

Working Paper

Review Mechanisms in the Effective Implementation of International Environmental Agreements

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Preface

Hundreds or even thousands of international legal instruments on "the environment" are in existence. What happens to international environmental agreements once they are signed, and how does the the process of implementing such agreements influence their effectiveness? These are the questions that motivate the IIASA project "Implementation and Effectiveness of International Environmental Commitments (IEC)". Research teams are examining these questions from many angles and with different methods.

In this paper, David Victor, Owen Greene, John Lanchbery, Juan Carlos di Primio and Anna Korula survey the roles that implementation review mechanisms (IRMs) might play in promoting effective international agreements. Such mechanisms allow the parties and others to verify the extent to which another party is complying with an agreement and offer a venue to handle problems, for example, of poor performance or noncompliance. They can make agreements more effective by keeping the international bargain connected to the reality of what states can implement. Consequently, building more effective IRMs could be a major way that policy-makers could improve the effectiveness of international environmental agreements.

From the vantage of major theories about international cooperation and implementation, the authors review all the major pathways by which IRMs might influence the effectiveness of international agreements and survey the relevant theoretical literature. They identify areas that are both important for understanding the overall operation and effectiveness of IRMs and are also in need of further study.

The IEC research project is now sponsoring several historical and comparative case studies on the functioning of IRMs. This paper, along with another paper that surveys the same issues but from an empirical rather than theoretical perspective, lays a foundation for our research program on IRMs.

The context of this paper in the IEC project

This paper is one of several IEC working papers that survey the existing literature, place the project in a framework of prior research, and identify the major questions that deserve further study. At the outset, members of the project decided to prepare these papers to ensure that we were adequately aware of other research in the field and, especially, to ensure that we would be studying the most important questions in the proper context. The papers that play these roles are listed below, divided into each of the three areas of IEC's research program. Fuller descriptions of different parts of IEC's research program are available in the IEC project description (copies available from IEC) and in the prefaces and working papers listed below.

1. Historical case-study and comparative research

Most of IEC's research is directed at studying how international environmental agreements have been implemented historically through examination of case-studies and focussed comparisons among selected cases. Teams are studying domestic implementation as well as international and transnational processes. Eight papers review the relevant literature and establish the context and research questions:

Research on implementation at the domestic level in Western Europe and in the Eastern economies undergoing transformation:

- o Steinar Andresen, Jon Birger Skjærseth, and Jørgen Wettestad, 1994, "Regime, the State and Society--Analysing the Implementation of International Environmental Commitments".
- o Vladimir Kotov, 1994, "Implementation and Effectiveness of International Environmental Regimes During the Process of Economic Transformation in Russia".
- o Elena Nikitina, 1994, "Domestic Implementation of International Environmental Commitments: a Review of Soviet Literature".
- o Alexei Roginko, 1994, "Domestic Compliance with International Environmental Agreements: a Review of Current Literature".

Research on international and transnational processes of implementation:

- o David G. Victor with Owen J. Greene, John Lanchbery, Juan Carlos di Primio and Anna Korula, 1994, "Roles of Review Mechanisms in the Effective Implementation of International Environmental Agreements".
- o David G. Victor, John Lanchbery and Owen Greene, 1994, "An Empirical Study of Review Mechanisms: Report on Work in Progress".
- o David G. Victor with Anna Korula, 1994, "What Is an International Environmental Agreement?"

- o Owen J. Greene, 1994, "On Verifiability, and How It Could Matter for International Environmental Agreements".

2. Development of a database

IEC is developing a database that will consist of key variables related to the development and effective implementation of international agreements. It will allow systematic use of historical evidence from a large number of cases. The goal is to make possible the testing of hypotheses and the drawing of general conclusions about which variables are causally linked to "effectiveness". One paper reviews the major hypotheses related to the formation and effectiveness of international regimes:

- o Marc A. Levy, Oran R. Young and Michael Zürn, 1994, "The Study of International Regimes".

3. Other research and policy activities

IEC researchers are applying their research findings to current and future policy issues as opportunities arise. The project is also sponsoring a major simulation-gaming exercise to explore issues of institutional design, implementation and compliance in international environmental agreements. Simulations can help promote creative thinking about political options for international management of climate change, identify potential pitfalls, integrate policy-relevant knowledge from a variety of domains, and identify important policy-relevant knowledge needs. One paper surveys the benefits of using simulation-gaming as a policy and research tool:

- o Edward A. Parson, 1995, "Why Study Hard Policy Problems With Simulation-Gaming?"

The above list includes only the papers that the project has used in establishing the framework for its research activities. A complete list of publications and copies of papers are available from the IEC offices at IIASA.

Abstract

This report is part of a research project on how the process of implementation influences the effectiveness of international environmental agreements. One way that agreements can be made more effective during implementation is if they include implementation review mechanisms (IRMs). Broadly, IRMs are the means by which data is exchanged and gathered, reviewed and assessed in the context of an international agreement, and by which problems of compliance and inadequate performance are managed.

Here we review all the major pathways by which the operation of an IRM might influence the effectiveness of an agreement. We describe the ways that IRMs might affect how states calculate their interests and thus what kinds of international agreements they seek; we explore the ways that the operation of IRMs might promote learning; and we examine how IRMs operating at the international level might affect domestic politics.

In many of these areas there are well-developed bodies of existing research that are relevant to studying IRMs. However, the issue-area of international environmental politics differs from other issue-areas such as trade and arms control and thus offers some opportunities to build and test new theories. Here we identify the major areas where research on environmental IRMs can help test existing theories and build new ones. Those areas include: 1) the role of IRMs in managing the process of standard-setting; 2) the roles of IRMs in verification of compliance and in promoting the verifiability of agreements; 3) how highly decentralized information about performance and compliance is managed by IRMs and the parties to agreements; 4) how IRMs can help manage various forms of complexity that arise in negotiating and managing international agreements; and 5) whether IRM functions make a larger contribution to effectiveness when they work in conjunction with hard law agreements (e.g. formally ratified treaties) or soft law. As a result of this exercise and the empirical paper that complements this theoretical treatment, we have research underway in four of these five areas (all except item #1).

The paper also identifies two major themes that might be given further research in the future: the role of IRMs in affecting the learning process at the international and domestic levels; and, the ways that IRMs make denser linkages between international and domestic politics.

Finally, the paper includes an annex that uses the major ideas to illustrate the practical options that policy makers confront when designing IRMs.

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Section I

Introduction

Addressing common problems frequently involves the negotiation and implementation of agreements. Agreements set standards, making it easier to coordinate and predict actions; they empower interest groups, giving them alternative points of access to the policymaking process; and, they build procedures and institutions that can provide helpful advice and assist in the rational collective management of common resources. All of these issues have received extensive attention in the literature on negotiation, implementation and the effectiveness of agreements, both with respect to environmental agreements, as well as other issue areas. For a review of the state of research on the effectiveness of international institutions see Levy et al. (1994) and Haggard and Simmons (1987); as well as Kratchowil and Ruggie (1985).

Among the procedures and institutions created by international agreements are those that allow and urge the parties to report on their behavior and review their performance. Indeed, many of the most effective international agreements efficaciously employ different varieties of these mechanisms, arguably increasing the overall effectiveness of the agreement. The GATT has evolved a sophisticated dispute panel system that allows (some) problems of inadequate performance to be addressed while also establishing precedents and interpretation built on decisions in particular cases. The World Bank and IMF review performance of their lending programs jointly with the recipients. Many international labor agreements are reviewed by a mechanism in the ILO that allows participation by states as well as labor experts, employers and labor groups. A myriad of informal agreements and standards are managed by the OECD which reviews performance and shapes expectations through a friendly but helpful process of consultation, pushing the process along by keeping standards one step ahead of performance. The Standing Consultative Commission of the Strategic Arms Control Limitation Talks (SALT) agreements has served as a forum for managing some issues of noncompliance in a relatively nonconfrontational manner. Most international review procedures are systems of consultation, but some—notably those of the IMF and OECD—can include tougher audits and powers of investigation. In short, there are numerous procedures for reviewing performance. Collectively we call them "implementation review mechanisms" (IRMs).

IRMs might also contribute to more effective environmental agreements, and elsewhere we are finding that most international environmental agreements evolve some form of IRM, but the experience is highly mixed and the most effective forms and functions are unclear (see Victor et al., 1994). Reporting and reviewing can lead to more effective agreements in many ways: initial agreements may be vague, and reports and joint reviews can allow the parties to "learn by doing". The goals of the agreement might not be matched by experience, and bringing these conflicts into the open can help resolve them, promoting more realistic agreements and expectations. Credible reports and reviews can assure parties that another party is in compliance, dampening fears that some members may be free riding,

and reducing the temptation to do the same. Initial effective cooperation on environmental issues, bolstered by effective IRMs, might even "spill over" into other issue areas.¹

These are all reasonable hypotheses that can be tested by experience. The purpose of this essay is to posit in more detail the major pathways by which IRMs lead to more effective international environmental agreements. Throughout we focus on environmental agreements, with reference to other issue-areas and the potential differences between them, and especially on those aspects that are relevant to policy. This theoretical paper is written in parallel with an empirical study of IRMs operating in more than 50 international environmental agreements (Victor et al., 1994) and with a study on verifiability (Greene, 1994). Together, these three essays are the basis of selecting hypotheses and case studies for detailed comparisons and research focussed on testing hypotheses and answering specific questions. That work is now under way, and described further in the research plan of the IEC project (IEC, 1994), especially the research under way by the authors of this paper. The conclusions of these papers also highlight other hypotheses worth investigation, and some of these will be studied later in this research project and/or hopefully by others.

