

Institutional Interplay: The Environmental Consequences of Cross-Scale Interactions¹

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Abstract

The boundaries separating social institutions from one another are sometimes hard to delimit with precision. Nonetheless, discrete institutions interact continually both horizontally or at the same level of social organization (e.g. interactions between trade regimes and environmental regimes at the international level) and vertically or across levels of social organization (e.g. interactions between national regulatory arrangements dealing with land use and local systems of land tenure). Focusing on issues of land use and sea use, this essay explores the consequences of vertical interplay in two distinct settings. The first setting features issues arising from the interplay between modern systems of public property articulated primarily at the national level and traditional, largely local systems rooted in practices involving common property. The second setting takes the analysis of institutional interplay to a higher level; it directs attention to regulatory regimes and examines interactions between international arrangements pertaining to the harvesting of natural resources and the management systems dealing with the same resources that operate within individual member states. The principal conclusion of the paper is that cross-scale interactions generate an inescapable tension between (1) the benefits of higher level arrangements measured in terms of opportunities to consider biophysical interdependencies and to engage in ecosystems management and (2) the costs of operating at higher levels calculated in terms of an inability to come to terms with local variations in biophysical conditions and a lack of sensitivity to the rights and interests of local stakeholders. The vigor of the debate regarding the subsidiarity principle testifies to the importance of this tension. But this debate also suggests that there is no simple criterion or formula that can be brought to bear in efforts to manage or regulate vertical interplay in these settings. Ideal responses to this institutional tension generally turn on a variety of situational factors; actual outcomes are typically products of complex political processes.

The boundaries separating distinct institutional systems - much like the boundaries between individual ecosystems - are often fuzzy and difficult to locate with precision. This is a consequence of the role that social construction plays in determining the scope or domain of individual institutions as well as of interdependencies connecting institutional arrangements to one another. As a result, efforts to understand the operation of specific institutions at the margins frequently run into trouble. Yet nothing in these observations alters the facts that human societies located at all levels of social organization are densely populated with well-defined and widely-recognized institutions organized around a variety of functional concerns and spatial domains and that these arrangements frequently interact with consequences that are too important to ignore.

Given the complexity of individual institutions, it is easy enough to understand the propensity of analysts to focus on specific arrangements and to ask questions about the formation, performance, and evolution of these systems on the assumption that a consideration of forces exogenous to individual institutions is not essential for these purposes. But as the density of institutions operating in a social space increases, the likelihood of interplay between or among distinct institutions rises. In complex societies, institutional interplay is a common occurrence; the resultant interactions can be expected to loom large as determinants of the performance of individual institutions and of their robustness or durability in the face of various pressures for change. With regard

to institutions that address environmental matters or what are commonly referred to as resource or environmental regimes (Young 1982), this means that interplay is a force to be reckoned with in evaluating whether regimes produce results that are sustainable, much less outcomes that meet various standards of efficiency and equity.

Two sets of analytic distinctions will lend structure to a consideration of institutional interplay and help to locate the principal concerns of this essay within the overall domain of interplay (Young et al. 1999: 48-53). Institutions interact continually with one another both horizontally or at the same level of social organization (e.g. interactions between trade regimes and environmental regimes operating at the international level) and vertically or across levels of social organization (e.g. interactions between local systems of land tenure and national regulatory systems dealing with matters of land use). The resultant interactions may generate consequences that are positive, as in cases where regional regimes gain strength from being embedded in global regimes, or negative, as in cases where national land-use regulations contradict or undermine traditional systems of land tenure operating at the local level. Similarly, institutional interplay may be more or less symmetrical in nature. In some case, interactions between distinct institutions are largely unidirectional. National regulatory regimes that impact local institutions dramatically while being generally insensitive to the impacts of local arrangements exemplify this prospect. In other cases, interactions are more nearly symmetrical. There are good reasons to believe, for example, that interactions between trade regimes and environmental regimes at the international level, which were once highly asymmetrical, are becoming increasingly symmetrical as environmental regimes

gain strength and begin to generate significant consequences for the operation of the global trading system.

In addition, institutions interact with one another both functionally and politically. Functional interplay is a fact of life. It occurs, whether we like it or not, when the substantive problems or activities that two or more institutions address are linked in biophysical or socioeconomic terms. Thus, the international regimes dealing with the protection of stratospheric ozone and with climate change are linked functionally both because chlorofluorocarbons (CFCs), which are the central concern of the ozone regime, are also potent greenhouse gases and because a number of the chemicals that seem attractive as substitutes for CFCs are at the same time greenhouse gases (Oberthür 1999). Regimes dealing with the regulation of marine pollution and with the protection of stocks of fish and marine mammals are functionally connected because the success or failure of efforts to control pollution can be expected to have significant consequences for the well-being of marine ecosystems and the stocks of fish and other organisms they encompass. For that matter, regimes that address fishing and regimes designed to protect marine mammals are functionally linked as a consequence of the fact that whales, seals, and other marine mammals depend on fish as a food source.

Political interplay, by contrast, arises when actors seek to link institutions intentionally and deliberately in the interests of pursuing individual or collective goals (Young 1996). In many cases, such initiatives are designed to enhance institutional effectiveness. Efforts to nest regional arrangements (e.g. the various regional seas regimes) into larger or more comprehensive arrangements (e.g. the overall law of the sea), for instance, are typically motivated by a desire to

promote the effectiveness of the smaller scale systems by integrating them into larger systems. In other cases, political linkages arise from conscious efforts to cope with the side effects of arrangements established for other purposes.

Whatever their ultimate results, recent calls for the creation of a World Environment Organization (WEO) owe much to the perception that the operation of the World Trade Organization (WTO) is now producing significant environmental impacts as unintended byproducts of the administration of the global trading system and that there is a need for a counterpart to the WTO responsible for protecting or securing environmental values. In still other cases, political linkages constitute responses to opportunities to improve efficiency by centralizing the supply of services that are needed to operate two or more distinct institutional arrangements. Funding mechanisms and dispute settlement procedures are obvious cases in point. The Global Environment Facility (GEF), for instance, provides funding both for the climate regime and the regime designed to preserve biological diversity (Sand 1999). But other services may be subject to such jointness of supply in specific cases.

