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Matching institutions and ecosystems: The problem of fit

Oran R. Young (Institute on International Environmental Governance, Dartmouth College, USA)

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Matching Institutions and Ecosystems: The Problem of Fit

Oran R. Young
Institute on International
Environmental Governance
Dartmouth College, USA

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Avant-propos

Le texte d'Oran Young s'insère dans la très riche littérature anglo-saxonne consacrée à l'étude des régimes internationaux. Cette dernière se propose d'expliquer pourquoi et comment émergent et se stabilisent des dispositifs institutionnels dans un domaine spécifique des relations internationales. Constituée sur les fondements des théories néo-institutionnalistes en sciences politiques, cette approche s'intéresse particulièrement à la manière dont les institutions influencent la coordination de l'action collective internationale. Deux grands modèles servent de base pour analyser ces phénomènes de coordination : les modèles de l'action collective fondés sur les présupposés utilitaristes de la théorie du choix rationnel et les modèles des pratiques sociales, qui considèrent que les intérêts et préférences des acteurs ne sont pas donnés et doivent être analysés en tant que tels pour comprendre comment ces derniers appréhendent leur environnement.

S'ils font souvent référence à ces deux grands modèles, les travaux d'Oran Young s'appuient sur les complémentarités de ces deux courants pour répondre aux problèmes pratiques que rencontrent les dispositifs internationaux de régulation en matière d'environnement. Dans quelle

mesure les institutions sont-elles responsables des résultats de l'action collective internationale ? Comment expliquer les différences de performance entre les institutions internationales en matière d'environnement ? Quelle forme doivent prendre les institutions internationales pour maximiser leurs performance ?

Président du conseil scientifique du réseau international Dimensions institutionnelles des changements environnementaux globaux (IDGEC en anglais), Oran Young a coordonné une recherche pluriannuelle sur les problèmes d'adéquation, d'interaction et d'échelle (*fit, interplay and scale*) auxquels sont confrontées les institutions. Ces trois critères sont en effet apparus comme les principales difficultés pratiques rencontrées par les institutions pour gérer efficacement les relations de l'homme avec son environnement. Nous reviendrons plus longuement sur le premier de ces critères – l'adéquation –, qui constitue le point central du papier présenté ici. Les problèmes d'interaction concernent les liens, horizontaux ou verticaux, existant entre les différentes institutions. Les questions d'échelle concernent les différences d'évolution des systèmes d'un niveau à l'autre en terme spatial et temporel.

Dans ce papier, Oran Young recense – sans néanmoins prétendre à l'exhaustivité – les raisons des décalages entre les institutions et les écosystèmes (problème d'adéquation). Parce que les institutions sont des construits sociaux, il devrait en principe être possible de les adapter aux caractéristiques biogéophysiques de problèmes environnementaux spécifiques. Cependant, les décalages entre les institutions et les écosystèmes sont courants. De plus, même lorsque leur existence est connue, il s'avère souvent difficile de limiter, plus encore d'éliminer, ces décalages. Après avoir identifié certains mécanismes pouvant les produire, l'auteur discute les stratégies permettant de minimiser les conséquences négatives de ce problème d'adaptation. Parmi elles, il propose la création d'une institution, Geomap, qui aurait pour mission d'assurer l'observation, la surveillance et l'évaluation des phénomènes biophysiques.

L'auteur reconnaît qu'une telle institution ne pourrait résoudre à elle seule les problèmes d'adéquation, ne serait-ce que du fait des insuffisances liées au fonctionnement

des institutions qu'Oran Young lui-même pointe dans son texte. Mais cette proposition a le mérite d'ouvrir une réflexion prospective, susceptible de fédérer différents acteurs ayant de légitimes divergences d'intérêt, de vision du monde ou de choix éthique, le succès d'un tel instrument international ne dépendant *in fine* que de l'appropriation par ces différents acteurs.

Il nous est apparu important de mieux faire connaître l'approche d'Oran Young. Les discussions internationales sur les règles en matière d'environnement ont fait apparaître des divergences. Ceux qui proposent la construction d'institutions nouvelles capables de faire respecter les règles environnementales et d'élaborer des systèmes de sanctions s'opposent à ceux qui ne croient qu'aux incitations ou à l'autorégulation des acteurs. La perspective d'Oran Young permet de fournir aux uns et aux autres une base objective pour leurs débats et de diffuser à tous l'accès à l'information comme outil de régulation des comportements et des pratiques. Pour la communauté intellectuelle française, souvent encline à privilégier droit positif, règles et sanctions, les propositions d'Oran Young donnent à réfléchir et appellent de nouvelles discussions.

