system for its scientific expertise and should be preserved as a monitoring and environmental assessment body. UNEP should also help develop rosters of experts for use by governments, international organizations, NGOs, and the private sector for assessing new environmental risks as they are identified. UNEP also has long-standing experience with coordinating loose, decentralized networks around the world. Thus it may still be capable of serving a coordinating function to ensure that the multiple elements of SIRs are coordinated, to anticipate any gaps, and to keep members of international policy networks in touch with one another. It would serve as an air-traffic controller for issues on the international environmental agenda, as well as for the multitude of associated ongoing studies and negotiations.

A GEO should be established to fulfill the policy and technology-based functions that provide institutional support for multilateral environmental governance. A GEO would consolidate environmental policy research, technology databases, and clearinghouses; conduct training; and centralize the secretariats that administer current environmental regimes. Centralizing these secretariats would facilitate the creation of a broader global policy network across specific environmental issues and justify the creation of national environmental embassies to represent states and participate in future negotiations. A GEO could also serve as a legal advocate for environmental protection and regulations to counterbalance the WTO by collecting a roster of international environmental lawyers to participate in WTO panels. The GEO should have high-profile annual ministerial meetings to address all environmental issues to assure widespread involvement in environmental policy networks and galvanize rapid responses to new alerts. Ongoing efforts would continue to be addressed through the existing secretariats and conferences of parties. The GEO could even have a panel of environmental inspectors available to verify compliance by states and firms with MEAs.

Much progress has been made in international environmental policy since Stockholm. The system remains fragile, however, and requires continual support and new recruitment to bolster its many policy networks and to maintain the pressure on governments for continued environmental protection.

NOTES

1. Edward O. Wilson, "On the Age of the Environment," *Foreign Policy*, no. 119 (Summer 2000), p. 34.
2. Michael Grubb et al., *The "Earth Summit" Agreements: A Guide and Assessment, An Analysis of the Rio '92 Conference on Environment and Development* (London: Earthscan and Royal Institute of International Affairs, 1993).
3. James Rosenau, *Turbulence in World Politics: A Theory of Change and Continuity* (Princeton, N.J.: Princeton University Press, 1990).
4. P. J. Simmons, "Environmental Security," in *Routledge Encyclopedia of Political Economy* (London: Routledge, 2001).
5. See Sheldon Kamieniecki, ed., *Environmental Politics in the International Arena: Movements, Parties, Organizations, and Policy* (Albany, N.Y.: SUNY Press, 1993); Miranda Schreurs and Elizabeth C. Economy, eds., *The Internationalization of Environmental Protection* (Cambridge, U.K.: Cambridge University Press, 1997); Martin Jänicke and Helmut Weidner, eds., *Successful Environmental Policy: A Critical Evaluation of 24 Cases* (Berlin: Edition Sigma, 1995); The Social Learning Group, *Social Learning and the Management of Global Environmental Risks* (Cambridge, Mass.: MIT Press, 2001); William Ascher, "Understanding Why Governments in Developing Countries Waste Natural Resources," *Environment*, vol. 42, no 2 (March 2000), pp. 8–18; Ruth Greenspan Bell, "Building Trust," *Environment*, vol. 42, no. 2 (March 2000), pp. 20–32; and Arild Underdal and

Kenneth Hanf, eds., *International Environmental Agreements and Domestic Politics: The Case of Acid Rain* (Aldershot: Ashgate, 2000).

