

as and bs:

Dynamics of Resource Use Among Property Regimes and States*

by Thomas Princen

School of Natural Resources and Environment, The University of Michigan

Ann Arbor, Michigan, USA 48109-1115; Ph: (313) 764-1320; email: tprincen@umich.edu

Abstract

This paper develops a model for analyzing interactions among different property regimes and among property regimes and states. The model rests on four premises of human behavior at the individual, group, and state levels: individuals are disposed to form restricted access property regimes--private or common; individuals tend not to "foul their own nests"; individuals deplete others' resources with little regard for long-term resource impacts and little attempt to moderate use of those resources; and state interests align with the interests of those who use others' resources.

The paper argues that although individuals tend to resist outsiders' appropriation of their resource, several factors mitigate against such resistance. These include: insufficient threat, monitoring benefits, favorable prices, state promotion, and jurisdictional distance. An especially important factor is the state and its imperative to generate revenues from convertible currencies. Introducing an outsider results in an increased aggregate discount measure, a strain on resource management, and a common currency that devalues self-organized restraint mechanisms. These results can occur when the exchange between regimes entails no gains from trade. They can be interpreted as the externalization of costs and the conversion of property regimes to open access. The paper concludes that the contemporary political economy is reaching a critical juncture ecologically whereby cost externalization and open access are no longer minor impediments to increasing wealth and prosperity.

*Paper prepared for the panel, "Multidisciplinary, Multilevel Approaches to Common Property Resources," of the Fifth Common Property Conference of the International Association for the Study of Common Property, Bodø, Norway, May 24-28, 1995.

The paper benefitted from the ongoing faculty seminar, "Durable Resource Use" and the 1994-95 masters seminar on common property both at the School of Natural Resources and Environment, the University of Michigan, USA. The comments of professors Raymond De Young, Bobbi Low, Robert Abrams, and Donald Mayer and masters students Rebecca Watts Hull, William Leach, and Jennifer Olsen were especially helpful. The School of Natural Resources and Environment and the Office of the Vice President for Research, both of the University of Michigan, provided financial support.

As work in progress, comments are most welcome.

8-15-95
WORKSHOP IN POLITICAL THEORY
AND POLICY ANALYSIS
513 NORTH PARK
INDIANA UNIVERSITY
BLOOMINGTON, IN 47408-3895 U.S.A.
Reprint files - CPL

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INTRODUCTION

The common property resource (CPR) literature has largely focussed on questions of internal management. To the extent external factors are included, the analysis aims to identify factors that facilitate or hinder internal management. Little attention has been paid to interactions among CPRs, let alone interactions among different property regimes or among property regimes and states.¹ In this paper, I develop a simple model for analyzing such interactions. The argument rests on several behavioral assumptions regarding resource use. These assumptions are stringent in the sense that they do not posit shortsightedness or inherently high discount rates or greed to explain patterns of environmental degradation. That is, the assumptions are deliberately chosen to be both accurate and generous with respect to resource conservation and yet show how individuals can nevertheless participate in practices that deplete a resource. The model thus points more to structural factors than to individual motives or the availability of technology and information. It

¹I use Daniel W. Bromley's definitions of property--a triadic social relation involving benefit streams, right holders, and duty bearers--and of property regime--human artifacts reflecting instrumental origins based on collective perceptions of what is scarce and what is valuable. "Commons, Property, and Common-Property Regimes," in Bromley, ed., Making the Commons Work: Theory, Practice, and Policy, San Francisco, Calif: Institute for Contemporary Studies Press, 1992, p. 4.

suggests that, to the extent structural factors are implicated in resource degradation, prevailing assumptions about growing populations or the human tendencies to increase consumption indefinitely or the inclination to play the free rider in collection situations are not sufficient to explain widespread, environmental deterioration.² The model rests on four premises of human behavior at the individual, group, and state levels.

First, humans in all societies are disposed to form restricted access property regimes--private or common--when migration is limited and the resource is deemed important to survival.

Second, humans tend not to "foul their own nests" -- that is, they do not deplete their own resources. Put differently, stewardship is perfectly "natural" when external conditions are stable, predictable, and supportive, and when migration is limited and the resource is deemed important.

Third, equally "natural" is the disposition to deplete others' resources, or, at least, to use others' resources with little consideration of the long-term resource impacts and with little attempt to moderate use of those resources.

Fourth, state interests align with the interests of those who use others' resources. In other words, states seek revenues from resource users and those revenues are most accessible where resources are exchanged among property owners and least accessible when used internally.

²See endnote for further discussion of the method employed and how it differs from conventional economic or resource approaches.

and, especially in common regimes, any spillover social benefits such as social cohesion that derives from collective management. At the same time, b_1 gains surplus value from R_A , assuming the costs of appropriation and transportation do not exceed the surplus value in which case b_1 would have no incentive to cross over.⁴ The important question, then, is, what impact does b_1 's external appropriation have on the extraction rates and management of R_A ? Put differently, what is the de facto aggregate discount measure when the appropriators are now all as plus one b ? Recall that R_A and R_B are identical and, to keep the model simple and symmetrical, that each society's skills and technologies are identical. In other words, questions of voluntary and mutually beneficial exchange are not relevant. The only issue at this point is whether an outsider, all else equal, affects the total appropriation behavior regarding a given resource. The assumption here is that it is the behavior of all users, those inside and outside of the management regime, that constitutes the analytically relevant appropriation behavior and its impact, whether or not all users make the management decisions.⁵

⁴For reasons that will become more apparent shortly in the argument, I restrict the term "surplus value" (SV) to those values that can be extracted by others. In practice, these values will be largely tangible and monetary. They will not include social cohesion, trust, and so forth.