IRMs may exist at both the domestic and international levels. In this paper we are primarily interested in the latter, but we note that at the domestic level, nations and industries may create IRMs to review performance and gather data. As part of our focus on international IRMs, we do consider explicitly what types of effects the operation of an international IRM may have on domestic politics, and thus on how agreements are implemented domestically and their effectiveness. Further, at times, IRMs operating domestically may interact with the international IRM, for example if the domestic system for gathering and assessing data is responsible for reporting to the international system (which is commonplace in international environmental reporting systems).

We say little about why IRMs are actually created; rather, the paper focusses on the potential *consequences* of the operation of IRMs. We do imply that IRMs might be created with these consequences in mind. For example, states that want to ensure that other states are complying with an international agreement might urge creation of an IRM to help gather and assess the relevant information on compliance. In practice, IRMs may be created with little detailed vision of what functions they will serve, or an IRM might evolve to serve

¹The literature relevant to the role of IRMs in improving the effectiveness of environmental agreements, or similar mechanisms with different names, is large. Some examples: Chayes and Chayes (1993); Lykke (1992); Chayes (1991); Victor, Chayes, and Skolnikoff (1993); Greene (1993); Fischer (1991); Ausubel and Victor (1992). For studies that touch on how review mechanisms improve management of local shared resources see Ostrom (1990) and Lee (1993).

functions for which it was not originally intended. These are possibilities that the IEC project is now studying in detail, and we will return to them in the conclusion of this paper and describe them also in the conclusion to the empirical paper that complements this paper (Victor et al., 1994). Further, in practice, the evolution of IRMs will be shaped by many factors and circumstances beyond the particular functions they serve and consequences that are intended by the IRMs' creators. For example, although an IRM might be created to help manage compliance, in practice it may not be diplomatic to discuss "compliance" and other directly evaluative terms, and thus if the IRM is to be effective it must account for the diplomatic circumstance and conduct its debates and process the relevant information through the shadow play of diplomacy. Again, in this paper, we focus only on the main consequences and leave to more detailed empirical research the issues of whether IRMs are created to achieve these consequences or whether they evolve from other conceptions eventually to serve these roles. Similarly, we leave aside the factors and circumstances that may shape evolution of the IRMs, although the annex of this paper--on the design aspects of IRMs--addresses some of those concerns.

The definition of what is an "effective" agreement has been debated extensively (e.g., see reviews in Young, 1994; Haas et al., 1993; Levy, 1993b); many definitions are possible. Here we adopt primarily the definition also used in IEC's other research (Andresen et al., 1994) and in similar social science research on the effectiveness of international environmental agreements (e.g., Haas et al., 1993): an agreement is effective if it leads to behavioral change--oriented towards solving (or adapting) to the problem--by those who are causing (or affected by) an environmental problem. This behavioral definition contrasts with others such as "solving the problem" or "solving the problem in a cost-effective manner" and, in our view, is best suited for our research task: how does the existence and operation of an international agreement lead to the correct changes in behavior where it matters—at the level of individual polluters and users of common resources? What the "right" type of behavioral change is depends on each particular case. The pathways from international agreements down to the level of individual polluters can be long and complicated, which is why implementation research is an important part of studies into how and whether international environmental agreements have any effect. (Indeed, the behavioral definition is also a foundation for work that examines "effectiveness" from other angles—such as whether the problem at hand has been solved or whether cost effective actions have been made.)

The behavioral definition leaves many stones unturned. Thus here we complement our primary focus on what causes behavioral change with three other definitions of effectiveness: 1) the ability of parties who want to cooperate to reach some form of agreement; 2) whether the agreement and what is implemented reflects underlying interests of those who have something at stake; and 3) whether the agreement promotes rational,

scientific or technical management.² These three provide different lenses on the ways that IRMs can aid international environmental governance. We raise these throughout this paper as they yield important insights; but primarily we are interested in how IRMs ultimately affect behavior.

The definition of "implementation review mechanism" broadly includes any mechanism by which the parties review each other's performance, and all the components that allow such reviews. Thus in addition to the mechanisms themselves—meetings and reports that comprise the actual 'review'—we also include the process by which information that provides the basis for review is gathered and exchanged. We use the label IRM, rather than "monitoring and enforcement" to convey that at the international level information is exchanged usually in a cooperative fashion, typically in the first instance through self-reporting, and thus the term "monitoring"—which is often perceived as independent observation—does not apply, although in some instances there are independent capacities to observe and gather information.

The broad definition could include a virtually unlimited range of international and domestic behavior. Throughout we focus on the international procedures, especially those that are formally established by international agreements and those that arise from practice related to those agreements. Although we focus on the operation of international IRMs, we will survey possible consequences of the operation of IRMs at both the international and domestic levels.

The paper is divided into two major sections. First, we consider ways that the operation of IRMs might affect how states interact with each other. Second, we consider how IRMs might affect the politics *within* a state. In both cases we analyze the ways that IRMs operate and how they influence the effectiveness of agreements. We aim to describe all of the major pathways by which IRMs could lead to effectiveness, and for each we assess the potential for further research based on the current state of the field and the importance of the pathway. The conclusion summarizes all the major pathways for which we have identified significant research potential, and ties it with the existing research program of IEC. In an annex to the paper we survey briefly the many choices faced by designers of IRMs, and suggest how these choices affect the operation of the different pathways identified earlier. That discussion of design choices is intended to highlight the major issues to be kept in mind as scholars pursue research on IRMs with policy implications.

International Consequences of Implementation Review Mechanisms (IRMs)

²We do not address here the important arguments of what is or should be "rational", but below we do address whether different conceptions of "proper management" may be relatively empowered by the operation of IRMs and, thus, bias the operation of an IRM or an agreement in particular ways.

In this section, we consider the state as a single entity. With that assumption in mind, how would the operation of an IRM affect how states interact, and how do changes in those interactions influence the effectiveness of agreements? A later section relaxes this unitary state assumption and focusses on possible consequences at the domestic level.

Interests-based pathways

First we consider several pathways by which states consider what is in "their interest", and in particular the roles that IRMs might play in how states make these choices. In practice these arguments are typically associated with the "rational actor" models—i.e., that states rationally calculate what is in their interest and then pursue international agreements that meet their interests. Agreements are possible when the interests of different states overlap, and thus here we explore ways that the operation of IRMs might affect the size and shape of what states perceive as that overlapping zone.

COST-BENEFIT CALCULATION OF INTERESTS States may calculate the costs and benefits of cooperation differently when an IRM is in operation. Violations of an agreement are more transparent, and the state may fear retaliation if others find out it is violating the agreement. Other states may find it in their interest to enforce the agreement, and the IRM can help identify the targets of enforcement. This is a simple but potentially powerful model, and the one that most analysts of enforcement have in mind as a basic explanation for when and why a party meets its obligations; namely, if it could be caught it will comply, and the likelihood of compliance increases with the potential penalties.

What is in a state's individual interest may be different from what is in the collective interest of all states. Frequently, cooperation problems, such as the classic prisoners' dilemma, are marked by these differences—if an agreement can be reached then all are better off, but the incentives to cheat on that agreement are strong, and cooperation can easily unravel. By aiding in enforcement and providing public goods such as credible reviews and assessment of performance, IRMs can help states sustain the collective interest by making the private incentives more closely connected with the interests of cooperation as a whole. Primarily, by making it easier to catch and deter cheating they can help increase the costs to any individual of not cooperating, in the interests of preserving the collective benefit of cooperating.

The argument is simple and the single most cited reason for international monitoring and enforcement. Most game theoretic studies of international environmental cooperation conclude, not surprisingly, that interdependent cooperation problems require enforcement to keep the deal together and reduce risks that "free riders" will unravel the agreement (e.g.,

Barrett, 1991). It is the logic that has driven such close attention to verification issues in arms control agreements (e.g., Schelling and Halperin, 1962/1985; Graybeal and Krepon, 1988; for reviews of current issues see Poole and Guthrie, eds., 1993; for discussion of verification issues in the environmental context see Fischer, 1991; Fischer et al., 1990; Ausubel and Victor, 1992; Greene, 1993; di Primio et al., 1994). It has directly led to the perennial arms control question "how much verification is enough?", the answer to which depends on the benefits of the agreement and the risks and costs if cheating is not detected and punished. Although this model, which focusses on costs and benefits of cooperation is fundamental, it says little about what types of penalties are possible and how states actually make the calculation of interests. And, it says little about how an international review mechanism should best operate in any particular context.

RELATIVE ADVANTAGE A special instance of the cost-benefit perspective is the negotiation and maintenance of agreements that are not marked by joint gains but are rather strictly zero-sum. States may care not only what is narrowly in their interest but also how they fare in comparison with others. In strictly zero-sum negotiations, a gain for one is by definition a loss for another; perhaps some security issues are characterized by zero-sum bargaining—a gain in allowable troops or missiles for one side is a direct loss in security for the other, and in these cases it is relative advantage that matters most. Most environmental negotiations probably do not have a strictly zero sum character, but some aspects—especially those that affect states' economic competitiveness—may have zero sum features.