Combining the two sets of distinctions yields a 2x2 matrix that delineates institutional interplay as a well-defined field of study for those interested in the operation of social institutions (see Matrix 1). This matrix also makes it easy to locate the primary concerns of this essay. Thus, the substantive sections of the essay seek explore the environmental consequences of vertical interplay in two distinct settings: (1) interactions between national arrangements dealing with marine and terrestrial ecosystems and local arrangements involving (often) informal practices pertaining to land tenure and sea tenure and (2) interactions between international regimes dealing with marine and terrestrial ecosystems and arrangements operating at the level of individual member states. Within this

framework, the primary emphasis falls on functional interplay (the lower lefthand cell of the matrix), although it is important to note at the outset that the occurrence of functional interplay sometimes provides a stimulus that is sufficient to trigger exercises in political interplay as the occupants of various roles seek both to take advantage of opportunities generated by the emergence of functional interplay and to avoid disruptive consequences flowing from the occurrence of cross-scale interactions.

MATRIX 1		
TYPES OF INSTITUTIONAL INTERPLAY		
	<u>Functional</u>	<u>Political</u>
<u>Horizontal</u>	FCCC/ozone regime	Joint funding mechanisms (e.g. GEF)
<u>Vertical</u>	CBD/national forest regimes	EEZs/national fisheries regimes

The general conclusion emerging from this analysis is that solving problems in the realm of environmental affairs requires an ongoing effort to manage institutional interplay rather than an exercise aimed at selecting the proper level of social organization at which to respond to particular problems. More specifically, there are good reasons to be wary of the pitfalls associated with blanket assertions that the formation of regimes at higher levels of social

organization offers a straightforward means of regulating human activities involving large marine and terrestrial ecosystems.

INTERPLAY BETWEEN (SUB)NATIONAL AND LOCAL RESOURCE REGIMES

Patterns of land use and the sustainability of human/environment relations associated with them are determined, in considerable measure, by the interplay of national - predominantly modern and formal - structures of public property and local - largely traditional - systems of land tenure. For their part, patterns of sea use and the sustainability of the relevant marine ecosystems are affected greatly by the interplay of (sub)national regulatory systems legitimized by the creation of exclusive economic zones (EEZs) during the 1970s and 1980s and subsistence or artisanal practices guiding the actions of local users of marine resources. National arrangements afford greater opportunities to take into account the dynamics of large marine and terrestrial ecosystems (Sherman 1992). But regimes organized at the national level also facilitate and sometimes promote commodification or, in other words, largescale, consumptive, market-driven, and often unsustainable uses of targeted resources (e.g. timber, fish). They provide arenas in which the interests of large, non-resident players generally dominate the interests of smallscale, local users. Local systems, by contrast, favor smallscale uses of living resources that evolve over time from the experiences of

resident harvesters; are less tied to market systems, and accord higher priority to sustaining local ecosystems over the long term. Because traditional, local and modern, national systems commonly coexist - though they seldom enjoy equal standing in relevant political and legal arenas - actual patterns of land use and sea use are affected substantially by the cross-scale interactions between these disparate systems operating at different levels of social organization. This section explores these forms of vertical interplay with reference to both terrestrial and marine ecosystems and illustrates the dynamics involved with brief accounts of uses of forest lands in Southeast Asia, grazing lands in the Russian North, and fish stocks in the eastern Bering Sea. Similar forms of interplay involving various marine and terrestrial resources occur in many other settings.

Systems of Land Tenure

The rights of national governments to exercise jurisdiction over all the lands and natural resources located within the boundaries of the states in which they operate are widely acknowledged.³ This is what accords governments the authority to promulgate regulations applying to the activities both of owners of private property and of users of common property. But beyond this, governments can and often do assert far-reaching claims to the ownership of land and associated natural resources in the form of public property by virtue of

³ . Both Principle 21 of the 1972 Stockholm Declaration and Principle 2 of the 1992 Rio Declaration, for instance, declare that “States have ... the sovereign right to exploit their own resources ...”

conquest (e.g. Russian ownership of Siberia), the exercise of royal prerogative (e.g. the establishment of crown lands in Sweden), purchase (e.g. the acquisition of Alaska by the United States), inheritance (e.g. Canada's inheritance of crown lands under the British North America Act of 1867), succession (e.g. Indonesia's claims to lands once owned by the Netherlands in the East Indies as an element in the process of decolonization and the acquisition of independence), or some combination of these claims. In most countries, claims to public property are remarkably extensive. The concept of private property is nonexistent in Greenland. Despite the publicity surrounding privatization, the government of the Russian Federation claims most of the land base of Russia as public property. The government of Canada treats upwards of 90% of the country's land base as public property.⁴ Even in the United States, which is widely regarded as a bastion of private property and free enterprise, the federal government alone claims about one-third of the nation's land as public property (Brubaker ed. 1984).

Yet this is not the whole story with regard to systems of land tenure. Although effective control has flowed steadily toward national governments during most of the modern era, many small (often indigenous) groups residing within states and engaging in distinctive social practices have not relinquished their claims to ownership of large tracts of land and natural resources in the form of common property (Berkes ed. 1989, Bromley ed. 1992). Often, these claims

⁴ Recent settlements of comprehensive claims with aboriginal peoples in the Canadian North have reduced the scope of public property somewhat and, at the same time, introduced some interesting arrangements featuring more complex systems of land tenure. Even so, public land remains the norm in Canada.

overlap or conflict with assertions on the part of national governments to the effect that the areas in question are part of the public domain. Indigenous land claims in British Columbia, for instance, cover virtually all the land area of the province. In some cases, national governments have recognized these claims and taken steps to reach settlements with indigenous claimants. Particularly noteworthy in this connection are the comprehensive settlements the government of Canada has negotiated with northern indigenous peoples over the last several decades and the cooperative arrangements under which the government of Denmark and the Greenland Home Rule handle matters of land use in Greenland. In other cases, the efforts of local communities to assert ownership - or even use - rights have met strong resistance on the part of national governments. The efforts of Sweden's Sami to gain recognition of their rights to use grazing lands constitute a striking case in point (Svensson 1997). In still other cases, national governments have made little effort so far to take the claims of local communities to rights involving common property seriously. Throughout much of the Russian Federation, where the legacy of collectivization introduced during the period of Soviet rule remains strong, serious land claims on the part of local peoples are just beginning to surface (Fondahl 1998).

How can these clashes between the claims of national governments to public property and local claims to common property be resolved? In some cases, such as the settlement of Native land claims in Alaska, the eventual outcome has taken the form of a formal transfer of title to some lands to Native peoples (or organizations acting on their behalf), usually in return for acceptance on the part

of these peoples of the extinguishment of residual claims to other areas.⁵ As experiences in places like Canada, Greenland, and Fenno-Scandia make clear, however, the concept of property encompasses a bundle of rights, and the contents of the bundle can be allocated in any of a variety of ways.⁶ This has given rise to lively debates about the nature and extent of usufructuary rights in situations where user groups have not been granted full title to land and natural resources. Among the most significant aspects of this debate are issues concerning the rights of national governments to authorize consumptive uses of forests, hydrocarbons, and nonfuel minerals in areas that are important to the conduct of traditional subsistence activities featuring the use of living resources on the part of local peoples.