6. See Elinor Ostrom and Robert O. Keohane, eds., *Local Commons and Global Interdependence: Heterogeneity and Cooperation in Two Domains* (Thousand Oaks, Calif.: Sage Publications, 1995); and Oran R. Young, *Governance in World Affairs* (Ithaca, N.Y.: Cornell University Press, 1999).
7. See Ken Conca, "Rethinking the Ecology-Sovereignty Debate," *Millennium*, vol. 23, no 3 (1994), pp. 701–11; Ronnie Lipschutz and Ken Conca, eds., *The State and Social Power in Global Environmental Politics* (New York: Columbia University Press, 1993); and Karen Litfin, ed., *The Greening of Sovereignty in World Politics* (Cambridge, Mass.: MIT Press, 1998).
8. Viktor Sebek, "Bridging the Gap Between Environmental Science and Policy-Making," *Ambio*, vol. 12, no. 2 (1983), pp. 118–20; Martin W. Holdgate, "The Environmental Information Needs of the Decision-Maker," *Nature and Resources*, vol. 18, no. 1 (January–March 1982), pp. 5–10.
9. The number is over 900 if one includes soft law, bilateral agreements, and EU directives. See Edith Brown Weiss, Daniel Barstow Magraw, and Paul C. Szasz, *International Environmental Law: Basic Instruments and References, 1992–1999* (Ardsley, N.Y.: Transnational Publishers, 1999).
10. Richard N. Gardner, *Negotiating Survival: Four Priorities After Rio* (New York: Council on Foreign Relations, 1992), p. 37.
11. Arild Underdal and the Oslo School refer to this class of problems as "malign problems" that are unlikely to yield effective collective responses.
12. Biliana Cicin-Sain and Robert W. Knecht, *Integrated Coastal and Ocean Management: Concepts and Practices* (Washington, D.C.: Island Press, 1998), pp. 32–6.
13. OECD Compendia, UNCSD, "Global Change and Sustainable Development," E/CN.17/1997/3; UNCSD, "Overall Progress Achieved Since the United Nations Conference on Environment and Development," E/CN.17/1997/2/Add.7.
14. Indur M. Goklany, "Factors Affecting Environmental Impacts: The Effects of Technology on Long-term Trends in Cropland, Air Pollution, and Water-related Diseases," *Ambio*, vol. 25, no. 8 (December 1996), pp. 497–509.
15. Early work includes Richard A. Falk, *This Endangered Planet: Prospects and Proposals for Human Survival* (New York: Vintage Books, 1971); and Harold Sprout and Margaret Sprout, *Toward a Politics of Planet Earth* (New York: Van Nostrand Reinhold Company, 1971). Since then the major works of primary research include David Kay and Harold Jacobson, eds., *Environmental Protection: The International Dimension* (Totowa, N.J.: Allanheld Osmun, 1983); Peter M. Haas, Robert O. Keohane, and Marc A. Levy, eds., *Institutions for the Earth: Sources of Effective International Environmental Protection* (Cambridge, Mass.: MIT Press, 1993); Nazli Choucri, ed., *Global Accord: Environmental Challenges and International Responses* (Cambridge, Mass.: MIT Press, 1993); Oran R. Young, ed., *Global Governance* (Cambridge, Mass.: MIT Press, 1997); Marvin S. Soroos, *The Endangered Atmosphere: Preserving Global Commons* (Columbia, S.C.: University of South Carolina Press, 1997); Oran R. Young and Gail Osherenko, eds., *Polar Politics: Creating International Environmental Regimes* (Ithaca, N.Y.: Cornell University Press, 1993); Oran

R. Young, ed., *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms* (Cambridge, Mass.: MIT Press, 1999); Edith Brown Weiss and Harold K. Jacobson, eds., *Engaging Countries: Compliance with International Environmental Accords* (Cambridge, Mass.: MIT Press, 1998); David Victor, Kal Raustiala, and Eugene Skolnikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice* (Cambridge, Mass.: MIT Press, 1999); Mostafa K. Tolba and Iwona Rummel-Bulska, *Global Environmental Diplomacy: Negotiating Environmental Agreements for the World, 1973–1992* (Cambridge, Mass.: MIT Press, 1998); Steinar Andresen et al., *Science and Politics in International Environmental Regimes: Between Integrity and Involvement* (Manchester, U.K.: Manchester University Press, 2000); and Peter Sand, *Lessons Learned in Global Environmental Governance* (Washington, D.C.: World Resources Institute, 1990).