It is unclear if the operation of an IRM affects the way states make these calculations nor whether it makes it easier to reach and maintain an agreement. An IRM could undermine cooperation by making it clear that games that appear to allow for joint gains are in fact zero sum. In these situations, the fog of negotiation with imperfect information may lead to more effective agreements (Young, 1989; Young and Osherenko, 1993), and the effect of an IRM in reducing uncertainties and increasing the availability of useful knowledge could undermine cooperation. Reaching an agreement does not always mean that the agreement will be effective, or even that the problem will be better solved than without an agreement. However, a perverse effect of information-gathering systems such as IRMs may be that agreements are easily reached when uncertainty is high but they unravel as information about the real situation emerges. This may happen in the new agreement on climate change, for example, which could suffer as the largest emitters realize that they are relatively invulnerable to climate changes (e.g., Ausubel, 1992), and as they realize that expensive controls on emissions of greenhouse gases reduces economic competitiveness in a zero-sum world economy.

Alternatively, IRMs could promote cooperation in zero-sum games by making transparent that games that appear zero sum in fact allow for joint gain by clever bargaining. Similarly, the operation of IRMs may also reveal linkages between issues, expanding opportunities for joint gains and perhaps making collective solutions to many linked issues

more effective. Insofar as most environmental agreements may allow many opportunities for joint gains and are not zero-sum, IRMs should help. And, for issues with strong zero-sum tendencies, IRMs could at least promote building of confidence.

These are interesting and potentially important hypotheses, and they overlap with studies on the roles of information and expert advice in international negotiations (e.g., Berkner, 1950; Skolnikoff, 1972; Skolnikoff, 1993, ch.6). And identifying joint gains is central to negotiation analysis literature (e.g., Pruitt, 1972; Zartmann, 1977; Raiffa, 1982). Most analysts assume that more information leads to better agreements, in that agreements better reflect underlying interests of the parties that are negotiating them. Perhaps better agreements are more implementable later. However, we expect that most issues of environmental cooperation are marked by many opportunities for joint gains. Thus, it is interesting if IRMs help to transform a nascent environmental negotiation from zero-sum to one where the parties explore possible joint gains. Nonetheless, the hypotheses here do not help us understand how the operation of the IRM may lead to effective implementation once the agreement is reached. This does suggest that IRMs might influence how agreements are reached and maintained by providing information relevant to how the parties assess their interests, but probably the most crucial determinant is how this information (e.g., opportunities for joint gains) is used and selected by the negotiators and how the negotiation itself is organized.

EFFICIENCY OF COMMON STANDARDS The operation of an IRM could lead to common standards, such as criteria for acceptable behavior and emissions limits for particular technologies. Standards improve the prospects of cooperation because they make it easier to coordinate, and for issues where coordination is important any activities that lead to prompt adoption of good standards should help lead to effective agreements. Further, once an agreement is in operation, the existence of accepted standards can reduce the need for each state to make its own standard, perhaps also making it easier to understand and compare data from others. Common standards can diffuse either because they are codified in an agreement, by some legitimate international organization or negotiating forum, or simply by being first and leading the way. Here we are particularly interested in the ways that IRMs can contribute to setting standards that are then followed.

IRMs can contribute to the origin and diffusion of effective standards in at least two ways. First, lead states may use the IRM (or an international agreement in general) as a place to pursue their own interests, and thus to set standards that meet their interests. Here the IRM is not epiphenomenal; rather, it is a crucial source of legitimacy, with which states pursue their own interests. (The IRM is epiphenomenal when the states use sheer force to set standards at home and diffuse them worldwide, with the IRM merely codifying what has already happened. The role of the United States in setting High Definition Television standards may be an example, where the US used its economic power—the size of its domestic market for televisions—to set what will probably become the worldwide standard, eclipsing a competing Japanese standard.) The outcomes may not be fair—they may

disproportionately favor powerful states—but nonetheless a system of effective standards emerges, and the IRM plays a role in bringing that into being. Second, the IRM may genuinely serve as a negotiating forum for working out the details of possible standards, and for debating competing standards. Most standards-setting processes probably have a mix of the two—states are not indifferent to which standards best suit their interests, but they also negotiate those standards with others who may have different interests.

These roles of IRMs and international organizations generally are part of the popular (but largely unproven) claim that it pays to be a leader on environmental issues. The most convincing reason for leadership is that it allows one to set standards—once established, standards will be followed, and in the process of setting standards there are many choices. Leaders can tune those choices to their interests. Thus where an IRM is involved in setting standards (or the operation of an IRM with a given standard sets the norm), it is in the interest of lead countries to promote the early and effective operation of the IRM and to push for environmentally friendly standards. In contrast to the assumption that industry opposes environmental standards, in these situations where a controlling lead (through standard-setting) yields profits, some industries will favor (their vision of) environmental protection. Where these incentives exist, the IRM should evolve rapidly. Insofar as the pursuit of a particular standard leads to more effective environmental protection, effectiveness will be increased by this competition for standard-setting. After standards are set, however, this mechanism may no longer be operative, and if it leads to monopoly-like dominance—with the standard-setting process as an extension of a nation's industrial policy—then long-term effectiveness might be degraded.

The roles of standards are very important, but ones that have been studied at length. The major standard-setting organizations (International Organization for Standardization, ISO; International Electrotechnical Commission, IEC; and the International Telecommunications Union, ITU) have well-defined and active roles in the world economy. In the area of the environment, existing standards organizations have roles where their standards overlap with activities that influence environmental quality (e.g., noise and emissions standards), and these have not received much attention by scholars of environmental politics. However, it is likely that the ways that standards organizations function in the environmental area is an extension of how they function elsewhere, and thus perhaps not a priority area for further research. Standards organizations may ultimately have a large effect on environmental quality, and thus deserve greater attention generally by environmentalists and students of environmental politics, but that is a reflection of their general influence on the innovation and diffusion of technology and does not necessarily reflect an opportunity for new research on the role of IRMs.

There may be two exceptions to this generalization. First, some environmental problems may require wholly new standards organizations or standard-setting functions. The examples are many: in the area of trade and environment, fears of competition from environmentally "dirty" trading partners will produce pressure for standards on production

processes, which to date have no international precedence.³ In contrast to many other areas of international policy, states have tended to address international environmental problems through the negotiation of formal agreements. The proliferation of new agreements reflects areas where new types of standards are needed: international trade in hazardous waste, trade in endangered species, production of ozone-depleting chemicals, emissions of gases that may cause global warming, and preservation of biodiversity and habitats. Research into these areas reflects the core of research on international environmental politics—issue-oriented research on the operation and effectiveness of particular international environmental "regimes". However, what may be different about this type of research—and worthy of explicit attention—is that standards-setting in environmental agreements typically occurs in fora that operate in the context of a formal treaty and high visibility to outside observers. In contrast, the standards-setting organizations are typically based on informal agreements, and usually bar entry to outsiders; the barriers are in the form of rules of access, as well as the technical knowledge required to participate, both of which are much higher for outsiders. The formal organizational arrangements associated with environmental agreements, usually a treaty secretariat, are much less extensive in comparison with the major standards-setting organizations. Thus we should expect that standard-setting in the context of environmental agreements might depend more heavily on the influence of the states participating in the negotiation rather than the technical secretariat, and perhaps it is much more extensively shaped by the formal treaty context within which these standards are set (including, e.g., the need for time-consuming and cumbersome national ratification of major changes to treaties). Further, many agreements are explicitly targeted at controlling international trade, even when the environmental problem is not wholly caused by trade, which is a reflection that the international community finds it easier to address those aspects of problems that cross borders than to work internally in countries. Indeed, most agreements that control trade hope to have a parallel effect on countries' internal procedures by highlighting the issues at stake, setting international standards for "appropriate" behavior, and at times financing, but the main target is trade. In this context, research into the evolution and roles of environmental standards may chart new territory. Standards-setting and coordination roles could be the major functions of most international regimes, and the major factor why the most effective regimes have achieved their success (Krasner, 1991).

The second possible exception is the special role of standards in promoting verification of international environmental agreements, which is an issue needing more attention (e.g., Fischer, 1991; Fischer et al., 1990; Ausubel and Victor, 1992; Greene, 1993; Greene, 1994). Arms control agreements have frequently set standards in terms that improve the prospects for verification—for example controlling numbers of nuclear warheads by controlling the

³Almost without exception, in the name of free trade, GATT rules do not allow restrictions on production processes because the ability of a country to use a different process, even if it is a "dirty" process, is considered part of its competitive advantage. The logic of free trade thrives on competitive advantage.

number and dimensions of the missiles that lift those warheads into orbit. Missiles are more easily observed than the warheads tucked away inside. Similarly, a variety of proxies may be available to redefine the substances and behaviors that cause international environmental problems into terms that may be more easily verified. Most fisheries agreements are aimed at controlling the number and size of fish taken, but in practice are expressed in more easily implemented and verified technical standards—on mesh size, types of nets and fishing lines, and season. The Montreal Protocol on Substances that Deplete the Ozone Layer is aimed at controlling releases of ozone-depleting substances, but its terms are expressed in units of production and trade, which fit better with national and industrial accounting systems and are much more easily verified. The determinants of a "verifiable" agreement, and the role of standard setting in this context, are discussed at length elsewhere (Greene, 1994). Here we note that the operation of an IRM may lead to more verifiable standards, and in turn to better agreements. Indeed, IRMs connected to the operation of a treaty may best serve this function because they are most likely to be able to marry the terms of the treaty to the need for verification and also to actual behavior. Thus research into the role of IRMs in influencing the verifiability of standards may be valuable.

