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COMPREHENSIVE PLANNING, DOMINANT-USE ZONES, AND USER RIGHTS: A NEW ERA IN OCEAN GOVERNANCE

*James N. Sanchirico, Josh Eagle, Steve Palumbi,
and Barton H. Thompson, Jr.*

ABSTRACT

Ocean-zoning arguments often center on the biology of ocean species, the geography of fishing-use patterns, and the need for preventing use conflicts. Here we expand this discussion to the social and legal aspects of ocean zoning, focusing on comprehensive planning, segregation of activities into use-priority areas, and the allocation of user rights within each zone. The inclusion of all of these features within an ocean-zoning regime can be a catalyst for a variety of ancillary benefits, including opportunities for user groups to form informal or formal long-lived institutions and a reassessment of the focus and scope of the regulatory institutions involved in ocean management. Along with the ability of users to negotiate and trade within and between zones, both features will lead to improved conflict resolution, efficiency of use, and ecosystem stability—critical components for the production of ecosystem services and maintenance of biological and human economic benefits.

The oceans hold many important natural resources and are themselves a resource. The sea is home to a seafood industry worth billions annually in the United States, provides an important fraction of animal protein in developing countries, and is also used for diluting waste, recreation and wildlife viewing, operating sea farms, transporting people, and moving goods.

Because the oceans are common property, regulating their use faces at least four issues. First, incentives for overuse that can lead to long-term resource loss are prevalent. Second, resource use by one sector often affects the costs and benefits of other sectors. Using seawater to dilute waste, for example, kills marine larvae in the dilutant seawater and might decrease the supply of marine species and the amount of area available for recreational fishing. Both of these issues are externalities, which arise when the welfare or well-being of one individual or group is negatively (or positively) affected by the decision of another group or individual that does not explicitly take these impacts into account. Third, in most cases, more than one group is interested in each resource or ocean area, and this overlap creates a problem of allocation. Pelagic fish stocks, for example, are valuable to commercial fishermen, recreational fishermen, underwater photographers, and people who enjoy the idea of less-disturbed marine ecosystems. Fourth, the extent to which cumulative impacts of ocean uses affect resource status (Rosenberg, 2006) or the value of resources to various user groups is uncertain.

With these challenges in mind, some experts have argued for ocean zoning. Like municipal zoning, ocean zoning (Jaakson, 1971; Russ and Zeller, 2003; Pikitch et al., 2004; Sanchirico, 2004; Babcock et al., 2005; Crowder et al., 2006; Eagle et al., 2008) would divide the ocean into different areas—for example, a commercial fishing zone, a recreation zone, and an oil and gas zone. Proponents argue that separating incompatible uses would reduce costly conflicts among users (Babcock et al., 2005; Crowder et al., 2006) and that zoning is a basis for implementing ecosystem-based management (Sanchirico, 2004; Babcock et al., 2005; Crowder et al., 2006). To the

extent that the zones include conservation areas, some of the benefits of zoning would include increased protection of biodiversity (Alder, 1996; McClanahan and Kaunda-Arara, 1996; Wantiez et al., 1997; Hall, 1998; Lubchenco et al., 2003), opportunities for scientific inquiry (Hilborn et al., 2004), and a hedge against exploitation risks elsewhere (Lauck et al., 1998). Others argue that zoning would eliminate the single-sector approach to the regulation of ocean activities that has led to conflicting management goals and a regulatory framework in which many state and federal agencies work with little coordination (Pew Oceans Commission, 2003; U.S. Commission on Ocean Policy, 2004; Crowder et al., 2006).

Unlike much of the previous literature that focuses on the biological basis behind ocean zoning and the separation of uses, we propose a comprehensive ocean-zoning regime whose main features include planning, dominant-use zones, and user rights. Dominant-use zones, as opposed to exclusive-use zones, give, in the rules governing the zone, priority to one type of use over all others in the form of a presumption. The goal, however, of instituting a coordinated place-based ecosystem approach for the sustainable use and provision of ecosystem services remains the same. Here, we make three main arguments that together present a case for a comprehensive ocean-zoning regime that provides both the necessary and sufficient conditions for achieving such a goal.

