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Improving Compliance with the Climate Change Treaty

■ **RONALD B. MITCHELL**

*Department of Political Science
University of Oregon*

■ **ABRAM CHAYES**

*Harvard Law School
Harvard University*

Most of the analytic and negotiating energy surrounding the development of a climate change treaty has focused on substantive limitations on net emissions of greenhouse gases, whether through targets and timetables, emissions permits, taxes, or technological standards. But no matter how stringent these commitments are, the treaty will not succeed unless the parties comply with them. The compliance problem must be addressed from the outset and a compliance system must be designed into the treaty from the beginning. In the climate change arena, the costs and magnitude of required behavioral changes, and the regulatory breadth and complexity, pose especially difficult compliance problems. Moreover, unlike most international agreements, which seek to affect only the actions of governments, a successful climate change treaty must alter the behavior of ordinary individuals and business firms whose activities account for the emission of greenhouse gases. The treaty must encourage national governments not only to comply with its provisions by adopting legislation and other appropriate policies, but also to take action to facilitate compliance and condemn violations of private actors within their own borders.

Numerous international and national factors influence whether a nation complies with a given rule of a given treaty at a given time—for example, the distribution of international power or the administrative efficiency and constitutional structure of the parties.¹ These factors bound

the aggregate level of compliance that can be expected under a treaty. This chapter focuses on the international rules, policies, and processes through which international organizations, states, corporate entities, and nongovernmental actors can influence the level of compliance with a specified treaty.

With respect to compliance, nations and subnational actors can generally be divided into three categories. First, some nations will have incentives and abilities that lead them to comply with a given treaty rule independent of the systems established to identify and respond to noncompliance. Thus, for example, many OECD countries have already committed themselves to reducing their greenhouse gas emissions. Given their domestic environmental concern and their ability to pay the costs involved, these states seem likely to reduce greenhouse gases on the schedules and in the ways required by international regulation.

Second, for some nations compliance will be contingent on the type and likelihood of responses to noncompliance institutionalized in the international regime. Included in these nations are those that desire to comply but lack the financial and administrative resources to do so and those that believe themselves to be marginally better off by not complying with the treaty so long as no significant costs attend violation and no major financing is provided for compliance.

Third, some nations will have incentives and abilities that will lead them either to not sign an agreement or to sign and violate the agreement independent of the systems established to identify and respond to noncompliance. Malaysia's opposition to certain terms of the forestry principles that were under negotiation at UNCED in June 1992 is one example.²

Which of these categories a state falls into is not foreordained. Where a nation falls depends on how the rules are framed, the direct costs and benefits of compliance, the expected actions of other international actors, domestic political forces, the degree of dependence on other states, and the nation's infrastructure and resources. Whether actors in the second category actually comply will depend on the structure of the compliance information and response systems. Thus, effective implementation requires a coherent and integrated approach that addresses all three types of actors. An integrated approach will make initial compliance likely, will identify and respond appropriately to noncompliance when it occurs, and will recognize those actors whose behavior will remain unchanged under the treaty and make the other elements of the system robust to such free-riding.³

This chapter examines the policy options available for the creation of a successful compliance system for a climate change regime and the obsta-

cles that stand in the way. We organize our analysis around the three questions suggested above.

- How can negotiators design the rules and procedures to elicit the highest possible compliance levels?
- What kind of information and monitoring system will provide information about the status of treaty-related behaviors?
- What kinds of response are appropriate in cases in which the information discloses a failure to comply with treaty commitments?⁴

We then discuss the institutional structure needed to implement an effective compliance system and assess the likelihood that the FCCC signed in Rio de Janeiro in 1992 will foster the development of such a structure. We conclude by recommending that policymakers design, and dedicate resources to, a compliance system that emphasizes efforts to make compliance easier for actors predisposed to comply while seizing less frequent opportunities to alter the incentives and capacities of those disinclined to comply.

RULES TO MAXIMIZE THE PREDISPOSITION TO COMPLY

Most discussions of what greenhouse gases to regulate are based on the contributions of a gas to global warming.⁵ They are also based on which economic sectors produce the greatest share of a given gas.⁶ To the extent that these discussions address compliance at all, they usually specify a gas or activity to regulate independent of compliance considerations and assume that monitoring and enforcement systems can be developed to maximize compliance. But the effectiveness of a rule in regulating climate change depends not only on its potential for reducing greenhouse gases under conditions of perfect compliance, but also on the level of actual compliance.

The choice of what gases to limit, which sources of emissions to regulate, and how to frame the regulations determines who must comply and how much compliance is likely. That choice, in turn, requires answers to two subsidiary questions: First, which economic actors and sectors responsible for emissions of a given greenhouse gas are most likely to alter their behavior in response to national efforts to legislate, implement, and enforce international treaty commitments? Second, which nations are most likely to have the incentives and ability to legislate, implement, and enforce such policies?

FIGURING WHICH SECTORS ARE LIKELY TO COMPLY

The most obvious determinant of an actor's compliance is the cost of adjusting behavior to meet the mandated requirements: the net cost of the changes required to come into conformance with the rule, the cost of alternative means of achieving the economic goal at lower emissions levels, and the value of any benefits from the shift in behavior. Companies or individuals with large resources will be more capable of bearing such costs, and, if they are high-visibility actors concerned about their public reputations, as with many multinational corporations, they will also have stronger incentives to do so. Producers can ordinarily pass on the costs to consumers and thus have fewer disincentives to comply. Actors facing less economic competition, and those who can readily perceive violations by competitors, will be more likely to comply because their own compliance is less likely to place them at an economic disadvantage. Finally, actors who are already regulated in other arenas or involved in existing informational infrastructures may be more likely to comply because they are more likely to be aware of the rule and its requirements and to be embedded in a culture and habit of compliance. Public utilities in the United States, for example, already face considerable regulation, including extensive monitoring, and stay abreast of new regulations as they are promulgated. In contrast, farmers in many developing countries may face very few regulations and be unaware of those they do face because they lack access to newspapers and other means of informing them of regulations, which are often taken for granted in other settings.

In regulating emissions of a given gas, policymakers may have wide latitude in selecting a point in the pollution production process, and therefore which actors, to regulate. As one example, electricity-related carbon dioxide emissions could be reduced by limiting use of fossil fuels by power companies, by mandating efficiency standards for appliance manufacturers and building contractors, or by requiring power consumers to conserve energy. Actors farther upstream in the pollution production process generally have fewer disincentives to compliance.⁷ Compliance would be facilitated most by limiting the fossil fuel use of power companies, which most countries strictly regulate and which are quasi-monopolies that can readily pass on increased costs to consumers.

INDUCING NATIONS TO IMPLEMENT TREATIES

A country's compliance decision will be driven in part by the perceived costs and benefits of implementing and enforcing their international obligations. Climate change commitments may provide the additional impetus for some states to undertake actions that have other significant ben-

efits but that were not otherwise politically possible. Thus, for example, a climate treaty may make gasoline taxes, which can reduce energy dependence and provide revenues, more attractive in energy-importing states. A country's ability to pay the costs of compliance also will influence the compliance decision, so that developed countries may be more likely than developing countries to meet their obligations. Domestic politics will shape the perception of whether the benefits of a regulation outweigh its costs, so that the breadth and power of domestic environmental lobbies relative to those actors targeted by the regulation will be an important factor.