⁵To preview the full argument, this assumption allows one to analyze more complex economic relations for ecological impact. At a minimum, accounting for the impact of all users forces the analyst to consider that no production or consumption decision is divorced from its natural resource base no matter how abstract or how much "value added" there is. Consequently, no assessment of sustainability can ignore the impacts on basic natural resources and no amount of pollution prevention or green production can be sustained if natural resources are being depleted or waste sinks filled. See the methodological endnote.

The first general proposition, then, is that the effective discount measure of all appropriators with respect to R_A increases with the addition of an outside appropriator; as a result, the likelihood of overharvesting and depletion increases.⁶ That is, assume an aggregate discount measure can be estimated (or inferred) for a set of appropriators and that an additional appropriator (internal or external) affects that measure. Further assume that, although an outsider's (b 's) discount measure for its own, self managed resource (R_B) is comparable to that of the insiders' discount measure (a 's measure for R_A), when the outsider uses the other's resource, its effective measure is higher. In other words, we discount another's resource, all else equal, more than our own.

In short, all else equal (individual and collective preferences, the nature of the resource, the cost of appropriation, available technologies, and so forth), an outsider always increases the likelihood of depletion. This result follows only from examination of the collective appropriation decision and the time frame applied by its users. It also holds even if total use in a given time frame is unaffected by b 's additional extraction. The primary concern is that, over time, b applies a higher discount rate than the average a . As a result, b 's extraction is more likely to be more risk seeking, more likely to push the resource to the limit. This tendency will be heightened if, as would be

⁶Assuming again that an aggregate, or averaged, discount measure can be estimated (or conceived of), the addition of an insider would not have such an impact as, all else equal, the expected discount measure of the individual would be the same as that of the group average.

expected, feedback from RA to the bs is inferior to feedback from RA to the as.⁷

The result of increased likelihood of depletion is also stronger if we surmise that outside intervention disrupts social mechanisms, including resource management mechanisms and their external institutional support structures, each of which may be delicately balanced. The fragility of such resource management may be especially high in CPRs.

Under these conditions, it is hard to imagine why any group of appropriators with a successful, on-going resource management regime would allow an outsider to appropriate its resource. The incentives to resist would appear to be considerable. But at least five factors mitigate against such resistance: insufficient threat, monitoring benefits, favorable prices, state promotion, and jurisdictional distance. These appear generalizable to many seemingly complex historical and contemporary patterns of resource degradation that involve interactions among resource regimes and among resource regimes and states.

THE MITIGATION OF RESISTANCE

i. Insufficient threat. The first mitigating factor against resistance to outsider appropriation is simply that the extraction rate of the outsider is not large enough to threaten the resource or the management structure. Outsider appropriation may diminish the appropriation level for the insiders but the costs of monitoring and enforcement may not warrant doing

⁷This formulation precludes long-term, well-enforced contractual access to the other's resource which would best be seen as a transfer of property rights. Here, I only wish to highlight the differential effects of appropriation by insiders and outsiders.

anything about it. Alternatively, the insiders have built in enough cushion or buffer to accommodate such use.

ii. Benefits to monitoring. The second factor is the attentiveness that encroachment encourages among appropriators. Boundary maintenance is critical to both private and common property regimes, but it is costly. Without challenges, the natural inclination is to relax one's guard. Doing so, however, makes the property regime vulnerable to a major challenge. Occasional intrusions, even if they temporarily deplete the resource, can, therefore, actually have net benefits by compelling the appropriators to maintain their vigilance.⁸

These first two factors are consistent with what I will call an invasion metaphor of inter-regime dynamics. This metaphor suggests that outsiders come to extract or exploit, leaving nothing for the insiders. It also suggests some degree of coercion. An alternative metaphor is exchange, implying that both sides benefit in some way and that the interaction is voluntary. A priori, interactions between property regimes that follow one metaphor or the other are not more destructive of the resource. There is, however, a prevailing view in the dominant discourse on political economy, especially among globalization proponents, that exchange is beneficial, or is neutral at worst, with respect to resource degradation and that it indeed does confer net gains, mutually, if not equally. My intention at this point in the argument is to show that other mechanisms may be at work beyond mere exchange and its presumed benefits. That is, what appears to be exchange can be, in effect, invasion. Later, I will argue that exchange can be interpreted as conversion to open access and the externalization of costs. From any of these perspectives, the interaction is not only the

⁸Raymond De Young, personal communication.

appropriation of another's resource in return for some other resource or skill or technology, but the jeopardizing of the resource biophysically, managerially, and socially. It is an exchange not just in substitutable resources and goods but in different and incommensurable attributes of each individual's utility function, a function that includes the desire for predictability, for economic security, and for the long-term stewardship of the resource. I proceed, then, by considering the conditions under which exchange is welcomed and yet can, over time, undermine the material well being and, as a result, the social stability, of a society.

iii. Favorable prices. The third factor mitigating against resistance to outside appropriation and one coming under the exchange metaphor is favorable prices or favorable terms of trade. In the hypothetical situation described to this point, there are no material gains from trade because the resources are identical ($RA = RB$) and each society's endowment is the same.

