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1 COMPLIANCE THEORY: AN OVERVIEW¹

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INTRODUCTION

Too many people assume, generally without having given any serious thought to its character or its history, that international law is and always has been a sham. Others seem to think that it is a force with inherent strength of its own Whether the cynic or sciolist is the less helpful is hard to say, but both of them make the same mistake. They both assume that international law is a subject on which anyone can form his opinions intuitively, without taking the trouble, as one has to do with other subjects, to inquire into the relevant facts.²

Five decades after Brierly made this insightful comment, empirical understanding of the impact of international law on behaviour, at least by political scientists, remains in its infancy. Very recently, however, political scientists have taken a renewed interest in identifying the links between treaties and international behaviour. This chapter provides an introduction to the current state of debate among political scientists on questions of treaty compliance, with special attention to how theories of international relations clarify the relationship of compliance to treaty provisions.

Do nations and their citizens adjust their behaviour to comply with environmental treaties? Can we improve environmental treaties to make compliance more likely? If so, how? Reliable answers to these and related questions require careful evaluation of past experience with efforts to improve such treaties. Such evaluation, in turn, profits from understanding the factors – treaty-based and otherwise – that previous research suggests are sources of international behaviour. Three different schools of thought – what I shall call pragmatist, realist, and institutionalist – provide different though not uncomplementary answers to these questions.

Policy interest in the relationship of treaties to behaviour stems from a pragmatic concern that treaty goals are not always achieved as completely and effectively as possible. Government diplomats and international lawyers spend

considerable resources drafting and redrafting treaties to resolve international environmental problems. Environmental groups commonly support these efforts, pressing governments to negotiate more new treaties and to strengthen and refine existing environmental treaties. Business groups regularly oppose provisions of environmental treaties as excessively costly and burdensome. Policy analysts and pundits regularly highlight the problems with existing treaties and propose new treaty provisions to address them. All these actions reflect a belief that better law can remedy bad behaviour. The actions simultaneously illustrate an assumption that treaties can influence behaviour and the fact that they do not always do so. Indeed, for many lawyers, 'the assumption that legal texts drive changes in behaviour is second nature.'³ The number and variety of proposals to improve environmental treaties suggest, however, that we still lack a solid understanding of what factors facilitate, and which impede, compliance with a treaty. Partly because these actors' involvement in the treaty process often is in response to concerns particular to a given treaty, they frequently fail to identify sources of failure or success common to other treaties.

Political science research provides a systematic methodology for testing theories of the relationship between treaties and behaviour against the empirical evidence. While these linkages have received only limited attention historically, they are currently the focus of much attention. In international relations, issues of compliance quickly enmesh one in a larger and long-standing debate over why nations behave the way they do. The realist school of thought, developed after World War II, views the pursuit and use of power and the anarchic structure of modern international relations as the primary determinants of international behaviour.⁴ Realists consider international law as having little significant impact on nations' international policies. 'Considerations of power rather than of law determine compliance' in all important cases.⁵ Law only influences behaviour, if at all, when relatively unimportant, non-security issues are at stake. The conformance of state behaviour to treaty rules reflects spurious correlation rather than true causation: structural factors that lead states to certain actions also lead them to negotiate treaties codifying those actions. Aspiring to explain 'a small number of big and important things,' realists have shown little interest in evaluating treaties as a source of international behaviour.⁶ Nevertheless, realism encourages a bias against assuming that treaties cause behaviour to change, and provides an essential set of alternative explanations of why nations might take actions that conform to treaty provisions.

Institutionalists and international lawyers agree with Hans Morgenthau that 'the great majority of the rules of international law are generally observed by all nations.'⁷ Disagreement arises over whether we can attribute such behaviour to the treaty. International institutions, regimes, organizations, and treaties 'appear to be major determinants of collective behaviour . . . at the international level.'⁸ Given this assessment, institutionalists have sought to identify the conditions under which treaties can influence behaviour and the types of norms, principles, rules and processes that do so most effectively.⁹ While realists see states as dominating international affairs, non-state actors also play important roles in institutionalist theories as targets of regulation and as participants in the effort to elicit compliance.¹⁰ While institutionalists look for cross-treaty generalities regarding the causal links between behaviour and treaties, they often fail to convert these into the practical advice demanded by policy-makers.

Drawing on each of these three outlooks on compliance – pragmatist, realist, and institutionalist – the following chapter develops a synthetic framework for subsequent analysis of the degree to which treaty rules influence behaviour and the causal mechanisms by which they do so. Pragmatists demand that our framework be sufficiently well-defined that it allow empirical analysis of past experience and prescriptive advice for future policy. Realists suggest a healthy scepticism that forces us to question rigorously whether political and structural factors more readily explain, or at least condition, any correlations between treaty provisions and behaviours. Institutionalists identify the means by which treaties may influence behaviour, demanding empirical validation of which ones prove more or less effective. Together they provide propositions regarding the sources of compliance and non-compliance, the means by which treaty rules can increase compliance, and the exogenous factors that may also increase compliance.

This chapter begins by delineating various possible sources of 'first-order' compliance, for example, the reasons why national and subnational actors often comply even in the absence of any efforts to elicit compliance. The opposing forces that may lead an actor to fail to comply are discussed. An outline is then provided on how these pressures for non-compliance can be countered by the unilateral actions of governments and non-governmental actors. This is followed by developing a framework for thinking about the various factors that institutionalists argue can improve compliance; I identify three components of a treaty compliance system – a primary rule system, a compliance information system, and a non-compliance response system – that form the basis for subsequent empirical analysis.

DEFINITIONS

I define compliance as an actor's behaviour that conforms to a treaty's explicit rules.¹¹ As a subset of compliance, I distinguish treaty-induced compliance as behaviour that conforms to such rules *because of* the treaty's compliance system. Since this chapter seeks to set forth a pragmatic framework for thinking empirically about the relationship of treaties to compliance, the definitions laid out here should not be taken as either representative of, or contradictory to, broader theoretical conceptions. Rather, I offer these definitions to be empirically useful, rather than theoretically comprehensive. Using these definitions, then, the realist-institutionalist debate becomes a question of whether treaty-induced compliance ever occurs. The term 'compliance' is commonly applied in comparing behaviour to specific treaty provisions, a treaty's broader spirit and principles, implicit international norms, informal agreements, and even tacit agreements.¹² While ambiguous and non-explicit rules, like principles and norms, may well influence behaviour, empirically evaluating these influences usually founders on the inability to get agreement, often among the parties and certainly among analysts, regarding whether a given action constitutes compliance or not. In contrast, restricting study to *explicit* treaty provisions allows replicable evaluation of compliance against clearer and less subjective standards. While recognizing that treaties may induce positive behavioural change that nonetheless fails to achieve an established standard, I exclude from my definition the notion of 'compliance with the spirit of an agreement' which introduces unnecessary subjectivity into empirical analyses.

Evaluating compliance against treaty provisions also makes more sense than speaking of compliance with the treaty as a whole. Parties often comply with some treaty provisions while violating others. Within a nation, different actors – governments, industry and non-governmental organizations (NGOs) – may well be responsible for implementing different treaty provisions.¹³ To speak of ‘treaty compliance’ therefore loses valuable empirical information by aggregating violation of one provision with compliance with another. It also deserves mention that measuring compliance by strict reference to legal standards suggests that compliance is binary, either one complies or one violates; in fact, treaties can induce considerable beneficial behavioural change that either falls short of actual compliance, *strictu sensu*, or goes beyond minimum treaty requirements.¹⁴ Compliance also needs to be kept distinct from the related concept of effectiveness. While I discuss the distinction at length at the end of this chapter, compliance can be thought of as exclusively a question of altering behaviours without consideration of whether these behavioural changes are necessarily sufficient to accomplish the stated or unstated aims of the treaty. In most instances, compliance will correlate sufficiently with effectiveness to make *more* compliance preferable to *less*.

For any given treaty provision, the actual compliance level across countries and across time is likely to reflect compliance due to a combination of sources. Compliance levels will reflect the underlying structure of the environmental problem, the relationship of the treaty’s requirements to existing behaviour and future interests, as well as the structure and decision-making processes of the governments, corporations and other organizations involved. A single environmental problem may pose different problems for developed countries and developing countries. For many environmental treaty rules, some actors will unilaterally decide to comply, others will decide to violate, and others’ decisions will depend upon whether, and how many, other actors comply. This section focuses on the factors that produce compliance even in the absence of a system for identifying and responding to non-compliance, thereby highlighting both the exogenous forces for compliance and the important role that corporate as well as governmental actions play in international environmental treaties.

SOURCES OF COMPLIANCE

Regulatory treaties’ proscriptions of undesirable actions and prescription of desirable ones are often fulfilled. Determining whether the subsequent absence of proscribed actions or presence of prescribed ones is evidence of treaty-induced compliance would be simple if no other potential explanations for these behaviours existed. But, as noted above, the contention is not about whether nations comply, but why. Governments and private actors face a wide variety of incentives and constraints in undertaking any action. Acts that the treaty defines as compliance (or violation) may occur for numerous reasons having little to do with treaty dictates. Enumerating the treaty-independent, first-order sources of compliance and non-compliance provides a valuable means of avoiding falsely characterizing compliance as treaty-induced.

Compliance as independent self-interest

The simplest explanation of why a government or other actor regulated by a treaty undertakes a given behaviour is because they believe it furthers their interest. Nations often negotiate treaties precisely ‘for the promotion of their national interests, and to evade legal obligations that might be harmful to them.’¹⁵ As consensual agreements between nations, treaty provisions reflect the relative success of the different signatories in promoting their interests. Obviously, a key determinant of the willingness to comply is the degree of behavioural change the treaty requires. The degree of required change varies across treaties and across rules and actors within a single treaty.