Résumé

Les institutions environnementales devraient être conçues en fonction des écosystèmes avec lesquels elles interagissent. Parce que les institutions sont des construits sociaux, il devrait en principe être possible de les adapter aux caractéristiques biogéophysiques de problèmes environnementaux spécifiques. Cependant, les décalages entre les institutions et les écosystèmes sont courants et il s'avère souvent difficile de les limiter, et plus encore de les éliminer, même lorsque leur existence est connue.

Oran Young explore les sources de cette énigme et identifie certains mécanismes pouvant produire ces décalages. Il propose des stratégies permettant de minimiser les conséquences négatives de ce problème d'adaptation, notamment la création d'une institution internationale, Geomap, qui aurait pour mission d'observer, de surveiller et d'évaluer les phénomènes biophysiques.

Abstract

It seems axiomatic that environmental institutions – or regimes as they are often called – should be designed to fit the properties of the ecosystems with which they interact. Because institutions are social artifacts, moreover, it is possible in principle to make them to order to match the biogeophysical features of specific problems. Yet mismatches between institutions and ecosystems are common. What is more, it often proves difficult to mitigate, much less to eliminate, these mismatches, even after their existence becomes common knowledge. This article explores the sources of this puzzle. In the process, it identifies a number of distinct mechanisms that can produce misfits as well as corrective measures available to those seeking to minimize the negative consequences of the problem of fit. Institutional stickiness often impedes efforts to apply corrective measures to specific situations. But it will not do to throw up our hands in the face of this obstacle. As a modest first step in coming to terms with the problem of fit, the article proposes the establishment of a Global Environmental Observing, Monitoring, and Assessment Programme (GEOMAP).

Matching Institutions and Ecosystems: The Problem of Fit

It seems axiomatic that environmental institutions – or regimes as they are often called – should fit the properties of the ecosystems with which they interact. Regimes that deal with highly migratory species like salmon and geese, for instance, cannot succeed unless they include all those actors possessing jurisdiction over the relevant migration routes. Similarly, regimes applicable to chaotic systems subject to rapid change events that are difficult to forecast (e.g. the Earth’s climate system) cannot succeed unless they encompass procedures for tracking changes and adjusting regulatory measures in a timely and efficient manner. Because institutions are social artifacts, moreover, it is possible in principle to make them to order to match the biogeophysical features of specific environmental problems. While there may be serious disagreements about the relative merits of different procedures for coming to terms with any given environmental problem, there is nothing to stop actors from devising and implementing specific arrangements once they arrive at a consensus on the provisions of a suitable constitutive contract.

Yet misfits or mismatches between institutions and ecosystems are common. Regimes for migratory species

frequently leave out portions of their range, and regimes for volatile systems often lack procedures for tracking changes and adjusting regulatory provisions smoothly and efficiently to changed biophysical conditions. What is more, it often proves difficult to mitigate, much less to eliminate, these mismatches, even after their existence becomes common knowledge. This article explores the sources of this puzzle. In the process, it discusses a number of types of mismatches, describes corrective measures designed to alleviate particular types of mismatches, and explains why it is often difficult to adopt and implement these measures. The article concludes with a modest proposal intended to assist those endeavoring to come to terms with the problem of fit especially, but not exclusively, at the international level.

Types of misfits

The first thing to notice in examining the problem of fit is that most environmental and resource regimes now deal with coupled human/natural systems in which human actions constitute a major and sometimes a dominant driving force. Thus, we are no longer dealing with systems in which the impact of human actions is negligible relative to the impact of various biophysical drivers (Vitousek *et al.* 1997). Under such conditions, misfits may arise from any of a number of sources. I do not attempt, in this section, to devise a fully-fledged taxonomy of misfits in the sense of a set of categories or types that are mutually exclusive and collectively exhaustive. But it is important to differentiate at the outset between misfits that are traceable to biophysical conditions and those that arise from socioeconomic processes. In the following paragraphs, I comment briefly on several types of misfits that belong to each of these broad categories.