An outsider, b, can only offer something else, say, capital accumulated from its resource extraction or specialized skills or unrelated activities such as entertainment.⁹ This single step, the intervention of an outsider with something to exchange, thus requires Society-A to generate an extra margin of resource units. That is, it must divert a portion of what was previously

a sustainable level of resource use and it must adjust its resource management to accommodate that diversion. The organizational dynamics of contraction, as opposed to expansion or maintenance, thus enter. When a property regime is stable, when it has built in a large margin of error in its management structure, and when it is well buffered from external shocks (eg., natural disasters), this adjustment may be easy to carry out. But if the regime is at all fragile either for internal or external reasons, this single, maybe small, step, can jeopardize the regime and the resource.

Even with favorable prices, therefore, a's acceptance of b's offer compels the as to adjust their resource use downward or increase the riskiness of their use. Perfectly rational individuals will, of course, optimize across this trade-off, increasing the risk to their own resource in exchange for other values. All other individuals, however, including the misinformed, the desperately poor, and the tempted, will easily overextend. They will forego their resource independence for the lure of external values (eg., capital, skills, technologies, luxury goods, entertainment). Such risk seeking behavior may not be a problem when the resource being risked is plentiful or resilient or capable of recovering should the external value be fully consumed or rendered unavailable. But if soil erosion, species loss, aquifer drawdown or other ecological changes characterized by irreversibility and non-substitutability are the result, this society is severely affected by what, from a simple, non-ecological, exchange perspective, appears to be a minor and mutually beneficial interaction. What appears to be

⁹These assets can, of course, be construed as the differences in endowments that provides the basis of trade. For the time being, however, I consider only those gains from trade that center on tangible, natural resources, not abstract entities such as capital and skills. This may not be consistent with the tenets of conventional trade theory but, because the research question relates to material resource use, it does help separate what, from an ecological perspective, is substitutable and what is not. It highlights the fact that although many goods are substitutable, many ecological services are not (eg., UV protection, water filtration, topsoil regeneration).

favorable prices is, in the long term, a threat to the resource. *b* has become an intruder.¹⁰

iv. State promotion. The fourth factor mitigating against appropriators' resistance is the State. To begin, assume the State is a revenue-seeking agent which seeks to secure its autonomy vis a vis its own societies as well as other states. And assume to begin with that *R_A* and *R_B* and their respective societies, Society-A and Society-B, are located within the State (Figure 2). The State can pursue roughly three strategies to generate revenues from *R_A* and *R_B*. First, with ultimate coercive authority, it can expropriate the land as state property and manage and use the resource as it sees fit. But if the State elects to allow private or common property regimes to continue, it can only generate revenues indirectly.

The second strategy, then, would be to demand revenues from Society-A and Society-B. With each society using its resource entirely internally, this strategy will be difficult to implement and enforce because resource knowledge is held locally; the opportunities for strategic misrepresentation by each society vis a vis the State is large. Moreover, if each society deals in its own "currencies," broadly construed, the State may simply have nothing useful to appropriate. For example, if Society-A used its forest strictly as a woodlot to cut cordwood for residential heating, the State would have limited use (unless it heated government buildings with wood). Possibly

¹⁰Notice that a premise of the entire set-up for this argument is that the baseline is a sustainably managed property regime, private or common. It is an ecologically constrained situation where there is not always a frontier, not always a resource to move to after overharvesting, not always a place to deposit wastes. I take this to be a fair characterization of the contemporary scene and one that provides a crucial context in which to explain patterns of degradation.

more to the point regarding sustainability criteria, if one of Society-A's currencies is, say, reputation and, specifically, a reputation for not cheating on the maintenance and appropriation of the resource, the state has no way of appropriating such a value. Reputation value is completely endogenous. What is more, its "production" in Society-A is, to some extent, at the expense of the production of the maximum resource units -- at least in the short term. To illustrate, the empirical CPR literature typically concludes that the resource in question is not being used "efficiently." Irrigators could build better dams, fishers could time their rotations better, and foresters could harvest older trees. In part, such inefficiency represents a trade-off the appropriators make against the vicissitudes of long-term, durable management. The appropriators forfeit maximum yield per acre, say, for optimal, or secure, yield over time. It is a trade-off that provides no value to an outsider, including, as modeled here, the State. This inability of the State to appropriate values from a resource regime therefore suggests a third and, likely, most profitable, strategy for the State: exchange.

The State has an incentive to encourage exchange between Society-A and Society-B for the sole reason that exchange compels the traders to devise a tradable currency, which is to say, one that the State is able to tap into. If *b* does indeed offer Society-A capital or skills or entertainment in exchange for the use of *R_A*, and if both Society-B and Society-A need the State to enforce the contract, the State has the opportunity to, in effect, exact tribute.

The key distinction here is that, without exchange, each society organizes itself, restraining its potential resource use with its own monitoring and

enforcement mechanisms.¹¹ Such restraint is required for ecologically rational management--that is, management that encourages feedback, that does not solve degradation problems by displacing them, and that encourages meaningful involvement of the full range of stakeholders.¹² Such management stands in contrast to what appears from the outsiders' perspective to be inefficiencies. With outsider appropriation, the resource can indeed be more "efficiently" harvested because self-imposed constraints have been eased and the long-term management costs have been avoided. By relying on the State for enforcement each society forfeits one element of its restraint.¹³ The appropriators' trade-off thus shifts from secure production over time to maximum yield per spatial unit or unit of labor.