EFFICIENCY OF JOINT EFFORT An interests-based argument for international cooperation rests on the efficiency of performing some functions jointly, with common standards and functions, rather than independently. International organizations can reduce the 'transaction costs' of reaching and maintaining agreements, and in this spirit IRMs associated with those agreements can provide common functions of collecting and sharing information (e.g., Keohane, 1984). Common functions may lead to more effective agreements either because more resources are available for other activities related to the agreement which could be a source of an agreement's effectiveness. In principle this source of effectiveness is always operative although actual budgeting may not be done with these tradeoffs in mind. Further, without common functions some (or all) countries might not perform the necessary functions. Here we focus on three common functions: monitoring, organized exchange of data, and enforcement.

Common monitoring programs can clearly save time and money by avoiding duplication of effort, and the savings are amplified by the legitimacy of a competent common program. In practice, few international environmental agreements include monitoring programs. The normal process of international scientific research has led to some monitoring programs that are useful for international environmental agreements, and some of that research is funded collectively. Some agreements include provisions for common (or at least coordinated) scientific research—for example, the Antarctic Treaty System—and such research tends to include monitoring, including some monitoring that could be relevant for the operation and enforcement of the agreement. Some agreements include explicit provisions for collective monitoring (or have those functions performed informally, but nonetheless collectively), notably many fisheries management programs, which tend to include monitoring of fish stocks, and the agreement to control acid rain in Europe, which includes a special protocol for funding of a joint monitoring program. The experience in arms control agreements has

been quite different, where especially for agreements on nuclear weapons the parties have chosen to perform essentially all monitoring independently—probably a direct reflection of deep mistrust and the legitimate fears of the dangers of undetected cheating.

Because centralized monitoring of all the relevant data for management of an international agreement is rare, virtually all agreements depend heavily on self-reporting, at times with checks on the veracity of those reports. It is widely known that self-reporting to international environmental agreements is substandard (e.g., GAO, 1992), and perhaps the condition would be improved with more central capacity and better review mechanisms to make use of the collected data. However, obviously the information needed for useful self-reports and generally for management of a treaty is more readily available to decentralized reporters than to (usually nonexistent) centralized monitors; thus a common function of collecting and reviewing data will lead to a better supply of data only if the operation of an international data-collection and review mechanism in turn gives incentives to local authorities with the data to share that data more effectively (a conclusion suggested by Mitchell, 1994a, 1994b).

Enforcement may be a particularly valuable collective function. At the domestic level enforcement of laws is largely centralized and relatively much more efficient than enforcement of laws at the international level might be. Certainly this broadly reflects differences in sovereignty—at the domestic level the state has legitimate central control that it can use (within limits) to enforce the state's laws, but at the international level no such legitimate authority exists. Nonetheless, perhaps allowing for centralized enforcement of some international laws could be a useful common function that an IRM could help perform, and one that is not entirely unrealistic. Many studies of economic sanctions and other potentially powerful instruments of international enforcement (e.g., war) note that they are difficult instruments to mobilize—domestic interests must be overcome, most states are reluctant to use force, and international cooperation on sanctions is helpful but difficult and time consuming to organize.⁴ Thus these conventional instruments of enforcement are suited only for major violations. But internationally accepted IRMs may make detailed enforcement possible, and in doing so make international agreements more effective because states might not perform the necessary enforcement on their own without the detailed oversight of an IRM. Collective agreements on many environmental issues may require detailed enforcement because the cumulation of relatively small violations could ultimately undermine the agreement and the existing legal doctrine of state responsibility is difficult to apply when many parties are using a common resource (e.g., Birnie and Boyle,

⁴The literature on sanctions is enormous, and much of it has been focussed on assessments of whether sanctions "work". Primarily see Galtung (1967) and the review in Doxey (1971) and Lindsay (1986) among many others. For the most extensive assessment of how international economic sanctions are used see especially Baldwin (1985) and Hufbauer et al. (1990).

1992, ch.4). The most recent illustration of the need for detailed enforcement is the use of internationally tradeable permits for greenhouse gases (e.g., Grubb, 1989). Markets for these permits will arise only if the property rights they imply are secure, requiring detailed accounting of permits and actions against those who undermine the system. IRMs have a role here, and could be crucial to the effectiveness of property-based systems, but to date they have not been used in this capacity (a review of enforcement issues, including the operation of possible IRMs, is: Tietenberg and Victor, 1994). There is some experience with IRMs in commodity agreements and the dispute resolution procedures of the GATT that suggest this role could be effective. Even where enforcement actions are made by the states themselves, outside the treaty system, the IRM may offer a forum for legitimate scrutiny and negotiation that either helps to identify proper areas for enforcement or helps to shape enforcement actions.

Thus monitoring, exchange of data, and enforcement are all areas of where IRMs could provide a common function and thus lead to more effective agreements. In large measure these are extensions of the functional literature on international organizations, which has stressed the helpful roles of international organizations by identifying the functions they could perform (e.g., Skolnikoff, 1972; Cox and Jacobson, 1973; for a review, see Kratchowil and Ruggie, 1985). More recently, it is an extension of the idea that international organizations keep 'transaction costs' low (Keohane, 1984). The need for these factors may result in a demand for international organizations (and international law and policy more generally), and that demand may result both in the creation of an IRM and its operation leading to more effective agreements.

Although this is an extension of well-developed arguments, there are two exceptions where further research could be of considerable value. First is the potential roles of IRMs in helping to manage decentralized information. A characteristic of virtually all international environmental agreements—in contrast to arms control agreements—is that the relevant information on behavior, practices and remedies is scattered amongst many state and non-state actors. Centralization is usually neither possible nor desirable, but IRMs might play important roles in allowing better use and access to decentralized information. This role of IRMs has not been investigated systematically.

The second exception is the role of IRMs in managing highly complex problems. The common functions of gathering and sharing information, and reviewing that information, may be especially valuable where a broad international legal instrument is attempting to control detailed national actions, which are complex for one of several possible reasons: 1) the issue may be intrinsically complex and thus perhaps poorly understood; 2) the number of relevant parties may be high (or shifting), thus leading to diverse and complicated potential coalitions and patterns of interests; 3) the agreement may be trying to control more than one substance or activity, thus leading to overlaps and complex mixes of interests, all packaged together in a common agreement. All these forms of complexity may make it difficult for an international agreement to remain substantively connected to reality because

multilateral agreements, especially those that include many parties, are necessarily broad, but implementation of those agreements must contend with the details of each specific case.

FLEXIBILITY IN INTERNATIONAL RELATIONS As both the natural environment we are seeking to protect and the social environment within which environmental protection measures are implemented are complex and often poorly understood, flexibility may be a premium in any agreement. Formal agreements can be both inflexible and tough to abandon; their commitments can become inconvenient easily. Diplomats know this and thus may negotiate unduly conservative formal agreements, however it may be difficult to keep conservative and inflexible agreements consistent with changing science and social contexts. Political scientists and legal scholars have compared formal and informal agreements (notably, Sand, 1993 and Lipson, 1991). Analysis of informal agreements strongly suggests that they work because of the review mechanisms that exist to connect the agreement to actual practice and experience, but none of that work focusses explicitly on the roles of IRMs. Much is at stake in the answers to these questions given that the normal mode of international environmental politics is to create formal agreements—"hard law". If the experience shows that under some conditions informal arrangements—"soft law"—work much better then the future of international environmental diplomacy might take a different path from the experience to date. Notably, soft law could help keep international agreements connected to the reality of what can be implemented. In contrast to research that might be done on complexity—which would have the purpose of exploring whether IRMs help manage systems as they become more complex—this research would explore whether IRMs help informal agreements act more effectively.

Research in both these areas—complexity and soft law—would help provide a useful complement on major ways that IRMs help manage problems that are uncertain, shifting and complicated, and thus where flexibility is needed. And, such research could reveal ways that IRMs help connect international agreements to domestic politics, a topic to which we will return.

Learning-based pathways

We have so far assumed that the interests of states remain constant. In fact, what states express as "their interests" may change over time as they learn. They may learn more about what is in their interest, learn about the issue they are cooperating to address, learn about (and learn to trust) each other, and build capacity to learn. Initial agreements are by nature unable to be fully complete, and thus international cooperation involves a lot of learning by doing. IRMs may help make the learning process more effective. Here we consider four types of learning—the relevant research questions are discussed together at the end of the section.

LEARNING ABOUT INTERESTS In practice, information is incomplete and states can not make a fully informed calculation of their interests. Where an international issue cuts across many different and complicated interest groups, a state may simply not know what is in its interest until it tries to formulate and implement policy—after an initial agreement is signed. In new policy areas, governments may also not know what policies work best. The operation of an IRM may highlight the real issues of implementation and thus contribute to learning. One benefit of learning is that parties better understand each other's interests and how they compare, and thus perhaps the parties are able to interact better in the negotiation and management of agreements. Knowing more about interests does not necessarily lead to more effective cooperation, but it will if fuller knowledge produces better agreements—agreements better tuned to what states can implement.