What difference does the resultant interplay between national systems of public property and local systems of common property make with regard to overall patterns of land use and to the sustainability of human/environment relations in various areas? The answer to this question emerges from a consideration of differences in the incentives of national policymakers and local decisionmakers. For the most part, governments can be expected to look upon public property as a means to promote the national interest through activities

⁵. In the Alaska Native Claims Settlement Act of 1971 (PL 92-203), for instance, the federal government awarded title to almost 44 million acres of land to Native corporation but, at the same time, declared that "All aboriginal titles, if any, and claims of aboriginal title in Alaska ... including any aboriginal hunting or fishing rights that may exist, are hereby extinguished" (Sec. 4b).

⁶. For an early, but still helpful treatment of property systems as social institutions see Hallowell (1943).

inspired by the search for export-led economic growth and the effort to attract foreign direct investment. More often than not, this means treating forests and nonrenewable resources as commodities to be harvested or extracted to meet the demands of world markets. Two other factors reinforce this approach to the use of public property, especially in the developing world and in countries in transition. National governments tend to cater to the interests of politically powerful individuals who have no roots in local areas and who look upon concessions covering natural resources located on public property primarily as a means to amassing personal wealth. A particularly virulent form of this phenomenon involves the practice of crony capitalism and the emergence of black markets that many observers of Southeast Asia have described in detail (Dauvergne 1997). International bodies (e.g. the multilateral banks) whose mandates emphasize the acceleration of economic growth in developing countries have often acted to reinforce the resultant bias against the preferences of local peoples with regard to patterns of land use (Lipschutz and Conca eds. 1993). The actions of the World Bank in supporting largescale irrigation systems, road construction, and nonrenewable resource extraction throughout the developing world offer striking illustrations of this pattern.

It would be a mistake to assume that the practices of local peoples do not cause major changes in ecosystems. There is ample evidence to demonstrate that swidden agriculture, the deliberate burning of forest understory, and the harvest of wildlife can all produce major ecological consequences (Krech 1999). Yet so long as their traditional socioeconomic practices remain intact, local peoples do not have strong incentives to harvest timber for export, to extract hydrocarbons or nonfuel minerals to sell on world markets, or to build massive dams to

support largescale irrigation systems and industrial agriculture.⁷ Where systems of common property controlled by local users prevail, therefore, we can anticipate that patterns of land use will differ markedly from the patterns likely to arise where systems of public property prevail. In essence, we should expect to find a pronounced tendency toward largescale exports of products like timber, palm oil, hydrocarbons, and nonfuel minerals in systems where public property arrangements govern the use of land and natural resources, whereas local users operating under common property systems are more likely to use land to support subsistence lifestyles and to avoid the extractive and developmental patterns characteristic of public property systems. Naturally, the situation will be more complex in those increasingly common situations in which the balance between claims to public property and claims to common property is contested or in which efforts to resolve such contests have resulted in complex and sometimes confusing allocations of the full bundle of property rights among several distinct groups of claimants.

To see how this reasoning plays out in practice, consider recent developments affecting the forests of Southeast Asia and the grazing lands of northern Russia. As a number of observers have pointed out, the tropical forests of Indonesia, Malaysia, and the Philippines have been harvested in an unsustainable fashion over the last several decades (Peluso 1992, Dauvergne 1997a). Peter Dauvergne, for example, has shown that "... loggers have degraded much of Southeast Asia's old-growth forests, triggering widespread deforestation" and that these activities "... irreparably decrease the economic,

⁷. In cases where traditional socioeconomic practices have given way to mixed economies, local peoples may experience a growing need to exploit natural resources to generate a flow of cash.

biological, and environmental value of old-growth forests" (Dauvergne 1997a: 2). Why has this happened? Many commentators have emphasized demand-side considerations, pointing to the role of Japan as a consumer of tropical timber and arguing that Japanese companies have few incentives to promote sustainable uses of Southeast Asian forests. At least as important, however, are supply-side considerations and, more specifically, the rules of the game governing decisions about alternative uses of Southeast Asian forests. A critical link in this story lies in the creation of systems of public property controlled by national governments as part of the process of decolonization and the establishment of independent states in Indonesia, Malaysia, and the Philippines in the aftermath of World War II. In effect, the emergence of public property in these countries constitutes a necessary condition for the pattern of forest degradation that has spread throughout this region. There is nothing in this arrangement that compels national governments to negotiate forest concessions in the quest for export-led growth and to engage in the practices referred to as crony capitalism. But the shifting balance between systems of public property and systems of common property has played a key role in allowing these developments to happen, since local users pursuing traditional lifestyles have no incentives to adopt strategies leading to forest degradation and, in the process, undermining the resource base needed to sustain these lifestyles. Among other things, this explains the views of many activists who see links between campaigns to reform land use practices that cause forest degradation and the struggle to strengthen the rights of indigenous peoples in countries like Indonesia and Malaysia.⁸

⁸ . For evidence of similar interactions occurring in other parts of the world see Gibson, McKean, and Ostrom eds. 2000.

A somewhat different illustration involves patterns of land use in northwestern Siberia where world-class reserves of oil and especially natural gas have been discovered in areas that indigenous peoples, such as the Nenets living on the Yamal Peninsula and the coastal plain of the Pechora River Basin, have traditionally used as commonly-owned migration routes and pastures for reindeer (Osherenko 1995). During the Soviet era, there was little doubt about the choice between hydrocarbon development and the protection of traditional lifestyles in this region. The national government claimed ownership of the area's land and natural resources as public or state property; oil and gas development was granted priority not only as a means to promote economic development but also as a source of hard currency earnings, and the concerns of the region's indigenous people's were generally ignored or treated as secondary matters. At the time of its demise, the Soviet Union was the world's largest producer and exporter of natural gas. Yet as Gail Osherenko has shown, recent years have witnessed new developments in patterns of land use in this region (Osherenko 1995). This is partly a consequence of the collapse of the Soviet Union and the resultant economic decline occurring throughout the Russian Federation. In part, however, it reflects a growing effort on the part of indigenous peoples to reclaim reindeer from the collective and state farms of the Soviet era and to reassert common property rights to the migration routes and grazing lands needed to sustain local economies. From the perspective of these peoples, this pattern of land use is superior to nonrenewable resource development, regardless of world market prices for oil and natural gas. It is far too soon to make predictions about what the future will bring in this region. The development of gas fields on the Yamal Peninsula, for example, is currently in a state of suspended animation. A revival of the overall Russian economy could well generate pressure to resume the construction of gas fields and transportation corridors in this sensitive area.

