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ENVIRONMENTAL PROBLEMS IN SOUTHEAST ASIA: PROPERTY REGIMES AS CAUSE AND SOLUTION[1]

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I have been asked to prepare a brief paper on the role of property rights in the economic analysis of environmental problems in Southeast Asia. The logical starting point, it would seem, is first to talk about the causal role of property rights in the existence of environmental problems. From there we can turn our attention to how property rights must be incorporated into our economic analyses of these problems. Finally, we can address the extent to which changes in property regimes may offer scope for solving persistent environmental problems.

In preparing my comments I was fortunate to have access to some materials regarding EEPSEA research projects between 1994 and 1996. I thought it might be useful to classify these projects into several groups. My classification appears in Table 1.

Table 1. EEPSEA Research Projects, 1994-1996

AREA OF RESEARCH	PROJECT NUMBER	PERCENT OF TOTAL
POLLUTION:	1, 3, 4, 10, 11, 16, 22, 24, 30, 33	30 percent
PRICING:	7, 17, 18, 19, 20, 28, 29, 31, 32	28 percent
VALUATION:	12, 13, 23, 25, 26, 27	18 percent
FORESTRY:	8, 15, 21	9 percent
AGRICULTURE:	5, 9	6 percent
RURAL DEVELOPMENT:	6, 14	6 percent
FISHERIES:	2	3 percent

[1] Paper prepared for the Economy and Environment Program for Southeast Asia Workshop in Singapore, May 13-15, 1997.

While any classification scheme is somewhat arbitrary, I believe the one in Table 1 is appropriate enough for our purposes. I note there that 30 percent of the EEPSEA research concerns pollution problems, that a slightly smaller proportion (28 percent) concerns resource pricing matters, and that another 18 percent concerns resource valuation issues. My scheme suggests that over 75 percent of the research projects concern so-called "market failure" problems. I will have more to say below on the usefulness of "market failure" as a category of resource problems. For now, let us turn our attention to environmental problems in Southeast Asia.

I. PROPERTY RIGHTS AS CAUSAL FACTORS IN ENVIRONMENTAL PROBLEMS

All environmental problems are property rights problems. Pollution is the visitation of unwanted matter or events on others. Douglas [1966] argues that pollution is "matter out of place" and so it should be obvious that one must address both the substance of the "matter" in dispute, and what it means to be "out of place." In most instances, the matter that is out of place is odor, heat, smoke, noise, dust, or chemicals. By being "out of place" we usually mean places where it does not belong, either ethically or legally.

When discussing pollution, economists will usually talk of externalities. Recall that an externality exists when the harm (or the benefit) of extra-firm (or extra-household) actions is not compensated for. When we speak of externalities we have in mind a situation in which the economic effects transcend the domain over which the firm has socially sanctioned control. That is, pollutants transcend the property regime pertinent to the firm (or household), thus giving rise to the external costs that comprise externalities. I like to stress the fact that

externalities are evidence that the "nominal boundary" of a firm (or of a household) that is the source of these external effects does not coincide with the "real boundary" of that entity. By the "nominal boundary" I mean the socially recognized domain over which the owner has control. In agriculture this would be the extent of the land on which the farm is located. In industrial settings, the "nominal boundary" would cover the geographic extent of the factory including the land on which it resides. But the "real boundary" of farms and firms reaches out to encompass the physical domain over which their pollutants travel. Agricultural chemicals washing off fields into waterways is an example of physical effects transcending the nominal boundary of the farm. Air or water pollution from chemical factories—or from manufacturing facilities—leaves smokestacks or pipes and enters physical domains under the legal jurisdiction of others. That is why I say environmental problems are property rights problems.

In addition to the classic pollution example, most conflicts in fishery management, groundwater management, forestry, or the extraction of exhaustible resources, arise because of difficulties in clarifying the property regimes [Bromley, 1991].

The traditional debate in economics between the Pigovian tax imposed by a regulatory authority, and the Coasean bargained solution, has caused us to imagine that most environmental problems represent a choice between regulation and free markets. This characterization is both unhelpful and logically false [Vatn and Bromley, 1997]. The term "market failure" has long been associated with externalities—probably owing to the seminal paper by Francis Bator [1958]. However, externalities do not represent market failure. That is, given the status-quo institutional setup—of which property rights are central—the presence of externalities can be considered a proper and rational outcome of atomistic maximizing and thus is not a failure of the market at all. Rather, the presence of externalities indicates a failure of the legal system—property

regimes—to structure domains of economic activity so that all of the costs and benefits associated with independent activities are brought to bear on the relevant parties. This is not a failure of the market; it is a failure of the legal foundations of the market [Bromley, 1989b]. Recall that markets simply reflect underlying institutional structures. All exchange takes place within a structured domain that we call the "market."