Other considerations will determine whether a regulation, once adopted, is likely to lead to national compliance with international commitments. Different regulatory approaches may have quite different outcomes. For example, even though actors may be more likely to comply with a carbon tax than with command-and-control or emissions-trading policies, taxes are inherently less certain with respect to total emissions and may therefore lead to inadvertent national-level noncompliance.⁸ Second, different political cultures may make what is apparently a more effective regulatory system politically unacceptable in a country. Thus, while Finland and Norway have adopted carbon taxes, the United States has found it difficult to adopt such a policy.⁹ Third, many countries, especially in the developing world, may simply lack the administrative and informational infrastructures necessary to translate well-designed legislation into real behavioral change. Akin to the efforts for transferring "appropriate technology" during the 1970s, the 1990s may see a need for "appropriate environmental policies" that take into account the informational and resource limitations that inhibit regulatory efforts in developing countries. The power to control relevant economic actors, which is often taken for granted in industrialized countries, may be doubtful when small developing nations seek to control the actions of multinational corporations.

Successful regulations must take into account compliance factors at the actor, sector, and national levels. For example, recent policies and negotiating positions suggest that the interests and capacities of the members of the OECD make them significantly more likely to comply with climate change treaty commitments than developing countries and former members of the Soviet Union. If this inference is true, a treaty requiring reductions in a greenhouse gas primarily produced by OECD countries (for example, carbon dioxide) will produce greater actual greenhouse gas reductions than would an otherwise equivalent treaty that required reductions in a greenhouse gas primarily produced by developing states (for example, methane).

For example, methane emissions from rice cultivation occur mainly in China and India, two countries unlikely to comply with climate change rules without large financial transfers. However, the regulation of oil consumption will probably elicit higher compliance: oil companies are more regulated and better informed of new regulations, and they operate in countries more likely and able to enforce fuel consumption targets or carbon taxes.

The point here is not to recommend a specific regulatory form, but rather to encourage careful comparison of alternatives on the basis of their compliance implications, avoiding the frequent assumption that the level of compliance will be equal for all possibilities. Compliance is rarely the only, or even the primary, goal of policymakers. Indeed, they will assuredly promulgate limits on certain activities despite low compliance. The framework presented here can help provide policymakers with a general assessment of the likelihood of compliance for alternative policies. This assessment can help them select activities for initial regulation, so that the climate change regime will develop a record of successful regulation and thus foster subsequent regulatory efforts.

AN EFFECTIVE COMPLIANCE INFORMATION SYSTEM

An effective compliance information system (CIS) facilitates compliance with a climate change agreement in several ways. First, it helps distinguish noncompliance due to inadvertence and lack of attention to the issue from willful violation. Second, the threat of peer pressure and adverse world public opinion implicit in the collection and dissemination of information may act as a deterrent to violation. Indeed, the Sustainable Development Commission relies exclusively on publicizing noncompliance data to foster implementation of Agenda 21.¹⁰ Third, an effective CIS identifies those actors uninfluenced by these first two factors, so that measures can be taken to bring them back into compliance.

To achieve these objectives, the CIS must have four components: rules that can readily be verified, a national-level self-reporting system, some form of independent verification system, and a capability to analyze the data that are generated.¹¹

DEVISING RULES AMENABLE TO VERIFICATION

The transparency or verification suitability of a given activity that contributes to global warming depends on the nature of the activity and the

ability to observe that activity.¹² Factors that influence ease of verification include the number of sources of a given gas; their size, mobility, and accessibility; the concentration of sources; the continuity of emissions; the ease and accuracy with which emissions may be imputed from factor inputs; and the technical capacity to measure emissions.¹³ Ideally, regulated emissions would be confined to a few large, concentrated, stationary, readily observable sources that produce continuous emissions which vary little for a fixed amount of inputs. This model suggests not only which gases to regulate to achieve transparency but also where in the emissions cycle to regulate.¹⁴ For example, although the Montreal Protocol nominally limits both production and consumption of ozone-depleting substances, the secretariat will collect data only on national production of, and trade in, CFCs because these are far more transparent than CFC consumption.¹⁵

The form of the treaty norm will also influence transparency. As arms control negotiators have argued for years, banning an activity completely rather than specifying a numerical limit makes the detection of noncompliance much easier.¹⁶ Infractions of quantitative limits, like those in the Montreal Protocol, are more observable than qualitative limits, like the Wetland Convention's requirement that signatories make "wise use" of wetlands.¹⁷ Compliance with the FCCC's various requirements that nations "cooperate" to mitigate climate change will prove impossible to verify in the absence of flagrant bad faith. Drawing clear and specific lines between compliance and noncompliance makes the activity not only more transparent to others but also to the actor itself, thus making compliance easier.¹⁸

Detecting a violation, however, may not be equivalent to identifying a violator. Negotiators often paper over conflicts by using the passive voice to avoid assigning responsibility for meeting an obligation to a particular actor.¹⁹ A climate change treaty may bind national governments to meet emissions targets, but some governments may have only limited direct control over the largely corporate and individual actors responsible for those emissions.²⁰ Rules that link fossil fuel consumption with emissions may prove sufficiently accurate to identify national-level breaches of emissions targets, but they are unlikely to prove adequate in most legal systems to authorize prosecution of an individual power plant.²¹ This situation hinders efforts to identify noncompliance. While treaties generally place obligations on governments, these obligations often must be performed by private corporate and individual actors. Treaties could facilitate compliance by prescribing or proscribing specific actions—for example, a ban on new constructions of coal-fired power plants. While

unlikely at present, such regulations would permit easier identification of violations and violators.

ESTABLISHING A SELF-REPORTING SYSTEM

Self-reporting is the primary basis for most existing environmental treaties. It is a major component of the FCCC and the Sustainable Development Commission.²²

A successful self-reporting system would elicit from all member nations prompt and regular reports with high-quality, compliance-relevant information that is comparable over time as well as across nations. The system should seek to develop a time-series database that identifies baseline levels for activities that already are, or might reasonably become, regulated. Since for many gases compliance will be defined relative to a specified baseline, the data needed to identify that baseline must be developed. To this end, the reporting of historical data should be encouraged. Data collection procedures should be standardized to facilitate reporting and to achieve comparability.²³ Reports should reflect government enforcement against private actors for violations of domestic legislation implementing the treaty. Reports should identify the sources of noncompliance so that proper policy responses can be developed.

The need for a high-quality reporting system has become part of the conventional wisdom.²⁴ However, several recent studies have demonstrated that compliance with the reporting provisions of environmental treaties cannot be assumed.²⁵ Little attention has been paid to how the amount and quality of international reporting can be maximized. Indeed, reporting provisions pose compliance problems that require increasing the incentives and ability of nations to report.

INCREASING THE INCENTIVES AND CAPACITY TO REPORT

A self-reporting system must overcome inherent disincentives of the members to report their own violations or noncompliance accurately. To this end, the treaty organization must seek to demonstrate the importance of frequent, high-quality reporting to the goals of the treaty.²⁶ Ensuring that discussion and analysis of the reports occur at annual meetings can help, as can high-quality use of the data in annual reports. The reporting format should require governments to explain the reasons for any failures to meet treaty norms. States are more likely to report noncompliance when they believe that it will be met with efforts to assist in their achieving future compliance rather than with sanctions for past noncompliance.