But it is clear that the shifting balance between public property and common property will play a role of considerable importance in determining future patterns of land use in northwestern Siberia.

Systems of Sea Tenure

The story of sea tenure differs - often quite dramatically - from the account of land tenure set forth in the preceding subsection. Whereas we have no difficulty organizing our thinking around concepts like patterns of land use and systems of land tenure, comparable phrases relating to marine resources - "sea use" and "sea tenure" - have an odd ring to them. Why is this the case? Broadly speaking, it is fair to say that this divergence stems from the fact that there is little history of private property and almost no experience with public property in the ordinary or normal sense of the term when it comes to the management of human uses of marine resources.

Part of the gap between arrangements dealing with land use and their counterparts governing sea use is attributable to the fact that it is particularly difficult and sometimes nearly impossible to establish effective exclusion mechanisms applicable to marine resources. This is so because marine resources run together in a fluid manner and, in the case of living resources like fish, often include organisms that move freely from place to place in ways that would frustrate any efforts to establish possessory rights that run with individual owners. Seeking to create private property rights in many fish stocks would be like endeavoring to turn migratory birds into private property in systems of land tenure. Even so, it would be a mistake to exaggerate this argument regarding property rights in marine resources. In cases where the relevant resources are

sedentary (e.g. clam and oyster beds), there is a good deal of experience with the creation of property rights, especially in the form of use rights that allow their holders to exclude others from harvesting living resources like clams or oysters in designated locations. Even more highly developed are the rights accorded to those who engage in various forms of aquaculture which depend upon the existence of secure rights to fish pens and other well-defined marine structures. As these last observations suggest, moreover, it is important to consider arrangements under which individual elements in the bundle of rights associated with property come into play, even when there is little prospect for establishing systems based on the full bundles of rights we ordinarily have in mind in thinking about private property and public property. There are many situations, for example, in which use rights to particular fish stocks have been established in such forms as preferences granted to harvesters using particular locations and specific types of gear or rights to harvest a specified proportion of the total allowable catch (TAC) established for a specific fishery in any given year. The recent growth of systems of individual transferable quotas (ITQs) in a variety of fisheries is particularly noteworthy in this connection (Iudicello et al. 1999).

In part, the scarcity of systems of private property and public property associated with marine resources arises from restrictions on the authority or the capacity of states to exercise jurisdiction over marine systems. From the beginnings of the modern states system in the seventeenth century, states have been treated as territorial units possessing virtually unlimited jurisdiction over terrestrial ecosystems located within their borders but very little jurisdiction over adjacent marine systems (Anand 1983). Early on, states began to assert some jurisdiction over waters located adjacent to their coasts in the form of a three-mile belt known as the territorial sea. For the most part, however, the granting of

jurisdiction over the territorial sea was justified largely as an arrangement required for purposes of security. Under this arrangement, coastal states agreed to allow outsiders to engage in a variety of activities – innocent passage of ships, the laying of submarine cables, overflight by aircraft – taking place within or affecting their territorial seas. Beyond this belt, states considered it impermissible to lay claim to marine systems as public property in the sense of areas actually owned by the state in the same way that the state owns the public domain.

Given this background, it makes sense to look upon the twentieth century as an era marked by the expansion of the jurisdiction of coastal states over marine systems in both spatial and functional terms (Juda 1996). The three-mile territorial sea has grown to twelve miles, and the establishment of exclusive economic zones (EEZs) has granted coastal states jurisdiction over approximately a third of the world ocean and most marine living resources. Justified largely on the basis of arguments framed in terms of conservation or the achievement of sustainable use, the expanded jurisdiction of coastal states over marine systems now extends to the management of a range of activities dealing with the harvesting of both renewable and nonrenewable resources and with the protection of marine systems from various forms of pollution. Even so, it is important to note that the jurisdiction of coastal states over adjacent marine systems still falls short of the bundle of rights that states exercise over terrestrial systems located within their borders. Coastal states do not have the authority to transfer title to marine systems to private owners in the way that states have traditionally been able to dispose of sizable portions of the public domain. In many states, it is considered inappropriate even for governments to collect economic returns from the use of marine resources treated as factors of production, a practice that is considered routine in situations involving the use of

natural resources (e.g. timber, hydrocarbons) located on the public domain. These restrictions have not deterred states from developing regulatory regimes operated by government agencies (or their subunits) and intended to ensure that users of marine resources pay attention to matters of sustainability and environmental quality associated with their activities. Nonetheless, they have produced a situation in which it seems awkward to think in terms of systems of sea tenure.

At the same time, there are substantial parallels between systems of land use and systems of sea use when it comes to the operation of smallscale, traditional arrangements, quite apart from the aggregation of management authority in the hands of the state. In virtually every case, these local arrangements can be thought of as featuring some form of common property (Pinkerton ed. 1989). Not surprisingly, numerous variations occur, depending upon the character of the biophysical systems involved, the nature of the harvesting procedures employed, and the content of the cultural norms operative among the members of the group of appropriators. Nonetheless, almost all these systems have a number of features in common. Although they do not assign full bundles of rights to individual users, they often do grant individuals priority in the use of particular fishing sites or the use of specific gear types. They typically exclude outsiders or, in other words, nonmembers of the relevant group or community from using the resources in question. They normally feature informal arrangements that evolve on the basis of trial and error and that undergo de facto adjustments over time as a way of adapting to changing conditions in the relevant biophysical systems or changing circumstances of the societies within which they operate. Yet the rules in use that comprise these institutional arrangements are well understood by members of

the user communities, and they are buttressed in most cases by compliance mechanisms that are effective in bringing the behavior of individual appropriators into conformance with the constellations of rights and rules that make up the core of these practices.⁹

How have these traditional arrangements governing the use of marine resources performed in practice? As in the case of systems of land tenure, it would be a mistake to idealize indigenous or artisanal systems of sea use. To be sure, anthropologists have succeeded in documenting a sizable number of cases in which these local systems have proven sustainable over relatively long periods of time. A particularly intriguing feature of these studies is the exploration of compliance mechanisms (e.g. arrangements featuring taboos) that prove effective from the point of view of guiding the behavior of users toward sustainable practices, even when they are not based on any scientific understanding of the dynamics of the ecosystems in question (Fienup-Riordan 1990). Nonetheless, there is no basis for assuming that all traditional systems of sea tenure produce results that are sustainable. Although this is a sensitive and – in some circles – contested matter, there is little doubt that the actual record associated with traditional systems of sea use features a fair number of failures as well as successes, especially in cases involving volatile biophysical ecosystems that undergo largescale non-linear changes from time to time.