As Dahlman [1979] reminds us, transaction costs are the sole source of the persistence of externalities, and transaction costs acquire their nature and magnitude from the underlying property regimes. Those who are ill served by the status quo structure of rights are the ones who must incur the transactions costs of bringing about change in that rights structure. Furthermore, the property regime provides the basis on which environmental problems will be judged. That is, if the status quo is one in which some interests are thought to have "rights," then it becomes more difficult to bring about change. And the presumed (though, as I will spell out below, not necessarily actual) rights structure will be important to the perception of change.

This process of change will often be characterized, especially by those whose actions are under challenge, as government intervention. But the idea of intervention must be considered carefully. Is it "intervention" when government decides to step in to protect coastal fishermen from the ravages of industrial pollution? It would seem that "intervention" to polluters is "protection" to the fishing industry. If government does nothing against the destruction of a coastal fishery it is still choosing sides—in this case against fishing and in favor of the chemical industry. Few would label doing nothing as government "intervention." But if government decides to protect the fishery against the ravages of industrial chemicals then those engaged in chemical manufactures would likely denounce government "intervention" into the "free market." We see, therefore, that the idea of government intervention is an artifact of the presumed property regime. That is, if the fishing industry is

protected from chemical contamination by the status quo legal regime, then if government steps in to allow the destruction of fish stocks by chemical firms that may well be seen as intervention by the fishing industry. The judgment of "intervention" is seen to be a function of who is protected by the status quo.

Moving beyond pollution, concerns for pricing and resource valuation are embedded in property rights issues as well. The several studies that concern pricing regimes for water and other natural resources must contend with the fact that any pricing regime is first dependent upon a regime of property rights and duties. Groundwater pricing is a classic example of an economic instrument (pricing) being asked to do what property regimes have failed to do. That is, a price for a unit of groundwater conveys signals about the social opportunity cost of extraction. In the realm of urban water supplies, we see the same idea at work. Here, as in groundwater extraction for industry and agriculture, there is a sense that drinking water is a "free" good and should be made available to all at zero price. But water, whether from underground aquifers or from surface sources, is a scare resource that will be squandered unless there is some coherent property regime in place.

We see that the structure of property rights—and more generally the prevailing property regimes—can be useful in gaining an understanding about why and how environmental problems arise. I will now turn to a more specific explication of these legal issues.

II. PROPERTY RIGHTS AND PROPERTY REGIMES

The work of Ronald Coase [1960] was instrumental in showing that rights can be thought of as factors of production. If an industrial firm has the right to discharge its wastes into a nearby river, then this right gives access to a productive service that has real economic value to the firm. In the absence of this right, the firm would need to undertake an investment to process the wastes; this would entail start-up costs as well as operational costs. Hence the right to use the river for waste disposal offers important economic savings to the firm, and the right can be said to have a shadow value to the firm at least as great as the opportunity cost of undertaking waste-disposal services by the next-best means. If the firm has a right to discharge wastes into a river, then we can regard the cost savings as the present value of all future costs that would be necessary in the absence of the right.

Think of this present value as a "property interest" just as ownership of a piece of land bestows a property interest on the owners. The property interest is, in fact, the present economic value of the future cost savings. If the firm has the right to discharge wastes in this manner, then we can think of this as a property right in the waste disposal services of the river. The property (the asset) is the value of the service provided by the river, and the right is the social assurance that the value will be available to the firm into the future; together we see that a property right entails both the value of the service (the asset) and the social assurance that it belongs to the firm. But what is the nature of this social assurance? What does it mean to have a "right" to discharge wastes?

Here we enter ambiguous terrain. In English, the term "right" has both an ethical and a legal connotation. The word "right" means an action that is both correct (good) and legally

protected. In legal terms, to have a right is to have the capacity to call upon the collective power—some authority system—to protect one's interests in some particular situation or outcome. This authority system could be the government of a local village, it could be a city council, a regional authority, or a national government. Rights only have content when there is some authority system that agrees to defend a right-holder's interest in a particular outcome. If I am protected by a right then it means that I can turn to the pertinent authority system to see that my interest is protected. The protection from this authority is given effect because it implies a correlated duty or obligation for all others interested in my claim.

There is a tendency to regard a right as a relationship between an individual (or a group of individuals) and some object. A landowner struggling against the predatory actions of some regulatory agency is a common perception. The claim will be advanced that the regulations deprive the landowner of some alleged "right." However, rights are not relationships between one person and some object, but are rather relationships between the claimant of that right and others with respect to the object or circumstances in dispute. Therefore, a right is a triadic (three-part) relationship that encompasses Alpha, the outcome or object of Alpha's interest (whether a physical object or a stream of benefits), plus all others with contrary interests (here called Beta). Rights only have meaning when there is a collective mechanism that gives duties to those interested in the particular outcomes of interest to the right holder.