Achieving a high-quality reporting system requires that a standardized report format be developed early and thoughtfully. Questions should be framed in terms that allow subsequent verification of compliance behavior. All necessary data should be requested explicitly.²⁷ The report format should allow comparison of data across countries. In a climate change agreement, this provision for comparability would require reporting on the sectors covered in emissions estimates and the basis for measurement and conversion.²⁸ The data to be collected and the conversion factors to be used should be explicitly delineated on the form itself.²⁹ States should be required to report even during periods of nil activity so that noncompliance with reporting provisions can be distinguished from substantive noncompliance.³⁰

To the extent possible, the reporting system should be integrated into the standard operating procedures of the responsible national bureaucracies and should rely on modifying existing domestic information infrastructures rather than on creating new ones. Combining a requirement that nations designate offices for reporting data with an interactive computerized reporting system would greatly improve both the quality and the amount of reporting.³¹ Computers and modems provide a direct link and a sense of a real presence of the international organization within national governments, raising the perceived importance of reporting and the dedication to it. Developed countries could provide developing countries with needed hardware and technical assistance. A computerized system would reduce the need to disseminate forms and, if coupled with an electronic mail system, would allow interactive questioning to correct obvious errors, clarify ambiguities, and secure additional information. An electronic system would also make it easier to improve the clarity and usefulness of the form.³² Finally, reporting in electronic formats would encourage compliance by making analysis and dissemination easier, and hence more likely.

Regardless of how well the information system is designed, major problems will exist in the ability of nations to compile the necessary data on emissions. For example, many obstacles exist to the estimation of emissions of gases from large-area sources, such as biomass burning or methane from rice cultivation, and accurate estimation is almost impossible.³³ The numerous complex data requirements of a climate change treaty make it likely that many countries will not be able to provide many data elements for some time. Countries should be encouraged to identify those data elements that they are unable to provide and the obstacles they encountered.

States frequently fail to report because of a lack of resources or a lack of attention to the issue. Developed countries should provide technical advice so that the information-intensive requirements of a climate change agreement can be met in developing countries that currently lack the necessary information infrastructure and resources. The Montreal Protocol provides for technical and financial assistance that could be used to improve required reporting.³⁴ Claims for financial assistance could also be made conditional on good faith efforts to comply with reporting requirements for some specified number of years prior to receiving funding.

VERIFYING NATIONAL REPORTS

Because the incentives against self-incrimination will lead to some failures to report or to false reports, an independent verification system is a necessary element of an effective CIS. Political and practical constraints dictate that such a system be limited primarily to identifying major treaty breaches. Four different models for the independent identification of noncompliance with environmental treaties either have been proposed or are in use. The systems could be used together.

The first model involves combining "national declaration systems and an international verification system which can largely dispense with measuring systems."³⁵ The regime on Long-Range Transboundary Air Pollution has successfully used such a system.³⁶ The LRTAP system compares national reports of sulfur and nitrogen oxide emissions to its organization's own emissions calculations on the basis of analysis of statistics on fossil fuel consumption.³⁷ This method has been frequently proposed as the major means of verifying compliance with the carbon dioxide component of a climate change agreement. Whether such independent verification can be used will depend on the types of gases and activities regulated by the regime.

A second model for independent identification of noncompliance uses cooperative on-site monitoring procedures when information developed through self-reports, satellite observation, NGOs, and the like raises concern among other parties. The Sustainable Development Commission includes plans for such a system.³⁸ Parties would agree in advance to an on-site inspection in such cases. If inspections were not perceived as punitive but rather as a way to assist nations to meet their international commitments, acceptance of the request would appear likely. The secretariat for the Wetlands Convention has conducted over twenty voluntary on-site wetlands inspections since the monitoring procedure was established in 1989. No request under this procedure has yet been refused.³⁹

A third verification model is the use of nonintrusive data collection that does not require the cooperation of the suspect country.⁴⁰ Satellites and reconnaissance aircraft have been frequently proposed as providing means for identifying major breaches of a deforestation treaty or a climate change agreement (for example, as a way to measure emissions due to agricultural activities). While several countries already have remote-sensing satellite capabilities or will soon, many obstacles prevent their use for accurate verification of reported data or for independent detection of extensive clear-cutting or other land-use changes.⁴¹ Numerous legal, economic, and political questions also may hinder an international organization from gaining access to satellite, aerial, or land-based data obtained by national governments or private companies. Satellites may prove most useful in connection with agreed inspection systems used in the second model described above.⁴²

Fourth, if international concern about the impacts of global warming becomes sufficiently intense, it may be possible to institute challenge inspections that sacrifice some national sovereignty to achieve greater international environmental protection. Major movement in this direction appears unlikely at present, but if and when opportunities arise, it will be important to take advantage of them to begin to change the international legal system.

Apart from the treaty organization, individual states, through the operation of national statistical or intelligence services, may develop information that can be used to verify reports submitted under treaty requirements. Similarly, NGOs can supplement these systems. NGOs and industries often have the incentives, the financial resources, and the informational infrastructure to identify cases of noncompliance. Information generated by national governments or by NGOs must be checked against less partisan sources, but it provides an important method for priming the informational pump.⁴³

ANALYZING COMPLIANCE INFORMATION

None of the data collected, whether from national reports or independent sources, will facilitate compliance unless they are analyzed to determine whether violations occurred, and if so, what the causes were and who was responsible. Such an analysis is often beyond the capabilities of the treaty organization. Significant effort is also needed to make the data comparable across countries and across time, so that trends can be identified and marked deviations noted.⁴⁴ Effective analytic capability implies an ongoing process of inquiry to clarify confusions and ambiguities, to raise the salience and importance of reporting and compliance, and to help avoid false accusations of violation.

It is often a matter of controversy whether the data produced show that the country is not in compliance. To give one example, in June 1992 NASA released satellite photos of the U.S. Pacific Northwest, claiming that clear-cutting was threatening "the ability of the forests to support a diversity of species." The USDA Forest Service responded that "it is misleading to make judgments about forest practices based on pictures from space."⁴⁵ Thus, even domestically, satellite data may be open to significantly different interpretations. Decisions about whether specific information is sufficient to warrant a response or even further investigation are ordinarily made by the political organs of the treaty organization.

The analytic process itself is not just a matter for the organization's staff. Compliance reports and analyses must become an important agenda item at regular meetings. The integration of this information into meeting structures is essential both to emphasize the importance of reporting and compliance and also to ensure that a regular process is established by which the sources of noncompliance can be identified and corrected. The process should include provision for disseminating the results as widely as possible. Publicity is the key basis on which positive political rewards will be bestowed on those fulfilling their international commitments, on which assistance will be provided to those failing to do so because of a lack of resources, and on which sanctions will be brought to bear on those intentionally violating the terms of an agreement. The Sustainable Development Commission's planned reliance on publicizing noncompliance information confirms the importance placed on dissemination as an essential element in altering behavior.

THE REMAINING OBSTACLES

Several factors are likely to prevent the development of a fully effective CIS, despite the best efforts of the treaty organization. The inherent disincentive to self-incrimination poses a continuing obstacle to a successful self-reporting system. Compliers and noncompliers seeking financial assistance may well report. Intentional noncompliers and nonsignatories will not.