The broad argument about learning is probably correct and has been supported, e.g., by research on the role of the Standing Consultative Commission (SCC) of the SALT nuclear weapons agreements (Chayes and Chayes, 1993) and the organizations that manage the Non-Proliferation Treaty (Nye, 1987). Several studies of international environmental agreements conclude, broadly, that the procedures for cooperation have led to learning (notably Levy, 1993a), and perhaps by extension we can posit that IRM-like procedures lead to learning. The insight that states can learn more about each others' interests are well known. The process by which learning might take place and the role of IRMs in promoting learning are less explored; we posit that the most important activities are at the domestic level and will return to this issue in the next section.

LEARNING ABOUT THE PROBLEM An added benefit of any data exchanges about behavior and performance is that such data are typically also relevant to scientific research on the problem at hand. Armed with data, scientists can learn more about the problem, especially because accurate data about behavior can be used to test scientific models, if other relevant data are also collected. For example, data about industrial emissions can test models of deposition and accumulation in the Rhine river, if there are also data on river concentrations and deposition at sufficiently numerous points in space and time to test the model. Well tested models are then more reliable for predictions and "what if" scenarios, in turn making them potentially useful for policy. This mode of learning has definitely been operative in many fisheries agreements and the agreement on whaling, where data collected under the agreements has been used not only to manage the resource but also to feed scientific research into the problem.

Similarly, international assessments, scientific research, and exchanges may be promoted by an agreement, in turn leading to better understanding of the problem. IRMs may also have a role, suggested (but not demonstrated) by the experience with the Montreal Protocol. The Protocol's scientific review panels—which operate in a manner similar to how an IRM might function, but consider only the broader scientific and technological issues, as well as the overall adequacy of the agreement, and not specific issues of national

implementation—have also resulted in significant advances in understanding of, and capacity to solve, the problem (Parson, 1993).

Credible models may also improve the prospects that scientific advice is used because scientists will gain stature when they have better and more useful knowledge about cause and effect. (Although clearly there are cases where scientists have been consulted because they are scientists and not because of special, helpful or accurate knowledge, as well as instances of the reverse.) Indeed, managers may be more reluctant to accept scientific advice when cause–effect relationships are poorly understood by scientists; instead, management decisions may be more readily made by rules-of-thumb and less scientific methods in this context. If so, the improvement in effectiveness that comes from building good databases could be exponential—the product of increasing access to policy making by scientists and increasing utility of scientific knowledge.

LEARNING AND ASSURANCE: CONFIDENCE-BUILDING Insofar as the operation of an IRM produces additional information about what states are doing, it can help build confidence. This is a matter that has received much attention in many arms control agreements, where the atmosphere of mutual suspicion and fear of being the victim of cheating is high.

The mechanism is valuable as a confidence-building measure (CBM) only if the parties are confident that the information gathered is useful for relevant assessments and if the operation of the IRM demonstrates that the parties are doing what they are expected to do. Obviously an IRM is also a potential vehicle for misinformation and in that role could be destructive of confidence. This mode of operation within environmental agreements would presumably become more important as environmental commitments become increasingly interdependent, leading one party to be vulnerable to others' actions and also in areas where the parties are suspicious of each other. In the empirical research that is the complement to this theoretical paper we are finding that IRMs tend to evolve where needed (Victor et al., 1994). If so, evidence of the existence and operation of IRMs may be evidence that the parties are learning about the need for assurance and confidence-building, i.e., that the agreement is seriously tackling difficult issues of implementation. That could be a valuable (but imperfect) means of testing whether or not the parties are taking implementation seriously. It could also lead to counter-intuitive results regarding the instances of noncompliance: for example, the fact that implementation is taken seriously will lead to much more awareness of noncompliance through the operation of such mechanisms, just as police statistics tend to show increases in the number of criminal events when the number of police officers increases. A rise in the rate of noncompliance is thus not necessarily symptomatic of an agreement that has become ineffective—it may even indicate the reverse—but it nonetheless could pose problems for confidence. Thus agreements marked by high levels of existing noncompliance may find the confidence-building roles of IRMs initially counter-productive. However, diplomats are highly aware of this, and in practice

counteract these tendencies (unless they intentionally want to undermine confidence). For an illustration of the issues in the case of the SCC, see Graybeal and Krepon (1985).

LEARNING AND CAPACITY Apart from any provisions for technical assistance related to an agreement (grants, loans, etc.), the operation of an IRM may also build capacity among participants by providing knowledge. The state can learn what others have tried, and what has failed and why, and in doing so be better able to make good choices and spend scarce resources wisely. This is the argument that underlies the popular argument in economic development literature that poor countries can ‘leap frog’ the bad experiences of the rich, for example by learning about new technologies and institutions and learning from the rich. It can be easier to catch up than it was for leaders to blaze the trail, provided there is a way to gain and use knowledge about the road ahead. If mechanisms exist perhaps learning is promoted, provided that the bottle necks in learning are the information and experience conveyed through the mechanism.

The argument is true between countries of similar economic background and not just between rich and poor. Countries learn lessons from each other; the review mechanisms of the OECD (the organization of the 25 rich industrial democracies) are probably the best example—rich countries learn from other rich countries through a dense network of interactions.

All of these ways that IRMs can promote learning are consistent with a new mode of thinking about international agreements that emphasizes their functions as conduits for information, learning and consultation, and negotiating through problems and disputes (e.g., Chayes and Chayes, 1993; Haas et al., 1993). This contrasts with (and at times complements) studies that emphasize enforcement and adjudication of disputes as major functions of international agreements. Thus research into learning has a hospitable context and could help elaborate this new model. Most of the pathways to learning in environmental agreements have not been studied systematically, but all the above are known. In practice it could prove quite difficult to conclude anything systematic about when those pathways are operative. Because the ways that learning results in effective agreements are complicated, assessing the relative contribution to effectiveness of these pathways will be especially difficult. Nonetheless, these remain interesting and relatively understudied.

Domestic Consequences

Suppose we now relax the assumption that the state is unitary and look below the level of the state to domestic politics and processes. How, if at all, do international mechanisms

affect actors at the domestic level that, in turn, influence the effectiveness of international cooperation? The causal links seem stretched, but as we will argue this is an area where research on environmental agreements is likely to produce new results, in part because a major consequence of putting a lens on domestic politics is that non-state actors come into focus.

IRMS are particular ways that international affairs can affect domestic politics (Zürn, 1993; Milner, 1988). As before, we distinguish ways that IRMs can affect how actors can pursue "their interests" at the domestic level, as well as how those interests can change through learning.

Interests-based pathways

The most widely accepted "model" of domestic politics is that individuals and groups pursue their interests, with the policy outcomes determined by the relative power of these actors (Stigler, 1971). Because IRMs operate at the international level, the chain of actions by which an IRM can influence domestic actors can be long and very complicated. Here we focus on the ways that IRMs may relatively empower different actors and thus affect the policies that the nation actually implements.

EMPOWERMENT OF THE STATE IRMs may empower the state because the state is the central legitimate actor in international law, and thus the state typically plays a central role in IRMs. Unless delegates are comatose, the state will gain information and expertise that it can use to solidify its position. Because the state is, in the first instance, the regulator of domestic activity, it can in turn use information and authority from international legal instruments as means of tuning domestic regulations. Indeed, whether authoritarian or democratic, the state may use international legal instruments as a means of pursuing other domestic goals that overlap with environment. The broadest overlap between environment and other issues is through energy. Many states, for fiscal reasons, are trying to reduce subsidies on energy production, notably dirty coal. Environmental agreements might help tip the balance. Insofar as other interests overlap with the environment, this should on balance lead to more environmental protection (although perhaps also more state control, which some environmentalists also abhor).

EMPOWERMENT OF BUREAUCRACIES Whether or not the state is relatively empowered, extensive IRMs probably lead to empowerment of the bureaucrats who attend the meetings. Again, the currency is knowledge. Bureaucrats who attend the plethora of IRM meetings are simply better informed to contribute to the making of state policy, and in doing so will be relatively advantaged. Insofar as the only bureaucrats who care about these details to attend meetings are those from environment ministries (and environment divisions of foreign ministries), that relative empowerment should typically lead to more environmental protection on the assumption that environmental ministries will push for environmental protection (which is usually, but not always true, and says little about which types of instruments or forms of environmental protection they will seek and whether those will be effective). As IRMs and the issues become more complex, the empowerment should be pronounced as it will be virtually impossible for other arms of the bureaucracy to gain expertise needed to speak knowledgeably, without a major investment in time and resources.

EMPOWERMENT OF EXPERTS Insofar as IRMs require expert advice, expert assessments or produce externalities such as datasets useful for building models and decision-support systems, experts will become invaluable. Similarly, IRMs might serve as a location for network-building by experts—and, by doing so, giving experts in different countries ideas and information that they then use to achieve changes in domestic policy (a

part of the "epistemic communities" hypothesis of Haas, 1990b, and elaborated in Haas, 1992). It may be that the experts who participate in IRM procedures are systematically predisposed to environmental protection for several reasons: 1) this is the issue they study and probably they think it is important; 2) the more one studies virtually any issue the more it seems complex and fragile, especially where ecology is concerned because the current tendency of ecological sciences is to emphasize how whole ecosystems are connected in fragile and complicated ways; and 3) experts are part of networks of experts worldwide who share similar values, making it likely that any temptation against environmental protection will be squashed by peer pressure. (Experts may also have a tendency to favor some types of solutions—especially those dependent upon science and technology—which could be viewed by others as fragile, costly or otherwise inappropriate.) IRMs may have a propensity to be captured by experts who think these are serious problems, and thus willing to put in the time to attend meetings and write reports. Thus the operation of IRMs may tend to empower the zealous environmental expert. (Mavericks may help counteract some of this enthusiasm from active scientists, but mavericks are probably unlikely to be empowered by IRMs because: 1) they are busy being mavericks and not willing to endure the boredom of meetings and reports; 2) they will not be selected as participants.)