When one has a right in something it means that the benefit stream arising from that situation is explicitly protected by some authority system. The authority system gives and takes away rights by its willingness—or unwillingness—to agree to protect one's claims in something. To have a property right, therefore, is to have secure control over a future benefit

stream. And it is to know that the authority system will come to your defense when that control is threatened. The thing of value to you is the benefit stream and this benefit stream is the property interest that individuals seek to have protected with property rights.

The degree of protection afforded by a particular structure of property rights is always relative to other social concerns and priorities. While property rights in land are usually more secure than property rights in other assets, this is not universally so across different cultures.[2] We see, therefore, that the structure and content of rights are social decisions. Rights are socially constructed to serve some collective purpose.

Before leaving this discussion, I should give some attention to the ethical domain of the idea of "right." And here the term will most often be used in a rhetorical fashion. There are two dimensions to this rhetorical idea of a right, and they both get invoked at various times. For instance, individuals will assert that they have a "right" to smoke in public places. When used in this sense, the term "right" is being used as a persuasive device to buttress a self-serving argument. Those who use this language know that this phrasing is much stronger than merely claiming that they wish to smoke in public places.

The second dimension of this rhetorical use is to confuse the traditional practice of smoking in public places with the legal right to do so. The mere longevity of some action will be thought to bestow a right. The owners of factories, with a long tradition of disposing of their waste in nearby rivers, will assert that they have a "right" to continue to do so. In this instance, the long use of a particular practice—smoking in public places, disposing of industrial wastes in rivers—is taken as proof of its propriety. Those who use this device would like for others to believe that there is a compelling ethical authority in tradition.

This argument is particularly prominent in environmental problems. New technology and new knowledge have both changed the way in which we interact with our natural environment, and this technology and knowledge have also changed our understanding of the implications of that interaction. New chemicals, more powerful machines, and the sheer concentration of more people into smaller spaces (an outcome made possible by new technology) mean that environmental problems are likely to be more prevalent than in times past. And, the ecological implications of those various insults are probably of greater importance now than in the past—especially over the long run. In consequence, many traditional practices can no longer be allowed to continue with the same presumption of innocence and social utility as in former times.

When more potent technology—or new industrial practices—threaten ecological integrity, collective action arises to prevent the unwanted outcome. Or, when new knowledge calls attention to the serious implications of some traditional situation, then efforts will be mobilized to bring about change. When this happens, those whose behavior is being challenged will invoke tradition to suggest that they have a "right" to do those things now discovered to be harmful. Farmers will insist they have a right to spray poisonous chemicals on their crops. Industrialists will insist they have a right to dispose of their waste products as they have been doing in the past. While the confusion of tradition for a right has an ambiguous basis in law, it is often used to put on the defensive those who desire a change in the status quo.

As suggested above, the idea of a right also can be used to suggest some ethical position. We see this in the area of so-called human rights. Here the term "right" is used to

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[2] The arid reaches of parts of Africa demonstrate clearly that, in certain economic and ecological settings,

suggest some inherent virtues and capacities associated with being human that transcend legal and political strictures that are the creation of some government. The related notion of the "rights of nature" appeals to this ethical element. This line of argument is then used to persuade others that "nature" should be protected. As with the previous category of rights talk, it is much more compelling to couch one's interests in terms of rights. Given the alternatives of fighting to have nature protected because we prefer that outcome, or arguing that nature should be protected because nature has "rights," the choice is obvious.

We see, therefore, that the idea of rights has both a rhetorical element and a legal element; rights are both prescriptive (normative) and descriptive. These two domains are clearly interdependent. After all, the law is simply a manifestation of the normative realm of human associations. What at one time is expressed as an "ought" or a "should" becomes, through the legislative process, a "must" in a subsequent time. Rights are simply the socially sanctioned and enforced normative elements of civil society. Property rights extend that legal force to the realm of objects and benefit streams [Bromley, 1991].

The incoherence in environmental problems arises because the term "right" will be used when some quite different legal situation is, in fact, controlling. Factories claiming a right to pollute are, in fact, being merely presumptive about their assertion of a right. Farmers using pesticides that contaminate food and various terrestrial and aquatic habitats are very often being presumptive about their alleged "right" to do this. That is, in most settings there is no right at all but rather a presumptive right. When I earlier discussed the use of the term "right" to suggest a legal status what was, in fact, merely based on tradition or some desired outcome, I was referring to the idea of presumptive rights. Such presumptive rights are, in fact, simply

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the fixation on landed property is of minor importance compared to other situations [Neale, 1969].

assumed; they are alleged, though they may be firmly believed by those who imagine that they have them. It is this confusion between presumptive rights and rights in fact (in law) that leads to much incoherence in environmental policy. These legal ideas are summarized in Table 2. Notice that a "presumptive right" is technically called a situation of *privilege* against which the other part has *no rights*.

Table 2. The Correlated Structure of Rights and Privileges.