Actors may comply because the treaty rules require no change in behaviour. Through successful negotiation a country may place all the burden for adjustment on other states. ‘Leader’ states negotiating an environmental accord may already have established and implemented legislation that goes well beyond the requirements to which ‘laggard’ states will agree. Industries already meeting a specified pollution standard may support treaties that require their foreign counterparts to do the same as a means of improving competitiveness without changing their behaviour. Especially when agreements reflect lowest common denominator policies, many states and companies will find themselves already in compliance. Some states may simply not be engaged, or only minimally engaged, in the activity regulated by the treaty, as is the case with Switzerland’s membership in the oil pollution and whaling regimes.

Compliance is not surprising when agreements proscribe undesirable actions that no one currently has incentives to undertake, in hopes of restraining future economic, political or technological pressures for such actions. As in the Antarctic Treaty’s constraints on mining, such agreements codify existing behaviours to ‘protect against changes in preferences’.¹⁶ Compliance to date has been perfect because the availability of lower-cost sources elsewhere has meant that incentives to mine in Antarctica remain low.¹⁷

States can also facilitate their own compliance by negotiating vague and ambiguous rules. Ambiguity may reflect agreements reached despite sincere differences about a specific rules content – ‘papering over’ – or efforts to accrue environmental praise by agreeing to terms that appear to require behavioural change, but that prove sufficiently vague to allow business as usual. The absence of an international court to interpret such ambiguities authoritatively ‘naturally’ leads states to interpret treaty rules so they can behave as their interests dictate while claiming their behaviour is in compliance.¹⁸ While excessively self-serving interpretations may well elicit international and domestic criticism, ambiguous treaty language makes charges of outright violation difficult.

When treaties require new behaviours, they may only require signatories to take actions they already know they want to take. Unilateral compliance may be a preferred option. In some such case, the state would have behaved as it did in any event, compliance being strictly coincidental. In others, the agreement provides international legitimacy which increases domestic political support enough to enable the government to implement a desired but otherwise unattainable policy. For example, a climate change agreement may provide some governments with the impetus necessary to adopt energy taxes. Treaties may also reflect ‘suasion’ games where one or more powerful states benefit from unilateral compliance but benefit more if others also comply.¹⁹ While it will seek

to get others to comply, such a state will comply whether or not those strategies succeed. DuPont's phase-out of CFCs and Conoco's installation of double-hull tankers before internationally required suggests these companies decided to comply independently of other companies' decisions, though they preferred that others comply.

The preceding sources of compliance show how actors may comply out of self-interest even if they define that interest myopically and independently of others' actions.²⁰ However, the calculus leading a state to comply may involve more expanded notions of independent self-interest than realist scholars would concede. Institutionalists point to states adopting broader and longer-term views of self-interest, including joint gains and empathy, for example, that lead them to comply in a wider range of situations than realism would predict.²¹ States and corporations may fear the unknown and unintended side-effects of their current non-compliance on the future of the treaty and on a range of other relationships.²² They may fear adverse public opinion, domestically or internationally. Parties may comply with rules viewed as fair and legitimate even if costly at times.²³ Even when dominant, powerful (hegemonic) states coerce weaker states to accept a treaty, legitimate social purposes and changes in perceived self-interest may cause nations to continue complying past the point that immediate self-interest can explain.²⁴ These conceptions of self-interest veer away from strictly independent decision-making: rather than making worst case assumptions that no others will comply, the decision-maker forecasts compliance by others based on past experience to calculate the expected benefits of their own compliance.

Even if a treaty rule requires change, bureaucratic procedures, group think, and bounded rationality may make the choice of compliance – once initiated – hard to revisit.²⁵ Governments and corporations deal with some compliance problems through standard operating procedures and habits, thereby foregoing potentially beneficial opportunities to violate in order to reduce overall decision-making costs, even in issues involving national security.²⁶ Even realists admit that habit sometimes drives states to actions contrary to immediate self-interest because states do not constantly reassess their interests and power.²⁷ Businesses promulgate and train personnel in corporate procedures that reflect domestic and international laws, even in cases where the likelihood of opportunistic violations being detected is minuscule. International rules allow actors to simplify or reduce the number of decisions they must make in a complex environment.²⁸

While compliance is calculated independently of other actors' behaviours, it is not a static decision. Over time, economic and technological changes can 'cause national governments to change their minds about which rules or norms of behaviour should be reinforced and observed and which should be disregarded and changed.'²⁹ Reductions in the price of alternatives to chlorofluorocarbons (CFCs) have increased the likelihood that the Montreal Protocol's phase-out deadlines will be met.³⁰ Oil price shocks in the 1970s explain some of the increase in compliance with oil pollution treaty rules in effect at the time. Economic recession will reduce environmental compliance if countries redirect resources from environmental to developmental goals, but could increase compliance if it reduces the economic activities creating the environmental externalities. Whether economic or technological shifts make compliance more or less attractive depends on the type of shift and government responses to it.³¹

Powerful non-state actors, including multinational corporations, non-governmental environmental groups and scientists, often influence international politics directly and by helping to define state interests.³² New scientific knowledge or greater environmental activism can cause increases in the perceived costs of an environmental externality and lead to greater compliance.³³ Elections or larger social or political factors often change the bargaining positions of domestic bureaucratic and political groups, altering how a state assesses its interests in compliance. Domestic environmental groups may become increasingly powerful and concerned; treaties provide them with 'a stronger case for constraint than would be possible in the absence of such obligations'.³⁴ Such developments not only increase the domestic costs of violation but often constrain even efforts at retaliatory non-compliance.³⁵ International agreements generate inertia which supports compliance once it has begun.³⁶ Such changes may increase overall compliance if they reflect transnational social shifts toward greater environmental concern.

At any given time, however, for those governments or non-state actors basing compliance decisions on self-interests independently defined, compliance proves robust and concerns over non-compliance are minimal. Indeed, the behaviour of these actors is not treaty-induced compliance. For these actors, treaty rules have been brought in line with existing or intended future behaviours, and not vice versa. When most parties to a treaty have such interests, the rule will exhibit high compliance even absent positive inducements or negative sanctions. Power plays little role in determining whether a state complies or not. In situations like those just delineated, we can expect considerable compliance. Efforts to manipulate interests are unnecessary because treaty rules reflect pre-existing interests, the rules require little change in current behaviour patterns, or the actors fail to recalculate their interests constantly. In these cases, compliance is not caused by the treaty but merely coincides with it.

Compliance as interdependent self-interest

Compliance can arise from interactive as well as independent decision-making.³⁷ States and corporations can not only include broader and longer-term concerns in their calculus of self-interest, but also can include their expectations regarding the impact their own compliance will have on others. Coordination and collaboration game models help clarify the operation of such interdependent conceptions of self-interest.

In coordination games, each actor prefers compliance so long as enough other actors comply. While 'enough' varies from actor to actor, each assesses whether to comply based on the actions, or expected actions, of others. Realists see such complementarity of interests in compliance as explaining why most treaties require so little enforcement.³⁸ Like Schelling's 'meeting' games, treaties can avert dilemmas of common aversion by coordinating action: the rule allows expectations to converge on an equilibrium behaviour that, once achieved, no one has incentives to violate.³⁹ The distribution of the benefits of compliance depend on the form of coordination, but once others choose to comply, the dominant strategy for all lies in complying.⁴⁰

Coordination games do not face the 'sanctioning problem' that plagues collaboration problems.⁴¹ First, actors are self-deterred because while my non-

compliance hurts others, it hurts me enough to deter me. Second, since non-compliance is always a public effort 'to force the other actor into a different equilibrium outcome', detection problems do not arise.⁴² Third, since other actors' most effective retaliation for non-compliance is continuing to comply, the desire to sanction reinforces rather than undermines the incentives to comply. For example, once nations agree on an allocation of the limited number of possible satellite orbits, no country has incentives to destroy its own satellite by placing it in the same orbit as another nation, and if it were to do so, it could not do it clandestinely.⁴³ The distribution of power among nations determines which behavioural equilibrium nations agree to, with the strong dictating to the weak, but not in determining whether the equilibrium is maintained. Treaties will tend to codify the equilibria that provide benefits to the strong, but they will not face the subsequent task of inducing compliance from weak states.

Situations involving public goods can exhibit similar properties for some actors involved. If enough actors recognize that they can be better off collaborating to produce a public good and can trust each other enough to 'jump' to this joint outcome, a subset of all actors can negotiate and comply with an agreement even though other nations continue to violate.⁴⁴ Actors willing to tolerate non-compliance by others may achieve joint gains, even though those gains are less than they would be if all actors complied. Actors who fail to consider how their decision to comply encourages others to comply see the costs of compliance outweighing the benefits. Actors who recognize that their decision to comply may convince enough others to comply to make the benefits outweigh the costs, will attempt to assure others of their good faith. Common to both these scenarios is the fact that, given what one actor can dependably expect others to do, that actor's best strategy is to comply.