First, drawing parallels to land-use management and planning, we argue that planning and use-priority management will increase prospects for conservation and efficient resource use. Advocates for marine spatial planning make similar arguments (Douvere and Ehler, 2007). In addition, two recent ocean commissions have argued for integrated multiuse ocean spatial planning (Pew Oceans Commission, 2003; U.S. Commission on Ocean Policy, 2004). Second, use-priority management along with allocation of user rights creates the potential for ancillary benefits because of the way in which it changes users' incentives. These incentives, deriving from place-based rules that assign better-defined rights to well-defined user groups, may lead to collective choice, bottom-up group organization, and nested enterprises. According to Ostrom (1990) these are the conditions necessary for successful common property management. How the process of drawing lines in the water could be a catalyst for creating these conditions is essentially absent in the policy discussions surrounding zoning. An exception is the recent paper by Eagle et al. (2008), which we extend by introducing a two-tier allocation scheme that allocates the dominant uses and the rights to the resources within the zones.

Finally, we go beyond the previous literature in discussing how the process of integrating comprehensive zoning into ocean management could be the means for a needed change in scope and scale of ocean governance, as called for in the two recent ocean commission reports (Pew Oceans Commission, 2003; U.S. Commission on Ocean Policy, 2004).

Obviously many interpretations of what a zoning system would entail are possible, and the potential benefits and costs depend on its design. Some envision zoning as a top-down regulatory mechanism (Norse, 2002; Crowder et al., 2006) that will add another burden to ocean industries, in the spirit of central planning. Others see it as a means to privatize the seascape (Edwards, 2008). As we discuss, the actual system needs to have features drawn from the two extremes, especially if the necessary conditions identified by Ostrom (1990) are to evolve. Too many top-down

Table 1. Regulations applying to commercial and recreational fishing in state and federal waters of the California coast. Data were compiled from regulations published on January 1, 2005, in public sources. Catch-limit regulations that apply to a single species, such as bag limits or trip limits, are not included because they are so numerous.

	Regulations	Spatially explicit regulations	Percentage of spatially explicit regulations
Commercial	173	97	56%
Recreational	321	226	70%

prescriptions are likely to create a new set of transaction costs and reduce necessary flexibility and adaptability over time. On the other hand, too much flexibility and decentralization might increase the environmental risks.

FROM AD HOC SPATIAL REGULATION TO COMPREHENSIVE OCEAN ZONING

Oceans are already subject to significant regulations that vary across space in terms of both the instruments applied and the level of controls applied. The traditional “management” paradigm for the ocean’s living resources evolved from a *laissez-faire* assumption to a system in which fishing effort is controlled across the entirety of a fishing stock. Over time, however, these “aspatial” approaches have developed special localized rules and conditions. For example, in California, fishing regulations combine to create 323 *de facto* fishing zones (Table 1) but do not represent a well-coordinated set of interlocking spatial regulations. Rather, they are a cluster of single-species or single-gear-type restrictions that have little relationship to other regulations. Similar fragmented patterns of regulations are documented for southern California (Crowder et al., 2006) and in the sea off Massachusetts (Edwards, 2008). This gradual shift from aspatial to spatially explicit regulations has proceeded with little policy debate or attention to the costs of activities.

On land, however, comprehensive planning has superseded this *ad hoc* approach. For example, at the end of the 19th century and the very beginning of the 20th century, various cities tried to identify and regulate specific land uses, such as brickyards, that were likely to be particularly harmful to local residents (see, for example, *Hadacheck v. Sebastian*, 239 U.S. 394 1915). Because they did not take a comprehensive approach to land-use conflicts, however, such regulations failed to minimize external costs among users, and our current system of comprehensive zoning quickly replaced them in the 1920s and 1930s.