EMPOWERMENT OF THE AGGRIEVED The operation of IRMs may empower any party who is aggrieved by the state not fulfilling its obligations. IRMs, even if ineffective in their main functions of exchanging information, typically require self-reports, including reports on planned policies, and well-developed IRMs may also produce independent analyses. These reports, and any instances of the state being found not in compliance, are ammunition for the aggrieved. Clearly environmental NGOs could benefit from this additional device for pressing their cause, but so could any party whose interests are adversely affected. If this holds true then the existence of an IRM should result in convergence towards compliance by parties to an agreement, provided that the aggrieved have other necessary rights to press their cause domestically (e.g., freedom of expression). However, empowering the aggrieved does not necessarily deal with two problems that could cause compliance to diverge: similarly, procedures that give power can also be mis-used, unless there is a means of selecting and responding only to legitimate complaints.

EMPOWERMENT OF NON-STATE ACTORS Other non-state actors such as environmental NGOs and firms may be empowered by IRMs because participation in the IRM confers knowledge and legitimacy—the mechanisms highlighted above for bureaucracies, experts and the aggrieved apply also to non-state actors. NGOs may become better able to help implement agreements because knowledge increases the possibility that NGOs' domestic policies and actions will be more closely related to the reality of the international agreement. And, NGOs of all types will be better able to win domestic arguments and battles when they have the legitimacy and knowledge gained by participation in a legitimate information-oriented process such as the IRM.

As a research program, the arguments do not appear to warrant much explicit attention because they are logical extensions of the basic model of domestic politics, which is already well known. Empowerment is a variant on the general argument that international commitments and pressures can be used by the state (Schoppa, 1993) and interest groups (Milner, 1988) to achieve changes in domestic policy. We have provided some examples of where these mechanisms seem to be operative, and evidence probably exists to support all these modes. Our description includes the conditions under which these should operate and may help observers predict when these different pathways to effectiveness will function. Given that much of the attention to environmental issues has focussed on the roles of non-state actors and experts in setting and promoting the agenda, the potential empowerment of these groups during the process of implementation may be of special interest in explaining environmental politics and effectiveness of agreements, even if they do not necessarily represent areas for new research.

Learning-based pathways

As at the inter-state level, IRMs may result in learning by different domestic actors. The operation of an IRM requires governments (and other participants potentially) to gather information and assemble it. Except for the most sterile of gathering exercises, this is bound to increase awareness of governments and delegations of the underlying interests at stake. In principle this should result in better agreements, if we define "better" as those which conform to domestic interests. But there are two problems with this argument. First, as long recognized, interest groups will not mobilize to map perfectly the real underlying interests of the state and its constituents. Second, the interests learned could be hostile to the environment. Thus in part we are caught in the problem of how to define "effectiveness", but the real issue is the relationship between interests, interest groups, and the expression of the interests to delegations of the state, who act as the agents of the people at international negotiations and meetings of IRMs. Learning by two groups may be especially relevant.

REGULATORS A chief difference between environmental and arms control agreements is the relative role for domestic regulation and implementation. Arms control agreements require the state to change its behavior, but environmental agreements require the decentralized subjects of the state (consumers and firms) to change. Thus implementing an environmental agreement requires passing additional rules and market adjustments at the domestic level to have the necessary effect on domestic actors. Overall effectiveness requires rules and actions at multiple levels of governance. The best means of domestic regulation are difficult to predict. Domestic regulators may learn from their counterparts in other countries if an IRM provides a forum for them to share ideas and experiences. An unstructured IRM may allow for ideas to be exchanged informally, in the hallways; structured IRMs with procedures for reports and reviews may promote further learning by

explicitly focussing on domestic implementation and connecting new ideas and critiques to specific practices.

NGOs Finally, non-state actors may learn through the operation of an IRM. In part they may learn the same lessons as those of regulators, and in doing so gain evidence and experience that they can use to push for more effective implementation at home. In part they may learn more about other NGOs and, from them, learn lessons about how to ply their cause more effectively. NGOs attend meetings and read reports of IRMs and may learn in that capacity, but a more plausible argument is that there is little in the formal meetings to be learned but rather contacts and stature gained at the meetings and by participating in the process enable (but do not assure) learning. By gaining real information, rather than the symbols and polemics that are prominent in public debates about environment, NGOs may gain a legitimate role in domestic policymaking that, in turn, allows them to tune domestic policies to their interests. These arguments should equally hold for environmental NGOs (ENGOs) and firms, industry groups, etc. In practice, all NGOs may not be treated equally in terms of access to meetings—environmental negotiations may have many informal barriers to entry for the non-green, in which case only other points of access (e.g., via government delegations) will be available. Nonetheless, all of these pathways for learning by non-state actors should lead to effectiveness.

All of these learning pathways may affect behavior, and there may be feedbacks between learning and empowerment. The assessment of research potentials here is as with learning at the inter-state level. The major pathways are known and this is potentially a very important avenue to effectiveness. In practice, it will be very difficult (even more so than at the inter-state level) to trace the consequence of an IRM's operation on learning and then to behavioral change in any systematic way. That suggests that beyond knowing the major pathways there may be little benefit to a systematic research program of working out the details. However, a better theoretical explanation of the learning process may lead to more varied pathways, and in doing so lead to new progress in understanding the learning process and the conditions that might allow IRMs to promote learning and effectiveness.

Conclusion: Areas for Research

We have identified the 16 major pathways by which IRMs lead to more effective agreements and surveyed the research potential in each. Here we review the five areas we have identified as particularly important for further research—because they are both important pathways and current research on them is inadequate—and summarize which aspects of our current research are designed to fill gaps in the literature related to IRMs. We also encourage others to do the same, especially with those aspects of IRM research that still remain to be explored.

We also note that this paper, which is a comprehensive survey of the major pathways by which IRMs might operate from the vantage of theory, is not the only way we have identified important research questions. In parallel with this paper we have also started a large scale survey of how IRMs actually operate in practice. The structure of the database and initial observations from that study are reported elsewhere (Victor et al., 1994). The two papers should be read together for a comprehensive overview of how IRMs operate and the research program.

Five research areas

STANDARD-SETTING IN ENVIRONMENTAL AGREEMENTS The roles of the major standards-setting organizations (e.g., ISO, IEC, ITU) have been studied extensively and probably do not warrant significant extra research (although some further research might be valuable in the areas where those standards affect environmental quality, which is relatively less studied). However, the role of *new* standards-setting organizations and the roles of environmental treaties in setting standards may merit further attention. Most international environmental problems are addressed through formal treaties with high visibility to and participation of outsiders (e.g., nongovernmental organizations). In contrast, most of the activity of the standards-setting organizations is based on informal agreements and with visibility and access only to qualified outsiders—usually barriers to entry to outsiders, in the form of rules of access and the technical knowledge required to participate, are much higher. Further, the formal organizational arrangements of environmental treaties—usually a treaty secretariat—are much less extensive in comparison with the major standards-setting organizations. Thus we should expect that standard-setting in these contexts will depend more heavily on the influence of the states participating in the negotiation, and perhaps it is much more extensively shaped by the formal treaty context within which these standards are set (including, e.g., the need for time-consuming and cumbersome national ratification of major changes to treaties). Further, many of these agreements are explicitly targeted at controlling international trade, even when the environmental problem is not wholly caused by trade, which is a reflection that the international community finds it easier to address those aspects of problems that cross borders than to interfere in the internal affairs of states. Indeed, most agreements that control trade hope to have a parallel effect on countries' internal procedures by highlighting the issues at stake, setting international standards for "appropriate" behavior, and at times financing, but the main target is trade. In this context, research into the evolution and roles of environmental standards may chart new territory, especially where they are able to determine the extent to which standards on trade activity are able to leverage other deeper domestic policy changes.

VERIFICATION, VERIFIABILITY AND STANDARDS Our discussion of standards also highlighted that standards can play a special role of standards in promoting verification

of international environmental agreements, which is an issue needing more attention (e.g., Ausubel and Victor, 1992; Fischer, 1991; Greene, 1993). Arms control agreements have frequently set standards in terms that improve the prospects for verification—for example controlling numbers of nuclear warheads by controlling the number and dimensions of the missiles that lift those warheads into orbit. Missiles are more easily observed than the warheads tucked away inside. Similarly, a variety of proxies may be available to redefine the substances and behaviors that cause international environmental problems into terms that may be more easily verified. The determinants of a "verifiable" agreement are explored at length elsewhere (Greene, 1994). Here we note that the operation of an IRM may lead to more verifiable standards, and in turn to better agreements. Indeed, IRMs connected to the operation of a treaty may best serve this function because they are most likely to be able to coalesce the terms of the treaty to the need for verification and also to actual behavior. Thus research into the role of IRMs in influencing the verifiability of standards may be valuable.