Unfortunately, environmental problems more often resemble collaboration games in which joint compliance is preferred to joint violation but in which each actor's dominant strategy is to violate, even if others comply. The literature on prisoners dilemma, multi-person prisoners dilemma, and on free-riding in such situations is extensive.⁴⁵

Realists point out that such conditionality of benefits on compliance by others coupled with the fear and uncertainty underlying international relations make collaboration essentially impossible. For example, as desirable as it collectively may be to reduce international industrial pollution, the anarchic international arena produces fears of free-riding that lead states to define interests on unilateral, unconditional bases, thereby preventing agreement or compliance.⁴⁶ Despite the benefits of mutual compliance, the absence of international enforcement and risks of relative gains by others leads all parties to violate.⁴⁷

Under such circumstances, compliance requires enforcement. International collaboration problems, in contrast to coordination problems, 'must specify strict patterns of behaviour and insure that no one cheats'.⁴⁸ Unfortunately, if anything best characterizes the weakness of international law, it is the lack of an effective central enforcement system. Realists, like Morgenthau, note that 'there can be no more primitive and no weaker system of law enforcement'.⁴⁹ The institutionalists recognize that coordination games often face significant 'sanctioning problems', where the lack of ability and incentives to detect and respond to violation in turn hinder achievement of compliance. Enforcement itself poses a collective action problem in which even states that comply may not monitor or enforce against others.⁵⁰

Compliance in collaboration problems can arise from enforcement by a dominant or hegemonic state with system-wide concerns that sees what may be a collaboration problem for others as a suasion game. The dominant state manages the problem because it is capable of, and perceives sufficient benefits from, complying itself and/or enforcing compliance by others. Weak states are forced to comply with these 'imposed orders' by 'coercion, cooptation, and the manipulation of incentives'.⁵¹ The economic and technological changes mentioned earlier can alter compliance levels by increasing a dominant state's power for, and interest in, enforcing such treaties. Growth in international economic interdependence will increase a dominant state's desire and capacity to exercise control of the international system.⁵² Improved satellite surveillance could aid a dominant state's ability to monitor activities, impose sanctions more swiftly, and thereby increase compliance. Such changes may correlate with treaty amendments if they also lead to compliance system changes, such as less ambiguous wording. In such cases, however, tighter wording is simply another indicator of the changed interests that caused improved compliance, rather than being an independent cause of improved compliance.

Fears of free-riding can also be overcome if states view the benefits they derive in other existing and future international agreements as conditional upon a record of compliance.⁵³ Such caution is fostered when states detect violations and either reciprocate with their own violation or 'discount the value of agreements on the basis of past compliance'.⁵⁴ Even if compliance in a given instance may be costly when narrowly construed, the costs in other areas and on one's reputation can persuade a state to comply. Compliance under such conditions is possible but will be more fragile and more difficult to establish than when actors have independent interests in compliance.

Since such cooperation depends on some degree of international trust, decreases in underlying rivalries and competition, such as the end of the Cold War, will likely increase compliance levels.⁵⁵ As with changes in power, such a change may produce changes to treaty rules as well as compliance levels, leading to spurious correlations. However, the regime itself can increase trust by improving knowledge and reducing misperceptions of other states.⁵⁶ Over time, such trust, reputations, rule legitimacy, and habitual practice grow and can reinforce incentives for compliance.

SOURCES OF NON-COMPLIANCE

Having noted several reasons for compliance, we can now turn to the reasons for non-compliance. Especially in collaboration situations, unless some parties encourage compliance or discourage violation, other parties may find it preferable to violate a given treaty rule. Other factors may also lead to non-compliance. To understand how actors elicit compliance in the face of such preferences, the various sources of non-compliance need to be delineated.

Non-compliance as a preference

An actor may prefer non-compliance simply because the benefits of compliance - absent coercive efforts, simply do not outweigh its costs. This situation may arise for several reasons. Some actors may consciously sign treaties to garner the

political benefits of membership, never intending to comply.⁵⁷ Others may feel strong domestic and international pressures to sign an agreement regardless of the compliance costs. For example, the 178 countries in attendance at the 1992 United Nations Conference on Environment and Development (UNCED) faced strong pressures to sign climate change and biodiversity agreements; few countries refused to sign, based on claims that compliance did not serve their interests. Other states may view most but not all rules in a treaty as in their interests, leading them to sign with the intention of complying with most but not all rules.

Assumptions that because states sign they will comply ignore the fact that a state's material interests may include signature but not compliance. At least three scenarios can account for this. First, a state may be a classic free-rider, valuing the benefits of compliance by others, but seeking to avoid the costs of its own compliance. Second, a state may value compliance by itself and by others and even deem that the benefits of compliance outweigh the costs, but may nonetheless prefer to devote the compliance-related resources to more pressing social problems. Third, a state may view compliance as having no real benefits. A state may not value actions that they admit would improve the environment. It is tempting to view environmental problems as global commons or 'prisoner's dilemma' problems with the implicit assumption that all actors prefer mutual compliance to mutual violation. Yet, this ignores basic disagreements over man's relationship to the environment. The Iraqis' intentional dumping of oil during the Gulf War, the controversy over commercial whaling, and the general debate over environment versus development reflect such disagreements.

Even when total social costs make compliance a preferred strategy, the incidence of those costs usually means that those being asked to comply will have continuing incentives to violate. Environmental treaties frequently seek to remedy industrial pollution externalities; by definition, therefore, compliance involves companies incurring costs that they had previously imposed on other social groups. Compliance with the Long-Range Transboundary Air Pollution Convention's sulphur dioxide emission restrictions required private power plants to install scrubbers and otherwise increase costs so that citizens in other countries could enjoy a cleaner environment.⁵⁸ The resources that targeted industries use to oppose international regulatory efforts attest to the costs they view as involved in compliance. Whether dealing with reluctant nations or reluctant industries within a nation, benefits from compliance arise only when others link compliance to other issues through positive or negative inducements.

Non-compliance due to incapacity

Even actors who perceive compliance as beneficial may fail to comply for lack of the necessary resources. In economic terms, the willingness to pay need not equate to an ability to pay. Violation can be due to financial, administrative or technological incapacities, rather than any unwillingness to comply.⁵⁹

While developing country governments may not value environmental improvement because of the lack of domestic constituencies or because of more pressing concerns, even those that do may simply not have sufficient resources to meet the costs of compliance. Growing attention to this source of non-compliance has led nations to establish mechanisms to finance compliance in

both the London Amendments to the Montreal Protocol and the Framework Convention on Climate Change.⁶⁰

Environmental non-compliance also occurs because of a lack of administrative capacity.⁶¹ Even if we assume that governmental decisions to comply with treaty rules will bring government actions into compliance, that assumption comes into serious question when compliance requires a government to alter successfully the actions of myriad sub-national actors. This two-level quality of environmental treaty compliance can lead to non-compliance when a government lacks informational or regulatory infrastructures adequate for eliciting compliance. Even using its best efforts, the Brazilian government may fail to communicate successfully restrictions on tree clearing to the peasant farmers responsible, leading to non-compliance. Even if the informational infrastructure exists, an effective regulatory infrastructure that can induce behavioural change by these actors may be absent. Tankers registered in Liberia and Panama rarely enter those countries' ports, making inspections for compliance with international marine pollution standards difficult.

Negotiators may even establish standards that current technologies are unable to meet. Hopes that regulatory necessities will lead to technological inventions do not always prove well-founded, leaving companies with no, or only prohibitively expensive, means of complying. While these problems often boil down to variants of financial incapacity problems, cultural and social contexts may make compliance significantly more difficult to elicit from the companies and citizens of one country than another.⁶²

Non-compliance due to inadvertence

Finally, states may take actions sincerely intended and expected to achieve compliance but nonetheless fail to meet treaty standards. Environmental rules establishing aggregate national targets for pollution reduction by specified deadlines may pose particular problems in this regard.⁶³ For example, a carbon tax established in good faith at a level deemed sufficient to achieve a 20 per cent reduction in carbon dioxide emissions by a specified date might reduce emissions by only 15 per cent by that deadline.⁶⁴ This problem is not restricted to developing states; inherent uncertainty in the impacts of most policy strategies mean even developed states efforts to alter their citizens' and companies' behaviours may fail to achieve their intended results.⁶⁵ And programmes that bring one country into compliance may fail to have the same results elsewhere. Whether due to misguided policy or to the inherent uncertainties in the outcomes of certain policies, the two-level nature of environmental compliance may make compliance due to inadvertence especially common.

ELICITING COMPLIANCE IN THE FACE OF PRESSURES FOR NON-COMPLIANCE

To this point, the discussion has largely been restricted to first-order sources of compliance and non-compliance, ie, those incentives that governments and private actors have to comply with treaty rules prior to efforts by other actors to directly influence their choices. Whether their predisposition to non-compliance

actually leads a government or company to violate depends on how willing and able other actors are to manipulate incentives to make compliance both possible and preferable. Such manipulation can involve positive inducements or negative sanctions that take the treaty framework as given or they can involve refining various components of the treaty compliance system itself.

Positive inducements

Giving positive rewards for compliance provides one means of increasing incentives for compliance. To the extent that non-compliance is due to inadvertence or incapacity, other actors can respond in two ways to those who appear likely to, or already have, failed to comply with a treaty rule. Efforts at education clarify treaty requirements and identify strategies for compliance. Educational efforts can involve diplomatic discussions between government officials or can directly target the private actors responsible for the environmental problem. Industry groups in one country often conduct seminars to educate their own personnel as well as those of companies in other countries as new regulations are promulgated. Such efforts help avoid non-compliance due to lack of knowledge or inadvertence. Such seminars can demonstrate and disseminate information on cheap alternative means of complying that help increase the ranks of compliers. Private corporations seeking to increase sales may seek out and promote compliant technologies, independent of any governmental or inter-governmental efforts. As environmental concerns increasingly influence overseas development aid, policy advisers are helping devise programmes to address or avoid the administrative incapacity problems that plague many developing nations.

Beyond educational efforts, financial transfers can elicit greater compliance when non-compliance arises from any of the factors mentioned above. In essence, one actor pays for another's compliance. Inter-governmental side-payments outside of formal treaty procedures for environmental treaty compliance have been infrequent to date. However, NGOs have paid debts for, and pharmaceutical companies have negotiated deals with, developing countries to create environmental preserves. Finland has paid the USSR to clean up a nickel smelting plant.⁶⁶

The fact that these actions have not been linked with specific environmental treaty provisions suggests two problems. First, governments prove reluctant to pay not only their own compliance costs, but those of other governments who are obligated under the treaty to comply in any event. Second, such efforts, whether taken within or outside the treaty context, face the 'mundane problem of funding'.⁶⁷ Financing proves difficult to organize because it poses collective action problems for the fund providers.⁶⁸

Negative sanctions

The more traditional remedy for non-compliance has involved deterrence through the threat or use of sanctions. To be effective these sanctions must be both credible and potent. Actors hoping to encourage compliance must convince reluctant actors that the likelihood that a violation will be detected and stiffly sanctioned make the expected costs of violation exceed those of compliance.