In drafting model legislation that states could use to authorize local land-use regulation, Secretary of Commerce Herbert Hoover and an expert study committee emphasized the importance to zoning of comprehensive planning. Under the model legislation, all zoning must be “made in accordance with a comprehensive plan.” According to the expert committee, this requirement is essential to “prevent haphazard or piecemeal zoning. No zoning should be done without such a comprehensive study.” Although cities have not always engaged in the degree of advance planning contemplated by Hoover’s committee, both legal experts and courts have agreed on the value of engaging in land-use regulation through systematic and comprehensive planning (Haar, 1954).

Local zoning is not the only example in the terrestrial context of the importance of comprehensive planning. Habitat conservation plans (HCPs) under the Endangered Species Act were initially developed on a property-by-property basis. As a result,

reserves created through HCPs were typically nonintegrated, failed to maximize the land's potential value for biodiversity, and did not ensure that the choice of land minimized societal costs. Beginning in the late 1990s, therefore, federal, state, and local governments began to place greater focus on regional HCPs that developed comprehensive plans for the development and conservation of lands within a broader geographic area.

The experience of HCPs provides some insights into the difficulty of the enterprise for the marine environment. First, a recent article by Rahn et al. (2006), who reviewed 22 multispecies HCPs, reports that, although the plans are a valuable tool, the design and implementation fall short of the level needed for conservation of the species. Rahn et al.'s research highlights that planning alone, especially for complex issues such as species conservation, does not guarantee that the planning goals will be achieved. Second, the complexity of how to define the scale of area to be considered when one sets out to develop comprehensive plans should not be underestimated. If the scale is too limited, the planning process may simply "move" any offending uses to another jurisdiction, as certainly occurred in land-use planning.

Comprehensive planning through ocean zoning is particularly important in the marine context because important institutions that address conflicts among different uses are lacking. On land, three systems are available for resolving conflicts among users: governmental regulation, judicial resolution, and private ordering. Governments address many conflicts through zoning laws and other regulatory schemes, including incentive-based measures such as cap-and-trade policies. In the land context, however, courts have also developed the common law of "private nuisance" to help resolve conflict among neighboring land uses (e.g., residential property adjacent to a factory emitting noise and vibration) and the law of "public nuisance" to resolve conflicts between land uses and public welfare (e.g., factory pollution that poses health risks to the local population).

The existence of well-defined private property rights on land, moreover, enables private individuals to resolve conflicts through "private ordering." One property owner can pay a neighbor not to engage in a potentially conflicting land use. The government and public-interest groups also can pay a private landowner to avoid uses that might injure the public interest. For example, the Nature Conservancy can purchase a conservation easement under which the landowner agrees to protect valuable habitat.

These multiple systems for resolving land-use externalities provide useful redundancy and flexibility for addressing the varied types and scales of externalities. If land users, governments, or public-interest groups are unable to use their preferred system to address a particular externality, they can turn to one or both of the remaining systems. In many cases, the government needs and uses multiple regulatory approaches to address externalities involving just a single land use. Regulation of petroleum and groundwater extraction, for example, uses well-spacing rules as well as quantitative restrictions, such as pumping allowances. Although scholars have disagreed over the comparative merits of the various systems for resolving land-use externalities, all three systems are used and play valuable roles in addressing these externalities (for a more in-depth discussion of the pros and cons of zoning on land see Karkkainen, 1994).

Currently, only regulation is available to resolve externalities from conflicting marine uses, such as fishing, aquaculture operations, and petroleum exploration.

