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## **Rights, Rules, and Common Pools: Solving Problems Arising in Human/Environment Relations**

We are in danger of choking on the cascade of conceptual distinctions social scientists have devised to frame questions and guide analysis concerning interactions between human users and natural resources and environmental services. Some analysts focus on the properties of goods and services (e.g., excludability and rivalness) and speak of common-pool resources and public goods without recognizing that these phenomena are to a considerable degree socially constructed. Others direct attention to attributes of management systems or resource regimes (e.g., structures of property rights), without realizing that the performance of these systems is affected by the character of the goods and services to which they pertain. Still others seek to understand the formation and performance of environmental or resource regimes without taking into account the fundamental distinction between dominium and imperium in considering the role of the state in such governance systems. Not surprisingly, some analysts simply refer to the commons in generic terms (e.g., the tragedy of the commons, governing the commons) without making any sustained effort to address the conceptual issues referred to in the preceding sentences. Small wonder, then, that analysts and practitioners alike often find themselves enmeshed in a conceptual labyrinth that they are unable to navigate successfully and yet are powerless to change.

What can we do to alleviate this problem and, in the process, to facilitate a productive dialogue among those striving to understand and ultimately to guide human/environment relations in a variety of settings? One possibility, of course, would be to scrap the existing suite of conceptual distinctions in the hope of starting fresh with a more straightforward and coherent framework for analyzing these matters. But the prospects for pursuing this avenue successfully are, to put it mildly, slim. The existing concepts all have articulate proponents, and there is no mechanism through which the community of analysts working in this field could select and implement a new conceptual system, even if there were a desire to do so. In this essay, therefore, I explore a second option, seeking to distinguish the major concepts in use today from one another as sharply and as precisely as possible and explaining why it is helpful to seek clarity regarding such matters by describing some of the more interesting lines of thought that

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come into focus once the prevailing terminological fog is lifted. Along the way, I refer to issues ranging from the conservation of local stocks of fish to the regulation of emissions of greenhouse gases to illustrate the scope of the domain to which this discussion pertains.

## I. TYPES OF GOODS AND SERVICES

Most of us are familiar with the variables known as excludability and rivalness (or subtractability) used to differentiate major types of goods and services.<sup>1</sup> Dichotomizing each of these variables produces the well-known 2x2 matrix depicted in Figure 1. Goods that are rival but excludable constitute the traditional category of private goods. The opposite pattern, encompassing goods that are both non-excludable and non-rival, gives rise to what are known as public or collective goods. The other axis encompasses goods that are non-excludable but rival or common-pool resources and goods that are excludable but non-rival (at least to the members of some well-defined group) and are often described as club goods.

The distinctions underlying this figure are not only conceptually neat; they also provide the point of departure for a number of well-known propositions about the tragedy of the commons in the case of common-pool resources, the free rider problem in the case of public goods, and the idea of the public interest in the case of the side effects associated with the use of private goods. The ensuing debates about how to avoid the tragedy of the commons and ways to circumvent the free rider problem have contributed significantly to our understanding of human/environment interactions.<sup>2</sup> But can we rely on the basic picture of the world reflected in the easily understood and enticing categories implicit in Figure 1? Unfortunately, there are a number of grounds for skepticism regarding this matter.

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1. See, e.g., MANCUR OLSON, JR., *THE LOGIC OF COLLECTIVE ACTION* (1965); ELINOR OSTROM, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* (1990); *RIGHTS TO NATURE: ECOLOGICAL, ECONOMIC, CULTURAL, AND POLITICAL PRINCIPLES OF INSTITUTIONS FOR THE ENVIRONMENT* (Susan Hanna et al. eds., 1996); *THE DRAMA OF THE COMMONS* (Elinor Ostrom et al. eds., 2002).

2. *MANAGING THE COMMONS 2* (John A. Baden & Douglas S. Noonan eds., 1998); *THE DRAMA OF THE COMMONS*, *supra* note 1.

FIGURE 1.

## TYPES OF GOODS AND SERVICES

	Excludable	Non-excludable
Rival	Private goods	Common pool resources
Non-rival	Club goods	Public or collective goods

In the first instance, there are conceptual pitfalls lurking in this set of distinctions. Goods or services that are non-excludable and non-rival (e.g., severe droughts) may actually turn out to be public “bads” in the sense that they cause harm to those who are affected by them. More often, particular goods are beneficial to some recipients and harmful to others, as in the case of certain types of climate change. Goods that are identical in material terms (e.g., swimming pools that are alike in every material respect) may be private goods, common-pool resources, or club goods depending upon the rules governing their use. The use of private goods (e.g., the harvesting of trees for timber) may produce more or less severe side effects (e.g., soil erosion, the loss of habitat for wildlife) that are harmful to people both in the neighborhood and in areas far removed from the site of the goods. The fact that common-pool resources are non-excludable may never even come to the attention of users so long as the supply is sufficient to meet the aggregate demand of the users.

Equally important is the fact that real-world situations are often difficult to map onto the simple and sharp dichotomies embedded in Figure 1. Many goods (e.g., fish stocks, freeways, the geomagnetic spectrum) are non-rival so long as the extent or intensity of use remains below a certain threshold. Beyond this, rivalness may set in with a vengeance as fish stocks become depleted, freeways suffer from congestion, and separate broadcasting operations interfere with one another. Similarly, it is sometimes possible to establish affordable exclusion mechanisms in the interest of avoiding the occurrence of these problems. The construction of various kinds of fences to protect land from the intrusion of neighbors’ cattle is a case in point. So also is the use of scramblers to prevent non-subscribers from benefiting from radio or television programs without paying a fee.