Governments, corporations, NGOs, and general publics can all impose

sanctions. Actors targeted for sanctions can similarly include governments, corporations or even individuals.⁶⁹ Social opprobrium and world public opinion can pressure such actors to comply through several channels.⁷⁰ Diplomats are 'called to account by other participants in the international system, either through bilateral diplomacy or in international forums'.⁷¹ NGOs and the publics they mobilize can prompt letter-writing campaigns, consumer boycotts of imports and tourism, corporate cancellation of contracts, and government trade restrictions, as evident in the response to Norway's resumption of commercial whaling.⁷² Whether these actions are adequate to force a reluctant business or government to comply, however, is open to interpretation. Realists contend that public opinion exerts no 'restraining influence upon the foreign policies of national governments'; institutionalists hold it 'can have unexpectedly powerful results ... help[ing] to bring about far-reaching [human rights] changes in powerful and entrenched regimes'.⁷³

Realists see collective goods as supplied when 'the interest of pre-eminent powers in the consumption of collective goods is strong enough to cause them to undertake the provision of those goods without being properly paid'.⁷⁴ A dominant state must both establish and enforce treaties resolving collective action problems.⁷⁵ Depending on its own commitment to the issue, which may vary over time, the dominant state may choose to

- (1) tolerate violations,
- (2) expend resources to force others to comply, or
- (3) expend resources to force others to both comply with and enforce the treaty.

In such cases, weaker states comply to the extent that stronger states actually, or credibly threaten to, force compliance via political and economic sanctions for violation.⁷⁶ Compliance does not require explicit enforcement: the reputation for power, or 'prestige', of stronger states leads weaker states to comply with rules that conflict with short-term self-interest even absent explicit enforcement.⁷⁷ Powerful states, and they alone, use sanctions to enforce those international rules that suit their immediate interests.⁷⁸ In essence, states do not enforce international law but command obedience from weaker states.⁷⁹

Compliance under such a model of hegemonic enforcement will tend to decline as powerful states lose their power monopoly and other states with different interests gain power.⁸⁰ Also, the costs of maintaining international agreements tends 'to rise faster than the financial capacity of the dominant power to support its position'.⁸¹ Thus, enforcement demands increase at the same time that the power to enforce decreases.⁸² Since states violate treaty commitments whenever they have the interest and power to do so, decreased hegemony increases non-compliance as weaker states gain relative power.

An alternative view of the influence of hegemonic power on compliance levels suggests that as extreme power asymmetries decrease compliance increases because no actor possesses sufficient power 'to ignore the dictates of the resultant institutions with impunity'.⁸³ Likewise, weaker states can no longer expect a public good to be provided without their contribution, and therefore comply. While predicting different effects of reduced asymmetries of power on compliance, both theories suggest that changes in power distribution will produce changes in compliance.

Reciprocity has been the dominant factor institutionalists have used to explain the 'potential anomaly' of why governments comply 'with rules that conflict

with their myopic self-interest'.⁸⁴ In collaboration problems, each party has immediate and continuing incentives to violate and few incentives to enforce the rules against others. Rather than general concerns over reputation, discussed above, specific reciprocity – promising to comply if others comply and threatening to violate if others violate – provides an enforcement strategy. If actors have long-term views, regular and continued interactions, and rapid and reliable information about the actions of others, reciprocity strategies can overcome the non-compliant free-rider problem.⁸⁵ For example, reciprocity strategies have been used to explain compliance with arms control treaties.⁸⁶

While working well bilaterally, reciprocity 'may not prove compelling in a multilateral situation'.⁸⁷ The initial violation may not impose sufficient costs on any single actor to provide incentives for retaliation. At the same time, those retaliatory violations that do occur can not be targeted directly at the initial violator. They impose costs on compliers and violators alike, leading the retaliator to 'suffer the opprobrium' of compliant actors, while failing to impose sufficient costs on the initial violator to induce compliance.⁸⁸ These disincentives to retaliation reduce the credibility essential to the strategy, and can lead to escalatory violations that undermine compliance by all parties.⁸⁹

Actors can skirt the problems inherent in retaliatory non-compliance through sanctions that link environmental compliance to other issues. In some instances, the gains of mutual compliance are sufficiently large that some actors undertake enforcement. Governments can use a wide range of unilateral or coordinated efforts to impose trade or other economic sanctions. Such sanctions, whether undertaken by states or other actors, allow costs to be targeted at the initial non-complier and avoid the risks outlined above of retaliatory non-compliance. NGOs and publics often prove more willing than governments to sanction violations by corporations or other governments. Governments can avoid retaliation by targeting sanctions against violating nationals or corporations of other countries; governments that might defend their own wrongful actions often care less about defending those of their nationals. This allows governments to induce compliance by foreign nationals without harming intergovernmental relationships on other issues by pressuring the other government directly.

In short, even taking the treaty context as given, many different actors can take a wide array of actions to induce actors to comply despite their pre-disposition to violate.

Compliance system design⁹⁰

Given the realist scepticism regarding the impact of treaties on behaviour, we must rely on institutionalists and pragmatists to identify principles for designing a treaty compliance system that will elicit high compliance. The institutionalists' disagreement with realists is not that other factors do not cause changes in compliance. Rather, they make the narrower claim that treaty rule changes also can increase compliance. While regimes and treaty rules reflect power and interests, they can have an independent effect on compliance. Power and interests sometimes provide inadequate explanations of observed correlations between international rules and actors' behaviour.⁹¹ International behaviour can reflect not only compliance, but treaty-induced compliance. However, whether a particular treaty actually induces compliance depends on how its compliance system is designed. Critical to this argument is the notion

that the structure of international power and interests underdetermines a treaty's compliance system; it assumes that at a given point in time, nations could have agreed to more than one compliance system design.

A 'compliance system' is that subset of the treaty's rules and procedures that influence the compliance level of a given rule.⁹² Building on this concept, three subsystems of any compliance system can be distinguished: a primary rule system, a compliance information system, and a non-compliance response system. If variance in compliance exists across treaties that can not be explained by factors exogenous to the treaty regimes, these three systems provide a framework for identifying the source of such variance in inducing compliance.

The primary rule system consists of the actors, rules and processes related to the behaviour that is the substantive target of the regime. By its choice of who gets regulated and how, the primary rule system determines the degree and sources of pressures and incentives for compliance and violation. The compliance information system consists of the actors, rules and processes that collect, analyze and disseminate information regarding the instances of, and parties responsible for, violations and compliance. The self-reporting, independent monitoring, data analysis, and publishing activities that comprise the compliance information system determine the amount, quality, and uses made of data on compliance and enforcement. The non-compliance response system consists of the actors, rules, and processes governing the formal and informal responses undertaken to induce those identified as in non-compliance to comply. The non-compliance response system determines the type, likelihood, magnitude, and appropriateness of responses to non-compliance.

An environmental treaty's primary rule system generally attempts to alter the actions of private, sub-national actors through the implementation activities of national governments. In contrast to arms control or human rights treaties, environmentally activist governments must elicit behavioural change by the primary target of regulation, either directly or by prompting the responsible national governments to implement and enforce treaty terms. Frequently, the rules and procedures comprising all three components of the compliance system can address either governmental, non-governmental, or sub-national level entities.

What factors endogenous to the treaty could increase compliance? What treaty compliance system changes would make compliance more likely for a given set of actors when addressing a given environmental problem? What attributes of treaty rules and processes should we look for as the basis of its impact? Compliance system design involves two distinct elements. First, the selection of the primary rules determines how many actors are predisposed towards compliance and how many towards non-compliance. Whether made consciously or not, choices of how the treaty defines compliance and who must change their behaviour becomes a major determinant of compliance. It sets the bounds on how many actors will comply voluntarily and the efforts needed to get others to comply. Second, having selected certain primary rules, the system must maximize the likelihood that actors will respond to non-compliance through means that redress the source of non-compliance. This element of design involves attempting to achieve the highest compliance possible by improving the compliance information and non-compliance response systems, to make the detection of, and response to, non-compliance more likely, credible, and potent.

Primary rule system

The preceding discussion has highlighted how the incentives of actors to comply or violate depend critically on the structure of the problem the treaty is attempting to solve. Collaboration problems fascinate analysts precisely because their resolution requires jointly desirable compliance that proves hard to generate internationally.⁹³ Different approaches to such resolution greatly influence who bears what costs under what conditions and the degree to which benefits depend on actions by other actors. Given this, 'choices of strategies and variations in institutions are particularly important, and the scope for the exercise of intelligence is considerable'.⁹⁴

Some analysts have explored how institutions can alter payoff structures, ie, the benefits and costs that actors incur in each of the potential outcomes of the strategic game. Yet, a less developed implication is how nations can choose between *different solutions to the same problem* that have different payoff structures. Payoff structures may vary by solution as well as by problem. Even if international institutions prove too weak to alter payoff structures, they may be able to increase compliance by selecting from an array of possible solutions those that increase the likelihood of compliance.⁹⁵ For a given problem, several alternative solutions may exist. Even if, under conditions of perfect compliance, these solutions provided equal environmental benefits, they might exhibit different likelihoods of compliance because they regulate different actors. What kind of activity is being regulated? How many actors with what interests must change their behaviour? How large and costly a change is involved? What exogenous incentives to comply do these actors have? By answering these questions, through the process of selecting the point for regulatory intervention and defining the standards for compliance, negotiators may take a large step towards determining the degree of treaty compliance. Claims that inducing compliance with the Framework Convention on Climate Change will be harder than with the Montreal Protocol rest on the notion that more people and industries must make much bigger behavioural changes in the former case. Regional agreements seek to increase cooperation by increasing the frequency of interaction between actors. Agreements that put greater burdens on developed countries may generate more compliance because those countries have the incentives and resources to do so. In short, the selection of primary rules may prove the most powerful lever international policy-makers have over the level of compliance elicited.