Technical and financial obstacles to conclusive, nonintrusive data collection and political resistance to inroads on sovereignty will likely preclude intrusive inspections necessary to verify compliance. Reliance on rule-of-thumb calculations rather than on accurate emissions measurement, as will be required for some time given current measurement technologies, will also hamper the identification of states that have violated the agreement. Similarly, the definitions of compliance will likely be too vague, at least during the initial years, to support charges of noncompliance.

In short, given the low costs of violations to the regime and the high costs of detecting them, it will not be surprising if the initial years of a climate change treaty are spent in trying to refine the rules rather than to ensure compliance with those already established.

THE NONCOMPLIANCE RESPONSE SYSTEM

Noncompliance due to inadvertence or incapacity and noncompliance caused by more or less deliberate violation of the agreement are two different kinds of conduct and suggest quite different responses. Noncompliance should be met with positive efforts to facilitate and encourage compliance by removing knowledge and resource barriers, by reducing the costs of compliance, or by increasing the ability to pay them. Violation might warrant some form of sanctions to alter the incentives and make violation less attractive.⁴⁶

These two types of response can also have quite different actors as their targets. The compliance system has both a national and a subnational component. Responses either can seek to get nations to take steps to induce compliance by their own corporate and individual citizens or, in certain cases, can seek to directly affect the choices of nationals of other countries through market-based measures, including establishing direct links between compliance and market access.⁴⁷

FACILITATING AND ENCOURAGING COMPLIANCE

Inadvertence (mistakes, lack of knowledge of requirements, or inadequate capacity to fulfill them) can be a major source of noncompliance. The response to this type of noncompliance must address its source.

Actors, be they nations, corporations, or individuals, are often unaware of the existence, nature, and cheapest means of complying with new regulations, especially when the regulated activities involve numerous, widely dispersed actors unconnected to existing information infrastructures. Thus, one source of noncompliance with a deforestation treaty would certainly be the failure to inform the poor and often illiterate peasants who cut trees for firewood and who clear agricultural land. Even if they are aware of new domestic limits to tree cutting, compliance will be unlikely unless they can be educated about culturally consistent alternatives for making a living without cutting trees. Monitoring procedures involving site visits, training programs, and seminars may provide opportunities for informing the responsible actors of what their commitments are and how they can most readily comply with them.

Valuable forums for communication can be provided by conferences of bureaucrats responsible for national implementation of a treaty; representatives from economic sectors that must comply; legal, policy, and technical experts; and treaty organization staff. Interchange between those responsible for devising rules and procedures to regulate climate change and those responsible for enforcing and complying with them is an important first step toward removing the barriers to compliance.

Compliance can be facilitated by the provision of technical advice to countries that are making efforts but that are nonetheless failing to achieve compliance.⁴⁸ As with the monitoring procedure, technical advisers with broad field experience can help countries devise cheaper and more effective means of achieving compliance and of conducting national-level enforcement activities. Lessons learned in one country may be applicable in others. Similarly, when new technologies become available, at-cost transfers to developing countries can ensure that they are adopted as widely as possible.

The most frequently discussed and most expensive means of encouraging states to comply is direct financial transfers conditioned on nations undertaking activities that will improve compliance. A modest compliance fund has been established under the Montreal Protocol. Funding might be provided for the technology transfers discussed above, for administrative programs to improve the effectiveness of human resources, or for capital projects. One frequent suggestion is that an international fund be established to which industrialized states would contribute and from which developing states would receive funds to cover the costs of compliance. Financing could also occur bilaterally, perhaps with an international organization as a clearinghouse, although this would probably mean fewer funds for developing countries. In any case, the magnitude of the required funding will be a major political issue in the legislatures of developed countries.

Thus far, developed countries have been unwilling to make commitments to provide funding to ensure compliance by developing states.⁴⁹ Even if they did, these commitments would face the same type of compliance and enforcement problems discussed in this chapter. The Sustainable Development Commission will address this problem by monitoring compliance with the financial and technology transfer provisions as well as with the substantive provisions of Agenda 21 and other environmental agreements.⁵⁰

Businesses may prove a valuable source of resource and technology transfers to developing countries. If national and international laws create

positive incentives for businesses to finance specific projects that reduce greenhouse gases or to provide at-cost or free technology and capital equipment, they could provide a valuable source of funding. Regulations that require businesses to reduce their own emissions or finance an equivalent emissions-reducing project in another country may prove politically acceptable where direct funding by the taxpayer would not.

Finally, NGOs have shown themselves willing and able to organize financial resources for transfer to developing countries in exchange for more environmentally beneficial programs, for example, debt-for-nature swaps.⁵¹ International treaties could facilitate such transfers by incorporating provisions that create a clearinghouse for requests for and offers of assistance and by removing obstacles that make banks reluctant to agree to the terms of such agreements.

In any case, those who fund projects to help actors comply need assurances that the project's terms will be met. Whether funded by an international climate change fund, the World Bank, a corporate tree-planting project as part of an emissions-trading scheme, or an NGO debt-for-nature swap, the funders will want to know whether the project was properly implemented. Corruption and inefficiency in some countries and the difficulty of auditing the use of funds make it very likely that some projects will not be completed, will run over budget, or will not result in the desired improvement in compliance. In short, efforts to facilitate and encourage compliance must be sufficient in size and appropriate to the source of the noncompliance. They must also lead to the expected changes in behavior.

SANCTIONING VIOLATIONS

Many authors bemoan the absence of strong enforcement provisions in a climate change treaty as well as in other environmental accords. They want a treaty with teeth.⁵² If "sanctions" refers only to coercive economic and military measures to punish past transgressions and deter future violations, in the manner of domestic criminal law, the likelihood of a treaty with teeth is slight.⁵³ But sanctions may denote a wider array of possible responses. They can be either formal or informal, can be imposed by both state and nonstate actors, and can consist of nothing more than having to respond to questions regarding the alleged violation.

Increasing the perceived costs of violations begins with publicizing the violations when they occur. One of the most common forms of jawboning and shaming is the discussion of infractions at annual meetings of parties to the treaty, which requires the country concerned to explain and justify

its conduct. The Sustainable Development Commission appears to be focused on just such efforts.⁵⁴ Publicity coupled with strong domestic political pressures to appear "green" led many states to adopt more environmental positions after ministerial meetings under the North Sea agreement.⁵⁵ The blacklisting of violators can prove costly to corporations that value their public image or states that want good relationships with their neighbors.⁵⁶ At the subnational level, NGOs often disseminate information on violations through their publications and the news media, which can lead to consumer boycotts of an offending country or company.⁵⁷

Despite the obvious sanctioning opportunities that publicity provides (or perhaps because of them), many international environmental organizations do not publicize information regarding countries or companies that fail to meet their treaty commitments. For example, the parties to the Memorandum of Understanding on Port State Control have consciously chosen not to make public the names of oil tankers caught violating oil pollution treaty regulations because of concerns over liability for false information and potential antitrust implications. They also conspicuously avoid publishing state-by-state inspection statistics in annual reports, presumably because of diplomatic unwillingness to embarrass other countries, despite the Memorandum of Understanding requirement that states inspect 25 percent of the ships entering their ports.⁵⁸ On the other hand, it is equally important to verify data provided by NGOs before using them as the basis for negative publicity. Thus, although publicizing data on noncompliance may be an important form of deterrence, legal concerns and political barriers to the use of such data must be addressed.