Biophysical fluctuations

Even in systems that feature equilibrating processes and that are not subject to non-linear or chaotic changes, sub-

stantial periodic (e.g. interannual) fluctuations are common. The flow of water in rivers, the size of fish stocks, and the amount of rainfall are all subject to this type of variability. In each case, the potential for mismatches between institutions and ecosystems is great. In cases where multiple appropriators are accorded rights to withdraw fixed quantities of water on an annual basis, for example, the supply of water may be insufficient to meet the combined demand during low-flow years. Some major rivers (e.g. the Colorado in North America and the Yellow in China) often run dry before they reach the sea. Inter-annual variations in the size of fish stocks can cause severe problems in fisheries where fishers hold permits to fish in a given area but do not have individual transferable quotas (ITQs). The predictable result is either depletions of the stocks or an increasingly inefficient fishery as fishing power exceeds what is required to harvest an unallocated quota (National Research Council 1999). In the case of rainfall, systems of land tenure that work perfectly well during good years can lead to disaster during bad years and especially during periods of prolonged drought. In effect, agricultural practices that are appropriate under some conditions produce undesirable and, in certain cases, disastrous results under other conditions. In all these cases, problems arise when institutional arrangements are based on provisions (e.g. the right to withdraw a fixed quantity of water each year, the right to fish with a certain type of gear) that do not take into account the consequences of biophysical fluctuations.

Chaotic systems

Some biophysical systems not only fluctuate on a periodic basis; they also are chaotic in the sense that they are subject to rapid change events that are non-linear in character and that are difficult to predict far enough in advance to be useful for purposes of management. The Earth's climate system is a particularly dramatic case in point, but there are many other examples of chaotic systems (Alley 2000, Mayewski and White 2002). The typical misfit here arises from the fact that institutions tend to be linear in character, mandating gradual reductions in emis-

sions of greenhouse gases, raising or lowering allowable harvest levels at the margin, or altering patterns of land use in a step-wise fashion. In effect, institutional arrangements better suited to biophysical systems that fluctuate within some larger pattern of equilibrium are paired with ecosystems prone to chaotic and non-linear changes (Wilson *et al.* 1994). Where the non-linear changes in question involve rapid change events, the problem of fit becomes particularly acute. In the absence of well-developed procedures for tracking and responding to such changes, regimes are apt to become increasingly inappropriate in the sense that they are geared toward situations that bear less and less resemblance to reality.

Special interests

Just as misfits often arise from misunderstandings about key features of biophysical systems, special interests or the interests of particular categories of human actors can lead to the creation of regimes that are poorly suited to the biophysical systems with which they interact. A classic case in point involves the efforts of influential leaders in western territories of the United States during the nineteenth century who wanted to attract enough settlers to meet the conditions for statehood and, in the process, to create opportunities for themselves to hold high elective offices (Stegner 1954). They advocated inappropriate systems of land tenure and devised doctrines like the proposition that “rain follows the plow” to provide at least a superficial defense of their actions. But it is easy to find more contemporary examples of the role of special interests as a source of mismatches between institutions and ecosystems. Many managers of large corporations and municipal power plants, for example, adopt positions regarding the climate change regime that are obviously self-interested in the hope of avoiding regulations that will add significantly to their costs of production. Similar observations are in order regarding efforts to defend arrangements that license what amounts to subsidized grazing on sizable areas of the public domain. The mechanism at work in such situations is easy to identify; the consequences in terms of mismatches between institutions and ecosystems can become severe.

Socioeconomic change

Regimes often rest on assumptions about socioeconomic and technological conditions that are perfectly reasonable at the time of their creation but that become increasingly untenable with the passage of time. The advent of high endurance stern trawlers in the North Atlantic fisheries, for instance, overwhelmed arrangements governing major groundfisheries that had worked well enough before the emergence of this innovation in harvesting practices (Warner 1983). A regime calling for nothing more than registration of satellite slots in the geostationary orbit that works well enough during an era of low usage can produce undesirable results when the number of users increases, congestion sets in, and the demand for slots exceeds the supply. On the other hand, technological change can lead to increased efficiency that reduces pressure on the electromagnetic spectrum, a development that may eliminate the need for elaborate procedures governing the allocation of space on this spectrum. In all these cases, the basic issue is the same. Changes in human systems over time can turn regimes that once fit biophysical conditions well into arrangements that are poorly matched with the biophysical conditions under which they operate. Unless such regimes include procedures for adjustment, the result is apt to be a growing gap between institutions and ecosystems. In some cases (e.g. the depletion of certain fish stocks), this process can eventuate in disaster (Harris 1998).