One key feature of the selection of a regulated activity involves its transparency. Some activities are highly visible and involve transactions between actors while others are autonomous acts conducted largely out of view. While transparency's main contribution to compliance comes through making detection of violations easier, as discussed below, it also facilitates compliance by reassuring each actor about others' behaviour. Actors predisposed to comply but concerned about non-compliance by others will violate under conditions of uncertainty. The ranks of 'nice' actors – those actors who will comply initially with a treaty rule before having information about the actions of others⁹⁶ – can be swelled by reducing this uncertainty. By regulating more transparent actions, treaties assure actors that others' non-compliance will be immediately visible and thus permit them to protect their interests accordingly. Reducing such fears that produce initial non-compliance allows compliance to develop.

Besides strategic choices of who and what to regulate, primary rules can increase compliance through greater specificity.⁹⁷ Chayes urges 'more concrete and quantitative performance criteria as they become politically and empirically validated'.⁹⁸ Increasing specificity increases compliance in at least two ways. First, for actors disposed to comply, specific rules make compliance easier by reducing the uncertainty about what they need to do to comply.⁹⁹ Specific rules also reassure actors that others will not dispute the compliance of a given act. The actor can therefore act without fear of facing sanctions for non-compliance despite a good faith effort to comply. Second, for actors predisposed to non-compliance, precise treaty language removes the excuse of inadvertence and misinterpretation from actors when they must account for non-compliance.¹⁰⁰ This will not change the actions of any actor facing significant compliance costs but may alter the choices of actors at the margin of compliance.

The notion that greater specificity improves compliance assumes that specificity can be increased without any change in the willingness to agree among the parties. At any given point in time, it may prove impossible to agree on more precise language. However, a rule's current level of precision need not always reflect the maximum possible level of precision for the existing level of common interest. Even within a context of nations seeking to avoid major constraints on their behaviour, the range of negotiable outcomes may include some rules that are less vague than others, making the choices between rules important to subsequent compliance levels.

Compliance information system

The major goal of any treaty's compliance information system is to maximize transparency. Transparency refers to both the amount and quality of the information collected on compliance or non-compliance by the regulated actors as well as the degree of analysis and dissemination. Increasing transparency is seen as an essential component in any prescription to increase compliance.¹⁰¹ Transparency is as essential to hegemonic states enforcing compliance and to states resolving coordination problems as to the reciprocity needed to elicit compliance in collaboration problems.¹⁰² To make the threat of a retaliatory violation – or linkage via sanctions or inducements – credible, the regulated actors must know that their choices will not go unnoticed.

If power and interests leave more than one rule in the zone of possible agreement, then negotiators' choices between rules will effect how easy verification is.¹⁰³ The choice of primary rules plays a crucial role since the choice about what acts to regulate implicitly includes a choice about how transparent compliance and non-compliance will be. The Montreal Protocol regulated CFC production because it was far easier to monitor a very few producers than thousands of consumers.¹⁰⁴ While numerous activities contribute to climate change, technological capabilities will make verification of point-source polluters, like power plants, far easier than areal polluters, such as logging or rice farming. Previously regulated activities may already have data collection and dissemination systems on which a treaty can piggyback, much as the LRTAP Convention has used economic fossil-fuel usage data to estimate emissions.¹⁰⁵

Treaties usually provide for self-reporting by national governments, and the wide variance in levels of self-reporting suggests that some reporting systems work better than others.¹⁰⁶ Transparency can be increased by making rewards

for compliance conditional on supplying such reports or allowing inspections. The human rights experience suggested to drafters of Agenda 21 that NGOs and industry had the ability and incentives to provide valuable compliance information.¹⁰⁷ On-site monitoring has been authorized in an international convention on wetlands as well as in nuclear weapons treaties.¹⁰⁸ Such measures skirt the self-incrimination problems that deter self-reporting and improve both the quantity and quality of data available. Treaty rules and procedures can also enhance information flow between parties, increase resources dedicated to monitoring, and finance the development of improved verification technologies.¹⁰⁹

For the collected data on behaviour to lead to an appropriate response, treaty staff, governments or NGOs must analyze and interpret the data to identify both the cases and sources of non-compliance. Often this may require a forum to inquire further into actions taken and the reasons behind them.¹¹⁰ By increasing both the actors and means authorized to collect, analyze and disseminate information, a treaty can increase the likelihood that those tasks occur. By improving the ability for, and likelihood of, detecting violations, transparency fosters all parties' abilities to invoke reciprocity, sanctioning, and inducement strategies.¹¹¹

Non-compliance response system

If the treaty's compliance information system succeeds at developing information about non-compliance and non-compliers, successful alteration of their behaviour also requires some response. While responsive actions available to actors were discussed above, the following sections discuss three strategies by which treaties can increase the likelihood that such responses occur and are effective.

Facilitating compliance

Treaty organizations and secretariats can increase the likelihood and effectiveness of the positive inducements that states can take unilaterally. They can provide mechanisms for burden-sharing for financing, making it feasible to fund projects that are larger than a single country ordinarily would fund. These arrangements also establish a set of commitments and correlated expectations regarding contributions from various states to such a fund. While the International Monetary Fund (IMF) and World Bank have funding problems, nations in general are willing to make funds available for project funding. International organizations may also be able to fund projects that would be too controversial for individual donor countries to fund. Whether such cooperative funding ventures will succeed in environmental affairs remains to be seen, as the Montreal Protocol and the Framework Convention on Climate Change are the first to include significant financial transfer mechanisms.

Facilitating compliance may also involve international education efforts targeted at clarifying rules and the means to compliance. For example, Sweden and the International Maritime Organization created the World Maritime University to provide courses on marine pollution requirements and how to comply with them. Technology transfers also help. The Montreal Protocol requires technology assistance to address non-compliance due to technical incapacity. The convention's highlighting of the fact that compliance by developing states depends upon these financial and technology transfers may

help press developed states to fulfil these commitments.¹¹² Financing and technology transfers provide useful levers to induce compliance when sanctions may be politically difficult to impose, as among allies. Inducements themselves ease the non-compliance detection problem since a government that might ignore a free-standing reporting requirement might well prove more forthcoming if providing the information opened up new funding sources.

These inducements can influence actors who want, but are unable, to comply as well as providing incentives for countries to re-examine the costs of, and priority given to, compliance. Even states planning to violate may reconsider if the financial transfers are large enough. Inducements have their own problems, however: joint funding itself has to overcome inherent free-rider problems. Also, inducements cost more than sanctions. For the country seeking to motivate compliance, the promise of inducements is costly if they succeed while the threat of sanctions is costly only if they fail.¹¹³ Inducements are also vulnerable to problems of moral hazard, in which those who would otherwise comply strategically misrepresent that fact to convince others to pay their compliance costs. While international funding, technology, and education programmes may prove difficult to enact and small in magnitude, they may nonetheless make compliance more likely.

Sanctioning violations

Proponents of sanctions contend that 'compliance can be obtained efficiently by making violation unattractive rather than by altering the costs or benefits of compliance'.¹¹⁴ While sanction strategies face major constraints on their effectiveness in the international environment they remain a recurring theme in efforts to strengthen compliance systems.¹¹⁵ As one example, Gro Harlem Brundtland, the Norwegian Prime Minister, has recommended ensuring compliance with carbon dioxide emission targets by establishing 'an international authority with the power to verify actual emissions and to react with legal measures if there are violations of the rules'.¹¹⁶

Sanctioning often proves ineffective because it involves costs for the sanctioner as well as the sanctionee. It can be made more effective through several means. Regular international meetings of treaty parties increase the opportunities for actors to bring diplomatic and public pressures on non-compliant actors to explain and change their behaviour.¹¹⁷ Treaty rules that allow publication and dissemination of self-reported and independently-gathered information provide a 'basis for a wider critique and evaluation of a party's performance and policies' by countries, companies, and NGOs that have incentives to respond to non-compliance.¹¹⁸ For example, Greenpeace and Sea Shepherd have frequently taken action to identify and prevent whaling.¹¹⁹ Media reports of non-compliance and pressures from domestic NGOs do not evoke the same questions of sovereignty that governmental sanctions often raise. NGOs may also be more likely than governments to impose political and economic costs on non-compliant governments and corporations. By fostering such diffuse but influential pressures, improved transparency can increase compliance even absent formal sanctions.¹²⁰

Treaties that formally authorize and 'assign responsibility for applying sanctions' increase the expectation that 'a given violation will be treated not as an isolated case but as one in a series of interrelated actions'.¹²¹ As Morgenthau

notes, 'nobody at all has the obligation to enforce' international law.¹²² Few countries even have incentives to do so. To address the concerns over sovereignty that counteract a desire to sanction another government for treaty violations, treaties can redefine what constitutes infringement of sovereignty by authorizing certain actions in the event of treaty violations.¹²³ Treaties can remove the international legal barriers, such as those in the General Agreement on Tariffs and Trade (GATT), that constrain those countries with incentives to enforce.

Finally, incentives to sanction can be increased by 'privatizing' the benefits and costs of enforcement activity.¹²⁴ The 1911 Fur Seal Treaty between Japan, Canada, the US and the USSR strictly curtailed killing seals at sea while leaving the US and USSR in exclusive control of kills on the seals' breeding islands. The latter countries annually compensated Japan and Canada with a share of the kills in exchange for their halting the wasteful at-sea killing. The seal population recovered from 300,000 in 1911 to its pre-exploitation level of 2.5 million by the 1950s.¹²⁵

Privatization can also involve authorizing governments to enforce directly against nationals of other countries caught violating treaty rules, as in the Convention on International Trade in Endangered Species' provisions for penalizing and confiscating specimens.¹²⁶ This 'use of domestic enforcement procedures is likely to be possible in an increasing range of cases, like environmental treaties, where international regimes are aimed ultimately at influencing the private activities rather than state behaviour'.¹²⁷ By authorizing and establishing standards for second-level enforcement, treaties can increase their frequency. Governments balk less at sanctioning individual and corporate nationals of other governments than at sanctioning those governments directly. Whether such a strategy can work depends on whether states with enforcement incentives have effective jurisdiction over the regulated activity, but treaties that are aimed at such opportunities to focus sanctions on individual actors provide one means of increasing compliance.