By the same token, the record compiled by the regulatory regimes created by (sub)national governments to guide uses of marine resources is generally

⁹ . For an extended account of the role of rules in use and the relationship between such rules and formal rules see Ostrom (1990).

unimpressive. Justified in large part by the need to manage large marine ecosystems on an integrated basis and to bring to bear the insights of science in order to ensure sustainability in the use of marine resources, most of these regimes have proven insufficient to prevent a growing crisis in many of the world's fisheries brought on by an excess of harvesting capacity and an inability - both scientifically and politically - to establish and enforce appropriate quotas or other restrictions governing the consumptive use of living marine resources (McGoodwin 1991). In fact, national governments have regularly provided subsidies to harvesters in a manner that has led to the acquisition of larger and more powerful harvesting capabilities along with heavy debt loads. As this last observation suggests, moreover, the regulatory regimes established by national governments have exhibited a marked tendency to favor the interests of some types of users over others. Thus, large, well-financed, and politically active harvesters have generally profited from the introduction of national systems of sea use in contrast to smallscale subsistence or artisanal harvesters who have little experience beyond the local level and few of the resources needed to influence national (or even subnational) policies relating to the use of marine resources.

Overall, it is probably fair to say that the result has been a commodification of marine resources favoring large commercial operators over small operators; eroding the role of traditional common property approaches to sea tenure, and leading to outcomes that are hard to defend in terms of sustainability or even efficiency. Recently, national regulators have begun to experiment with a range of policy instruments (e.g. permits to fish, individual transferable quotas or ITQs) intended to eliminate or suppress some of the worst features of this commodification (Iudicello, Weber, and Wieland 1999). The track

record associated with these efforts is not yet extensive enough to justify firm conclusions. Taken together, however, it is probably accurate to conclude that these institutional innovations show considerable promise at least as responses to the specific problem of overharvesting (NRC 1999). Yet there is no basis at this stage for granting high marks to state-based systems of sea tenure with regard to the production of outcomes that are sustainable over time, much less results that can be defended on grounds of efficiency or equity.

To see how the interplay between modern, national and traditional, local systems of sea tenure plays out in practice, consider the situation that has developed in the eastern Bering Sea Region over the last twenty-five years (NRC 1996). During the 1970s, the State of Alaska instituted a limited-entry regime for the inshore fisheries of this area - those fisheries taking place within a three-mile belt over which the state has jurisdiction - largely in response to declining harvests of salmon (Young 1983). Shortly thereafter, the federal government followed suite by creating a Fishery Conservation Zone (FCZ) together with a set of regulatory arrangements dealing with the harvesting of all species of fish in an area extending from the outer boundaries of state jurisdiction to a point two hundred nautical miles from the coastline (Young 1982). Although it would be unfair to argue that these initiatives have had no positive consequences, they have given rise to a number of unintended side effects due largely to problems of interplay with other institutional arrangements. The limited-entry system covering inshore fisheries has disrupted traditional arrangements featuring a fluid mix of subsistence and commercial fishing; placed severe restrictions on the ability of young people unable to afford the price of a permit to enter the fisheries, and led to a loss of permits among rural fishers whose financial insecurity sometimes leads them to succumb from time to time to the temptation

to sell fishing permits to meet short-term needs for cash. For its part, the creation of the FCZ in the eastern Bering Sea precipitated a dramatic rise in the participation of American fishers in this area and the consequent phasing out of foreign fishers. Because the regime established to regulate fishing in this area has the status of a national arrangement, the State of Alaska has been barred from instituting measures to protect local fishers in the area from competition on the part of large, heavily-capitalized fishers based in Washington and Oregon. The exclusion of foreign fishers from the FCZ led them to shift their focus to an area of the central Bering Sea just outside the FCZ and known as the doughnut hole.¹⁰ By the early 1990s, the pollock stocks in this area had collapsed.

During the 1990s, both the U.S. federal government and the State of Alaska took some steps to address these unfortunate side effects arising from the institutional innovations of the 1970s and 1980s. These include the creation of community development quotas (CDQs) intended to bolster the economies of small, coastal communities and the negotiation of a six-nation convention designed to address the problem of overharvesting of pollock in the central Bering Sea (Balton forthcoming). Although these are clearly steps in the right direction, it is premature at this stage to conclude that they will solve the problems arising from institutional interplay in the Bering Sea Region. CDQs do not provide a substitute in sociocultural terms for the existence of a strong cadre of individual fishers, and the pollock stocks of the doughnut hole have yet to recover sufficiently to activate the management procedures established under the six-nation convention. Accordingly, there is a real danger that the innovations of

¹⁰ . The doughnut hole constitutes a pocket of high seas wholly surrounded by the EEZs of Russia and the United States.

the 1990s will be assessed in the future as responses that were too little and too late. In any event, it is clear that the growth of coastal state jurisdiction over marine resources and the subsequent emergence of subnational and national systems of sea use have triggered new forms of institutional interplay in this realm whose consequences have proven costly not only for many individuals but also for the welfare of small, coastal communities in an area like Alaska.

INTERPLAY BETWEEN INTERNATIONAL AND NATIONAL RESOURCE REGIMES

Turn now to institutional interplay occurring at higher levels of social organization and, more specifically, to the proposition that the effectiveness of international regimes – measured in terms of efficiency and equity as well as sustainability – is determined, in considerable measure, by interactions between rules and decisionmaking procedures articulated at the international level and the political, economic, and social systems prevailing within individual member states. International regimes normally set forth generic rules applicable to all their members, leaving the implementation of these rules to be carried out for the most part by public agencies and actors located within individual member states.¹¹ It follows that the success of these regimes depends upon the performance of national institutions and is likely to vary substantially from one member state to another. Following an account of the logic of this proposition, this section turns to brief illustrations of these forces at work with regard both to regimes dealing with tropical timber in Southeast Asia and protected natural

¹¹ . Some recent arrangements (e.g. the ozone and climate regimes) differentiate among classes of members with regard to the specification of obligations and the application of rules.

areas in the Circumpolar North and to regimes addressing the fisheries of the Barents and Bering Seas. As in the case of interplay between national and local institutions, similar dynamics occur in many other settings.