MANAGEMENT OF INFORMATION IRMs can help provide many common functions, and in doing so help reduce the overall cost of solving common problems and increase effectiveness. That is a well-studied area, but one function that is both important and under-studied is the potential role of IRMs in helping to manage decentralized information. A characteristic of virtually all international environmental agreements—in contrast to arms control agreements—is that the relevant information on behavior, practices and remedies is scattered amongst many state and non-state actors. Centralization is usually neither possible nor desirable, but IRMs might play important roles in allowing better use and access to decentralized information. This role of IRMs has not been investigated systematically.

COMPLEXITY Another benefit of providing common functions might be an increase in the ability to manage highly complex problems. The common functions of gathering and sharing information, and reviewing that information, may be especially valuable where a broad international legal instrument is attempting to control detailed national actions, which are complex for one of several possible reasons: 1) the issue may be intrinsically complex and thus perhaps poorly understood; 2) the number of relevant parties may be high (or shifting), thus leading to diverse and complicated potential coalitions and patterns of interests; 3) the agreement may be trying to control more than one substance or activity, thus leading to overlaps and complex mixes of interests, all packaged together in a common agreement. All these forms of complexity may make it difficult for an international agreement to remain substantively connected to reality because multilateral agreements, especially those that include many parties, are necessarily broad, but implementation of those agreements must contend with the details of each specific case.

FLEXIBILITY AND SOFT LAW Because both the natural environment we are seeking to protect and the social environment within which environmental protection measures are implemented are complex and often poorly understood, flexibility may be a premium in any agreement. Inflexible agreements may be tougher to abandon, and thus perhaps making

them more effective when their commitments become inconvenient. But diplomats know this and thus may negotiate unduly conservative formal agreements, and those agreements may still find it tough to shape and remain consistent with changing science and social contexts. Political scientists and legal scholars have compared formal and informal agreements (notably, Sand, 1993 and Lipson, 1991). Analysis of informal agreements strongly suggests that they work because of the review mechanisms that exist to connect the agreement to actual practice and experience, but none of that work focusses explicitly on the roles of IRMs. Much is at stake in the answers to these questions given that the normal mode of international environmental politics is to create formal agreements—"hard law". If the experience shows that under some conditions informal arrangements—"soft law"—work much better then the future of international environmental diplomacy might take a different path from the experience to date. Notably, soft law could help keep international agreements connected to the reality of what can be implemented. In contrast to research that might be done on complexity—which would have the purpose of exploring whether IRMs help manage systems as they become more complex—this research would explore whether IRMs help informal agreements act more effectively.

Research in both these areas (complexity and soft law) would help provide a useful complement on major ways that IRMs help manage problems that are uncertain, shifting and complicated, and thus where flexibility is needed. And, such research could reveal ways that IRMs help connect international agreements to domestic politics, a topic to which we will return.

Our current research program

We have research in four of these five areas. First, the role of standards in determining verifiability of agreements is one aspect of a large survey of issues related to "verifiability" (Greene, 1994); that study, led by Owen Greene, also highlights some questions for further research and may form the basis for further work in the IEC project. Second, on the management of information, we have a study that examines what information is gathered, exchanged and verified in two international agreements—the Convention on Long Range Transboundary Air Pollution and the agreements to control operational oil pollution managed by the International Maritime Organization—led by Juan Carlos di Primio. That study touches on some of the problems in managing decentralized information, but is especially focussed on whether the procedures within the treaty result in the availability of high quality data, and whether that data is fully used. The need to study management of information is also motivated by the empirical study that complements this study (Victor et al., 1994). Third, directly on the role of IRMs in helping treaties to manage complexity, Owen Greene is conducting a comparison of the roles of IRMs in the Montreal Protocol on Substances that Deplete the Ozone Layer and the agreements to control pollution in the Baltic Sea. That study is also motivated by an empirical complement to this paper (Victor et al., 1994), which elaborates several types of complexity. Fourth, the role of IRMs in promoting flexible agreements is led by David Victor. That study is a comparison of the operation of IRMs under overlapping soft law and hard law agreements and is intended to explore the conditions under which soft law arrangements are more effective than hard law. We do not currently have any work under way directly related to standard-setting in international environmental agreements.

In addition to these studies motivated by this analysis, John Lanchbery is analyzing 35 agreements related to biodiversity, with special attention to long term trends in the use of IRMs and the role of the legal enabling language in shaping the development of IRMs. The research questions in that study are motivated entirely by the experience of "working with the data" in building a database on the operation of IRMs (Victor et al., 1994). That database now serves many purposes; primarily, it structures the major variables related to the effectiveness of IRMs and is useful for examining long-term trends and, especially, for selecting cases.

Additional information on these studies are available in the IEC research plan (IEC, 1994) and in detailed project descriptions available from the authors.

Cross-cutting themes and further research

This essay also identifies two themes that cut across the many pathways and deserve further attention, although at present they have not produced precise hypotheses or research questions. The first is learning. Research into learning must differentiate the role of ideas,

individual learning from social learning, and the role and diffusion of knowledge (Haas, 1990a; for a review of the social learning literature see Parson and Clark, 1993). IRMS can contribute to all these conditions and avenues for learning. At the inter-state and domestic levels we have identified learning as potentially a major way that IRMs can lead to effectiveness. Probably states do not "learn" but rather (influential) individuals learn, bureaucracies change their procedures in response to new information, etc. Thus any model of learning requires connecting the international and domestic levels, with specific hypotheses about the pathways of learning (here we only analyzed the different types of learning and hinted at the ways that learning might actually take place). This area deserves some more thinking.

The second area is the ways that international and domestic politics are connected by IRMs. We have implied that IRMs help connect international agreements to reality by providing information on what states are implementing, what they can implement, and where improvements are needed. Further, we have suggested, and offered many specific pathways, how the operation of an *international* IRM can affect domestic policy processes. But information also travels from domestic to international—for example in the minds of participants in IRM processes—and then cycles back to the domestic. The problem of domestic-international linkages is at the forefront of current political science research (Evans et al., 1993), and the operation of IRMs is but one instance of the general need to understand domestic–international linkages better. The work we have under way will help improve some of our understanding of domestic-international linkages, and we are now designing a next round of research to investigate them further.

Annex

Design Characteristics of IRMs

The above arguments comprise the major pathways by which IRMs might lead to more effective agreements, but they provide little insight into the ways that IRMs might be designed. In this annex we examine IRMs from the angle of design characteristics, thus focussing directly on the parameters that can be adjusted through policy. For each characteristic we refer back to indicate how it influences the major pathways; in doing so, the research program that is partially motivated by this essay can be conducted in a way that is relevant to policy choices that designers and managers of IRMs may face in the future. In other words, attention to design principles allows us to 1) be aware of the major design variables that we must include in any detailed analysis of IRM effectiveness; and 2) highly policy-oriented research, highlight which variables might be selected and controlled in an effort to provide robust answers. At IIASA, we have already used these variables in an analysis of a portion of the IRM that might be implemented in the climate change convention drawing upon previous research into the IRMs in use under the GATT (Victor, 1994)—that analysis illustrates the practical value in looking not only at the major pathways to effectiveness but also at those pathways from the perspective of the design variables.

NUMBER OF PARTIES AND PARTICIPANTS A constant tension in international environmental politics is participation, especially where global issues are concerned. Allowing (and encouraging) all states to participate in principle results in all stakeholders sharing a place at the table. But hundreds of delegates and interests may produce unmanageable complexity, lack of flexibility, and inability to move decisively to take advantage of opportunities (and avoid dangers). Smaller groups may allow swifter action, but larger numbers probably confer legitimacy, especially where excluded parties are suspicious of exclusive groups colluding to set standards and control an issue.

FORMALITY Much review and assessment happens informally, through scientific debate and exchange of information, and through informal contacts between states. Thus de facto an IRM of some form will emerge in virtually any agreement. However, to what degree should formal procedures also be created? Formality lends authority to reports produced by the IRM, but at the cost of having those reports conform to normal diplomatic politeness (although any international report involving states or official state representatives must conform to those norms). A formal requirement to submit reports may make states more likely to compile and submit such documents—and regardless of their use within the IRM, such reports are useful to others (e.g., the aggrieved) who can use admissions of guilt in reports as ammunition for their claims, or can use falsified or incomplete reports for the same. Where others, e.g., NGOs, can submit reports on another state's behavior then those reports might also be formal entry points for a complaint. But experience suggests that even where formal requirements exist they do not induce even nearly full compliance. Formal procedures may be helpful because formal institutions are difficult to kill—but uncooperative states will probably remain uncooperative regardless of the formality of procedures.

The most obvious product of formality is voting, and there are examples of that power improving and degrading effectiveness. Unit veto systems clearly lend themselves to least common denominator practice (e.g., Underdal, 1980), but probably also help to ensure that all parties stay within the regime. In the interdependent world, states may remain within unit veto systems, and even tolerate decisions against their interest, in order to remain an active participant in the broader arena of world affairs (a conclusion dating back to Keohane and Nye, 1977/89). The most important fact about formality is that while formal procedures do matter, most of diplomacy occurs informally. Different types of majority voting allow the majority to push along the minority, which presumably leads to effectiveness if the minority are laggards. Formal procedures are a means of securing an outcome against change, if only because formal systems are difficult to change. A priori, however, this provides little insight into whether and under what conditions formal systems lead to effectiveness.