No judicial tool similar to private nuisance exists to address externalities stemming from ocean use, and marine public-nuisance cases are extremely difficult both to bring and to win. Except in those few instances where the government has provided property interests in the oceans, marine users also cannot engage in private ordering, because no private rights exist to be traded and enforced. If government regulation is not effective in addressing marine externalities, those individuals or interests that might be injured have no way of removing the potential conflicts. Where a conflict actually leads to significant economic injury, as in the case of the EXXON VALDEZ oil spill, the government and injured parties may be able to bring criminal and civil actions for the injury. Although these cases may provide postinjury compensation, however, they do not provide a method of removing conflicts in advance of injury. This constrained world creates incentives for interests to expend resources in wasteful rent-seeking activities in the regulatory process. In fisheries, for example, these rent-seeking activities lead many to argue that the conservation decision (setting the total allowable catch) should be divorced from the allocation decision (deciding which fishermen get to catch the fish).

USE-PRIORITY ZONES, USER RIGHTS, AND EFFICIENCY

Comprehensive ocean zoning may not only reduce conflicts through the creation of use-priority areas but also act as a catalyst for users within zones to coordinate their activities, especially with the creation of dominant-use zones. Whether on land or in the sea, zoning both separates conflicting users and rations the space, which is itself a resource, where each activity can occur (Mills, 1979). Recent articles on ocean zoning have focused solely on the benefits directly attributable to separation (see, for example, Crowder et al., 2006). Zoning can mitigate external costs between parties, for example, oil and natural gas extraction and undisturbed nature reserves. As many have noted, separating uses to mitigate external costs works best when the costs are localized and place-based and the set of conflicting users is large and diffuse. Even in these situations, however, the benefits of separation are not always going to be greater than the costs (Mills, 1979; Edwards, 2008). Because of the current institutional system, impressions on the sizes of conflicts in the ocean realm are also probably distorted as the existing regulatory framework arguably provides incentives for users to overstate the magnitude of the conflict (Eagle et al., 2008). The “need” for separating incompatible uses may therefore not be great as is often argued.

Separating conflicting uses, however, does not necessarily lead to sustainable provision of marine and coastal ecosystem services. For example, drawing on the experience of the demarcation of 200-mi exclusive economic zones (Sanchirico and Wilen, 2007), where the allocation of space to domestic uses resulted in a “tragedy of the regulated commons” (Eagle et al., 2008), governments would not want to rely on drawing lines in the water alone to achieve sustainable common property management.

Rather separation must be accompanied by the determination of dominant-use or use-priority classifications and better-defined rights within each zone. To this end, we envision a two-tier allocation process. In the first tier, the dominant-use designation is determined that allocates a particular space of ocean for a class of uses (rations the space). In the second tier, the resources within the zone are appropriated to the users by means of rights, long-term leases, or concessions (the resources within the

space are rationed). For example, the planning process could allocate a dominant-use status to offshore aquaculture and at the same time auction off long-term leases to the space within the zone.

This two-tier allocation processes will lead to potential ancillary benefits that as yet have been missing from the discussions around marine spatial planning and ocean zoning. For example, the dominant-use designation will reduce uncertainty about the extent and potential location of offshore aquaculture operations in U.S. waters (Fletcher and Neyrey, 2004) and the long-term leases provide environmental stewardship incentives, as any deterioration in the condition of the marine environment will reduce the economic profitability of the operation. Furthermore, as is found on land where zoning is accompanied by property rights (Steele, 1986), this two-tier allocation process will probably lead to an improvement in the solidarity and cohesiveness of the users (Steele, 1986; Karkkainen, 1994).

For commercial fisheries, the allocation of dominant-use areas must be combined with catch-share programs (second-tier allocation). These rights could be defined at various scales; for example, we already use a mechanism known as territorial use rights in fisheries (TURFs), under which rights are allocated for a species or bundle of species in a particular area (Christy, 1982; Holland, 2004; Wilen, 2006). Individual fishing quota programs and fishery cooperatives allocate the rights to particular species and in some cases to species-gear combinations. In general, whether the rights are better defined at the zonal level or at the species level within zone will depend on the economic, ecological, and social context. The appropriate scale of rights for conservation of natural resources and the notion that tenure should match both the temporal and spatial dimension are difficult issues to resolve, as discussed by Scott (1955: 128): "... when the state desires to conserve resources, and therefore desires individuals to invest effort and materials in, and to abstain from using, the product of certain lands, then the state must reward these individuals by giving them title to the future product of such activities. Indeed, unduly small individual rights, even if they are absolute in the legal sense, may be too small to make conservation a profitable individual activity. Hence tenure must be appropriate to the resource not only in the time-dimension, but also in the spatial-dimension of the site."