Competence, Compatibility, and Capacity

It is tempting to assume that once states sign conventions or treaties establishing international regimes, they will proceed to carry out the obligations they assume under these agreements as a matter of course. As numerous studies of national implementation of international obligations have shown, however, there is no basis for adopting any such assumption. In fact, implementation typically varies greatly from one regime to another as well as among individual members of the same regime; the examination of factors influencing implementation at the national level has become an important area of emphasis for regime analysis (Underdal ed. 1998, Weiss and Jacobson eds. 1998, Victor, Raustiala, and Skolnikoff eds. 1998). What are the key factors that determine whether members succeed in implementing the rules of international agreements within their own jurisdictions and whether they accept the results of decisionmaking procedures operating under the auspices of international regimes? In some cases, this is essentially a matter of political will. Governments can and do sign agreements they have no intention of implementing; executive branch officials who sign international agreements in good faith may be unable to persuade legislators to pass implementing legislation and allocate the resources needed to operate these arrangements, and changes in the composition of governments can bring to power officials who did not participate in the creation of a regime and have little interest in fulfilling obligations undertaken by their predecessors. At the same time, three sets of factors that are more general and that bear directly on the matter of institutional interplay have

emerged as important considerations in this context. For shorthand purposes, I will label them competence, compatibility, and capacity.

Competence is a matter of the political and legal authority needed to implement commitments made at the international level. Competence in this sense is largely a function of the constitutional arrangements prevailing within individual states. In the United States, for instance, international conventions do not become legally binding until they are ratified by a two-thirds majority in the Senate. Even then, the American constitution does not guarantee that commitments embedded in legally binding conventions will always take precedence over domestic laws.¹² As a result, American negotiators in international forums frequently oppose otherwise attractive institutional arrangements on the grounds that there is little prospect that they can survive the pressures arising from domestic legal and political processes. Small wonder, then, that many other states regard the United States as a difficult partner when it comes to the creation and implementation of international regimes. In other cases, the problem arises from the allocation of authority between national and subnational units of government in contrast to the separation of powers among the components of national governments. In the Canadian confederation where authority over many issues resides with the provinces in contrast to the federal government, for example, the government in Ottawa lacks the competence to

¹². In the terminology of international law, the United States has a dualist system in contrast to a monist system (Higgins 1994: Ch. 12). A somewhat similar arrangement prevails in the European Union.

enter into legally binding commitments at the international level regarding many issues, without seeking the explicit consent of the individual provinces.¹³

Compatibility is a matter of the fit between institutional arrangements set up under the provisions of international agreements and the social practices prevailing within individual member states. Whereas competence is a matter of authority, compatibility concerns standard practices or procedures for handling governance issues that grow up in political systems over time. Given the character of international society, there is general agreement on the proposition that member states should be free to implement international commitments within their own jurisdictions in whatever way they choose to do so. But this does not eliminate the problem of institutional fit. Consider, by way of illustration, a case in which an international regime calls for the establishment of a system of tradable permits (e.g. permits for carbon emissions), while the social practices prevailing within some of the members are based on the use of command-and-control regulations offering little or no scope for the sorts of incentive mechanisms associated with the creation of tradable permits. To make this concern more concrete, think of the issues now coming into focus relating to the development of a carbon sequestration subregime within the overarching framework of the international regime dealing with climate change. For those committed to the proposition that tradable permits are essential to ensure efficiency and, therefore, to secure widespread acceptance of targets and timetables relating to greenhouse gas emissions, the case for allowing and even promoting trading in carbon credits earned through the creation of carbon sinks

¹³. A concrete case in point involves the harvesting of whales. Under the Canadian Constitution, the formal authority to set harvest quotas for whales resides with the provinces.

is self-evident. Yet such mechanisms are alien to the political cultures of many countries, and the relevant government agencies are lacking in experience with mechanisms of this sort which would allow them to assimilate a new initiative relating to carbon sequestration into familiar and well-understood ways of doing business (Chertow and Esty eds. 1997).

For its part, capacity is a measure of the availability of the social capital as well as the material resources needed to make good on commitments entered into at the international level (Chayes and Chayes 1995, Keohane and Levy eds. 1996). Of course, we are used to paying attention to the problem of capacity in cases where the economic and political systems of developing countries lack the resources needed to shift to alternative technologies (e.g. substitutes for ozone-depleting substances) or to enforce international rules within their jurisdictions (e.g. rules pertaining to trade in endangered species) (Gibson 1999). But issues of capacity also arise in connection with the actions of advanced industrial countries. In the United States, for instance, international commitments may be treated with benign neglect in cases where no individual agency is willing to take responsibility for their implementation (that is, to become what is known as the lead agency) or responsible agencies are unable or unwilling to obtain the material resources required to play this role. Consider, in this connection, the contrast between American participation in the regime for Antarctica where there is no doubt about the role that the National Science Foundation plays as lead agency for matters relating to this arrangement and in the emerging regime for the Arctic where a dozen or more agencies want a say in what happens but none is able or willing to accept the role of lead agency (Osherenko and Young 1989: Ch. 8).

As this discussion makes clear, international regimes normally operate in social settings featuring substantial institutional heterogeneity among their members. What is more, those responsible for administering international regimes are seldom in a position to resort to what constitutes the normal procedure for handling interplay of this sort between national and subnational governments, a setting in which national governments generally possess the authority to compel subnational governments to adjust their rules and procedures to ensure that they do not conflict with arrangements established at the national level. The result is a mode of operation in which the rules of international regimes are framed in terms that are sufficiently generic to allow officials within individual member states considerable leeway in operationalizing them within their own jurisdictions. Up to a point, this is clearly desirable. National officials are not about to let the managers of international regimes dictate to them, and there is much to be said for allowing individual members to assimilate the rules of international regimes into their own systems in ways they deem appropriate. But this situation accentuates the proposition under consideration here to the effect that the consequences of international regimes will be determined in considerable part by the interplay between the regimes themselves and the relevant national practices prevailing in individual member states. Among other things, this should lead us to expect considerable variance in the performance of member states when it comes to fulfilling commitments made during processes of regime formation. Under some circumstances, this variance may not be critical to the overall performance of international regimes. In the case of equipment standards applicable to the construction of oil tankers, for instance, the regime can be expected to operate effectively so long as a few key member states take the standards seriously (Mitchell 1994). But in other cases, such as phasing out the production and

consumption of ozone-depleting chemicals (French 1997), it is apparent that it takes conformance on the part of all to provide effective protection of the relevant natural systems.