LEGAL STANDING	LEGAL TERMINOLOGY
Alpha is free to disregard the interests of Beta Beta has no legal basis to object to Alpha's actions	**Privilege** for Alpha **No Rights** for Beta
Beta can obtain relief from Alpha's actions Alpha may no longer disregard Beta's interests	**Rights** for Beta **Duty** for Alpha

The difference between a situation of *privilege* and one of *right* is crucial. This can be seen by reference to the legal correlate of each. When Alpha has *privilege* with respect to certain actions that adversely affect Beta (perhaps dumping poisonous chemicals into coastal fishing areas central to Beta's survival), it means that those harmed by this behavior (Beta) are unable to seek relief from the state—either for an injunction or for the damages they are made to suffer. There is no law prohibiting such dumping and so Beta has *no rights* against the actions of Alpha. To be in a situation of *no rights* is to mean that Beta may not appeal to some political authority to get relief from the actions of Alpha. Or, perhaps, Beta may indeed seek protection from the state, only to be told that "you have no rights" in this particular situation.

Notice, as I have said previously, that to have a *right* is to have the ability (the capacity) to require the state (with its coercive power) to come to your defense. When you

have a *right* you have that wondrous capacity to compel the state to come to your defense. In the absence of that, you are without voice before the damaging behavior of Alpha.

But it is essential to understand that *no right* for Beta does not mean a *right* for Alpha. The legal correlate of *no right* is not a *right*, but a *privilege*. Alpha may well claim to have a *right* to dump poisonous compounds into the ocean, but that claim must be understood to be presumptive on the part of Alpha. All Alpha has is the opportunity (the *privilege*) to disregard the interests of Beta. And Beta must remain without protection (remedy) against this unwanted situation.

But of course, as time wears on, Beta may finally decide that silence is not conducive to survival. When Beta decides to challenge the legal structure that gives it *no right*, it is starting a process of institutional transactions that may or may not result in a new legal situation [Bromley, 1991]. If Beta fails then the status quo prevails and Alpha is able to persist in complete disregard for Beta's interests. Notice that the decision by Beta to challenge Alpha's current *privilege* might well end up giving Alpha the *right* to imposes costs on Beta, thereby changing Beta's situation from one of *no right* to one of *duty*. On the other hand Beta may actually succeed in changing the law such that Alpha acquires the obligation to change its behavior vis-a-vis Beta. If that should happen, Alpha's new *duty* corresponds to a new *right* for Beta.[3]

With this elementary structure of legal correlates, we can now turn our attention to the various property regimes pertinent to environmental economics. In this discussion I will use the term resource management regime to denote these possible property rights structures. A

[3] This process of institutional change represents the dynamic element in property rights analysis. We say that if Beta succeeds in putting Alpha into a new legal situation (*duty* rather than *privilege*) then Beta has power and Alpha has exposure (or *liability*). If Beta is unsuccessful in changing the legal structure, then Alpha has immunity against Beta's no power [Bromley, 1989a].

resource management regime is a constellation of legal correlates that defines the relationship of individuals (or groups) to one another with respect to that particular environmental resource. I will treat the subject of property regimes by suggesting that there are four broad types of resource management regimes pertinent to environmental economics: (1) state-property regimes; (2) private-property regimes; (3) common-property regimes; and (4) non-property regimes (called open access).[4]

A. State-Property Regimes

State-property regimes are those where ownership and control over natural resource use and management rest in the hands of the state through various government agencies. Individuals and groups may use the natural resources, but only with the approval of the administrative agency responsible for carrying out the wishes of the larger political community. National forests, national parks, and military reservations are examples of state-property regimes. The state may either directly manage and control the use of state-owned natural resources through government agencies, or it may lease the natural resource to groups or individuals who are given usufruct rights for a specified period of time. That is, state-property regimes remove most discretion from the user, and generally do not convey long-term expectations to the immediate users.

However, many state property regimes, by their very nature, convey secure expectations for some interests. National parks and forest preserves insure that the resources under such management regimes will be conserved for future generations. To be successful,

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[4]The problems identified with the so-called "tragedy of the commons" are correctly understood as problems of open-access resources [Bromley, 1991].

such regimes require governmental structures and functions that can match policy pronouncements with meaningful administrative capacity.

Resource degradation in state-property regimes will arise when the administrative reach of the management agency is insufficient to control the behaviors of those authorized to use the resource. This can happen because of an absence of knowledge about proper use, or it can arise because of inadequate funding to make timely enforcement decisions. Resource degradation also occurs in such property regimes when political processes are not sufficiently robust to resist pressures from those allowed to use natural resources.

Where governments are weak, and their legitimacy is easily undermined, there is a tendency for resource degradation to arise from the inability of the government to confront powerful commercial interests who exploit natural resources under state property regimes. Timber concessions in the developing countries represent a typical form of this practice. It takes a secure government to stand up to those who are making large economic gains from the use of those natural resources the government has said it owns. Unfortunately, such governments are also likely to be ineffective in regulating the use of privately held natural resources.