Selective taxes provide another means to increase the costs of violations. Taxes at the domestic level can serve as "graduated" penalties to deter production of a given greenhouse gas by increasing the costs of producing the emissions. Carbon taxes, which have been heralded as a means of inducing private actors to decrease their greenhouse gas emissions, seem more likely to be used as a domestic rather than an international policy tool. A frequently touted advantage of a carbon tax is that it can piggyback on existing domestic tax collection systems, interceding at points of existing market transactions.⁵⁹ At the international level, however, no such infrastructure exists, and it seems highly unlikely that states will grant such taxation powers to an international body. Similarly, some authors have proposed that fines should be used to enforce emissions limits.⁶⁰ In the domestic context these may be appropriate, although often they are not the most effective way of inducing compliance with regulatory requirements. At the international level, however, there is no adjudicative or collection infrastructure to implement such a measure and

little likelihood that the power to impose fines would be granted to an international body.

One way of dealing with these difficulties would be a treaty provision that a multinational corporation could be taxed in its "home" country for activities conducted elsewhere if the host country failed to tax it for that activity. Similar arrangements could be instituted for fines for violations. Such provisions would increase incentives for host countries in the developing world to tax or fine companies since, if they did not, the developed home country would. This taxation method would also allay the fears of home countries that levying such taxes or fines would place a host country at a competitive advantage. These measures would be available, however, only between states that were parties to the treaty.

Environmental treaties often impose limitations on trade in goods that are prohibited by the treaty, such as endangered species or CFCs. At least nineteen environmental treaties authorize some form of trade measures in support of their provisions.⁶¹ Taxes could be imposed on imports from countries failing to sign or comply with a climate change agreement.⁶² In the case of major multinational corporations found in violation of an agreement, similar taxes could be imposed on their imports. Such sanctions would raise serious problems, however, not only under the GATT, but also under bilateral commercial treaties and other agreements providing for most-favored nation status or national treatment of imports. While various proposals were made for the climate change convention to provide for trade sanctions against nonsignatories and noncompliant parties, it is not surprising that the final FCCC did not include such provisions. Widespread use of trade sanctions to enforce environmental agreements is unlikely until nations resolve the larger issue of free trade versus environmental protection.

It has been suggested that the World Bank and the IMF might discontinue loans or progress payments on the basis of compliance with treaty rules on climate change. The World Bank's rules already provide that it will not finance a project that conflicts with an international environmental obligation of the borrowing state. However, broader financial sanctions would probably require changes in the charters of the lending institutions, which now require decisions to be based solely on economic considerations.

In any case, experience with economic sanctions in other issue areas shows that they do not provide an easy mode of enforcing international obligations.⁶³ Ordinarily, the ability to impose economic costs large enough to be effective depends on widespread cooperation among a large number of states and on the inability of the sanctioned state to skirt these costs. It

is very difficult to mobilize this kind of cooperation, and even then, as the case of Iraq shows, the target country can hold out for a long time.

The most effective sanctions are likely to be those that are directed at violating companies, rather than at countries, and that prevent the company from conducting business in a country that is one of its major markets. Fines and taxes can be incorporated into the cost of doing business, but the limitation of operational access to major markets poses a far more potent threat. For example, many tanker operators continued to discharge oil at sea even though this practice subjected them to the possibility of a fine, but the threat of having their tankers detained in port or denied entry for noncompliance led most tanker owners to comply with expensive requirements for segregated ballast tanks and other equipment.⁶⁴ Sanctions imposed directly against businesses skirt contentious sovereignty issues, which often provide the rationale, if not the reason, for states to avoid sanctioning violations.

Many states will be reluctant to undertake sanctions either because they are viewed as ineffective or because the costs of imposing the sanctions appear too great. Some countries, on the other hand, have shown a strong willingness, usually because of strong domestic pressure from environmentalists, to sanction those actors that threaten the effectiveness of an environmental treaty. U.S. threats of sanctions against nonmember whaling states and against states impeding the effectiveness of the Convention on International Trade in Endangered Species (CITES) provide some examples.⁶⁵ Many states recently banned wildlife purchases from Thailand because of its violations of the CITES treaty.⁶⁶

Sometimes, states willing to impose sanctions will not do so because of existing legal barriers to sanctions. One example, albeit involving domestic rather than international rules, is the GATT condemnation of a U.S. ban on imports of Mexican tuna because of the high number of dolphins killed. Reducing or eliminating such barriers may be the best way to impose costs on violators. The explicit requirement of the International Convention for Prevention of Pollution from Ships that port states detain ships detected in violation of the equipment requirements did not lead states uninterested in enforcement to detain noncomplying ships, but it did result in detentions by states inclined to enforce the rules by removing the legal barriers that had previously prevented them.⁶⁷ We conclude that international treaties can best improve the prospects for sanctions by removing the practical and legal barriers that inhibit states already predisposed to undertake sanctions rather than by attempting to induce reluctant states to do so. New legal rights may prove more effective than new legal obligations.

As with disseminating information, NGOs may feel fewer constraints on imposing sanctions on companies or states found in violation of treaty rules. NGO efforts in the United States have brought about changes in tuna-fishing methods to reduce dolphin by-catch even in the absence of international regulations on the subject. Evidence of violations developed or disseminated by NGOs can provide the basis for effective mobilization of consumer boycotts and other actions.

Finally, business or industry practice can sometimes provide a channel for increasing the costs of violating an agreement. Certifications or insurance premiums linked to historical violation rates or to the conformance of technology to international standards may provide strong incentives for polluting businesses to pay greater attention to international regulations. Similarly, large and powerful green corporations may be capable of using the threat of taking their business elsewhere to make companies with which they do business more responsive to environmental rules.

THE INSTITUTIONAL FRAMEWORK

The compliance information and response system described above involves a number of complex organizational activities.

- Collection and analysis of party reports on performance
- Follow-up inquiries or independent verification activity
- Investigation of the causes of any compliance problems, usually by means of prolonged interactive exchanges with officials in the country concerned
- Development of recommendations for corrective measures, often including identifying sources for necessary funding
- Preparation of reports to the governing body having jurisdiction, together with drafts of appropriate action documents
- Follow-up to ensure that the country concerned has taken the necessary steps to bring itself into compliance

All of the elements above imply a significant level of organizational and bureaucratic resources and competence.

Unfortunately, current experience with international organizations does not bode particularly well for the fulfillment of these organizational requirements. Over recent decades, the international community, and particularly the developed countries that provide most of the resources,

has manifested a pronounced skepticism of international bureaucracies and organizations. The payor countries have conducted a continuous campaign to reduce the budgets and activities of existing organizations and to resist the creation of new ones. This resistance has manifested itself particularly in the area of environmental affairs; as a result, the sharp increase in environmental law making over the past two decades has not been accompanied by the development of any overarching international secretariat with broad responsibility over the range of international environmental concerns. The UNEP, created after the UN Conference on the Human Environment in 1972, is a creature of the General Assembly, rather than a specialized agency of the UN, and therefore does not have its own charter and budget. It operates on extremely limited funding and is confined to catalytic and broad review functions.

Most environmental treaties have created their own highly decentralized governing institutions. Secretariats are rudimentary, and reliance is placed on various committees and working groups staffed by the parties themselves for analysis of relevant data and for preparation and documentation of the substantive actions of the organization. The situation is further confused and diffused because of the framework convention and protocol format assumed by many modern environmental treaties, including the FCCC adopted at Rio de Janeiro. Since the parties to any single protocol are not necessarily identical to those of the framework convention itself or of other protocols, each protocol to some extent must have its own governing institutions, although ordinarily the same overburdened, understaffed, and underfunded secretariat acts for all protocols under a single convention.