In general, the delineation of dominant-use zones creates exclusion or membership rights to particular places. In some cases, the second-tier allocation is not necessary, for example, in the creation of dominant-use conservation areas. Even in this setting, however, a second-tier allocation could create valuable public-private partnership opportunities. For example, the Nature Conservancy could purchase the rights to a particular section of the conservation area and open it up to certain uses or restrict the set of uses that are permissible and consistent with conservation.

For other uses, such as recreational fishing, the second tier in the allocation process is likely to be overly cumbersome and costly, as the number of recreational fishers is large and the group is diffuse. In this case, the dominant-use designation could set in motion the formation of place-based recreational fishing clubs in which individuals would come together to obtain the mutual benefits from organizing. (See Sandler and Tschirhart, 1997, for an economic discussion on club formation and club goods.) For example, some have proposed angler management organizations (AMOs) to reduce the costs associated with regulating private-boat recreational anglers (Sutinen and Johnston, 2003). The idea is to use AMOs as a means of better aligning the incentives of anglers with conservation. The concept of AMOs is similar

to that of hunting clubs, in which the club has incentives to maintain good-quality hunting grounds. The AMOs would be allocated catch that they would decide how to distribute to their members, and the AMOs would be responsible for monitoring and enforcing the catch rules.

Creating a zone for marine recreational fishers (e.g., pelagic trolling areas) could become the catalyst by which such an organization develops because of its inherent benefits to members, rather than because of a top-down declaration that a club must form for management purposes. Our conjecture that better defining user rights for recreational fishers can lead to the development of clubs or cooperatives is based on experiences to date with commercial fisheries. For example, in New Zealand the quota-owner cooperatives that formed after the creation of the individual-transferable-quota system invest in marketing, science, and fishing and gear technology research and development. (Yandle, 2006, presents a nice discussion of the rock lobster cooperative.) Furthermore, the value of membership in these clubs would be a function of the ecosystem services produced in the area, implying that club members will have local stewardship incentives. These incentives derive from the improved ability of managers to hold the clubs accountable for any damage, as well as the ability of the club to have primary access to improved productivity that arises from better stewardship of the local ecosystem.

In the terrestrial setting, where private property rights enable significant private ordering, some argue that zoning is not necessary (Fischel, 1978). In the ocean, however, market failures arising from the lack of property rights are not self-correcting, and these failures generate transaction costs that create significant barriers for users who might otherwise seek out beneficial partnerships, negotiations, and collaborations to address conflicts (Wiggins and Libecap, 1985). The certainty of allocating space to offshore aquaculture uses, for example, could reduce transaction costs that currently make negotiations with an existing offshore oil platform to act as an aquaculture monitoring and management facility too costly.

The two-tier allocation process could open up possibilities for self-organization, private ordering, and other approaches to addressing market failures. Such social dynamics are also likely to move our oceans closer to a comanagement regime, in which users work closely with each other and with national, state, and local governments to develop sustainable rules within each zone (Yandle, 2006).

Flexible and decentralized mechanisms for allocation between users of an area (once the dominant uses are determined) are a critical component that will permit the necessary realignment of rights and resources over time. Under such a system, environmental organizations could purchase rights to certain areas to create private marine reserves that could complement government efforts. Alternatively, owners of a conservation area could “sell” rights to fish in their area to the owners of a recreational fishing area in exchange for greater conservation in the recreational fishing zone.