There is a public-finance aspect to many state property regimes as well. In some countries the sub-national entities (states, counties, provinces) may not have an independent source of revenue and hence one way for them to acquire revenues independent of those passed on to them from the center will be to regard natural resources as a base for government income. When that system is in operation, we may find excessive extraction of natural resources not to earn foreign exchange (as the national government might seek to do), but to earn domestic currencies from the center in exchange for products such as timber and minerals.

B. Private-Property Regimes

The most familiar property regime is that of private property. Here the range of discretion open to the owner(s) is fairly extensive and will include the right to control, the right to transfer, the right to use, and several other aspects signifying relative autonomy for the owner. Note that private property does not necessarily mean individual property; corporate property is private property administered by a group. Similarly, marital property is often the joint property of the spouses. Nor does private property imply absolute control for the owner. An owner is always faced with a number of strictures and obligations in the use of private land and its related natural resources [Christman, 1994].

There is in economics a strong presumption favoring private property on the ground that private property assures proper stewardship [Alchian and Demsetz, 1973; Buchanan, 1962, 1972, 1973; Coase, 1960; Demsetz, 1967; Furubotn and Pejovich, 1974; North and Thomas, 1977]. The idea in this literature is that only an individual owner can make the proper management decisions and that when government regulations get in the way, the efficacy of private ownership is compromised. There are three aspects of this presumption in favor of private property.

First, it is asserted that economic efficiency results when individual decision makers hold exclusive rights over the use of an asset (a natural resource). This proposition follows from the assumptions of economic theory in which efficiency results when decision makers have perfect information, all resources are divisible and mobile, and decision makers are unable to influence prices in factor or product markets. Notice that efficiency is defined as the outcome that will occur in situations in which these assumptions hold, and therefore actions taken under these circumstances are—by definition—efficient actions.

Advocates of individualized control over environmental resources argue that private property, and the absence of governmental environmental regulations, will insure the proper use and care of environmental resources. However, Page [1977] has shown that careful management by a self-interested private owner can result in the destruction of living resources if the time rate of growth of the resource is less than the rate of time preference of the owner. Beyond the domain of living resources, there is the widespread loss of valuable top soil from privately owned farms. The obvious question is, therefore, if private property embodies the proper incentives for wise natural resource management, why are there problems of soil erosion in agriculture? Don't farmers care if valuable top soil is washing away?

Second, the above arguments suggest that the choices of private owners are efficient and that is sufficient justification for their social legitimacy. Yet this claim assumes away externality problems and hence often confuses efficient outcomes with socially preferred outcomes [Bromley, 1989a]. The defenders of individualized control over environmental resources suggest that what owners of assets want is identical with what others in society want. Or, it will be suggested that the only thing that matters in environmental policy is what the owners of privately held assets want. The obvious conflict is between private interests and collective interest. The private-property advocates suggest that such ownership protects the decision maker from social pressure concerning how the resource is used. However, the content of ownership itself is a social construct and if private owners are allowed to create social costs for others then that very content will certainly be reexamined in the legislatures and the courts [Bromley, 1991, 1993; Christman, 1994; Sax, 1983].

Finally, and on the practical side, it is not possible to turn many of the world's fisheries over to a single private owner. Nor can one individual own the earth's atmosphere

and manage it as the private-property advocates suggest; it would be technically and administratively difficult for a single party—aside from a collection of nation-states—to own the high seas or the global atmosphere.

If there are no socially relevant off-site effects from decisions made by individual owners, and if the private owner correctly takes into account the interests of the future, then individualized control of environmental resources will conduce to social efficiency. If those assumptions do not hold, then it is hard to sustain an argument that individualized control will lead to socially preferred resource decisions. This can be seen by recognizing that the more complete is the individualization of control over environmental resources, the more possibilities there are for external effects. This leads us back to an earlier point; that much environmental policy is driven by those many instances in which the nominal boundary of decision making units does not coincide with the real boundary of such units. Indeed, recognition of this fact in many social settings has produced the third type of resource management regime—common property.

C. Common-Property Regimes

Scott Gordon's [1954] use of the term "common property" to describe the open-access fishery, and Garrett Hardin's [1968] "tragedy of the commons," both set environmental economics off on an unfortunate path. The matter has been set right over the past decade and it is now well understood that Gordon and Hardin had open-access resources in mind, not common property [Bromley, 1991; Ciriacy-Wantrup and Bishop, 1975].

At the most fundamental level, common property is similar to private property in the sense that non-owners are excluded from use and decision making. Along with this

exclusionary similarity, we also find that each of the co-owners in a common-property regime has rights and duties inside the regime. A true common-property regime requires the same thing as private property—exclusion of non-owners. While we know that property-owning groups vary in nature, size, and internal structure across a broad spectrum, they all are social units with definite membership and boundaries, with certain common interests, with at least some interaction among members, with some common cultural norms, and with their own endogenous authority systems. Tribal groups or subgroups, subvillages, neighborhoods, small transhumant groups, kin systems, or extended families are all possible examples of meaningful authority systems. In many societies, these groupings hold customary ownership of certain natural resources such as farm land, grazing land, and water sources [Netting, 1976; McKean, 1992; Wade, 1992].