16. See Stephen Hopgood, *American Foreign Environmental Policy and the Power of the State* (Oxford, U.K.: Oxford University Press, 1998); and Robert Paarlberg, "Lagged Leadership," in Norman Vig and Regina Axelrod, eds., *The Global Environment: Institutions, Law, and Policy* (Washington, D.C.: CQ Press, 1999), pp. 236–55. Strong environmental leadership need not lead to positive environmental outcomes. For instance, the United States exercised its leadership in opposing the biodiversity treaty and in seeking to water down a climate change treaty. From the perspective of climate change skeptics conducting policy analysis, the United States is exercising hegemonic leadership to promote social welfare by opposing a set of unwarranted commitments and thus preventing policy based on a diagnosis of a false positive.
17. Paarlberg, "Lagged Leadership."
18. For similar inventories of properties of institutions capable of inducing behavior change by member units, see Haas, Keohane, and Levy, eds., *Institutions for the Earth*; Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge, U.K.: Cambridge University Press, 1990); Young, *Governance in World Affairs*; Weiss and Jacobson, eds., *Engaging Countries*; Ernest Haas, *When Knowledge Is Power: Three Models of Change in International Organizations* (Berkeley, Calif.: University of California Press, 1990); Victor, Raustiala, and Skolnikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments*; see also earlier international institutions literature: John Gerard Ruggie, "International Responses to Technology," *International Organization*, vol. 29, no. 3 (Summer 1975), pp. 557–84; Eugene Skolnikoff, *The International Imperatives of Technology, Technological Development and the International Political System* (Berkeley, Calif.: Institute of International Studies, University of California Press, 1972); and Kay and Jacobson, eds., *Environmental Protection*.
19. Arild Underdal, "The Roles of IGOs in International Environmental Management," in Michael H. Glantz, ed., *The Role of Regional Organizations in the Context of Climate Change* (Berlin: Springer-Verlag, 1994), p. 153. See also Peter M. Haas and Ernst B. Haas "Learning to Learn," *Global Governance*, vol. 1, no. 3 (September 1995), pp. 255–85.
20. See Paul Wapner, *Environmental Activism and World Civic Politics* (Albany, N.Y.: SUNY Press, 1996); Ronnie Lipschutz with Judith Mayer, *Global Civil Society and Global Envi-*

ronmental Governance (Albany, N.Y.: SUNY Press, 1996); Sheila Jasanoff, "NGOs and the Environment," in Thomas Weiss, ed., *Beyond UN Subcontracting: Task-sharing with Regional Security Arrangements and Service-providing NGOs* (New York: St. Martin's Press, 1998), pp. 203–23; Kal Raustiala, "States, NGOs, and International Environmental Institutions," *International Studies Quarterly,* vol. 41 (1997), pp. 719–40; and P. J. Simmons, "Learning to Live with NGOs," *Foreign Policy*, no. 112 (Fall 1998), pp. 82–109.

21. Russell J. Dalton, *The Green Rainbow* (New Haven, Conn.: Yale University Press, 1994).
22. See Riley E. Dunlap, George H. Gallup Jr., and Alec M. Gallup, *Health of the Planet Survey* (Princeton, N.J.: Gallup International Institute, 1992). The countries are Brazil, Canada, Chile, Denmark, Finland, Germany, Great Britain, Hungary, India, Ireland, Japan, Mexico, Nigeria, Netherlands, Norway, Philippines, Poland, Portugal, Russia, South Korea, Switzerland, Turkey, United States, and Uruguay.
23. The Delaney Clause in U.S. pharmaceutical regulations is an early example of such an approach. The Delaney Amendment of 1985 states that no additive shall be deemed safe if it is found to induce cancer when ingested by man or animal. Thus, it sets an absolute regulatory standard, subject to evolving determination of dose-response relationships that cause cancer.
24. Wolfgang H. Reinicke and Francis Deng, *Critical Choices: The United Nations, Networks, and the Future of Global Governance* (Ottawa: International Development Research Centre, 2000).
25. See Naomi Roht-Arriaza, "'Soft Law' in a 'Hybrid Organization': The International Organization for Standardization" in Dinah Shelton, ed., *Commitment and Compliance: The Role of Non-binding Norms in the International System* (Oxford, U.K.: Oxford University Press, 2000); Riva Krut and Harris Gleckman, *ISO 14001: A Missed Opportunity for Sustainable Global Industrial Development* (London: Earthscan 1998); Aseem Prakash, *Greening the Firm: The Politics of Corporate Environmentalism* (Cambridge, U.K.: Cambridge University Press, 2000); Ronie Garcia-Johnson, *Exporting Environmentalism: U.S. Multinational Chemical Corporations in Brazil and Mexico* (Cambridge, Mass.: MIT Press, 2000); and Stephen Schmidheiny with the Business Council for Sustainable Development, *Changing Course: A Global Business Perspective on Development and the Environment* (Cambridge, Mass.: MIT Press, 1992).
26. See Michael Zurn, "The Rise of International Environmental Politics," *World Politics*, vol. 50, no. 4 (July 1998), pp. 617–49. Compare with George W. Downs, Kyle W. Danish, and Peter N. Barsoom, "The Transformational Model of International Regime Design," *Columbia Journal of Transnational Law*, vol. 38, no. 3 (2000), pp. 465–514; and Ronald B. Mitchell, "Structures, Agents, and Processes in International Environmental Politics," in Thomas Risse, Beth Simmons, and Walter Carlsnaes, eds., *Handbook of International Relations* (Thousand Oaks, Calif.: Sage Publications, 2001).
27. Peter M. Haas, "Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control," *International Organization*, vol. 43, no. 3 (Summer 1989); Abram Chayes and Antonia Handler Chayes, *The New Sovereignty: Compliance with International Regulatory Agreements* (Cambridge, Mass.: Harvard University Press, 1995).
28. Sand, *Lessons Learned in Global Environmental Governance*.