SIZE AND CAPACITY An IRM typically requires competent administrative and professional support, and procedures for managing their activities. IRMs may be organized and managed by a skeletal secretariat, with most of the functions actually performed by the participants in the IRM process. Or, expertise could be built within the secretariat itself. Once created, staff may become empowered advocates for the problem, leading to a tendency for them to advocate environmental protection. Further, international staff may tend to advocate international solutions.

These are standard arguments and issues; because secretariats seem to be chronically underfunded, a key point of focus is the extent to which resources within the IRM and the secretariat leverage external resources. Underfunding may give more authority back to the funders—usually the states—and thus reduce the autonomy and operation of the secretariat from what is originally designed.

SOURCES AND TREATMENT OF INFORMATION What does the IRM consider as evidence, and how is it admitted and authenticated? Formal IRMs give a prominent role for the state and thus in the first instance information will come from the state in the form of self-reporting. But some IRMs have provisions for gathering additional information (e.g., EMEP⁵) that can be used to authenticate self-reported data. In practice, information is frequently abundant and the issue is rather who (if anyone) will authenticate national reports. Concerned delegations and NGOs may perform some checks of veracity, and in some IRMs models used by the IRM can identify cases of gross noncompliance and misreporting (e.g., in the expert committees associated with management of international whaling, which have at times noted irregularities between model predictions and observed stocks, and the possible role of noncompliance as a cause).

⁵ Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe.

These concerns are especially important in managing environmental problems where frequently there is a dense network of information outside the formal regime. Relevant information on behavior is highly decentralized and is not only in the hands of the state; thus information useful for assessing whether a party is living up to its commitments is available to many, even other countries and their experts, over and above any formal mechanisms for exchanging information and apart from any state-centered monitoring scheme. This is similar to many trade and economic agreements—where experts writing Op-Ed articles and lobbyists can have as much information as government negotiators—but markedly different from most arms control agreements, where it tends to be more centralized in the hands of the state. Effective regimes are designed to make optimal use of these external sources. One option is to allow information from any interested party, but this extreme form of the global village risks intractable confusion. Another option is to allow information from parties that have demonstrated expertise—some UN fora have done this in a limited way by allowing NGOs to speak, most international organizations have evolved a variety of mechanisms by which to control access of NGOs, and experts have long been given special access to scientific and review committees. As in domestic legal systems, rules that allow informal or formal "friend of the court" submissions can help ensure that these sources of information have an access point; most international environmental agreements allow a variety of (usually informal) access points for knowledgeable non-state actors (as well as states, who also have formal access). Nonetheless, gathering and submitting information can be expensive for all concerned, and the problem of how to make optimal use of decentralized information remains.

Some international agreements allow for investigation or inspection, but this is rare and almost always done with the consent of the investigated party. Investigation requires resources and, even when friendly, some political space. Allowing for investigation raises many other design issues, such as who can initiate investigation, who pays, what rights and limitations are given to investigators, and how to balance between the need to protect against release of industrial secrets while also ensuring that investigations are useful. Most analysts think of investigation in response to a concern about noncompliance, but broader investigations are also possible—not targeted at particular concerns. The International Atomic Energy Agency, which manages nuclear safeguards under the Non-proliferation Treaty, has the most elaborated intrusive inspection scheme, and it performs both types of inspection. Safeguards general inspections are much more common than those targeted at specific violations, which usually require special circumstances (such as the UN Security Council resolutions after the Iraqi war). Investigation probably increases the probability that the parties will learn from the operation of an IRM because it increases the likelihood that information will be gathered and applied directly to the case at hand.

PARTICIPATION The effectiveness of IRMs may be shaped by the rules governing participation. Representatives of states have a clear role as stewards of the state-oriented international system and virtually always have standing, although their exact rights to

intervene is a matter of design: the IRM staff might conduct reviews on its own, or reviews could be conducted with the participation of sub-committees or other selections of state representatives (e.g., as members of review panels). Different actors may have formal standing to raise complaints and set the IRM process in operation; as above, rules of access for providing information into the process are probably important. The ability to influence drafts and supporting data in the IRM process, as well as final reports, will affect the access to information that different actors have through the IRM.

POWERS TO RESPOND IRMs could have many options to respond to particular cases or questions about noncompliance. In practice, the responses are rarely (if ever) the tough enforcement actions that are commonplace in domestic enforcement systems. Usually a formal or informal report is a possible response. There are many pressures to avoid criticism in reports, but even critical conclusions can be written in ways that are acceptable. Informal pressure may be the most important response—requesting that a party explain why it is not in compliance could be a significant inducement to avoid that unpleasant experience. However, there is tension between the role of an IRM as a means of promoting learning and open consultation by states and its role as allowing and empowering non-state actors. State representatives will tend not to be frank if their discussions are open to others who do not observe inter-state diplomatic protocol, or if frankness will lead to damaging reports.

The limited responses typically available at the international level might be leveraged to allow other actors to respond. Notably, some domestic enforcement of international law is possible, and it might be more effective (and more widely used) if IRMs render at least vague judgements or indications about what behaviors are not in compliance. This is a hot topic in the GATT, where dispute panels can render judgements (sometimes not adopted, but judgements nonetheless) but in practice the powers to respond are very limited. Unilateral enforcement of GATT (and similar norms) may help open markets in a manner consistent with GATT, but many analysts oppose this use for three reasons: 1) unilateral enforcement, even if effective, is against the multilateral spirit of GATT; 2) unilateral enforcement, even if done to support some GATT norms, tends to be conducted in the interest of the enforcer only; and 3) only very powerful states have the option of unilateral enforcement. Another possibility for leveraging enforcers is that non-state actors may be able to take some measures on their own (including pressing for action within domestic legal systems) in response to a legitimate international judgement that a state needs to change its policies, conduct a project, or take some other action.

RELATIONSHIP TO THE TREATY To what degree is the IRM part of the larger complex of legal instruments. Clearly any organization operating in the area will by default have some effect on the law, if only because its operations, decisions and precedents will affect the parties who, in turn, frame the treaty. Further, any IRM operating within a treaty probably must have at least some formal legal enabling language.

The IRM-like process most extensively connected to a treaty is dispute resolution, which handles disputes as they arise and applies the obligations of the treaty directly when resolving disputes. Most international treaties have dispute resolution procedures, and in their absence there are well-established ideas in international law on how to handle disputes (e.g., Merrills, 1991; Bilder, 1986). However, in practice, environmental agreements rarely use these procedures. Other, less conflict-oriented procedures also perform IRM functions and can be formally connected to the treaty. The implementation committee of the Montreal Protocol is one example of such a process—a venue for raising questions about implementation and discussing them in a mostly non-confrontational manner. A few treaties also formally include monitoring programs (a source of information used by IRMs) but as mentioned earlier, most information is usually decentralized. IRMs also gain information from self-reporting by the parties, and typically those reports are formally required in the treaty. Thus there can be many formal relationships between an IRM and the treaty. The design choices of level of formality and the exact relationships involve many tradeoffs. Primarily, formal relationships may increase the probability that states will participate systematically (although in practice full participation in IRM-like procedures is rare, even when formally required). However, formal relationships may reduce flexibility, and getting agreement of the parties to a formal relationship and obligations under IRM procedures may be difficult.

RELATIONSHIPS TO OTHER INTERNATIONAL ORGANIZATIONS IRMs perform functions that are also performed by many other international organizations. Indeed, in some areas there is a dense network of existing organizations that can either perform functions in an ad hoc capacity or can be delegated to perform the necessary functions. The International Council for the Exploration of the Seas, for example, was originally established as an organization for fishermen to collect data on fishing effort and catches; it has logically evolved into the major data exchange arm under many fisheries agreements and the Whaling Convention, frequently explicitly mentioned in those agreements. Where organizations in addition to the IRM exist we should expect the exchange of information to take place more thoroughly, and probably the review of reports and information will also be more thorough. It is unclear what types of formal relationships with these other organizations lead to effectiveness. A close formal relationship probably leads to greater legitimacy and participation in the adjunct organization, and probably also makes the organization better incorporate the interests of the IRM participants. But, formalism can also lead to rigidity and inability to make hard assessments.

CONCLUSION What is striking is that virtually every characteristic of IRMs that can be influenced by policy involves tradeoffs regarding effectiveness, and there are few clear guiding lessons for which options to choose. The number of choices is huge, and much work applied research remains to be done. It is probably best to answer these questions in response to particular mechanisms that might be designed in a treaty, which we have illustrated in proposing the design of a part of the new Framework Convention on Climate

Change (see Victor, 1994; Greene and Salt, 1994 and Lanchbery, 1994 for applications of this framework to the design question).

In part, the tradeoffs reflect tension between at least two definitions of effectiveness: One definition stresses the mesh between the actions under the treaty and the interests of the participants—by this definition an effective agreement is one where the mesh is tight. Thus a treaty that results in overfishing could still be effective if the underlying interests of the parties basically lead to overfishing, which is probably true in many instances. The other definition stresses "behavioral" effectiveness, where the metric is whether changes in behavior are consistent with what is needed to protect or preserve the environment. This is a loose definition, and in some cases coincides with the other—for example the interests of most (industrialized) states in the ozone agreement is to eliminate CFCs, in part because of profits from alternatives and in part because of the environmental consequences of ozone-depletion. But even if we sustain both definitions, the best policy choices are not clear.

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