Compliance, protected and reinforced by an authority system, is a necessary condition for the viability of any property regime. Private property would not work without the requisite authority system that makes certain the rights and duties are adhered to. The same requirements exist for common property and for state property. Without authority there can be no property. When the authority system breaks down, the coherent management of natural resource use can no longer exist. Under these circumstances, any property regime, whether private, common, or state, degenerates into open access (non-property).

A common-property regime entails exchange rights, entitlements over the distribution of net economic surplus accruing to the group, a management subsystem, and authority mechanisms as necessary components of the enforcement system. When any part of this complex system is undermined, the entire system malfunctions and ceases to operate as a property regime. It is indeed the management subsystem, with its authority mechanisms and

ability to enforce operating rules and system-maintenance provisions, that insures the particular property regime is adhered to, and that its systemic integrity (or system equilibrium) is well protected. This, in principle, is not different from the ways in which the other property regimes operate as authority systems. For instance, in private-property regimes the owner also relies on the authority of the state and its coercive power to assure compliance and hence to prevent intrusion by non-owners. If this (or other) authority would not be exercised, even private property would collapse and become an open-access regime.

Resource degradation in common-property regimes will usually arise for two reasons. The first is a breakdown in compliance with group rules by the members of the regime. This will often happen because of an increase in co-owners through population growth within the group. If economic opportunities beyond the boundaries of the regime are disappearing, then this disintegration in compliance with the rules of the regime may be difficult to prevent. If spreading privatization in the surrounding area precludes seasonal adaptation to fluctuating resource conditions—a problem of particular importance in semi-arid grazing regimes—then overuse of a local resource may be necessary for survival by members of the group. This problem represents a form of disintegration of the internal coherence of the property regime.

Secondly, if the government holds common property in low esteem—that is, if the state disregards the interests of those segments of the population largely dependent upon common-property regimes—then external threats to the regime will not receive the same governmental response as would a threat to private property. The willingness of the modern state to legitimize and protect different property regimes is partly explained by the state's perception of the importance of the citizens holding different types of property rights. If pastoralists are regarded as politically marginal then the property regimes central to

pastoralism will be only indifferently protected against threat from others. If those threatening pastoralist property regimes, for example sedentary agriculturists, enjoy more favor from the state, then the protection of rangelands under common property against encroachments for cultivation will be indifferent at best. This represents the disintegration of external legitimacy of the property regime.

D. Open-Access Regimes

Open-access regimes are devoid of any property rights—they represent situations of unowned resources (***res nullius***). Open-access regimes allow individuals or groups to make use of scarce resources without regard for the interests of others who may also seek to make use of the same resources—this was defined above as exercising *privilege*. Under open access, the first individual to make use becomes the beneficiary of the benefit stream arising from the resource. There are no property rights in open access, there is only the rule of first capture. Unlike property regimes where individuals and groups have both rights and duties, open-access regimes are fundamentally situations of no law. Everybody's access is nobody's property; a resource under an open-access regime belongs to the party to first exercise control over it. The investment in (or improvement of) natural resources under open-access regimes must first focus on this institutional dimension. If property and management arrangements are not spelled out in clear detail, and then if there are investments such as improved tree species or range revegetation, the institutional vacuum of open access insures that use rates will eventually deplete the asset and the investments will have been for naught.

Most environmental problems can be traced to a property regime that approaches that of open access (or, as seen above, presumptive rights). Pollution occurs because the

ownership of the medium—air or water—is in doubt. Fish are over-harvested because there are no limits on who may harvest fish. Groundwater is over extracted because there are no institutional arrangements controlling pumping. The same applies to oil pools, certain forested areas, and some grazing areas.

Open access results from the absence, or the breakdown, of a management and authority system whose purpose is to introduce and enforce a set of norms of behavior among participants with respect to that particular natural resource. When valuable natural resources are available to the first party to effect capture, it is either because those natural resources have never before been incorporated into a regulated social system, or because they have become open-access resources through institutional failures that have undermined former collective or individual management regimes.

III. PROPERTY REGIMES AS SOLUTIONS, NOT AS PROBLEMS

The solution to many environmental problems will usually start with addressing the problems that arise because of open access, or because of the presumptive rights that one party will claim to have. When air pollution regulations set new ambient air standards, a formerly open access resource comes under the legal structure of a state-property regime. Now an agency will specify the legislative intent as to what constitutes clean air, and it will develop a set of administrative rules and procedures to make sure that the intentions of the legislative process are realized. We may say the same thing about water pollution. If firms were, at one time, free to dump their industrial wastes into rivers, then they were making use of an open-access resource (under the pretense of a presumptive right). The advent of strict

water-quality standards represents a fundamental shift in the property arrangements over water. Now, industry must recognize others with an interest in water quality. These others, when the regulatory process has been completed, will have acquired a *right* to cleaner water, and industry will have acquired a *duty* not to contaminate water bodies below some declared ambient standard.