Thus, for example, the ozone regime operating under the Montreal Protocol has its own Conference of the Parties, separate from that of the Vienna Convention, its parent convention. When, a year after the adoption of the Montreal Protocol, it became apparent that many of the parties were not providing the required reports on imports, exports, and production of controlled chemicals, the Conference of the Parties established an Ad Hoc Group of Experts on Reporting to investigate the causes and to make recommendations for improving the situation. The Conference of the Parties has proliferated similar committees and expert groups, generally staffed by representatives of the parties, to address similarly narrow issues. The secretariat, which must also service the Vienna Convention, consists of less than a dozen people employed by the UNEP in Nairobi, Kenya. By contrast, the Organization for the Prevention of Chemical Warfare, established by the Chemical Warfare Convention, is expected to

have a secretariat of 500 or more and an annual budget in the range of \$100 million.

It is too early to be sure, but the FCCC, which entered into force in March 1994, seems likely to adopt the organizational approach of the environmental treaties. It establishes a Conference of the Parties, in which all significant powers of the organization are vested. There is a Subsidiary Body for Scientific and Technological Advice and a Subsidiary Body for Implementation. Each is a committee of the whole in the sense that it is made up of governmental representatives rather than independent experts, and any party that wishes can be a member. A financial mechanism to raise and distribute moneys for assisting developing countries to reduce emissions is to be established at the first meeting of the Conference of the Parties. In the interim these functions are to be performed by the Global Environmental Facility administered by the World Bank, with the assistance of the UNEP and the UN Development Programme. It seems likely that this arrangement will be confirmed when the Conference of the Parties meets.

One short article in the FCCC establishes a secretariat with strictly limited functions; in particular, it is to (1) make arrangements for meetings of the policy-making bodies established by the convention, (2) compile and transmit (but not analyze) the reports from the parties, and (3) facilitate (but not provide or arrange for) assistance to parties in developing countries in preparing the reports.

Although practice may in time introduce some latitude of interpretation, the text of the convention is relatively meager. The convention establishes no quantitative targets or limits on emissions, although developed countries "recognize" that "the return by the end of the present decade to earlier levels of anthropogenic emissions of carbon dioxide and other greenhouse gases" would be desirable.⁶⁸ The FCCC's principal mechanism for reducing emissions of greenhouse gases is an information and response system similar in form to that described in this chapter.

For developing countries, the reporting requirements are quite general and do not come into effect until three years after a country joins the regime. At that point, they are to provide a "national inventory of anthropogenic emissions by sources and removal by sinks of all greenhouse gases" and "a general description" of the steps they are taking to implement the convention. Funds are to be provided to assist them in compiling and communicating this information. Developed countries, however, are responsible for most emissions, and they have assumed extensive reporting obligations, including "a detailed description" of their policies

and measures for reducing greenhouse gas emissions as well as "a specific estimate" of the effects of such policies on emissions levels, "with a view to returning individually or jointly to their 1990 levels of emissions of anthropogenic emissions of carbon dioxide and other greenhouse gases."⁶⁹ The first report is to be filed within six months after the treaty goes into effect. The reports of developed countries are to be reviewed by the Conference of the Parties at its first session and periodically thereafter.

As noted above, the secretariat's functions with respect to these reports is limited to receiving them and transmitting them to the Conference of the Parties. The Subsidiary Body for Scientific and Technological Advice, however, is empowered to "prepare scientific assessments on the effects of measures taken in the implementation of the Convention," which entails the possibility for substantive review of national reports.⁷⁰ It is also charged with assessing the general state of scientific knowledge about climate change and its effects. The Subsidiary Body for Implementation is to consider the developed country reports "in order to assist the Conference of the Parties in carrying out" its review functions and "in the preparation and implementation of its decisions."⁷¹ Thus, the substantive functions performed by the secretariat in such international organizations as the IMF and the International Atomic Energy Agency are delegated by the FCCC to committees of the parties. If problems with implementation arise, they are to be handled by a multilateral consultative process to be established by the Conference of Parties at its first meeting. Presumably this process will be patterned after the one established under the Montreal Protocol, which provides for investigation and conciliation by a special committee and, if that fails, a report to the Conference of the Parties, which can make recommendations for corrective action. As with most treaties, environmental or otherwise, there is no provision in the FCCC for trade sanctions, or sanctions of any kind.

What seems to be envisioned is a rather anemic compliance program. There is no provision for systematic and energetic coordination of national policies and activities. Although the treaty calls for the support of national and international research programs and the development of educational and public awareness programs, these provisions are addressed to the parties, and the international organization is given no express mandate with respect to these matters. The Subsidiary Body for Science and Technological Advice has no general charge to oversee and is not empowered to coordinate national and international research on climate change or to evaluate overall climate trends. There is little indication that a vigorous effort to achieve effective and accurate reporting, or an aggressive monitoring and

verification program, is contemplated. The formal commitments are too vague to permit clear-cut identification of noncompliant conduct. Responses to any deficiencies in performance are left to ad hoc decisions of the Conference of the Parties. The treaty makes provision for subsequent protocols, but there is no hint of an active program to adapt the convention to new developments or to strengthen the commitments of the parties.

It may be possible to cure these lacunae by interpretation or practice in the years ahead, but the textual basis for such a development is skimpy. Unless there is some such evolution, the prospects for success of the FCCC are doubtful.

CONCLUSION

Under the best of circumstances, several characteristics of the climate change issue are likely to lead to significant noncompliance for a considerable time. Many actors will see the current costs of undertaking needed activities as higher than the current benefits of the status quo. In the climate change arena, not only do the costs involve large and continuing outlays of funds and major changes of economic infrastructures (and even of ways of life), but the benefits are uncertain and will come far in the future. At any reasonable discount rate, the current costs may appear unconvincing as a reason for action.

Even where national governments might agree that reducing greenhouse gas emissions is a virtuous goal, they may not feel it deserves priority over the other pressing needs of their countries. This may prove as true for developed countries, such as the United States and members of the EC, concerned about jobs and economic growth as for developing countries concerned about economic development and feeding and housing their populations.

The breadth and complexity of activities that contribute to global warming and the degree to which they are interwoven with everyday behavior mean that the time required for changes to occur will be considerably longer than what ardent proponents of action would like. Achieving compliance, even by those with incentives to do so, will take time. All of these factors suggest that significant noncompliance should be expected with any international rules that establish exacting limits on behaviors that emit greenhouse gases. To recognize this fact can make expectations more realistic and help avoid the disappointment, frustration, and despair that might lead to reduced efforts to resolve these problems.

As the almost seventy-year history of oil pollution demonstrates, the development of the political will and international, national, corporate, and individual machinery to address a recognized problem can take decades.⁷² In the case of oil pollution, the level of oil inputs relative to the carrying capacity of the ocean was adequate to tolerate this delay. In the case of climate change, such circumstances may not be in our favor. We may be forced to learn and adapt more quickly.