Corrective measures

What can be done to close the gaps caused by these different types of misfits and, in the process, to reduce problems of conservation, efficiency, and equity arising from them? As I shall suggest in the next section, a variety of obstacles can impede efforts to eliminate or even to alleviate misfits. But that does not mean that no corrective measures are available. Considering the same types of misfits identified in the preceding section, the following paragraphs describe measures that can be taken to enhance the fit between institutions and ecosystems under a variety of conditions.

Adjustable keys

Where biophysical fluctuations are the source of the problem, the solution is to abandon arrangements guaranteeing appropriators a certain quantity of water or fish and to introduce what are often called adjustable keys in their place. In the case of water, for instance, this means authorizing users to appropriate a given proportion or percentage of the annual flow rather than providing them with a right or a valid claim to a fixed number of acre feet of water, regardless of the impacts of this withdrawal on other users. With regard to the harvesting of fish or other living resources, the application of this idea means giving appropriators a right to take a certain percentage of allowable harvests set on an annual basis in the light of forecasts used to establish trends in the status of various stocks. This is the fundamental insight underlying the idea of ITQs in the marine fisheries. Not only do ITQs provide harvesters with the right to take a certain percentage of allowable catches in specific fisheries, but also the fact that they are transferable provides a mechanism that can help to ensure that the relevant permits end up in the hands of those who place the highest value on them (National Research Council 1999). Of course, arrangements of this type do not provide any guarantee that projections regarding overall flows of water or total allowable catches will prove to be well-grounded and realistic. Those responsible for administering the international whaling regime, for example, regularly set quotas for individual species that were too high during the early years of this arrangement; some would argue that the zero quotas of recent years are too low (Friedheim 2001). Assuming that overall withdrawal or harvest levels are set appropriately, however, the introduction of adjustable keys offers a means of alleviating mismatches resulting from biophysical fluctuations in key systems.

Adaptive management

With regard to mismatches that stem from the non-linear or chaotic behavior of ecosystems, the key to success lies in the establishment of effective assessment procedures

and the inclusion of steering mechanisms that allow for adjustments of institutional arrangements in a smooth and efficient manner. Adaptive management of this sort can become a tricky business. Provisions that make it too easy to alter rules and procedures constitute an open invitation to special interests to manipulate regimes to suit their own preferences under the guise of embracing adaptive management. Yet the avoidance of institutional rigidity is essential in dealing with chaotic biophysical systems. An interesting case in point is the procedure built into the ozone regime that allows for accelerations in phaseout schedules for families of chemicals already subject to regulation without triggering a need for ratification on the part of individual member states (Parson and Greene 1995). Perhaps the greatest challenge facing adaptive management today arises in connection with the problem of climate change. Many observers assume, at least implicitly, that climate change will take the form of a gradual and more or less uniform increase in mean surface air temperatures. But research on the Earth's climate system has made it clear not only that rapid climate change events (RCCEs) occur from time to time but also that these events are likely to produce dramatic impacts that pose far greater challenges to human systems than more incremental changes (Mayewski and White 2002).

Limited commitment periods

Perhaps the most effective way to address mismatches arising from the influence of special interests is to introduce sunset clauses in the sense of provisions that require renegotiation of the terms of regimes every so many years. Insofar as special interests are able to control processes of institutional bargaining, of course, they may be able to perpetuate institutional arrangements that are favorable to themselves even though they are poorly suited to underlying biophysical conditions. Something of this sort seems to occur quite regularly with regard to the harvesting of timber or the grazing of animals on public lands. Yet a built-in requirement for periodic renegotiation of the terms of regimes does provide an opportunity for critics to rally their forces when mismatches arising from the operation

of special interests become particularly severe (Koremenos 2001). Interestingly, this mechanism for addressing mismatches seems more common in domestic settings than it is at the international level. In the United States, for example, the legislation establishing many resource regimes (e.g. the regime dealing with commercial fisheries in the exclusive economic zone) are subject to reauthorization on a periodic basis. At the international level, it is difficult to find regimes that contain similar provisions. The Antarctic Treaty of 1959 does contain a provision (Article 12.2) allowing any Consultative Party to call for the organization of a review conference after the treaty has been in force for thirty years. But this provision is voluntary rather than mandatory in the sense that it does not require the holding of such a conference, and it is no cause for surprise that none of the Consultative Parties has taken the initiative in calling for such a conference.