29. Tolba and Rummel-Bulska, *Global Environmental Diplomacy*, p. 6.
30. Grubb et al., *The "Earth Summit" Agreements.*
31. Other analysts have similar taxonomies of regime patterns. See Ethan Nadelmann, "Global Prohibition Regimes: The Evolution of Norms in International Society," *International Organization*, vol. 44, no. 4 (Autumn 1990), pp. 479–526; Oran R. Young, *Governance in World Affairs*; and Stacey VanDeveer, "Protecting Europe's Seas," *Environment*, vol. 42, no. 6 (July/August 2000), pp. 10–26.
32. Peter M. Haas, "Scientific Communities and Multiple Paths to Environmental Cooperation," in Anathea Brooks and Stacy VanDeveer, eds., *Saving the Seas: Values, Scientists, and International Governance* (College Park, Md.: Maryland Sea Grant College, 1997), pp. 206–07.
33. From data presented in Bertram I. Spector and Anna R. Korula, "Problems of Ratifying International Environmental Agreements," *Global Environmental Change* (December 1993), pp. 369–81; Peter M. Haas and Jan Sungren, "Evolving International Environmental Law," in Choucri, ed., *Global Accord*, pp. 401–30.
34. Sand, *Lessons Learned in Global Environmental Governance*.
35. The concept of a k-group, introduced by Thomas Schelling, is a small core group of countries that are responsible for enough of a problem that if they reach an agreement, then the problem is likely to be resolved, making it easier for other countries to join the regime out of an anticipation that their costs will not be futile.
36. Tolba and Rummel-Bulska, *Global Environmental Diplomacy*, pp. 17–21.
37. See Patrick Szell, "The Development of Multilateral Mechanisms for Monitoring Compliance," in W. Lang, H. Neuhold, and K. Zemanek, eds., *Environmental Protection and International Law* (London: Graham & Trotman, 1991); Peter H. Sand, *Trusts for the Earth* (Hull, U.K.: University of Hull Press, 1994). UNEP administers twelve trust funds for the Regional Seas Program and CITES. The World Bank administers the Montreal Trust Fund for the ozone regime, while the Global Environment Facility (GEF) exists to finance the international component of projects intended to preserve biodiversity, protect the ozone layer, curtail climate change, control marine pollution, and limit desertification.
38. For UNEP's regional seas experiences, see Peter M. Haas, "Save the Seas," in Elisabeth Mann Borgese et al., *Ocean Yearbook 9* (Chicago: University of Chicago Press, 1991), pp. 188–212; and Peter M. Haas, "Prospects for Effective Marine Governance in the NW Pacific Region," *Marine Policy*, vol. 24, no. 4 (July 2000), pp. 341–48. For acid rain in Europe, see Leen Hordijk, "Task Force on Integrated Assessment Modelling," *Monitair*, vol. 4, no. 6 (October 1991), pp. 8–11.
39. See Ronald B. Mitchell, "Compliance Theory: A Synthesis," *Review of European Community and International Environmental Law*, vol. 2, no. 4 (1993), pp. 327–34; and Ronald B. Mitchell, "Compliance Theory: An Overview," in James Cameron, Jacob Werksman, and Peter Roderick, eds., *Improving Compliance with International Environmental Law* (London: Earthscan, 1996), pp. 3–28; and Ruth Greenspan Bell, "Developing a Culture of Compliance in the International Environmental Regime," *The Environmental Law Reporter*, vol. 27, no. 8 (August 1997), pp. 10402–12.