This chapter has emphasized the need to facilitate compliance, reporting, verification, and responses to noncompliance by those actors already predisposed to perform these tasks. Efforts to alter incentives and capacities are less likely to succeed than are efforts to elicit the highest possible cooperation from existing incentives and abilities, which may be making a virtue of necessity. Nonetheless, this chapter has demonstrated several ways to craft a compliance system that is better than frequently proposed alternatives. The demands of such a system will be extensive and will require nations, corporations, NGOs, and individuals to dedicate significantly greater resources to the task than they have to other environmental problems.

Several other processes can and should be set in motion to address the underlying factors inhibiting compliance for the foreseeable future. First, a major enterprise that is already under way and should continue is research on the greenhouse gas problem. Greater knowledge of the timing and nature of the effects of global warming can increase the perceived benefits of action, even if the costs of mitigation remain the same. To have this effect, these research efforts must involve a wide group of researchers and policymakers. The resultant knowledge must be made available and be assimilated widely. Successful social processes must also include evaluating and changing those modes of thinking and patterns of development that are less directly connected to climate change, including population growth.

Second, research should also be directed at developing a greater understanding of technologies and processes that can reduce greenhouse emissions. These efforts must go beyond mere development of technical fixes to include a better understanding of the factors that influence the speed and depth with which new technologies and processes are accepted in different regions of the world.

Third, an increased effort to address population growth not only would have long-term benefits in decreasing one of the major sources of global stress underlying greenhouse emissions, but also would have significant benefits in terms of development and quality of life. Without addressing this issue (and doing so with a long-term perspective), many

of the other actions discussed here may prove inadequate to forestall global warming.

Finally, efforts should continue to encourage states and their citizens to adopt new perceptions of the costs of maintaining current conceptions of sovereignty. The development of the EU has provided one example of states redefining the rules of international relations on the basis of altered notions of sovereignty. Opportunities for even minor modifications of existing conceptions, such as allowing states to tax companies or to prosecute them for violations occurring within another country's borders, should not be lost. Developing new notions and definitions of sovereignty is by no means a prerequisite for achieving substantial progress toward an effective climate change regime, but modifications of current views of the sanctity of the state may merit consideration as one set of policy changes that would facilitate greater compliance with treaties and, in turn, greater mitigation of greenhouse gas emissions.

NOTES

1. See, for example, Oran Young, *Compliance and Public Authority: A Theory with International Applications* (Baltimore: Johns Hopkins University Press, 1979); Roger Fisher, *Improving Compliance with International Law* (Charlottesville: University Press of Virginia, 1981); Abram Chayes and Antonia Chayes, "Compliance without Enforcement: State Behavior under Regulatory Treaties," *Negotiation Journal* 7, no. 3 (July 1991): 311-330; Abram Chayes and Antonia Chayes, *The New Sovereignty: Compliance with International Regulatory Agreements* (Cambridge, MA: Harvard University Press, 1995); and Ronald B. Mitchell, *Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance* (Cambridge, MA: MIT Press, 1994).
2. While the factors determining compliance will vary, corporate and individual actors can be divided into similar categories according to their predisposition toward compliance.
3. Fisher, in *Improving Compliance*, refers to "initial compliance" as "first order" compliance.
4. We use the term "compliance information system" to designate what is often referred to as "monitoring" or "verification," because these latter terms suggest an excessive focus on detecting violations. The problem often requires identifying who is complying and understanding the sources of compliance as much as knowing who is violating. Similarly, we use "compliance response system" rather than

- “enforcement system” to capture the notion that appropriate responses are likely to depend more on positive action to facilitate and encourage compliance than on sanctions to deter or punish violations.
5. The contribution of a specific gas to global warming is measured on the basis of its “forcing” potential and the magnitude of current and projected emissions, that is, on the temperature increase per unit of emissions and the quantities of emissions.
 6. Rules based on these criteria will lead to greater greenhouse gas reductions if and only if compliance levels are equal across activities or if higher compliance levels correlate with higher greenhouse gas contributions. Unfortunately, neither can be safely assumed.
 7. Thomas A. Barthold, “Issues in the Design of Environmental Excise Taxes,” *Journal of Economic Perspectives* 8, no. 1 (winter 1994): 133–151.
 8. See Stram’s detailed discussion of this point in his chapter in this volume. Michael Grubb also provided an extended discussion of the problems of uncertainty in quantitative outcomes under a carbon tax system in his “The Greenhouse Effect: Negotiating Targets” (*International Affairs* 66, no. 1 [January 1990]: 67–89).
 9. Barthold, “Excise Taxes.”
 10. Paul Lewis, “Delegates at Earth Summit Plan a Watchdog Agency,” *New York Times*, 7 June 1992, 20.
 11. While in practice these components may become coupled, the CIS for a climate change treaty is distinct from, and should not be confused with, an environmental monitoring system, which collects information to evaluate how the environment is responding to human behavior. A CIS collects information to evaluate human behavior itself.
 12. The term “transparency” has been used by Chayes and Chayes in “Compliance without Enforcement” and by Young in *Compliance and Public Authority*. The term “verification suitability” has been used with specific reference to climate change by W. Fischer, J. C. di Primio, and G. Stein in *A Convention on Greenhouse Gases: Towards the Design of a Verification System* (Jülich, Germany: Forschungszentrum Jülich GmbH, 1990).
 13. Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*, 3. See also Barthold, “Excise Taxes.”
 14. Of course, the fraction of global emissions of a given gas that is due to a specific source type will influence how effective such a regulation would be at reducing total emissions.

15. The treaty defines consumption as production plus imports minus exports (Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* [Cambridge: Harvard University Press, 1991], 79–82).
16. Unfortunately, most greenhouse gas emissions arise as a by-product of otherwise beneficial economic activities and lack satisfactory substitutes, thus making bans on those activities highly unlikely. CFCs are an exception.
17. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, 2 February 1971, 996 U.N.T.S. 245, 11 I.L.M. 969 (1972), 5 I.P.E. 2161 (hereinafter Wetlands Convention).
18. While equipment requirements are rightly criticized for being economically inefficient, they have the advantage of being far more readily verified.
19. For example, the International Convention for the Prevention of Pollution from Ships (2 November 1973, 12 I.L.M. 1319 [1973], 2 I.P.E. 552 [hereinafter MARPOL]) requires that signatories “ensure the provision” of reception facilities for marine pollutants but does not specify whether nations or companies must provide them.
20. The potential lack of governmental control contrasts with the situation in arms control treaties and the GATT (30 October 1947, 61 Stat. A11, 55 U.N.T.S. 187), in which the policies addressed by the inter-governmental treaty reflect largely governmental, not private, actions.
21. Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*, 35.
22. Lewis, “Watchdog Agency.”
23. See Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*; and Abram Chayes and Eugene B. Skolnikoff, “A Prompt Start: Implementing the Framework Convention on Climate Change” (unpublished paper, Cambridge, MA, 28–30 January 1992), 5.
24. Fischer, di Primio, and Stein (*Convention on Greenhouse Gases*, 20) described the development of a standard questionnaire as an “urgent task,” but did not address how reporting can be encouraged.
25. See, for example, U.S. General Accounting Office, *International Environment: International Agreements Are Not Well Monitored*, GAO/RCED-92-43 (Washington, DC: U.S. GPO, 1992); Gerard Peet’s report, “Operational Discharges from Ships: An Evaluation of the Discharge Provisions of the MARPOL Convention by Its Contracting Parties” (Amsterdam: AIDEnvironment, 15 January 1992); and Ronald B. Mitchell, *Intentional Oil Pollution at Sea*, chapter 4.
26. The almost perfect reporting records of the International Convention for the Regulation of Whaling (2 December 1946, T.I.A.S. No. 1849,