Monitoring mechanisms

In cases where mismatches result from socioeconomic and technological changes occurring after the creation of institutional arrangements, efforts to improve the fit between institutions and ecosystems require, in the first instance, a well-developed capacity to monitor the impacts of the relevant changes. In some cases the cause-and-effect relationships are relatively transparent. Although there is no substitute for careful longitudinal monitoring to establish causal links in a rigorous manner, it was not difficult to observe the impact of the introduction of high endurance stern trawlers on fisheries regimes operating in the North Atlantic. In other cases, the source of the problem is somewhat more difficult to pinpoint. It is now well understood, for instance, that an institutional arrangement granting rights to riparian users to withdraw water with no provision for the transfer of these rights to others has created severe misallocations of water and led those faced with a rapid rise in demand (e.g. municipal water departments) to launch initiatives that have become sources of significant biophysical problems. Yet a clear understanding of this problem was a long time coming. Of course, detecting situations in which socioeconomic and technological

changes turn regimes that were once perfectly adequate into outmoded misfits does not guarantee that key actors will take steps to address the problem. As the collapse of cod stocks off the east coast of Canada during the 1990s makes clear, such mismatches in the fisheries may become so severe that they effectively destroy the resource base (Harris 1998). In some cases, moreover, disruptions attributable to socioeconomic changes may not be severe enough to force adjustments in institutional arrangements. The case of water in the western part of the United States is a case in point. In the absence of some mechanism (e.g. a market in water rights) allowing for a reallocation of water rights to the highest bidder, tensions regarding conflicting uses of water generate protracted political confrontations in which the problem of fit between institutions and ecosystems is lost in the shuffle.

Institutional stickiness

Those who believe in the power of rational design are apt to assume that calculations of costs and benefits will lead actors, at least in rough-and-ready terms, to take steps to redesign or reconfigure institutional arrangements in such a way as to avoid or at least to ameliorate costly mismatches between institutions and ecosystems (Koremenos, Lipson, and Snidal 2001). Yet institutions are sticky in the sense that once formed they often have considerable staying power, even in the face of undeniable evidence that they are poorly suited to the biophysical and socioeconomic conditions in which they operate. As many frustrated reformers have discovered, alterations that appear to serve the public interest in the sense that they improve social welfare (e.g. various “no regrets” initiatives in the realm of greenhouse gas emissions) regularly prove difficult –even impossible– to effectuate in the real world (Young 1982). To understand this resistance to change, it will help to draw a distinction between general sources of stickiness and sources that are more specific to particular types of misfits.

General sources of stickiness

Those who have sought to account for the remarkable stickiness of institutional arrangements have generally framed their arguments either in collective-action terms or in social-practice terms (Young 2002). From a collective-action perspective, efforts to (re)form social institutions are apt to run into the familiar problems associated with the supply of public goods. Even when the existence of a severe mismatch is apparent to all, the introduction of corrective measures will often be non-excludable in the sense that all the members of the group will benefit from new institutional arrangements once they are supplied and non-rival in the sense that the consumption of this “good” by one member of a group does not diminish benefits accruing to others. On the contrary, the value of an institutional reform to individual members of the group may rise as more members participate in the new arrangement. Of course, some social groups may be privileged in the sense that a dominant or hegemonic member concludes that it is in its own interest to supply new institutional arrangements to the whole group (Olson 1965). But, in practice, such situations are rare and, in any case, may result in institutional arrangements that some members of the group regard as public “bads” rather than public goods. Under the circumstances, it will come as no surprise that discussions of regime (re)design often focus on the prospects for establishing effective exclusion mechanisms. But excluding individual actors from the benefits of institutional reform is apt to be easier said than done. It is hard to exclude those who refuse to participate in a climate regime, for instance, from benefiting from arrangements that serve to stabilize the Earth’s climate system. Under the circumstances, it seems reasonable to expect that the occurrence of free-rider problems will undermine or blunt efforts to solve misfits between institutions and ecosystems in many situations.