The fact that there may be a permit-trading system introduced to facilitate efficiency in achieving the new ambient standard does not change the fact that a regulatory action had previously redefined the property regime with respect to water resources. The instruments chosen—quantity restrictions on each plant's emissions versus marketable permits—are simply implementation refinements built into the new property regime.

All property regimes gain their legitimacy from judgments concerning social utility. Becker [1977] notes that any property regime must be understood at three levels: (1) the general level; (2) the specific level; and (3) the particular level.

At the general level it is easy to make the case that each type of property regime has its merits—depending on the specific circumstances. Indeed, when resources are not scarce then a situation of open access is socially optimal. We may think of the energy from the sun's rays in this category. At the specific level we must then turn our attention to which property regimes seem most efficacious in which situations. Finally, at the particular level, the choice will come in terms of the unique circumstances. To argue that pasture land in the valleys of Switzerland is best managed as private property is not to say that the Swiss summer pastures at 3,000 meters elevation are best managed as private property. Indeed, the Swiss have answered this institutional question by creating common-property regimes over the high mountain pastures [Netting, 1976]. The Swiss, like mountain people the world over, see something in

private-property regimes that is ideal for well-watered valley bottoms, but also find that common property is well suited to the ecological and social situations in the higher Alps.

There is, in the EEPSEA research program, an apparent interest in carrying out resource valuation studies.[5] If this aspect is to spread throughout the region, it will be important to make sure that the property rights issues are kept firmly in view. I have in mind the practice of estimating monetary values of natural resource damages. I will argue that the practice of determining willingness to pay (WTP) in contingent valuation studies is inappropriate under a correct reading of the property regimes in most environmental disputes.

We can imagine an interest in discovering the economic benefits of a program to improve the water quality in a body of water. This would be an example of a welfare-increasing event. Similarly, if the lake is now clean but threatened by the possible establishment of a chemical factory, some may suggest that we should attempt to estimate the benefits of preventing it from deteriorating in quality.[6] This is a possible welfare-decreasing event. In such instances, it has become the accepted tradition to use willingness-to-pay estimates to derive benefit measures. Indeed, some will insist that these WTP estimates represent the benefits of clean water.

There is another approach to valuation, though this alternative is less favored than those approaches that seek to discover estimates of willingness to pay. In the alternative approach, one seeks to learn what individuals would require by way of compensation to endure an event that would make them worse off. In the above example of possible lake pollution, one would seek to determine what individuals would require by way of compensation to allow the quality

[5] If the development of environmental economics follows the trend in North America, this line of research will expand to dominate the field in less than a decade [Vatn and Bromley, 1994].

[6] I am limiting the discussion to so-called "use values" of the body of water.

of the lake to be degraded by industrial discharges. Alternatively, individuals could be asked what level of compensation they would require in order to forego an event that would make them better off. Imagine that the lake is in a deteriorated condition and a group of citizens demands that it be cleaned up. If it is expensive to accomplish that clean up, perhaps the industry responsible for pollution would be willing to compensate those harmed by the pollution. Contingent valuation studies would be concerned with discovering the willingness to accept compensation (WTA) to continue to suffer a welfare-decreasing event, or to be prevented from enjoying welfare-increasing opportunities.

There are two possible economic measures here—willingness to pay and willingness to accept compensation—that fall within the class of empirical work known as the contingent valuation method. There is an intuitive plausibility to particular pairings of these two measures. It is logical to suppose that willingness to pay is the more appropriate measure when individuals face a welfare-enhancing choice. Similarly, there is some logic to the idea of determining the willingness to accept compensation for a welfare-decreasing event.

When a choice situation holds the promise of welfare gain it seems obvious that one should estimate the monetary value of the welfare gain by asking what individuals would be willing to pay to experience that welfare gain. This is certainly consistent with economic theory in general, and consumer demand theory in particular. Similarly, when faced with a welfare loss, there is a certain intuition to an approach that seeks to estimate what might be required by way of compensation to make that person whole. The difference in which approach—WTP or WTA—is followed is not trivial in terms of empirical estimates of monetary valuation. As noted in Ward and Duffield:

> ...Hanemann has recently shown that it is possible that willingness to pay and willingness to accept can differ substantially from each other and from ordinary consumer surplus, for cases of public goods with few close substitutes. Hanemann's work may provide an acceptable theoretical basis for the widely divergent estimates of willingness to pay and willingness to accept that have been found in practice [Ward and Duffield, 1992, pp. 200-01].