The State encourages such exchange and sets up the legal and administrative machinery to facilitate it because the more it does so, the more revenues it generates and the more autonomy vis a vis other states and vis a vis Societies-A and -B it acquires. In so doing,

¹¹Self-organization is most pronounced among common property regimes but private property regimes need a degree of common self-organization and maintenance to get started and to survive as well. Thus, if private property evolves out of open-access or common or state property, some subset of the private owners must act collectively to establish the regime. See Carol M. Rose, Property and Persuasion: Essays on the History, Theory, and Rhetoric of Ownership, Boulder, Co: Westview, 1994, pp 37-39.

¹²For discussion of these three criteria of ecological rationality, see Thomas Princen, "Getting on the Ban Wagon: Ecological Rationality and the Zero Option in World Environmental Politics," under review.

¹³Outside appropriation not only reduces currencies but reduces stakeholders. That is, only those who can deal with other property regimes or with the state can inject their values into the decisionmaking. Reduced stakeholders may be useful for the state as, among other things, it probably reduces the transaction costs of revenue extraction. But it violates a tenet of ecological rationality, namely, that all stakeholders, all who benefit and all who stand to be harmed, have a voice in the decisionmaking.

the State necessarily imposes a short-term perspective because it has only one currency, revenues, and, as modeled, one overriding goal, revenue maximization.¹⁴ This is unlike Societies-A and -B which are optimizing across a range of values employing a number of currencies, including reputation, reciprocity, and social cohesion, all of which necessarily entail long-term, constitutional and institutional concerns. The usual currency of exchange and hence revenue generation--money--has no such values and, hence, reinforces short-term views. What is more, money is context-free. It represents social and ecological values imperfectly at best.¹⁵ A system of restraints based on money requires rules of access and appropriation completely different from that based on dense social and ecological networks as described in much of the CPR literature, one of the few literatures that documents patterns of long-term, durable resource use.¹⁶

Returning to the question of an outsider's impact on resource use, we can now see that RA suffers a kind of triple jeopardy. As shown, the mere mathematics of introducing an outsider results in an increased aggregate

¹⁴If one disaggregated the state and considered it, for example, a representation of interest groups, the effect on resource appropriation would, in most instances, be even greater. That is, industrial development interests generally prevail, albeit often with environmental concessions. I thank Bobbi S. Low for bringing this point to my attention.

¹⁵Scott Atran (personal communication) makes this point from an anthropological perspective; Robert L. Heilbroner (Behind the Veil of Economics: Essays in the Worldly Philosophy, New York: Norton & Co., 1988) makes it from an economic perspective.

¹⁶On the replacement of direct feedback with density and redundancy in the context of ecological rationality, see John S. Dryzek, Rational Ecology: Environment and Political Economy, Oxford: Basil Blackwell, 1987; and Barbara Welling Hall, "Information Technology and Global Learning for Sustainable Development: Promise and Problems," Alternatives 19 (1994) 99-132.

discount measure with respect to R_A . Next, voluntary exchange puts a strain on management. Now, the State introduces a currency that devalues self-organized restraint mechanisms.

It is important to stress that this result follows when R_A and R_B are identical and when their costs of extraction are identical, and, for that matter, when the endowments and skills of the two societies are identical. In other words, the State has an incentive to promote exchange even when there are no gains from trade. And any outside appropriator, "b", has a comparable incentive to promote exchange if it can discover a means of appropriating another's resource, R_A , without paying the cost of management and, eventually, of depletion. Under an invasion metaphor, this result is straightforward and expected. Self-interested individuals, human and non-human, seek low-cost resources from others even when, or especially when, it is at the others' expense. What is less obvious in the prevailing discourse of globalization and economic expansion, is that this result also follows from the exchange metaphor. Free and open voluntary exchange can, under these minimal assumptions (societal self organization for durable resource use; state's interest in revenue generation; different currencies between society and state) result in resource depletion, and all without resorting to notions of greed or ignorance or shortsightedness.

The only brake on such a process would be the State's interest in ensuring a long-term flow of revenues. If ecological and social feedback mechanisms are adequate, or if decisionmaking is oriented to the long term--say, toward nation building rather than positioning for the next election--such restraint by the State might be expected. But if the costs are obscure or delayed over time as with the health impacts of

persistent toxics, the irreversible depletion of deep soil and large aquifers, and the loss of biodiversity, we would expect to see pressure towards short-term revenue generation. Thus, states typically act to protect depleted fisheries and, to varying degrees, to preserve scenic vistas and historical sites because the feedback is direct and immediate. They are much less effective at reversing trends in land conversion, non-biological pollution, and global warming. States will, however, attempt to address their immediate depletion problems by extracting revenues from resources outside their jurisdictions where feedback is minimal at best. This consideration leads to the fifth condition mitigating against a society's resistance to outside appropriation, the jurisdictional or cultural separation between Societies-A and -B and their respective States.

v. Jurisdictional distance. When the resources and their respective societies of appropriators are found in different States and when appropriators cross boundaries (see Figure 3), feedback is hindered. Thus, if State-B encourages its bs to trade with Society-A, little in the exchange relationship allows for restraint in resource use. More trade is generally better for State-B assuming favorable terms of trade. And even if State-B was concerned about the depletion of R_A , it cannot compel Society-A or State-A to restrain its use. Most important from the perspective of strategic interaction, when other states (State-C, State-D, State-E, . . .) and their appropriators are potential users of R_A , problems of collective action make it irrational for State-B to withhold use of R_A . Logically, then, all states would have to agree to restrain use. This is, in effect, what happens regarding trade in certain endangered wildlife under CITES or whales under the IWC. But such examples of restraint are overwhelmed by states' promotion of the trade in virtually all other natural resources and their manufactured products. In sum, the

incentives for states to promote revenue generating trade regardless of resource impacts are considerable.