Those who approach institutional stickiness from a social-practice perspective, by contrast, will point to the constitutive (in contrast to the regulatory) role of institutional arrangements. In essence, the provisions of regimes, even when they produce undesirable results from an eco-

logical point of view, often play a role in shaping the identities of major players and give rise to discourses that influence the way actors think about the issues that regimes address (Onuf 1989; Wendt 1999). This is particularly true when key institutional provisions are cast in the form of rights. Those who claim riparian rights, for instance, are apt to feel entitled to withdraw as much water as the need/want without interference on the part of any public authority. The value of grazing rights on the public domain is generally capitalized in the value of the properties of ranchers who claim such rights. The rights of aboriginal subsistence harvesters to take fish and marine mammals are regularly defended as an integral element in the identity of particular groups of indigenous peoples. Of course, it is possible for a legitimate and effective public authority to place restrictions on rights of this sort, without expropriating these rights altogether. As the protracted and bitter confrontations regarding so-called “regulatory takings” of material property make clear, however, it is extremely costly to overcome the opposition of rights holders, even in cases where the need to impose restrictions in the interests of conservation is undeniable. Under the circumstances, changes in institutions treated as entrenched social practices are almost always costly; they will often prove infeasible despite the need to reform institutional arrangements to prevent growing mismatches between institutions and ecosystems.

There is no need to choose between the collective-action perspective and the social-practice perspective in thinking about general sources of institutional stickiness. Each perspective captures an aspect of the problem; both mechanisms may operate at the same time. The collective-action perspective highlights what is widely known as the free-rider problem and emphasizes the importance of reaching enforceable agreements regarding matters of burden sharing. The social-practice perspective points to the influence of framing and suggests that efforts to address mismatches will often require changes in rights and rules that are constitutive rather than merely regulatory in nature. Such changes may require actors to redefine who they are and what their interests are rather than simply accepting new rules whose benefits and costs can be evaluated in utilitar-

ian terms without raising any deeper questions about social roles and individual identities. Those seeking to minimize misfits between institutions and ecosystems would be well advised to think clearly about both of these ways of conceptualizing the general sources of institutional stickiness.

Specific sources of stickiness

In many cases, these general sources of stickiness are augmented and intensified by rigidities that are associated with individual corrective mechanisms. In the case of adjustable keys, for instance, major players are apt to see the introduction of such measures as an infringement on existing rights and to put up a fierce resistance to any alterations of this kind. To illustrate, those who believe they have a right to a certain number of acre feet of water per year can be expected to view the idea of a redefinition of this right as an entitlement to a percentage of the annual flow as a change that detracts from and conflicts with their preexisting right. Much the same can be said of changes affecting marine fisheries. Holders of permits granting a right to fish in a given area until the overall quota for the relevant fishery is met are likely to object to changes that grant them only an entitlement to harvest a limited and fixed proportion of the total allowable harvest. While it is important to exercise caution in generalizing about institutional matters, holders of rights ordinarily exhibit a tendency to cling tenaciously to existing rights, even in situations where reconfiguring larger bundles of rights and rules may lead to changes that are Pareto optimal in character. Rights are widely viewed as trumps in contests with claims cast in utilitarian terms, and the holders of specific entitlements often defend rights-based claims with little regard for calculations of costs and benefits (Dworkin 1978).

In dealing with chaotic systems, the specific sources of stickiness center on problems of social learning and concerns about dangers inherent in relying too heavily on adaptive management. Not only are non-linear processes hard to forecast in advance, it also is difficult to determine with certainty when the onset of such changes actually occurs. Witness the problem of determining whether climate change attributable to human actions is currently

underway. What is more, social learning is more complex than individual learning (Social Learning Group 2001). Individuals operating within a government agency or corporation may well come to understand largescale environmental changes but find it difficult to persuade higher level decisionmakers of the reality or the relevance of what they have learned. Implementing changes in existing practices needed to accommodate new understandings is more complex as well at the level of collective entities than at the individual level. Added to this is the understandable concern that increasing flexibility in the name of adaptive management may expose institutional arrangements to excessive pressure from self-interested actors desiring to advance special interests rather than to promote the common good. It is easy to imagine, in this connection, situations in which regime members find it preferable to confront the hazards of non-linear changes than to accept the consequences of self-interested manipulation that arise when rights and rules become too malleable.