Preventing violations

Besides positive inducements and negative sanctions to elicit compliance, treaties, like domestic regulations, have a third potential strategy. Some international standards rely on efforts to raise obstacles to, and otherwise prevent, non-compliance in the first instance. If primary rules can be established which succeed at coercing compliance in the first place, the demands placed on those responsible for monitoring and enforcing treaty regulations can be dramatically reduced. To implement such a strategy requires greater attention to 'pre-monitory' control measures, ie, efforts to inspect and survey behaviour before violations occur, rather than to detect and investigate them afterwards.¹²⁸

A coerced compliance system relies on finding regulatory chokepoints where limits can be placed on the ability to violate a treaty's terms, thereby restraining actors who might otherwise be inclined not to comply. Careful selection of the point for regulatory intervention can allow treaties to target actors who have fewer incentives to violate rules, or target transactions between actors with differing incentives. Often it entails restricting the most transparent activity in the train of actions that precede an environmentally harmful action; an activity that is not environmentally harmful itself may nevertheless provide the most

effective point for preventing violations from occurring. Domestic examples include requiring manufacturers to install catalytic converters on automobiles, or banning handgun sales. In switching from limiting intentional oil discharges to requiring oil tankers to install expensive pollution-prevention equipment, the International Convention for the Prevention of Pollution from Ships elicited compliance from tanker owners with strong economic incentives not to comply because non-compliance would have required the cooperation of a ship-builder, a classification society, and an insurance company in constructing what all knew to be an illegal tanker.¹²⁹ Any one of these actors could prevent a violation from occurring.

A deterrence-oriented approach underlies the use of sanctions, which require successfully detecting, prosecuting, and sanctioning violations after they occurred to deter them from occurring in the future. In contrast, a coerced compliance model greatly reduces the need for 'post-monitory' control that can identify violations after they have occurred. Post-monitory control efforts face the common problems of detecting violations that violators desire to keep hidden, identifying the perpetrator of a detected violation which may not always be obvious, collecting legally legitimate proof of the violator having perpetrated the violation, and ensuring that the sanctions imposed are sufficient to deter others. A preventive orientation can be designed into treaty provisions by ensuring that the actors responsible for preventing violations have both the incentives and authority to do so.

Time and treaty process

Finally, beyond the instrumental compliance policies involved in the compliance systems discussed above, treaties can reflect longer-term, less direct efforts to induce compliance. Compliance systems are nested among broader norms, principles, and processes that may play far greater roles in altering behaviour. Treaty processes can seek to influence the ways governments and other actors perceive and define their interests so they increasingly see compliance as furthering their interests. 'Soft law', involving norms, principles and guidelines, informal agreements, and tacit bargaining strategies may all wield considerable influence over behaviour. Larger 'behavioural alteration' systems, of which treaties and their compliance systems form only a part, may exercise influence not only through altering behaviour in an instrumental sense but by successfully changing the values and interests of the actors involved. Many theorists contend that treaties alter behaviour by leading states to adopt broader and longer-range views of their interests, providing new scientific information that clarifies policies to achieve existing goals, or causing governments to learn new goals.¹³⁰ As Alexander Wendt argues, 'international institutions can transform state identities and interests' and through so doing change their behaviour.¹³¹ Treaties that establish exclusively hortatory goals may have significant behavioural impacts, even when 'compliance' proves impossible to measure. This chapter decidedly does not exclude such transformation as an important pathway by which institutions change behaviour - it has simply sought to identify how treaties can mitigate international environmental problems through the less ambitious means of changing the behaviour of nations and their citizens even when it proves impossible to alter their identities and interests.

Parties previously inclined to non-compliance may come independently to

prefer to comply. A treaty can authorize and fund scientific research and information-sharing to clarify the benefits and costs of a state's own behaviour to its independent self-interest. Compliance becomes more attractive if new knowledge shows greater benefits to compliance, such as higher costs of environmental degradation. Efforts to foster open-ended knowledge creation can increase domestic political pressures for compliance.¹³² The Long-Range Transboundary Air Pollution Convention provided scientific exchanges and a joint database on transborder fluxes of pollutants that convinced some states to change their behaviour.¹³³ Such international exchanges were essential in showing states the degree to which their environmental fate depended on the actions of their neighbours, increasing incentives for both compliance and enforcement. Research and development into cheaper means of complying provides a long-term solution to incapacity and high compliance costs as sources of violations.

Treaty processes can also encourage a process of social learning by which governments and other actors come to alter their values and objective functions.¹³⁴ The negotiation and re-negotiation process can change the value actors place on certain goals. Thus, treaties can increase environmental concern simply through regular discussions that increase the understanding and perceived importance of the issue. This involves more than re-assessing costs or discovering new ways to achieve existing goals; it involves changing those goals. International organizations can consciously shape perceptions of self-interest. Developing and disseminating information regarding pollution and helping place scientists in domestic policy positions altered interests which increased compliance with treaty rules regulating Mediterranean pollution.¹³⁵

COMPLIANCE AND EFFECTIVENESS

A final word is in order regarding the relationship between compliance and effectiveness.¹³⁶ While this chapter argues for better evaluation of whether and how treaties alter behaviour, such behavioural change is an important, but essentially intermediate goal. We are most interested in whether treaties produce the environmental improvements that motivate their negotiation in the first place. Compliance and behavioural change are valuable only if they lead to accomplishment of treaty goals. In Oran Young's terms, we are interested in a treaty's problem-solving, as well as behaviour-changing, impacts.¹³⁷ Some recent scholars have proposed three indicators of effectiveness that go beyond compliance, namely, the degree to which

- (1) parties achieved treaty goals,
- (2) actual decisions corresponded with expert advice, and
- (3) the environmental resource improved relative to what would have happened in the absence of the treaty.¹³⁸

Evaluating effectiveness defined as problem-solving requires making an often-subjective choice among various possible definitions of the problem. First, 'sharp statements of objectives seldom are achieved' in international environmental treaties, making it difficult to find the yardstick against which to measure effectiveness.¹³⁹ Second, even if one defines effectiveness as the degree of environmental improvement, the multiple causes of most environmental

phenomena and the generally poor quality of data make identification of causal links extremely tenuous.¹⁴⁰

Greater compliance is neither a necessary nor sufficient condition for effectiveness. First, high compliance is not necessary. Non-compliance with an ambitious goal may still produce considerable positive behavioural change that may significantly mitigate, if not solve, an environmental problem. Second, high compliance is not sufficient. High compliance levels with rules that merely codify existing behaviour, or rules that reflect political rather than scientific realities, will prove inadequate to achieve the hoped-for environmental improvement. For example, compliance with the Montreal Protocol may prove perfect but too late to avoid irreversible harm from stratospheric ozone loss.¹⁴¹

Even a treaty that can be empirically identified as the cause of compliance may fail to lead to the desired environmental improvement. Most environmental problems have three different types of sources: the regulated human behaviour, other non-regulated human behaviours, and non-human sources. A treaty that successfully brought a halt to an environmentally harmful behaviour might not preserve the environmental resource if other human behaviours and natural factors influencing environmental quality caused the resource to be depleted.

Having said that, however, compliance can provide a valuable proxy for effectiveness, since greater compliance will produce more environmental improvement so long as the rules do not have perverse effects, although the improvement may still be insufficient to mitigate the problem. In most cases negotiated rules have a positive relationship to better management, if not resolution, of the environmental problem.¹⁴² In these conditions, higher levels of compliance will lead to higher levels of effectiveness, *ceteris paribus*. In some cases, under assumptions of perfect compliance, two rules will be equally beneficial to the environment. In such cases, the rule that induces greater compliance can safely be inferred as increasing treaty effectiveness. In other cases, however, determining whether a given rule will be more effective in solving an environmental problem will require evaluating the trade-offs between a rule that offers large nominal environmental benefits but is likely to elicit low compliance and another rule that offers smaller nominal environmental benefits but has a high likelihood of compliance. A particularly striking example of such trade-offs is involved in the current choice faced by the International Whaling Commission (IWC) regarding whether to maintain a moratorium on commercial whaling in a treaty to which fewer countries are willing to be parties or allow some commercial whaling to keep countries operating under treaty auspices.

Rules that achieve high levels of compliance may be too costly, economically inefficient, or fail to be cost-effective. Compliance cannot be the sole criteria for making choices among alternative treaty provisions. The argument is that evaluating likely compliance levels must be an important and relevant consideration in policy debates. Nominally cheaper, more 'efficient' policies may simply not be capable of inducing the level of compliance needed to achieve a socially desirable outcome. In contrast, a more expensive, inefficient policy may prove more enforceable or otherwise more likely to elicit high levels of compliance needed to achieve this outcome. Before selecting a particular policy approach, the benefits of the socially desired outcome must be weighed against the costs required to induce high compliance levels. We cannot rule out certain options simply because more efficient options can 'conceivably' achieve the

intended environmental end. Policies must be evaluated in terms of compliance, as well as efficiency, cost, and equity. Where they elicit the compliance necessary to achieve the environmental goal, more efficient solutions are clearly preferable. Where compliance with efficient solutions appears significantly less likely than with alternatives, we must examine whether the compliance costs of inefficient solutions are nonetheless outweighed by the benefits that high compliance provides.¹⁴³

FURTHER RESEARCH

This chapter has laid out one view of the theoretical context that informs much of the current research being conducted by international relations scholars into compliance with environmental treaties. This framework suggests a large number of important empirical questions that need to be answered if scholars are to contribute to the important task of advising those who actually negotiate international environmental accords. The study of international environmental politics in general, and issues of compliance and effectiveness in particular, is currently receiving a large and rapidly growing amount of scholarly and policy attention.¹⁴⁴

Certainly one important task involves identifying whether treaty-induced compliance is common. Specific studies have evaluated compliance with the provisions of particular treaties, such as the International Convention for the Prevention of Pollution from Ships and the Convention on International Trade in Endangered Species.¹⁴⁵ Studies of individual treaties can provide in-depth understanding, especially when they identify variance in compliance across rules within a treaty which allows control of many of the variables that often confound analysis of cross-treaty variation. They suffer, however, from the problem that their conclusions often prove difficult to generalize and, by definition, can evaluate the success or failure only of whatever types of particular institutional and legal arrangements were undertaken in those particular treaties. Such studies also do not address the larger question of whether treaty rules generally do prompt changes in behaviour. Indeed, most such studies document instances of rules failing to influence behaviour, as well as succeeding at doing so. Determining if compliance occurs frequently in international environmental affairs, whether treaty-induced or not, demands study by those evaluating treaty rules and behaviour across a wide range of treaties.