Finally, if these incentives exist for the hypothesized State-B then they exist for all states. Each state has an incentive to promote the exchange of its own societies' resources (to extract revenues domestically) and each state has an incentive to encourage the extraction of surplus value from other states' resources. In either case, the means could follow either the invasion or exchange metaphors. Only under extreme conditions--eg., the endangerment of charismatic megafauna such as the African elephant or the blue whale or a clear and imminent threat to stratospheric ozone--will states override such incentives.¹⁷ In sum, under conditions where states promote exchange and ever-increasing levels of exchange, the aggregate tendency to exploit most resources beyond sustainable levels is virtually inexorable. The connections between exchange and depletion are mostly invisible, however, due in part to the fact that, on one hand, costs are externalized in time and space and, on the other, what appears to be mutually beneficial and voluntary exchange is, in reality, the conversion of property regimes to open access. I, therefore, next interpret exchange as cost externalization and the creation of open access.

¹⁷Even, then, these cases can be explained by incentives other than pure environmental protection. Wildlife protection has low political and economic costs. The Montreal Protocol only applies to known ozone depleting substances. It allowed industry leaders to shift products while maintaining, if not increasing, market share. Kenneth A. Oye and James H. Maxwell, "On Reconciling Particularistic and General Interests: Managing Distributional Effects of Environmental Regulation," January 18, 1994, paper prepared for conference, "Heterogeneity and Collective Action: Local Commons and Global Cooperation," in the proceedings for the workshop held at Harvard University, "Linking Local and Global Commons," April 23-25, 1993.

FROM EXCHANGE TO EXTERNALIZATION AND OPEN ACCESS

What happens as b appropriates more and more of R_A or more and more bs get into the act and appropriate R_A ? As shown, R_A is threatened in this two-resource, two-society world. But at some level of appropriation activity, bs ' efforts to extract R_A will detract from their ability to manage their own resource, R_B . This could jeopardize their management regime and the resource itself. If the surplus value from R_A is large enough, however, Society-B may not perceive, or care about, the threat to its own resource. Recalling that R_A is equivalent to R_B in all material respects except that the outsider does not pay the management costs, in this scenario, Society-B has thus exchanged the high-cost, but dependable, values of R_B for the low-cost SV of R_A . Consequently, Society-B gains the extractable values of the resource, say, the wood from the forest, but forfeits, or risks, all other values including social cohesion and economic security associated with managing its own resource. Society-B is, in effect, trading long-term economic security (the value of R_B plus associated social values) for short-term material wealth (extractable SV_A). In growing economies with abundant resources and a never-ending frontier, this is not a problem. In an ecologically constrained world, such tradeoffs risk the material underpinnings of an economy and the social glue of a society. Three conditions that favor such a tradeoff stand out.

The first is when SV_A is large for bs relative to all values of R_B . This could happen, for example, when extraction of R_A is easy or as put up little resistance or the terms of trade are highly favorable.

The second condition is when the management costs of R_B are significantly higher than that of R_A . If R_A and R_B are truly identical resources as posited, then management costs could vary with the nature of the property rights and with the use of surplus values. For example, we would expect that the more the resource is managed in common (as opposed to private), the higher the management costs for each appropriator. Under private ownership, the State picks up a large share of the aggregate management costs through its legislative, judicial, and administrative machinery. Thus, if R_B was managed in common (high management costs) and R_A was private (low management costs), bs would have an incentive to appropriate R_A , all else equal. Similarly, if, say, Society-A applied its SV_A to infrastructure to facilitate the management of R_A (and still managed the resource sustainably) while Society-B applied its SV_B to entertainment, we would expect higher management costs for Society-B.

The third condition favoring the trade-off of material and social values is the absence of negative feedback. bs' extraction of R_A provides little negative feedback. And Society-B's neglect of its own R_B may result in little feedback as well if the costs of neglect are obscured, delayed, or displaced. This is typical of deforestation, for example.

These conditions suggest that it is possible, in fact, perfectly "rational" from an economic perspective, for one country to neglect or deplete its own resources if it can find ways to extract other countries' resources. Moreover, because the argument is symmetrical with at least some of the favoring conditions, we could actually expect to see countries extracting each others' resources (even if identical) while neglecting their own. And they

would do all this with no gains from trade. What is more, they would count the short-term bonanza, call it voluntarily derived joint gains, and miss the long-term social and ecological costs. How can this be explained?