- 161 U.N.T.S. 72) and the Memorandum of Understanding on Ports State Control in Implementing Agreements on Maritime Safety and Protection of the Marine Environment (26 January 1982, 21 I.L.M. 1 [1982], I.P.E. II/A/26-01-82) demonstrate the willingness of states to report when they perceive reporting as essential to accomplishing the goals of the agreement.
27. An example of the failure to request information explicitly is evident in the International Maritime Organization's standardized reporting format for the MARPOL Convention, which does not include a space for the report period, making determination of the report period difficult in many cases.
 28. The EC reports ozone-depleting substance emissions aggregated not only across gases but also across countries, but this practice makes it impossible to determine whether individual states are in compliance (Benedick, *Ozone Diplomacy*, 181).
 29. Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*, 16.
 30. Gerard Peet, in "Discharges from Ships," came to a similar conclusion with respect to reporting under the MARPOL Convention.
 31. Fischer, di Primio, and Stein, in *Convention on Greenhouse Gases*, suggested that member states should create national authorities responsible for acquiring, aggregating, and reporting "national emissions or other convention-relevant activities by the country" (p. 7).
 32. The Memorandum of Understanding on Port State Control has developed a computerized system (Secretariat of the Memorandum of Understanding on Port State Control, *Annual Report 1990* [The Hague: The Netherlands GPO, 1990]).
 33. Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*.
 34. Montreal Protocol on Substances that Deplete the Ozone Layer (16 September 1987, 26 I.L.M. 1541 [1987], Art. 10).
 35. Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*, 35.
 36. Convention on Long-Range Transboundary Air Pollution (13 November 1979, 18 I.L.M. 1442 [1979]).
 37. See Marc Levy, "European Acid Rain: The Power of Tote-Board Diplomacy," in *Institutions for the Earth: Sources of Effective International Environmental Protection*, eds. Peter Haas, Robert O. Keohane, and Marc Levy (Cambridge: MIT Press, 1993). For a description of a similar system used for analysis of trade statistics in the Convention on International Trade in Endangered Species, see Mark C. Trexler, "The Convention on International Trade in Endangered Species of Wild Fauna and Flora: Political or Conservation Success?" (Ph.D.

- diss., University of California at Berkeley, 1989); and U.S. General Accounting Office, *International Environment*.
38. Lewis, "Watchdog Agency."
 39. Daniel Navid, secretary-general, Wetlands Convention, interview, 1991.
 40. In arms control, these methods are known as national technical means, or NTM.
 41. Countries with satellite capabilities include the United States (military and LANDSAT), Russia, France (SPOT), the EU (ESA), Japan, Brazil, and India (Fischer, di Primio, and Stein, *Convention on Greenhouse Gases*, 22).
 42. *Ibid.*, 22-26.
 43. Chayes and Skolnikoff, "A Prompt Start," 11-12.
 44. Comparability involves converting data into standard currencies and adjusting for inflation, for example.
 45. Timothy Egan, "Space Photos Show Forests in Pacific Northwest Are in Peril, Scientists Say," *New York Times*, 11 June 1992, A13.
 46. While the two strategies are logically distinct, in practice they may often be coincident, as when continued financing for a project acts as a positive incentive for compliance and the elimination of such financing acts as a sanction for violation.
 47. Of course, nations will also need to determine whether and how they will respond to actors who fail to meet the requirements established in domestic treaty-implementing legislation. Nations will choose a wide variety of approaches to encourage compliance and discourage violation based on sociopolitical factors as well as on the effectiveness and efficiency of the approach. For brevity's sake, we do not discuss the various advantages and disadvantages of different domestic-level response strategies.
 48. Hilary F. French, "After the Earth Summit: The Future of Environmental Governance," *Worldwatch Paper 107* (Washington, DC: Worldwatch Institute, 1992), 31.
 49. French, "After the Earth Summit," 31.
 50. Lewis, "Watchdog Agency."
 51. See Timothy B. Hamlin, "Debt-for-Nature Swaps: A New Strategy for Protecting Environmental Interests in Developing Nations," *Ecology Law Quarterly* 16, no. 4 (1989): 1065-1088.
 52. For historical examples, see George F. Kennan, "To Prevent a World Wasteland: A Proposal," *Foreign Affairs* 48, no. 2 (April 1970): 401-413; and Grenville Clark and Louis Sohn, *World Peace through*

- World Law* (Cambridge: Harvard University Press, 1960). More recently, see French, "After the Earth Summit."
53. See, for example, Grubb, "Greenhouse Effect."
 54. Lewis, "Watchdog Agency."
 55. Peter Haas, "Protecting the Baltic and North Seas," in Haas, Keohane, and Levy, *Institutions for the Earth*.
 56. The International Labor Organization uses blacklisting extensively to encourage reporting.
 57. For example, see the Earth Island Institute's advertisement urging trade sanctions against Norway for its resumption of whale hunting (*New York Times*, 3 May 1993, A15).
 58. See, for example, Secretariat of the Memorandum of Understanding, *Annual Report 1990*. George Kasoulides has discussed this problem with the Memorandum of Understanding at length ("Paris Memorandum of Understanding: A Regional Regime of Enforcement," *International Journal of Estuarine and Coastal Law* 5:1-3 [February 1990]: 180-192).
 59. See Barthold, "Excise Taxes"; and U.S. Congressional Budget Office, *Carbon Charges as a Response to Global Warming: The Effects of Taxing Fossil Fuels* (Washington, DC: U.S. GPO, 1990).
 60. Grubb, "Greenhouse Effect."
 61. French, "After the Earth Summit," 30.
 62. James K. Sebenius, "Negotiating a Regime to Control Global Warming," in *Greenhouse Warming: Negotiating a Global Regime* (Washington, DC: World Resources Institute, 1991), 36.
 63. See, for example, Gary Clyde Hufbauer and Jeffrey J. Schott, *Economic Sanctions Reconsidered: History and Current Policy* (Washington, DC: Institute for International Economics, 1985).
 64. See Ronald B. Mitchell, "Intentional Oil Pollution of the Oceans," in Haas, Keohane, and Levy, *Institutions for the Earth*; and Mitchell, *Intentional Oil Pollution at Sea*.
 65. Gene S. Martin, Jr., and James W. Brennan, "Enforcing the International Convention for the Regulation of Whaling: The Pelly and Packwood-Magnuson Amendments," *Denver Journal of International Law and Policy* 17, no. 2 (winter 1989): 293-315; and Dean M. Wilkinson, "The Use of Domestic Measures to Enforce International Whaling Agreements: A Critical Perspective," *Denver Journal of International Law and Policy* 17, no. 2 (winter 1989): 271-292.
 66. French, "After the Earth Summit," 30.
 67. For an extended analysis of compliance under the MARPOL Convention, see Mitchell, *Intentional Oil Pollution at Sea*.

68. UN Framework Convention on Climate Change (15 May 1992, UN doc. A/AC.237/18 [Part II]/Add.1), Art. 4(2).
69. *Ibid.*, Art. 12.
70. *Ibid.*, Art. 9(2).
71. *Ibid.*, Art. 10.
72. See Mitchell, *Intentional Oil Pollution at Sea*.