Current research is looking at both national-level factors that influence compliance, as well as at variance across different types of problems to identify the necessary conditions for treaty-induced compliance to arise. Political science scholars are beginning to explore systematically the variance across different environmental treaties in eliciting compliance and achieving desired behavioural changes. Some variance will certainly be shown to arise from differences in how the treaties frame their substantive provisions and design their compliance information and non-compliance response systems. However, several other factors will certainly be shown to play key roles in compliance variance across issue areas. First, different levels of international concern regarding a problem may have large effects on the level of compliance achieved. Second, some types of activities are inherently more difficult to regulate than

others. Some environmental remedies need only alter current production processes to eliminate that component causing the environmental externality, as with oil pollution and acid rain. In other cases, achieving treaty objectives may require reducing the level of activity to correspond to the relevant ecosystem's carrying capacity, as with fisheries agreements. In still other problems, treaties may need to ban an activity completely in certain areas or for certain periods, as with whaling, trade in endangered species and atmospheric nuclear testing. Several research teams, involving many international scholars from a wide array of disciplinary backgrounds, are currently probing into these and related questions.¹⁴⁶

Understanding what limits contextual factors place on compliance, and what factors determine that context, can make it easier to design politically viable, yet successful, environmental compliance systems. One major international team of scholars is conducting a cross-treaty and cross-country evaluation of compliance in ten countries with five environmental treaties.¹⁴⁷ Another study currently underway is evaluating the financial mechanisms in various environmental treaties.¹⁴⁸ Considerable effort is underway to collect more systematic databases on variables related to both the compliance and effectiveness of environmental treaties to facilitate progressively better analysis of the effects of international treaties.¹⁴⁹ Comparisons across different treaties can highlight the impact of contextual factors on the effectiveness of similar compliance systems, or the relative effectiveness of different compliance systems. Factors that are not policy-manipulable in the short run, such as scientific understanding of (and hence governmental concern over) the risks of a particular environmental threat or solutions to it, may be policy-manipulable in the long run. Numerous questions suggest themselves. How do wildlife preservation treaties compare with pollution regulation accords? Do bilateral agreements prove better or worse at eliciting compliance than multilateral agreements? In general, how does the number of parties influence compliance levels?

Political scientists are also just commencing research to determine what valid lessons can be learned from broader international relations research efforts, for example those investigating compliance, verification and enforcement issues in arms control.¹⁵⁰ Comparing and contrasting the arms control experience with that of environmental treaties could shed light on both areas of study.¹⁵¹ Similar comparisons might usefully be made with compliance provisions and experience in trade and human rights conventions.¹⁵² The Commission on Sustainable Development for monitoring adherence to the principles in UNCED's Agenda 21 was modelled after the UN Commission on Human Rights, yet little close study has documented whether and why the human rights experience should easily and successfully transfer to the environmental realm.¹⁵³

CONCLUSIONS

The preceding discussion provides a foundation for identifying both whether and how treaties induce compliance. Most treaties have parties that combine the different types of motivations outlined. Even in the international environmental issues commonly characterized as collaboration problems, it seems likely that some states comply due to an independent interest in compliance, others are

willing to comply if enough other states do, and others will seek to violate, complying only if they receive sufficient sidepayments, face sanctions, or are prevented from violating. Some might act no differently if there were no treaty while others may be complying only under direct threats of sanctions. High compliance levels in general, and increases in compliance levels in particular, may be due to a treaty but may be due to a range of other factors.

The wide array of compliance sources that are exogenous to the treaty suggests a healthy scepticism in attributing a treaty as having caused compliance. More importantly, they provide rival hypotheses of why compliance would increase at the same time as a change in rules. They provide a check-list of 'likely suspects' that will help avoid attributing causation to rules in cases where other factors are responsible for a change in compliance.

Changes in the power and interests of dominant states may lead both to adoption of more stringent rules and to better compliance. Treaty rules and correlated behaviours may often be merely different indicators of the same set of power and interests that drive much of international politics. The existence of deeper causal links, rather than just coincidence, will regularly cause compliance changes to correlate with rule changes. Economic and technological changes might increase incentives and capacities to comply, and domestic political changes may also lead actors to change their calculus regarding compliance. These factors may confound efforts to attribute causally a change in compliance to a particular rule change. Explicitly looking for independent evidence of such changes, however, allows us to confirm this analysis if appropriate evidence is found and to eliminate it if evidence shows no such change occurred. If changes in rules do appear to have caused increased compliance, however, the review presented here delineates the types of changes to the primary rule system, compliance information system, or non-compliance response system that we should expect to see.

Despite the continuing reference to international environmental politics as a new field, many environmental treaties have been in force long enough to begin evaluating their behavioural impacts.¹⁵⁴ While empirical evidence of compliance may take time to develop, many environmental agreements stand ready to be analyzed by those inclined to find data addressing whether international rules effect compliance.¹⁵⁵ Whether the nations of the world succeed at averting the many international environmental threats that loom on the horizon will depend not on negotiating agreements to alter the behaviours that harm the air, land, and water but on ensuring that those agreements succeed in getting governments, industry and individuals to change their behaviour. We can hope and work for a day when all nations and their citizens are sufficiently concerned about the environment that we will not need international law to outlaw pollution and dictate environmentally-benign behaviours. Until then, however, identifying and then implementing those treaty provisions that elicit compliance will provide one valuable means of managing the protection of the global environment.

NOTES AND REFERENCES

1 COMPLIANCE THEORY: AN OVERVIEW

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- 3 Donoghue, J E (February 1993) 'On learning not to think like a lawyer: improving the effectiveness of international environmental law'; Washington, DC (unpublished manuscript), p 6, ('Donoghue').
- 4 For the major works on realism, see Morgenthau, supra note 2; and Waltz, K (1979) *Theory of International Politics*, Addison-Wesley Publishing, Reading, MA ('Waltz').
- 5 See Morgenthau supra note 2 at p 268.
- 6 Waltz, K 'Anarchic orders and balances of power', in Keohane, Robert (ed), (1986) *Neorealism and its critics*, Columbia University Press, New York, NY, p 328.
- 7 Morgenthau, supra note 2 at p 267. See, for example, Henkin, L (1979) *How Nations Behave: Law and Foreign Policy*, Columbia University Press, New York, NY, p 47; Young, O (1989) *International Cooperation: Building Regimes for Natural Resources and the Environment*, Cornell University Press, Ithaca, NY, p 62 ('Young'); and Chayes, A and Chayes, A (July 1991) 'Compliance Without Enforcement: State Behavior Under Regulatory Treaties', *Negotiation Journal* 7, p 31 ('Chayes and Chayes'). For an introduction to institutionalist views, especially regime theory, see Krasner, S (ed) (1983) *International Regimes*, Cornell University Press, Ithaca, NY ('Krasner'); and for its application to international environmental problems see Haas, P, Keohane, R O and Levy, M (1993) *Institutions for the Earth: Sources of Effective International Environmental Protection*, The MIT Press, Cambridge, MA ('Haas, Keohane and Levy').
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- 14 On this point, see Young, O (1991) 'The effectiveness of international institutions: hard cases and critical variables', in Rosenau, J N and Czempiel, O (eds) *Governance Without Government: Change and Order in World Politics*, Cambridge University Press, New York, NY, p 183, ('Young, "The effectiveness of international institutions"'), Chayes, A and Chayes, A supra note 12, pp 188-192; and Levy, M A 'The Effectiveness of International Environmental Institutions: What We Think We Know, and How We Might Learn More,' Paper prepared for presentation at the Annual Convention of the International Studies Association, Acapulco, Mexico, pp 23-27, March 1993.
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- 20 Keohane supra note 16 at p 99.
- 21 Stein, A A 'Coordination and collaboration; regimes in an anarchic world' in Krasner supra note 7 at pp 138-139; Keohane supra note 16 at pp 120-124.
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- 23 Franck, T M (1990) *The power of legitimacy among nations*, Oxford University Press, New York, NY; Puchala and Hopkins supra note 22 at p 66.
- 24 Ruggie, J G 'International regimes, transactions, and change: embedded liberalism in the postwar economic order', in Krasner supra note 7 at p 200.
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- 26 Abram Chayes develops a clear argument regarding how these factors lead to compliance in arms control agreements in his excellent article, 'An Inquiry into the Workings of Arms Control Agreements', *Harvard Law Review* 85. See also, Young, *Compliance and Authority*, supra note at pp 25 and 178; Young supra note 7 at pp 78-79.
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- 29 Strange supra note 18 at p 348; Gilpin, R (1981) *War and Change in World Politics*, Cambridge University Press, Cambridge, MA, Chapter 2 ('Gilpin').
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- 32 Gilpin supra note 29 at pp 51-2; Gilpin, R (1975) *US Power and the Multinational Corporation: The Political Economy of Foreign Direct Investment*, Basic Books, Inc., New York, NY; and Haas, P M (1990) *Saving the Mediterranean: the politics of international environmental cooperation*, Columbia University Press, New York, NY ('Haas').
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- 43 Krasner, S (April 1991) 'Global communications and national power: life on the Pareto frontier', *World Politics* 43.
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- 45 See, for example, Olson supra note 44; Hardin supra note 44; and Axelrod, R (1984) *The Evolution of Cooperation*, Basic Books, New York, NY ('Axelrod').
- 46 Waltz supra note 4 at pp 196-197.
- 47 Waltz supra note 4 at p 70.
- 48 Stein supra note 21 at pp 128-130.
- 49 Morgenthau supra note 2 at p 298.
- 50 Indeed, since states that violate a treaty are unlikely to enforce it, unsuccessful enforcement efforts only increase the relative gains of non-compliant states. As with compliance, models of limited rationality or habit-driven behaviour may best explain the variance between those who enforce and those who do not.
- 51 Young, O 'Regime Dynamics: The Rise and Fall of International Regimes' in Krasner supra note 7 at p 100.
- 52 Waltz supra note 4 at p 209.
- 53 Keohane supra note 16 at pp 105-106; Axelrod and Keohane supra note 41 at p 250; and Young supra note 7 at pp 75-76.
- 54 Keohane supra note 16 at p 105; and Morgenthau supra note 2 at p 267.
- 55 Stein, *Why nations cooperate* supra note 40 at p 187; and Axelrod and Keohane supra note 41 at p 227.
- 56 Axelrod and Keohane supra note 41 at p 247.
- 57 It remains an empirical question whether this is common or 'exceptional' international behaviour (Chayes and Chayes supra note 7 at p 311).
- 58 Convention on Long-Range Transboundary Air Pollution, 13 November 1979, reprinted in 18 ILM 1442 (1979) ('LRTAP Convention'); Protocol to the 1979