First, it is important to stress that what underlies this dilemma is not the collective action problem or the difficulties of finding a contract zone.¹⁸ Rather, the underlying problem is the equation of extractable values (eg., timber) and non-extractable values (eg., trust in restrained use of timber), on the one hand, and the displacement of ecological costs, on the other; in short, the externalization of costs. And what distinguishes cost externalization from problems amenable to economic, legal, or administrative solutions is that externalization is fundamentally an ecological problem. Equating all values--which is to say, reducing them to one--violates the irreducibility of ecological problems, on the one hand, and displacing costs--that is, passing them on to others in time or space--violates the connectedness of ecosystems, on the other.¹⁹ Thus, the dilemma is characterized by an asymmetry in ecological costs over time and space, an asymmetry that is exacerbated by external appropriation (bs in R_A) and, in practice, by attempts to implement universal schemes of management--eg., state resource policies, foreign aid, openings to global markets.

Second, when Society-A allows bs to appropriate R_A , it is, in effect, reorganizing its

¹⁸For development of these problems in the context of interstate bargaining, see Oran R. Young, International Cooperation: Building Regimes for Natural Resources and the Environment, Ithaca, N Y.: Cornell University Press, 1989.

¹⁹On the special features of ecosystems and their incompatibility with conventional problem-solving approaches, see Dryzek, Rational Ecology, 1987.

aggregate management regime from all as to as-and-bs. The more that bs appropriate RA without paying management costs and long-term depletion costs, the less RA is a managed property regime with appropriation rights and responsibilities (private or common) and the more it is, in effect, open access. That is, the prototype open access resources may be deep sea fisheries and the atmosphere where property rights cannot be assigned and where users assume little responsibility for resource maintenance. But any property regime can become open access when, among other things, its members fail to maintain boundaries to the resource and to its users or fail to restrict use of the resource.²⁰ The result is always the same assuming sufficient demand and technology: degradation. There may be cases of deliberate conversion to open access where the state formally withdraws private or common property rights, in effect, removing the fences. More often, but less obvious and possibly more significant, are cases of conversion from a de jure property regime to de facto open access. A general indicator would be evidence that users only claim rights of access but assume no responsibility for maintaining the resource. An example of such de facto conversion and one consistent with the invasion metaphor is state logging concessions to non-residents when forest residents' livelihoods are jeopardized. The concessionaires cross the boundaries of the resident peoples and extract timber but never take responsibility for maintaining that

²⁰This may be an overly liberal use of the concept of open access: if a resource is not maintained it is open access. Conceptually, it may be more useful to think of the three predominant property regimes--private, common, and state--as located on two continua. The first is the nature of the actors ranging from single owner to small group to a representation of the largest group in the international system, the state. The second is the degree to which use is restricted, both from internal and external use. The less the restrictions the more a private or common or state property regime resembles open access rather than a managed property regime.

resource. The state not only grants the concession but enforces it where necessary with coercion.²¹ An example consistent with the exchange metaphor is the offer of income to rural poor to store hazardous waste. With huge disparities in information and employment options between waste producers and residents, these residents are effectively opening their land to "overharvesting" vis a vis the persistent toxicity of the waste, converting it from, say, pasture or even human waste disposal, to long-term non-use. Once again, instances under the exchange metaphor will be least visible but most threatening to property regimes and sustainable practices. A general proposition is that de facto conversions to open access will be more prevalent to the extent bargains are asymmetrical or Faustian. State-led offers from concessionaires to forest residents for the clearing of their forest are asymmetrical; waste hauler's offers to peasants to accept toxic chemicals are Faustian. Both destroy the social organization necessary to sustainably manage the forest or land.

CONCLUSION

In this paper, I have developed a stylized depiction of resource use where the initial conditions of secure property rights and resource dependency predict long-term durable use and the conditions of exchange and state involvement predict short-term use with the threat of depletion. My intention has been to highlight through a simple, highly abstracted model with stringent behavioral assumptions for individuals, groups, and states the incentives actors have to deplete resources. In particular, my intention has been to show

²¹For analysis of such activities in Kenya and Indonesia, see Nancy Lee Peluso, "Coercing Conservation: The Politics of State Resource Control," in Ronnie D. Lipschutz and Ken Conca, eds., The State and Social Power in Global Environmental Politics, New York: Columbia University Press, 1993, pp. 46-70.

that degradation can occur even when there are material gains from mutual and voluntary exchange and the accumulation of wealth, gains, at least, in the short term.

These incentives and the degradation that results tend to develop when the dynamics between property regimes and between property regimes and states overwhelm the dynamics within property regimes. That is, an underlying assumption has been that property regimes for sustainable resource use are perfectly "natural"; they are readily constructed employing local ecological knowledge and adapting social structures including boundary maintenance and locally tailored decision-making rules. If degradation is indeed inexorable, it is only because the dynamics between regimes violates the dynamics within regimes.

In some sense, the story is familiar. States are self-interested, power-maximizing entities that seek riches from all sources, domestic and foreign. The world has a long history of overharvesting at home followed by adventures abroad.²² But the second half of the 20th century may be unique in at least two respects, suggesting that the underlying mechanisms of resource depletion are not the same as in the past and thus not obvious and that they are potentially catastrophic over the long term.

The first distinguishing feature of this period is that there are few, if any, resource frontiers. One cannot assume there will always be another forest to cut, a body of water to absorb effluents, or an aquifer to mine. The largest timber importer in the world, Japan, has contributed significantly to the deforestation of SE Asia

and is now moving into South America, Africa, and Siberia. As large as those forests are, they too will be depleted. In other words, the familiar story of economic expansion and resource exploitation comes to a critical juncture when resources are depleted and, especially, irreversibilities are incurred. Replanting, for example, will not restore a host of values associated with forests, including biological and cultural diversity. At this juncture, states cannot assume unending revenue sources. They and their economic agents ("bs") can, however, delay the time of reckoning via technological innovation and the displacement and obfuscation of costs. This, arguably, is what is happening in the contemporary political economy.