The ability to negotiate and trade is especially important because ocean ecosystems are subject to external forcing across a multitude of time and spatial scales that shift the provision of ecosystem services (Eagle et al., 2008). It also reduces the necessity in the design phase of trying to match the ecosystem scale with the policy scale, which is almost impossible given all of the dimensions in the socioeconomic and ecological realms that would need to be considered. In general, rationing is best left to the users within each zone, who could determine the benefits from sharing

natural resources or potential economics of scale and scope more easily than could a regulator prescribing permanent allocations within each zone through a top-down mechanism. Rationing by the club could be accomplished by the creation of finer spatial rights to resources for its members, such as harvest rights, by the imposition of fees for use of the resources, such as landings charges or by regulations on the amount of fishing time or fishing gear.

Of course, flexibility in the types of actions and uses must be subject to environmental reviews to ensure that ecological and biological integrity is not compromised. If, for example, a divergence between private short-term and public long-term economic incentives develops, then the flexibility mechanisms would need to be held in check. These mechanisms could entail developing approaches to pairing responsibilities with rights through contracting. Research on other mechanisms and institutions for strengthening accountability among users is an important endeavor.

ZONING AS A CATALYST FOR BENEFICIAL OCEAN-GOVERNANCE REFORM

Current ocean-management institutions are geared toward management of single resources, or small subsets of resources, over relatively large geographical spaces that are defined by reference to political jurisdictions (Crowder et al., 2006). At the federal level, for example, the National Marine Fisheries Service in the Department of Commerce regulates fishing within the United States' Exclusive Economic Zone, whereas the Minerals Management Service in the Department of the Interior regulates continental shelf oil and gas prospecting and development beyond state waters. At the state level, state fish and game departments typically manage ocean fisheries, whereas state land agencies control seaweed harvesting, and state energy agencies manage oil and gas operations.

Because the management agencies focus on the regulation of single resources, or small subsets of resources, within the jurisdictional waters at large, many claim that regulated industries can easily capture the agenda and rulings of management agencies (Okey, 2003). Fisheries agencies at both the national and the state level, for example, are often criticized for putting too much weight on commercial and recreational fishing industries' interests (Weber, 2001; Okey, 2003). At the federal level, regional fishery management councils composed largely of representatives of commercial and recreational fisheries make initial decisions regarding the conservation and allocation of fisheries (Eagle et al., 2003). Although the National Marine Fisheries Service decides whether to approve these decisions, the service has historically deferred to such decisions in the vast majority of cases (Weber, 2001).

Because it focuses on the integrated management of spatial areas rather than aspatial regulation of particular activities, comprehensive ocean zoning requires rethinking of current ocean governance institutions. The legislature that adopts an ocean-zoning statute will have at least three options. One option (the "integrated agency") would be to delegate administrative responsibility for all zones in a region, or in all the government's jurisdictional waters, to one agency. This is the model that is used in most municipal zoning and by Australia in managing the ocean-zoning system created for the Great Barrier Reef (Day, 2002). A somewhat similar option ("coordinated single-sector agencies") would be to maintain the current regulatory agencies but to require them to consult and coordinate their rules in each zone (Rosenberg, 2006). A third option ("specialized zone agencies") would be to use

specialized agencies to manage particular types of zones and to encourage those agencies to work together in the management of the larger seascape (Eagle, 2006). That is, a commercial-fishing agency would administer commercial fishing zones, a conservation agency would regulate conservation zones, and so forth. This is the model that Congress has adopted for management of the United States' public lands, where the National Park Service manages national parks, the Forest Service manages national forests, and so on (Eagle, 2006).

These various choices entail trade-offs. The integrated-agency option, for example, may reduce transaction costs or allow the borders of the integrated agency's jurisdiction to approximate the borders of the relevant ecosystem closely. This option can also dilute the current ability of individual industries to capture the managerial process (Weber, 2001; Okey, 2003). In a system of specialized zone agencies, each agency can focus on developing the expertise needed for effective management of the type of zone for which it is responsible; agencies, in short, can take advantage of managerial specialization. Like states in a federal system, competing agencies might take different approaches and thereby generate scientific information about the relative benefits of alternative management strategies (Gerken, 2005). Thus, the design of the ocean governance institutions could lead to practices that are in effect consistent with the intention of adaptive management.