Special interests are invariably difficult to combat, even when the fact that the institutional arrangements they prefer are not well matched with key properties of the relevant ecosystems becomes a matter of common knowledge. The sources of this problem are well known. Special interests typically involve small numbers of actors whose preferences regarding the issues at stake are intense. The costs associated with the actions of special interests, including the costs of mismatches, by contrast, are generally spread over large groups of actors –in many cases it is the general public– for whom the issues at stake are less critical. When special interests give rise to the creation of iron triangles or, in other words, coalitions of legislators, public officials, and corporate executives, changes in institutional arrangements opposed by these coalitions are especially difficult to effectuate. Representatives of special interests often play critical roles in legislative processes, and well-paid lobbyists regularly act to protect the positions of their clients. What is more, the presence of sympathetic officials located in key governmental agencies is apt to make it hard to implement changes in institutional arrangements on a day-to-day basis, even after the enactment of legislation authorizing –or even mandating– such changes (Pressman and Wil-

davsky 1973). The result is a situation in which entrenched institutional arrangements can and often do remain in place long after it becomes evident that they are poorly matched to properties of the ecosystems with which they interact. A classic case in point involves the longstanding and generally successful opposition to significant alterations of the Mining Act of 1872, the antiquated legislation governing hardrock mining on the public domain in the United States (Klyza 1996).

The problems of monitoring include challenges to the legitimacy of specific efforts as well as doubts about the objectivity of the observations on which they rest. In many cases, there is a severe shortage of resources needed to engage in systematic monitoring activities under the auspices of a legitimate public authority. This typically leads either to superficial efforts carried out within the public domain or to privately funded activities that seek to take up the slack left by the inadequacy of public efforts. Needless to say, superficial efforts often fail to pick up important socioeconomic changes in a timely and unambiguous manner. For their part, private activities (e.g. the work of TRAFFIC in conjunction with the international regime dealing with endangered species of flora and fauna) are always subject to challenges on the grounds that they are based. This is not to say that monitoring efforts never play a role in bringing about significant changes in the character of institutional arrangements. The activities of the Cooperative Programme for the Monitoring and Evaluation of the Long-Range Transmission of Air Pollution in Europe (EMEP) in tracking changes in industrial processes and shifts in emissions of pollutants associated with these processes, for example, have certainly played a role in the evolution of the regime dealing with long-range transboundary air pollution in Europe (Munton *et al.* 1999). But this case is striking in part at least because it is unusual. More often than not, difficulties in measuring socioeconomic changes in an objective fashion as well as in demonstrating the impacts of these changes on major biophysical systems make it difficult to put together a conclusive case for the need to restructure the provisions of regimes to address problems arising from changes in patterns of human action.

A modest proposal: GEOMAP

What steps can we take during the near future to solve the problem of fit, especially in addressing a range of largescale environmental concerns, such as ozone depletion, climate change, and the loss of biological diversity, that are looming larger and larger on policy agendas? This is a question that is too large to answer in any comprehensive way within the scope of this article. Yet I do want to offer a modest proposal that could provide a basis for tackling issues of fit in a wide range of circumstances. Specifically, I suggest that we take steps to create a Global Environmental Observing, Monitoring, and Assessment Programme (GEOMAP) to be sponsored jointly by the UN Development Programme (UNDP) and the UN Environment Programme (UNEP) and to work closely with the secretariats of a variety of issue-specific regimes.

The distinction between assessment and monitoring is important in this connection. Assessment centers on efforts to describe the behavior of biophysical systems, to understand the dynamics of these systems, and to identify significant shifts in the operation of these systems over time. The efforts of the Ozone Trends Panel to understand the chemical processes involved in seasonal losses of stratospheric ozone and of the Intergovernmental Panel on Climate Change (IPCC) to forecast the biophysical impacts on the Earth's climate system of a doubling of pre-industrial concentrations of carbon dioxide in the Earth's atmosphere are prominent examples of assessment. Improved assessment is obviously important to any effort to understand the nature and significance of misfits attributable to biophysical conditions. Monitoring, by contrast, is a matter of tracking human actions that lead to environmental problems and identifying the mechanisms that give rise to these actions. Efforts to pinpoint factors that determine decisions about the mix of fuels used in industrial facilities and about largescale uses of technologies that can improve fuel efficiency in automobiles offer clearcut illustrations of monitoring. Improved monitoring, therefore, is critical to understanding misfits that are traceable to socioeconomic processes. For its part, observation, which is largely a matter of acquiring data and making it available

in appropriate formats, is essential both to assessment and to monitoring. The GEOMAP proposal is designed to enhance capacity in all of these areas at the same time.