Thus, the second feature that distinguishes the current situation is the widespread belief that more of the same--more GNP, more trade, more foreign investment, more state revenues, more regulations, more treaties, more organizations--will solve the global ecological crisis. The model presented here sees restraint in resource use coming primarily at the local level, not through these large-scale processes. That is, private property owners and CPRs provide the only known examples of long-term durable resource use--and, then, only under certain, possibly increasingly rare, conditions. These conditions include secure property tenure, the ability to draw effective boundaries, and manageable penetration by outside forces, especially global markets. The larger inter-regime and regime-state dynamics are mostly antithetical to such conditions. To construct a theory of, say, global sustainability on the premise that states can continue such dynamics yet fine tune them is wishful thinking at best. A theory of sustainability must be grounded in biophysical conditions and well-established behavioral patterns. If the only examples of durable use we have are small-scale private and common property regimes,

²²Donald Worster, ed., The Ends of the Earth: Perspectives on Modern Environmental History, Cambridge: Cambridge University Press, 1988.

then such examples must be the starting point analytically for such a theory (see endnote on methodology).²³

As for applications, the onus for every interaction between property regimes and for every state intervention into durable property regimes is on the interveners to show that the aggregate discount measure of all its users does not increase with respect to the resource. It is not enough to show that some of the users benefit, let alone that some benefit in the short term. The relevant calculation must be with respect to all users, inside and outside of the property regime, and over the long term. This stipulation is consistent with stakeholder notions in general but is grounded in the commonsensical observation that the fate of a resource depends on the net sum of all decisions made about its use. If resident forest peoples have a discount measure approaching zero for their forest and they then "voluntary" log it in exchange for monetary income, the appropriate discounting of the resource must include that of the traders, which is extremely high.

This is a bottom-up approach but not in the sense that localities solve their environmental problems and then their successes are somehow multiplied through education and imitation. It is bottom up in the sense that all interventions by states, by "bs", by their various agents whether transnational corporations or intergovernmental organizations, are presumed guilty of raising discount measures, that is, guilty of threatening both the resource and its management structure unless

proven otherwise. Moreover, the analysis developed here helps provide localities the tools for distinguishing material and non-material costs and benefits, short-term and long-term effects, and the nature of asymmetrical and Faustian bargains.

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METHODOLOGICAL NOTE -- ESTABLISHING THE ANALYTIC BASELINE

The model developed here, like all abstract representations that attempt to isolate a few key variables, rests on a set of initial conditions. To some extent these conditions are necessarily arbitrary: one must start somewhere. But a model is stronger to the extent its initial conditions are determined by the research question posed. Thus, Adam Smith was trying to characterize the differences between craft-based production and industrial production and chose the pin factory as his prototype. The initial conditions led to a model of the firm and modern markets.

The research question here relates to the puzzle of how it is that societies can depend on natural resources for the material underpinnings of their existence and yet destroy those very resources, often knowingly. The approach presumes that such destruction relates to issues of economic production and consumption and ownership, as well as to the manipulation of demand. It also presumes that not all factors of production are alike (as economic thought is inclined to do). Natural resources are not infinitely available nor infinitely substitutable among themselves or with human capital. Natural resources are the foundation for all other factors of production and, hence, of all economic activity, no matter how value-

²³ An area ripe for research is to conceptualize "local" in both biophysical and social terms. A variety of literatures emphasize the local but, to this author's knowledge, little systematic work has been done, conceptually or empirically, to sort out its meaning for long-term, social and biophysical resource use, that is, for questions of sustainability.

added, how information based, or how abstract.²⁴ An analysis of the economic sources of resource degradation, therefore, must rest on, and start with, fundamental resources and their use.

In this model, then, my initial conditions are actual, sustainable practices, not some hope-for ideal, but well-documented, theoretically grounded instances of long-term resource use. These come largely from the CPR literature, although I suspect there are large numbers of privately managed instances, as well.²⁵ I do not choose instances of environmental amelioration (pollution control, eg.) nor laws and treaties that ban an activity (phase-out of ozone depleting substances, eg.). These may tell us something about slowing some trends in environmental degradation. But they tell us nothing about reversing those trends, let alone about promoting sustainable use.

The baseline, biophysically and socially, therefore, is sustainable practices, regardless of their scale, their ubiquitousness, or their level of technology

²⁴ A parallel conceptual distinction is being developed in the field of risk analysis. Rather than assuming that all risks can be quantified with a single measure, eg., expected value, analysts are coming to realize that individuals legitimately perceive different qualities of risks and these cannot be compared. Threats to children, for example, are not comparable to threats to informed, functioning adults. Similarly, then, resources that provide essential ecosystem functions such as UV protection and temperature moderation are not comparable to those that add commercial value to a computer chip. Marie Lynn Miranda, personal communication.