- Convention on Long-Range Transboundary Air Pollution on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at Least 30 Per cent, 9 July 1985, UN Doc ECE/EB.AIR/12 reprinted in 27 ILM 707 (1988), ('LRTAP Sulphur Protocol').
- 59 Young 'The effectiveness of international institutions' supra note 14 at pp 183-185; Haas, Keohane, and Levy supra note 7.
- 60 Article 10 of London Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer, 29 June 1990, reprinted in 30 ILM 539 (1991), ('London Amendments'); Article 4(3) and Article 11, Framework Convention on Climate Change, UN Doc A/AC.237/18 (Part II)/Add.1 (15 May 1992).
- 61 See the introduction and conclusion of Haas, Keohane, and Levy supra note 7.
- 62 For example, two governments could be equally committed to reducing population growth but one with a predominantly Catholic population might prove significantly less successful at complying.
- 63 Examples include the Montreal Protocol and the LRTAP Convention.
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- 68 Keohane supra note 16 at p 159.
- 69 For example, individual traders may be convicted and punished for trades in endangered species prohibited by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 3 March 1973, TIAS No 8249, 27 UST 1087, 983 UNTS 243 reprinted in 12 ILM 1085 (1973) ('CITES'). For an analysis of the CITES agreement, see Trexler, M C (1989) 'The Convention on International Trade in Endangered Species of Wild Fauna and Flora: Political or Conservation Success?' (unpublished thesis), Berkeley CA ('Trexler').
- 70 Young, *Compliance and Authority* supra note 11 at pp 22 and 44.
- 71 Chayes, A and Chayes, A (1991) 'Adjustment and Compliance Processes in International Regulatory Regimes' in Tuchman Mathews, J (ed), *Preserving the Global Environment: The Challenge of Shared Leadership*, W W Norton and Co, New York, NY, p 290 ('Chayes and Chayes, "Adjustment and Compliance"').
- 72 Lemonick, M D (2 August 1993) 'The hunt, the furor,' *Time*.
- 73 Morgenthau supra note 2 at p 265; Chayes and Chayes supra note 2 at p 324.
- 74 See Waltz supra note 4 at p 208; Gilpin supra note 29 at p 169; and Olson, M (1965) *The Logic of Collective Action*, Harvard University Press, Cambridge, MA, p 35.
- 75 See Gilpin supra note 29 at p 30; Waltz supra note 4 at pp 136 and 157; and Krasner, 'Structural Causes and Regime Consequences: Regimes as Intervening Variables' in *International Regimes* supra note 7 at pp 13-15.
- 76 Gilpin supra note 29 at p 36. Strange suggests that compliance with multilateral treaty rules, eg, GATT, is best explained by parallel bilateral deals that allow more efficacious and direct application of power (Strange supra note 18 at p 352).
- 77 Gilpin supra note 29 at p 31.

- 78 Morgenthau argues that attempts by weak states to violate, by strong states to enforce, and the success of both, depend on 'political considerations and the actual distribution of power' (supra note 2 at p 266).
- 79 Young defines 'obedience as a response to a command from an identifiable authority figure in a specific situation' (*Compliance and Authority* supra note 11 at p 5).
- 80 Waltz supra note 4 at pp 177-8. See also Gilpin supra note 29 at pp 173-4.
- 81 Gilpin supra note 29 at p 156.
- 82 Lipson, C 'The Transformation of Trade: The Sources and Effects of Regime Change', in Krasner supra note 7 at pp 254-5.
- 83 Young, 'The Effectiveness of International Institutions' supra note 14 at p 187.
- 84 Keohane supra note 16 at p 99. For extended discussions of reciprocity, see Keohane, R O (Winter 1986) 'Reciprocity in International Relations', *International Organization* 40:1 ('Keohane, 'Reciprocity' ') and Axelrod supra note 45.
- 85 Axelrod and Keohane supra note 41 at p 232. See also Axelrod supra note 45; Keohane, R O 'The Demand for International Regimes', in Krasner supra note 7; and Jervis, R 'Security Regimes', in Krasner supra note 7.
- 86 Young, *Compliance and Authority* supra note 11 at p 58; and Wittman, D (September 1989) 'Arms Control Verification and Other Games Involving Imperfect Detection', *American Political Science Review* 83.
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- 88 Id.
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- 92 Young, *Compliance and Authority* supra note 11 at p 3.
- 93 Stein supra note 21.
- 94 Axelrod and Keohane supra note 41 at pp 228-232.
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- 96 Axelrod supra note 45.
- 97 Fisher supra note 11; Kennedy, D (1976) 'Form and Substance in Private Law Adjudication', *Harvard Law Review* 89; and Donoghue, J E supra note 3.
- 98 Chayes, A (Spring 1991) 'Managing the Transition to a Global Warming Regime or What to Do Till the Treaty Comes', *Foreign Policy* 82, p 16.
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- 100 Kaplow, L (Spring 1990) 'Optimal Deterrence, Uninformed Individuals, and Acquiring Information About Whether Acts are Subject to Sanctions', *Journal of Law, Economics & Organization* 6 pp 93-128; and Kaplow, L (March 1992) 'The Optimal

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- 101 See, for example, Young, 'The Effectiveness of International Institutions' supra note 14 and Chayes and Chayes, 'Adjustment and Compliance Processes' supra note 71.
- 102 Jervis, R 'From Balance to Concert: A Study of International Security Cooperation', in Oye supra note 35 at p 74. See also Downs, G W, Rocke D M and Siverson, R M 'Arms Races and Cooperation', in Oye supra note 35.
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- 129 Mitchell, R B *From Paper to Practice: Intentional Oil Pollution and Treaty Compliance*, Cambridge, MA: The MIT Press (forthcoming).
- 130 See, for example, Keohane, R O (1984) *After Hegemony: Cooperation and Discord in the World Political Economy*, Princeton University Press, Princeton, NJ, Haas supra note 32; and Parson, E A and Clark, W C (1991) 'Learning to Manage Global Environmental Change: A Review of Relevant Theory', (unpublished paper), Cambridge, MA ('Parson and Clark').
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- 132 See Haas, Keohane and Levy supra note 7.
- 133 Levy supra note 105.
- 134 Parson and Clark supra note 130.
- 135 When facing uncertainty, especially in environmental treaties, politicians may defer to scientific experts to define the nation's interests and implement the treaty domestically. These scientists have strong incentives to ensure their country complies with and enforces environmental treaties (Haas supra note 32 at pp 54-63).
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- 141 See Parson, E A 'Protecting the ozone layer' in Haas, Keohane and Levy supra note 7.
- 142 John Kambhu has explored the interaction of these two effects at the domestic level in his excellent article (June 1989) 'Regulatory Standards, Noncompliance and Enforcement', *Journal of Regulatory Economics* 1.
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- 144 These include, among others, book manuscripts being written and projects being conducted at, or with funding from, Dartmouth College (Oran Young and Marc

- Levy); the European Science Foundation (Kenneth Hanf); the Foundation for International Environmental Law and Development (James Cameron); the Fridtjof Nansen Institute (Steinar Andresen); Harvard University (Abram Chayes and Antonia Chayes); Harvard University (William Clark, Robert Keohane, and Marc Levy); the International Institute for Applied Systems Analysis (David Victor and Eugene Skolnikoff); the Social Science Research Council (Edith Brown Weiss and Harold Jacobson); and the University of Tübingen (Volker Rittberger).
- 145 On oil pollution, see Mitchell supra note 129; and on endangered species, see Trexler supra note 69.
- 146 See note 27 in Chapter 1.
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- 149 The International Institute for Applied Systems Analysis in Laxenburg, Austria has just begun a project on compliance with international environmental accords that includes a major database module.
- 150 For example, see Duffield, J S (Autumn 1992) 'International regimes and alliance behavior: explaining NATO conventional force levels', *International Organization* 46:4.
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- 153 Lewis, P (7 June 1992) 'Delegates at Earth Summit Plan a Watchdog Agency', *New York Times*; and Glass supra note 107.
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2 COMPLIANCE, CITIZENS AND NGOS

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