Ward and Duffield report that it is not uncommon to find that estimates of willingness to accept compensation—or compensation required—can be three to five times larger than willingness to pay measures for the same event.[7]

The argument advanced here is that the appropriate measure of resource value is a function of the perceptions of the appropriate *status quo ante*. In an example from Ward and Duffield, respondents were willing to pay only $3.50 to preclude the need for a dam (thus saving a scenic waterfall), but demanded $22.00 to accept the loss of the waterfall should the dam be built. That is, they seemed willing to pay less than one sixth the amount to avoid the destruction of a waterfall than they would require in compensation should the dam be built. Is it possible that the respondents frame the choice as paying to avoid the dam (rather than to save the waterfall) versus being compensated to tolerate loss of the waterfall? Hanemann concludes his study of this matter by observing:

> Thus, large empirical divergences between WTP and WTA may be indicative not of some failure in the survey methodology but of a general perception on the part of the individuals surveyed that the private-market goods available in their choice set are, collectively, a rather imperfect substitute for the public good under consideration [Hanemann, 1991, p. 646].

It is now well established that individuals value possible gains much differently than they value possible losses [Knetsch, 1990; Knetsch and Sinden, 1984; Tversky and Kahneman,

1981]. The problem in most environmental policy is to determine whether those answering contingent valuation experiments regard the choice situation as one of a gain or a loss.

When the property regime changes in response to public policy, it will usually alter the proper way in which the CVM should be applied. In the *status quo ante* we can assume that the legal structure was one of *privilege* with respect to the *no rights* of those suffering from pollution. New laws change the legal relation to one of *duty* for responsible parties, and to correlated *rights* for those adversely affected by pollution. Often these new rights will be protected by a liability rule—a necessary legal arrangement when pollution is accidental. Under rights protected in liability, an individual that violates the interests of others is liable for compensation to the injured party [Bromley, 1991, 1995].

To undertake estimates of natural resource damages by asking how much individuals would be willing to pay not to experience those damages is not dissimilar to asking how much individuals would be willing to pay to avoid being mugged in a dark alley.

Some authors recognize the inappropriate nature of willingness to pay measures: "Theory suggests that, if lost use values are measured by willingness to pay, compensation demanded ... will be understated [Ward and Duffield, 1992, p. 201]." However, they then suggest that:

> in hypothetical market applications, willingness-to-accept scenarios are often implausible. Respondents simply do not have experience with or cannot realistically accept the idea of being compensated for natural resource losses. For this reason, guidelines for implementation of contingent valuation have generally recommended use of willingness-to-pay formats [Ward and Duffield, 1992, pp. 201-202].

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[7] See also Stevens, et al.

We see, in other words, a defense of an inappropriate empirical measure not on logical grounds, but because the theoretically correct measure yields incoherent results. Ward and Duffield are not alone in the position that willingness to pay measures are appropriate for natural resource damage assessments. A panel convened by the National Oceanic and Atmospheric Administration has also endorsed this approach [Arrow, et al., 1993]. Despite the obvious logic of different valuation approaches for different choices faced by individuals, there is an overwhelming affinity for the willingness-to-pay approach in contingent valuation research.

This preference for WTP over WTA appears to be driven by a preference for empirical tractability over theoretical coherence. Put somewhat differently, we see an instance in which precision trumps accuracy. I note in passing that the "value" of natural resources is logically invariant to how we as economists undertake to measure that value. It is, therefore, meaningless to say that the value of a natural resource is measured by estimates of willingness to pay but it is not measured by estimates of the demand for compensation. All we can say is that both approaches yield different estimates of resource value—with those differences being explained by: (1) differences in how respondents perceive the context of choice; and (2) differences in how researchers structure survey instruments to accommodate that different perception among respondents. This means, as well, that both approaches yield different estimates of the "benefits" arising from the same complex of natural resources. For compensation purposes, this means that both approaches yield different estimates of the "costs" of damages to those natural resource complexes. It is, therefore, the legal context that is decisive in determining which empirical approach to follow.

Researchers are certainly justified in their concern that the wide variability in responses to questions about willingness to accept compensation are troublesome. However, empirical coherence will not be realized unless researchers apply the same diligence and care to this alternative approach as they have applied to the large and still-growing literature on willingness to pay.

Let me conclude by returning to the broader categories of EEPSEA research listed in Table 1—pollution, pricing, valuation, forestry, agriculture, rural development, and fisheries. The EEPSEA portfolio contains a large number of very diverse projects. We see rural sanitation issues, over-fishing, irrigation, recycling of livestock wastes, mining, pricing of electricity and urban water, watershed protection, the health consequences of pesticides, and many more. The breadth of this work is impressive, and it reminds us of the daunting environmental challenges facing many countries in Southeast Asia.

My comments here have been focused on the conceptual issues of property rights and property regimes in environmental problems. I could not possibly address the particular property issues in each of your 33 research endeavors. But I hope that the structure offered here will be useful as you seek to bring economic insight to the understanding of, and the solution to, these important environmental issues.

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