Coordinated agencies would seem to be the least desirable of the options because they incur significant costs in the process of consulting and coordinating in each zone (Hanna, 2006). The legislature, moreover, would need to create a system for resolving differences of opinion among the coordinating agencies or be willing to tolerate the possibility that rules were not coordinated and supportive.

All three options are likely to lead to greater attention to rational and sustainable use than is found in current ocean-management agencies—although to varying degrees depending on the particular option. The integrated-agency option, for example, could dilute the current ability of individual industries to capture the managerial process. Although the current management system of use-specific agencies enables industries to dominate the agencies focused on the regulation of their specific activities, the integrated agency would involve a broader set of interests and might make capture of the agency by any particular industry more difficult. Conservation interests might still be underrepresented, however, compared to the combined interests of ocean-use industries.

Specialized zone agencies could provide the greatest protection for sustainability by ensuring that conservation agencies were explicitly responsible for at least some of the ocean zones. Agencies with specialized land-management missions can serve as proxies for the interests of similarly minded interest groups (DeShazo and Freeman, 2005). For example, in negotiations over the future of the greater Yellowstone ecosystem, the U.S. Fish and Wildlife Service effectively represents the interests of grizzly-bear conservation groups, and the Forest Service similarly represents timber interests. Representation by proxy can be valuable where interest groups, such as conservation organizations, would otherwise be underrepresented.

DISCUSSION

A plausible argument is that planning and dominant-use zones are nice concepts but that they are not necessary to reach the goals of increased ecosystem stability and

efficiency of use of ocean resources. That sentiment includes some truth, especially given that other means are available to treat the causes and not just the symptoms of the problems (Wilén, 2006), but New Zealand, a world leader in “rights-based” fishery management, is facing challenges from escalating conflicts between recreational and commercial fishing interests and the issues of aquaculture and marine reserves. Better planning and coordination at the beginning of the process might avoid these and other allocation issues that will arise in the future. Such an effort would move beyond the traditional view of managing each sector separately that virtually ignores spillovers and beyond the equivalence of marine reserves or no-take areas and spatial management (Agardy, 1997).

Conflicts and allocation disputes will not disappear with comprehensive zoning. For example, during the rezoning process in the Great Barrier Reef, 31,540 public comments were submitted—one for every 25 members of the local population (Innes et al., 2004). Rather, zoning and the process creating the zones will expand the set of mechanisms for addressing these conflicts. These same conflicts exist today, and the only the means for resolution is the regulatory process, which is very costly and inefficient.

Another common misconception is that, although good fences make good neighbors on land, drawing borders in the ocean is impossible. That may have been true 10 yrs ago, but technological developments, including satellite tracking, global positioning systems, remote sensing, vessel transponders, electronic log books, and information technology, now permit electronic patrols of spaces (both area and depth) in the ocean (Wilén, 2004). Because of the technology and the incentives created by better accountability, place-based approaches are potentially more feasible from a monitoring and enforcement perspective.

We also expect that an optimal zoning configuration will require experimentation, learning, and revisions to the plans over time. Learning and adaptation require that systems be put in place to collect the data at the appropriate spatial and temporal resolution and that flexibility be built into the system, such as trading and negotiating both across and within each zone.

In sum, the requirements of planning, use-priority management, and allocation of user rights will (1) encourage a needed reassessment of the focus and scope of the regulatory institutions involved in ocean management, increasing prospects for conservation and efficient resource use, and (2) create opportunities for user groups within each zone to form informal or formal long-lived institutions by which they can coordinate their activities and maximize long-term resource yield. The potential for this latter outcome follows directly from Ostrom’s (1990) characteristics of successful common property regimes that include clearly defined boundaries, place-based rules, collective choice, right to organize, conflict resolution, and nested enterprises.

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