Regimes for Terrestrial Resources

To think concretely about the impact of this form of interplay on patterns of land use, consider some illustrations dealing with the operation of the International Tropical Timber Agreement (ITTA) and the effort to create a Circumpolar Protected Areas Network (CPAN) in the Far North. ITTA, created initially in 1983 and substantially restructured in 1994, is first and foremost a trade agreement in which producers (e.g. Indonesia, Malaysia, and the Philippines) and consumers (e.g. Japan) of tropical timber endeavor to stabilize and regulate the world market in wood products harvested from tropical forests (Humphreys 1996, Dauvergne 1997b). What makes this regime interesting from an environmental point of view is the recognition that most harvesting of tropical timber in recent decades has taken the form of highly destructive practices best described as the "mining" of forests and that there is a need to restructure the industry to put it on a more sustainable basis. The centerpiece of the 1994 agreement is a commitment on the part of member states to implement a system of guidelines intended to ensure that both natural and planted tropical forests are managed sustainably and that biological diversity is protected in these forests. To this end, regime members committed themselves to the Year 2000 Objective which calls for all tropical timber entering international trade to be produced from tropical forests under sustainable management by the year 2000. What are the prospects that this objective will be met? The answer depends on the interplay between the international regime itself and the national political systems of member countries, such as Indonesia and Japan. At this stage, the

prognosis is not particularly encouraging (Guppy 1996). Given the economic and political turmoil affecting Southeast Asia in recent years combined with the continuing grip of crony capitalism, the capacity of a country like Indonesia to meet the Year 2000 Objective is limited, and the sanctions associated with non-conformance are likely to prove ineffectual. For its part, the severity of the economic downturn that has plagued Japan recently together with the political influence of the major companies involved in the tropical timber trade creates a setting that is not conducive to bringing effective pressure to bear on domestic users of tropical timber.

A major goal of the Arctic Environmental Protection Strategy (AEPS) - launched in 1991 but integrated since 1996 into the broader structure of the Arctic Council - is to promote the conservation of flora and fauna in the Circumpolar North (Huntington 1997). To this end, the AEPS established a Working Group on the Conservation of Arctic Flora and Fauna (CAFF) and provided it with a mandate to take the initiative in devising innovative means to achieve its general goal. Despite the relative weakness of CAFF in terms of formal authority, this initiative has generated a good deal of interest. CAFF has become a forum in which government officials and representatives of nonstate actors interact freely; it has succeeded in capturing and holding the attention of public agencies in a number of member states, and it has emerged as a mechanism for applying universal guidelines relating to biological diversity to the particular circumstances prevailing in the Circumpolar North.¹⁴ One of CAFF's highest priorities has been to promote and oversee the creation of a

¹⁴. Updates on the work of CAFF appear regularly in the *Arctic Bulletin*, published four times a year under the auspices of the WWF Arctic Programme.

Circumpolar Protected Areas Network (CPAN) or, in other words, a linked system of parks, preserves, wildlife refuges, and so forth located in all the Arctic countries and organized in such a way as to provide harmonized management for the entire system (CAFF 1996). The success of this initiative depends largely upon the willingness and the ability of management agencies located within individual member states to collaborate effectively or, in other words, to manage protected natural areas on a coordinated basis. This is where problems begin to arise in connection with this intuitively appealing initiative. Within some of the key countries - the United States is a good example - management authority regarding the areas involved resides with a number of distinct agencies (e.g. the National Parks Service, the Fish and Wildlife Service, the Geological Survey, the Bureau of Land Management) that are not in the habit of cooperating effectively with one another, much less with their counterparts in other countries (Clarke and McCool 1996). In other countries - the Russian Federation is a prime example - economic and political problems are so severe at this time that there is little energy and few resources available for international cooperation. This initiative does not require integrated management across national jurisdictional boundaries; coordinated or harmonized management practices carried out by relevant agencies within each country would suffice. Yet the complexities of institutional interplay between international commitments and national practices raise serious questions about the prospects for CPAN.

Regimes for Marine Resources

Turning now to institutional interplay relating to marine resources in the Barents Sea and the Bering Sea, an even more complex pattern of institutional interplay comes into focus. In effect, the regimes that have emerged in these areas feature interactions between and among three distinct sets of institutional

arrangements: the global rules governing EEZs, the national regulatory systems that individual coastal states have put in place within their own EEZs, and several regional arrangements created to deal with situations in which national EEZs either adjoin each other (i.e. the relevant states are adjacent or opposite states) or leave pockets of high seas surrounded by national EEZs. Although the introduction of EEZs was justified in large measure as an institutional innovation required to manage the resources of large marine ecosystems on a sustainable basis, it soon became apparent that this reform created a range of new problems, quite apart from its consequences with regard to the treatment of preexisting problems. Marine ecosystems do not conform to any legal or political boundaries, however ingenious the effort to delineate them may be. As a result, many states that acquired expanded jurisdiction over the harvesting of living resources in their individual EEZs soon found themselves confronted with a sizable collection of new problems relating to what have become known as straddling stocks. One response to this development, intended mainly to coordinate efforts to manage marine resources located partly within an EEZ and partly in the high seas, is embodied in the Straddling Stocks Agreement negotiated in the wake of the UN Conference on Environment and Development and signed in 1995. Another response, intended primarily to coordinate the efforts of adjacent and opposite states to manage fish stocks common to their individual EEZs, has taken the form of the creation of a growing collection of regional fisheries regimes (Stokke ed. forthcoming).

Two particularly interesting examples of these regional arrangements are the predominantly bilateral Norwegian/Russian regime dealing with the fisheries of the Barents Sea and the somewhat more complex set of arrangements that have emerged in the Bering Sea Region. Not only do these cases exemplify

different ways of dealing with institutional interplay; they also have produced strikingly different outcomes. In the Barents Sea, Norway and Russia capitalized on the emergence of EEZs to create a bilateral regime that has phased out or drastically curtailed participation on the part of fishers from third states and that has put in place a system under which the principal fish stocks of the entire region – including a disputed area known as the Grey Zone – are managed on an integrated basis (Stokke, Anderson, and Mirovitskaya 1999). This system is not immune to biophysical surprises, and it has had to cope with severe stresses attributable to the transition from the Soviet Union to the Russian Federation and the subsequent decline in the capacity of Russia to regulate the activities of Russian fishers (Hønneland 1999, Stokke forthcoming). But by and large, this is a case in which the interplay between two sets of national arrangements and an international regime has been managed in such a way as to produce positive results.

The situation that has emerged in the Bering Sea Region, by contrast, illustrates a somewhat less auspicious response to institutional interplay. Russia and the United States responded to the creation of EEZs by establishing complex but somewhat poorly coordinated national regimes in the western Bering Sea and the eastern Bering Sea respectively. In addition, the 1990s have brought the creation of a regional agreement covering salmon stocks migrating back and forth through the EEZs of the two countries along with a six-nation agreement dealing with the pollock stocks of the doughnut hole and designed to prevent a recurrence of the collapse of these stocks that occurred in the late 1980s and early 1990s. But the results of this complex mosaic are far from reassuring. Both coastal states have experienced severe problems in controlling harvests of living marine resources within their own EEZs. The pollock stocks of the doughnut hole have

not recovered sufficiently to allow for any harvesting under the terms of the international agreement created to manage these stocks. Above all, there are a number of disturbing indications that anthropogenic forces have triggered severe stresses affecting the Bering Sea ecosystem as a whole (NRC 1996, National Marine Fisheries Service 1997). These include startling declines in populations of several unharvested species, such as sea lions, northern fur seals, and red-legged kittiwakes, as well as some harvested species, such as eider ducks and several species of geese. No doubt, it would be wrong to point to problems of institutional interplay as the sole cause of these disturbing developments. But it is hard to avoid the conclusion that difficulties plaguing efforts to coordinate institutional arrangements across levels of social organization constitute a significant feature of this story.