40. Harold K. Jacobson and Edith Brown Weiss, "Assessing the Record and Designing Strategies to Engage Countries," in Jacobson and Weiss, eds., *Engaging Countries*, pp. 511–54; and Kal Raustiala and David G. Victor, "Conclusions," in Victor, Raustiala, and Skolnikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments*, pp. 659–707. Young, ed., *The Effectiveness of International Environmental Regimes*, provides a similar analysis.
41. See Peter M. Haas, "Choosing to Comply: Theorizing from International Relations and Comparative Politics," in Dinah Shelton, ed. *Commitment and Compliance*, pp. 43–64; and Peter M. Haas, "Compliance with EU Directives," *Journal of European Public Policy*, vol. 5, no. 1 (March 1998), pp. 17–37.
42. Harold K. Jacobson and Edith Brown Weiss, "Assessing the Record and Designing Strategies to Engage Countries," in Jacobson and Weiss, eds., *Engaging Countries,* pp. 511–54.
43. Ibid., pp. 520–21.
44. See Kal Raustiala and David G. Victor, "Conclusions," in Victor, Raustiala, and Skolnikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments*.
45. Edith Brown Weiss, "Concluding Remarks," in Dinah Shelton, ed., *Commitment and Compliance*.
46. Ronald B. Mitchell, "Regime Design Matters," *International Organization*, vol. 48, no. 3 (Summer 1994), pp. 425–58; and Ronald B. Mitchell, *International Oil Pollution at Sea* (Cambridge, Mass.: MIT Press, 1994).
47. Peter H. Sand, "Introduction," in Peter H. Sand, ed., *The Effectiveness of International Environmental Agreements* (Cambridge, U.K.: Grotius Publications, 1992), pp. 13–14; U.S. General Accounting Office, *International Environmental Agreements Are Not Well Monitored* (Washington, D.C.: U.S. General Accounting Office, January 1992).
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49. Margaret Keck and Katherine Sikkink, *Activists Beyond Borders: Advocacy Networks in International Politics* (Ithaca, N.Y.: Cornell University Press, 1998).
50. Steve Charnovitz, "Trade Measures and the Design of International Regimes," *Journal of Environment and Development*," vol. 5, no. 2 (June 1996), pp. 168–96.
51. David Victor, "The Operation and Effectiveness of the Montreal Protocol's Non-Compliance Procedure," in Victor, Raustiala, and Skolnikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments*, pp. 137–76.
52. See Frank Biermann, "The Case for a World Environment Organization," *Environment*, vol. 42, no. 9 (November 2000), pp. 22–31; Calestous Juma, "The UN's Role in the New Diplomacy," *Issues in Science and Technology*, vol. 17, no. 1 (Fall 2000), pp. 37–8; Dan Esty, "The Case for a Global Environmental Organization," in Peter B. Kenen, ed., *Managing the World Economy: Fifty Years After Bretton Woods* (Washington, D.C.: Institute for International Economics, 1994), pp. 287–309; and Dan Esty, "An Earthly Effort," *Worldlink* (September/October 2000), available at <http://www.worldlink.co.uk/stories/storyReader$334>.

SUGGESTED ADDITIONAL READING

See also Peter H. Sand's recommended readings on nature conservation.

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Zurn, Michael. "The Rise of International Environmental Politics." *World Politics*, vol. 50, no. 4 (July 1998), pp. 617–49.

Internet sites

International Treaties and Institutions

The Interlinkages Initiative: Synergies and Coordination Between Multilateral Environmental Agreements <http://www.geic.or.jp/interlinkages/>

Yearbook of International Cooperation on Environment and Development <http://www.ngo.grida.no/ggynet/>

Environmental Treaties and Resource Indicators (ENTRI) at the Center for International Earth Sciences Information Network (CIESIN), of Columbia University, New York <http://sedac.ciesin.org/entri/texts-home.html>

International Institutions

UN Environment Program (UNEP) <http://www.unep.org>
Rio Plus 10: The World Summit on Sustainable Development <http://www.un.org/rio+10>
UN Commission on Sustainable Development (UNCSD) <http://www.un.org/esa/sustdev>
World Bank <http://www.worldbank.org>
Intergovernmental Panel on Climate Change (IPCC) <http://www.ipcc.ch>
Global Environment Facility (GEF) <http://www.gefweb.org>
U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs <http://www.state.gov/www/global/oes/index.html>

Global Environmental Assessments

Global Environment Outlook, UNEP <http://www.unep.org/Geo2000>
World Conservation Monitoring Centre <http://www.wcmc.org.uk>