GEOMAP would operate as a broad-gauged facility capable of addressing issues of assessment and monitoring arising in conjunction with a wide range of environmental concerns. There is an obvious parallel in this connection with the Global Environment Facility (GEF) in the realm of funding, though GEOMAP would consider a wider range of issues than those designated for GEF support. GEOMAP would not endeavor to supplant issue-specific arrangements, like the IPCC in the case of climate change. There is plenty of room for the operation of a variety of issue-specific arrangements alongside the more comprehensive activities of GEOMAP. The premises underlying the proposal to create a more comprehensive arrangement are twofold. GEOMAP would generate insights through a systematic effort to compare and contrast the findings arising from assessment and monitoring activities dealing with a variety of issue areas. In addition, it would be in a position to draw on its work in a number of issue areas to refine and strengthen methodologies for the collection and analysis of data in the fields of assessment and monitoring.

UNDP and UNEP should administer GEOMAP jointly. Unlike the situation arising in the case of the GEF, where the allocation of funds is a major concern, the operations of GEOMAP would not generate any compelling reason to involve the World Bank in managing or overseeing its operations (Fairman 1996). The involvement of both UNDP and UNEP, on the other hand, would be essential. UNEP is more attuned to biophysical conditions and has accumulated considerable experience in organizing and carrying out assessments. But UNDP has more experience with efforts to track socioeconomic processes. It has a good deal to contribute in the realm of monitoring. In addition, GEOMAP could and should cultivate close working relationships with the secretariats of a sizable number of issue-specific regimes. As a means of enhancing both its expertise and its credibility, GEOMAP might build capacity by identifying individuals with expertise in assessment and monitoring all over the world and creating an electronically accessible database of experts who have indicated a

willingness to contribute to GEOMAP activities involving assessment and monitoring in a range of issue areas. Unlike the GEF, GEOMAP would not be an expensive program to operate. An annual budget of the order of 10 million dollars should suffice. It would be highly desirable to create a trust fund for GEOMAP and to use the income from this fund to cover its expenses (Sand 1999). Short of this, commitments on the part of UNDP and UNEP to cover GEOMAP's expenses on a 50-50 basis would suffice.

The proposal to create GEOMAP is a modest response to the overall problem of fit between institutions and ecosystems. Most importantly, it does little to address major sources of institutional stickiness that often impede efforts to eliminate or mitigate mismatches between the properties of ecosystems and institutional attributes. It would be essential, therefore, not to assume that we can safely ignore the problem of fit following the establishment of GEOMAP. At the same time, there is much to be said for the proposition that building capacity in the areas of assessment and monitoring can provide a solid base for addressing the problem of fit in many areas. The experience with issue-specific arrangements, like EMEP in the case of transboundary air pollution and IPCC in the case of climate change, is encouraging in this context. Under the circumstances, there is much to be said for launching GEOMAP as a first –rather than a last– step in coming to terms with the problem of fit.

Conclusion

Misfits between institutions and ecosystems are both pervasive and persistent. And the underlying concern here is by no means limited to the realm of human/environment relations. The establishment of institutions that are poorly suited to important features of the problems they are created to solve is a common occurrence in other issue areas as well. In most instances, it is possible to identify corrective measures that are feasible and that could go some way toward alleviating the misfits described in the preceding sections. But the argument of this article sug-

gests two important caveats that need to be borne in mind in thinking about corrective measures. To begin with, one size does not fit all. In other words, it is critical to think carefully about the sources of specific misfits in developing corrective measures that are well-suited to specific cases. In addition, the fact that it is possible to identify feasible corrective measures offers no guarantee that key actors will accept them or that they will be implemented effectively once accepted on paper. Both the design and the administration of environmental regimes are profoundly political processes, a fact that ensures that considerations other than conservation, efficiency, and equity will often drive outcomes regarding the formation and operation of specific regimes. Even so, it will not do to throw up our hands and treat the occurrence of severe misfits as an unavoidable fact of life. The proposal to create a GEOMAP should be viewed in this light. It is a modest initiative, and there is no assurance that it will work as intended even if it gets off the ground. Still, a concerted effort to move forward with this initiative would constitute a significant step in the struggle to improve the fit between institutions and ecosystems.

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