IMPLICATIONS AND TAKE-HOME MESSAGES

The principal conclusion to be drawn from the analysis set forth in the preceding sections is that cross-scale interactions among resource regimes generate an inescapable tension between the benefits of higher level arrangements arising from opportunities to consider interdependencies in large marine and terrestrial ecosystems and to devise regimes based on the precepts of ecosystems management on the one hand and the costs of operating at higher levels expressed in terms of an inability to come to terms with local variations in biophysical conditions and a lack of sensitivity to both the knowledge and the rights and interests of local stakeholders on the other.

Those operating at higher – national or international – levels are typically compelled to devise and promulgate structures of rights and regulatory rules in

terms that are broad and generic. While this may cause few problems in dealing with marine and terrestrial ecosystems that are homogenous, problems mount rapidly where there are local variations both in pertinent biophysical conditions (e.g. the dynamics of fish stocks) and in patterns of human uses of natural resources (e.g. hunting and herding practices). In the absence of effective procedures for cross-scale coordination, the result is apt to be a proliferation of formal rights and rules that are poorly suited to local circumstances or the evolution of systems so encrusted with local exceptions and informal interpretations that they become unworkable. Similar observations are in order regarding the rights and interests of various groups of stakeholders. Moving to higher levels of social organization can open up opportunities for increased efficiency in the use of resources and for more comprehensive approaches to equity. But the costs associated with such developments are apt to be substantial. National regimes increase the influence of economically and politically powerful actors who do not reside within the ecosystems they exploit; who often move on to new areas once the resources of one area are exhausted, and who favor the exploitation of resources that are tradable in (often international) markets. For their part, international regimes often cater to the interests of multinational corporations which have operations located in many places and which have no long-term commitment to the ecological welfare of particular areas and the social welfare of those who reside permanently in these areas. Under the circumstances, it is easy to see that shifts to higher levels of social organization justified in order to manage large marine and terrestrial ecosystems in a holistic manner can and often do lead to changes in patterns of land use and sea use that raise profound questions not only in terms of sustainability but also in terms of normative concerns including equity as well as efficiency.

The vigor of the debate about what is often called the subsidiarity principle is testimony to the importance of this tension regarding the environmental consequences of cross-scale interactions. But this principle, which calls for management authority to be vested in the lowest level of social organization capable of solving pertinent problems, does not offer much help in coming to terms with the problems of cross-scale interplay addressed in this essay. National and even international arrangements are needed to manage human activities relating to large marine and terrestrial ecosystems. Yet the dangers inherent in moving from local to national and from national to international regimes are severe. What is needed, under the circumstances, is a conscious effort to design institutional arrangements that recognize local knowledge and protect the rights and interests of local stakeholders even while they introduce mechanisms at higher levels of social organization required to encompass the dynamics of ecosystems that are regional and even global in scope.

This is not a task to be handled through efforts to determine the proper level of social organization at which to vest management authority. A more interesting response to this tension involves arrangements that numerous analysts have explored in recent years under the rubric of comanagement (Osherenko 1988, Berkes 2000). In the typical case, comanagement involves the creation of environmental or resource regimes featuring partnerships between local users of natural resources and regional or national agencies possessing the formal authority to make decisions about human activities involving marine and terrestrial ecosystems as well as the resources needed to administer management systems. This intrinsically appealing approach may well give rise to a range of social practices that are of lasting significance in dealing with specific problems

of vertical interplay. But it would be premature to jump to any such conclusion at this stage. Comanagement is in danger of becoming a catch-all conceptual category containing a ragtag collection of tenuously related arrangements. Even in dealing with the interplay between local and national arrangements, experience on the ground with comanagement is limited, and we are far from the formulation of well-tested propositions about the determinants of success and failure in the creation and operation of comanagement regimes. And it is anything but clear whether experience with comanagement in dealing with local/national interactions can be scaled up to offer an effective method of organizing the interplay between national and international regimes. These observations are not meant to belittle the significance of comanagement as a strategy featuring the use of political interplay to manage problems arising from functional interplay; many analysts are engaged in interesting studies of comanagement at the present time. Nonetheless, there is much to be done before we can assert that substantial progress is being made in coming to terms with the tensions arising from cross-scale interactions.

More generally, the argument of the substantive sections of this essay is intended to initiate a dialogue regarding the role that vertical interplay involving cross-scale interactions among distinct institutions plays in the overarching picture of the human dimensions of global environmental change. The cases of land use and sea use are particularly interesting in this connection because patterns of land and sea use are directly and intimately linked to largescale environmental changes, such as the loss of biological diversity and climate change. But similar issues of institutional interplay arise in conjunction with other concerns, including human uses of atmospheric and hydrological systems. There is no assumption here that institutions in general or the interplay among

distinct institutions in particular can account for all the variance in human uses of atmospheric, hydrological, marine, or terrestrial systems. On the contrary, institutional drivers interact with other forces in complex ways; one of the main challenges facing those interested in the human dimensions of largescale environmental change is to sort out the relative significance or weight of institutional drivers and other driving forces.

Yet an emphasis on the role of institutions in this connection has great appeal, so long as care is taken to avoid the assumption that institutional arrangements operate in a vacuum in the sense that they produce results without regard to the character of the broader biophysical and socioeconomic settings in which they operate. The content of prevailing institutions is subject to intentional reform, a fact that opens up the opportunity to engage in design efforts in the interests of minimizing the negative consequences of existing institutions and supplementing or even replacing these arrangements in order to mitigate or adapt to largescale environmental changes. The message of this essay regarding this prospect is one of great caution but certainly not pessimism. Even if we succeed in identifying the institutional forces giving rise to environment problems, there is no guarantee that we can take the steps needed to alter the operation of prevailing arrangements in a well-planned fashion. Nonetheless, the prospect that (re)designing institutions can play a role in controlling or managing largescale environmental changes provides a compelling reason to invest time and energy in enhancing our understanding of the dynamics of institutional interplay.

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