²⁵ Small, family-owned timber operations appear to qualify but, to my knowledge, no systematic literature exists on them. Natural rubber production does, as well, where 75% of all such rubber is produced by small holders in polycultural plots, not monocultural plantations and this production with sales to world markets has been going on for at least a century. Michael R. Dove, "Rice-eating Rubber and People-eating Governments: Peasant versus State Critiques of Rubber Development in Colonial Borneo," Ethnohistory (forthcoming).

or wealth creation. That is, just because the CPR literature deals largely with small-scale, rural, often isolated and low technology cases and the dominant economy is large-scale, urban based, global and high technology, it does not follow that the path to sustainability will follow from the latter. Quite the contrary, if, as the CPR and other literatures show, the conditions for sustainable use are unlike that of the contemporary political economy, then restructuring for sustainability must begin with what we know works, not what we wish will work--i.e., more of the same, more industrial development, but somehow ecologically integrated.

With these initial conditions, one question becomes, how can sustainable practices be subverted? How, if resource users have had successful experience with sustainable use, can they then change their practices and jeopardize the resource? Notice that posing the question this way does not presume that all, say, pre-industrial societies were sustainable. Rather, the model starts with the real possibility of sustainable practices--that is, well established in the relevant literatures--and asks under what conditions economic agents will undermine those practices. By selecting these initial conditions and making a few behavioral assumptions (again, well established in the literature), the model points to general, possibly universal, factors contributing to degradation. What is more, the simplicity of the model allows the analyst to avoid resorting to the often empty notions of "greed" or "lack of political will" or to problems of insufficient information, skill or technology to explain degradation.

A second question relates to the relevant kinds and levels of interaction. I choose interactions among property regimes rather than among property owners to emphasize resource based, cultural conflicts. Conventional analysis, whether economic or legal,

employs individuals as the unit of analysis and, to accommodate cultural and political differences, states as aggregations of individuals (eg., trade theory, finance, international development). Here, by contrast, I employ "society" as the unit of analysis implying that what is important from a sustainable use perspective is the social organization of property rights and responsibilities. What is more, the relevant level of social organization is sub-state or "local." This approach also puts the state as largely separate from these societies, as a protagonist to some, an antagonist to others. It does not presume that state interests and a society's interest correspond nor that the state will represent a society's long-term resource interest vis a vis other societies and other states.²⁶

In short, this approach is absolutely contrary to conventional approaches to environmental protection and, especially, global change. It is important to emphasize, however, that the choice of the unit of analysis is not arbitrary nor designed to assure a particular logical outcome. It is grounded in precisely what evidence exists for long-term durable resource use. And that evidence is not of sustainable practices imposed by states (with the possible exception of some state lands and waterways) but of sustainable practices organized by and for resource users themselves. Self-organization, I stress, is not just an ideologically convenient element in this analytic baseline. It is a defining characteristic of resilient ecological and social

systems. That they come together in small-scale, durable systems is probably no coincidence.

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Figures 1, 2, 3
Property Regimes, Users, and States

Figure 1

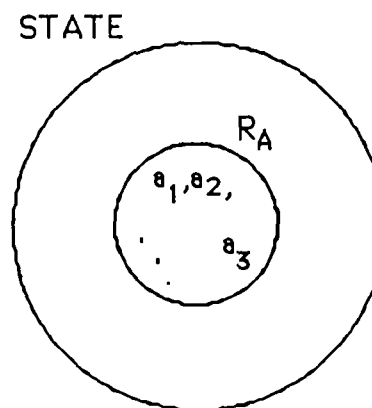


Figure 2

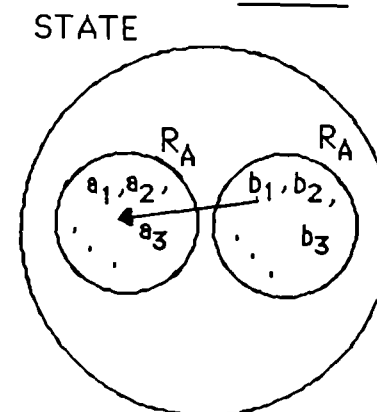
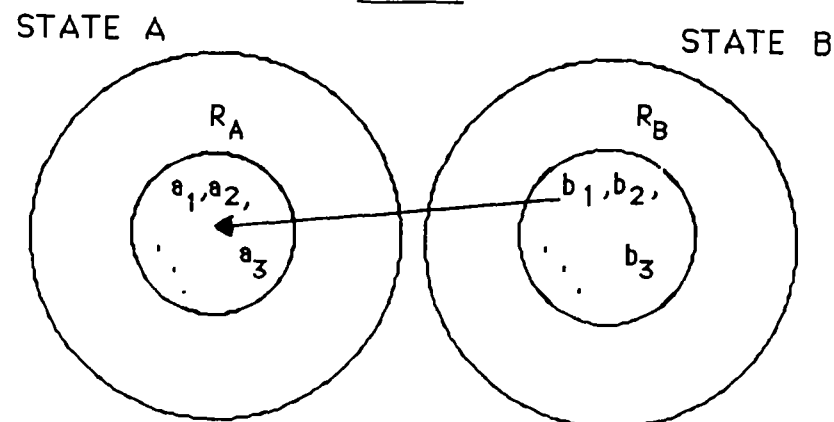


Figure 3



²⁶Such assumptions are intrinsic to global management approaches. Despite a vast literature showing marked state-society cleavages, not to mention the inability of many governments to respond to basic social needs, these approaches proceed as if states will act rationally and in the interests of their societies once sufficient data is collected to show the impacts of what is largely state-sanctioned activity (i.e., industrial development, market expansion, capital mobility).