As these observations suggest, the most fundamental problem with the familiar distinctions reflected in Figure 1 is that the relevant variables are to a greater or lesser degree socially constructed or, in other words, products of human thought and actions. Sophisticated analysts have taken to qualifying the notion of non-excludability by saying that it refers to

goods that cannot be made excludable at a reasonable cost.<sup>3</sup> But this formulation does not solve the problem. Whether a cost is reasonable or acceptable depends upon the values of the relevant actors and the resources at their disposal. Wealthy landowners may have the capacity and the will to pay for exclusion mechanisms (e.g., robust fences around their land holdings) that are simply out of reach for poor landowners. Country clubs whose membership consists of members of the economic and social elite can afford to hire private security guards if necessary to ensure that non-members cannot and do not gain access to their facilities.

Equally important is the fact that the introduction of new technologies or new social institutions can transform a non-excludable good into an excludable good at reasonable cost. The invention of barbed wire is said to have had this effect with regard to the Great Plains of North America.<sup>4</sup> The development of affordable scramblers can do the same for lighthouses, which some analysts have treated as quintessential examples of public goods. Much the same is true in the case of wildlife, where royal proclamations can and often have put wild animals off limits to ordinary citizens, and in the case of fisheries, where the establishment of individual transferable quotas gives rise to clear cut exclusion mechanisms. Of course, the effectiveness of these mechanisms often depends upon the existence of a state or some sort of public authority able and willing to enforce such arrangements. But in the final analysis, the creation of exclusion mechanisms is limited only by human ingenuity. It should come as no surprise, therefore, that it is not uncommon to find goods that were once common-pool resources or public goods migrating into the categories of private goods and club goods.

Somewhat comparable observations are in order regarding the attribute of rivalness. Once again, technological innovation can move a good from the category of rival to being for all practical purposes non-rival. Advanced broadcasting methods, for instance, have gone a long way toward relieving competition for slots on the geomagnetic spectrum.<sup>5</sup> Similarly, institutional inventions like the introduction of time slots governing the use of swimming pools or tennis courts can reduce or even eliminate congestion, even though they limit the access of individual users in significant ways. Note also that some goods—most often public goods—may become more valuable as the number of users or members grows. Defense construed as a public good produced by an alliance is apt

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3. Thomas Dietz, Elinor Ostrom & Paul C. Stern, *The Struggle to Govern the Commons*, 302 SCIENCE 1907 (2003).

4. Terry L. Anderson & P.J. Hill, *The Evolution of Property Rights: A Study of the American West*, 18 J.L. & ECON. 163 (1975).

5. MARK W. ZACHER & BRENT A. SUTTON, GOVERNING GLOBAL NETWORKS: INTERNATIONAL REGIMES FOR TRANSPORTATION AND COMMUNICATIONS (1996).

to become more credible as the size of the alliance grows. And institutions themselves treated as public goods—subjects often regard them as both non-excludable and non-rival—can become more valuable or effective as the number of users/subjects grows. Far from becoming rival, for instance, electoral systems perform better as the proportion of the eligible voters participating rises. But note in this connection that powerful actors in the relevant societies will often see to it that institutions are structured in such a way as to favor the interests of certain groups of subjects over others without eliminating the attributes of non-excludability and non-rivalness.

## II. STRUCTURES OF PROPERTY RIGHTS

Those who speak of the commons frequently have in mind concepts relating to property rights and more particularly to arrangements to which we often attach the label common property.<sup>6</sup> It is perhaps unnecessary to stress the fact that structures of property rights or, for that matter, other sets of rights are social artifacts all the way down. Although they lack material referents, they are no less significant as drivers of human behavior for that. As a result, it will help to introduce some of the key distinctions relating to property rights and to discuss their relationship to the types of goods and services described in the preceding section.

A straightforward way to think about rights is to treat them as entitlements that go with the occupancy of recognized roles.<sup>7</sup> Thus, we speak of human rights, women's rights, indigenous rights, patients' rights, animal rights, and so forth. As this observation suggests, rights are not cast in concrete or fixed for all time by the forces of nature. On the contrary, the rights accorded to the occupants of specific roles can and often do vary from one society to another and over time within the same society. The rights of women to vote, to hold property, and even to control their own bodies, for example, are relatively recent developments in many societies; they remain non-existent in others. Issues pertaining to rights frequently become battlegrounds in the political and legal arenas of individual societies. Consider as cases in point the debates of the last 50 years in the United States about civil rights or the longstanding debates in the world at large regarding human rights.

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6. JOHN HARKNESS DALES, *POLLUTION, PROPERTY AND PRICES: AN ESSAY IN POLICY-MAKING AND ECONOMICS* (1968); CAROL M. ROSE, *PROPERTY AND PERSUASION: ESSAYS ON THE HISTORY, THEORY, AND RHETORIC OF OWNERSHIP* (1994); DANIEL H. COLE, *POLLUTION AND PROPERTY: COMPARING OWNERSHIP INSTITUTIONS FOR ENVIRONMENTAL PROTECTION* (2002).

7. RICHARD FLATHMAN, *THE PRACTICE OF RIGHTS* (1976).

Property rights, on this account, are entitlements associated with the role of owner.<sup>8</sup> In the crudest of terms, we typically speak of private property where there is a single owner (which may be a legal person like a corporation in contrast to a natural person); public property where the owner is the state (or a government agency acting on behalf of the state), and common property where two or more—often a sizable number—of actors hold the property in question either as joint tenants or as tenants in common. Cases where none of these conditions holds are often characterized as null property, open-to-entry property, or *res nullius*, and the resources covered by these arrangements are open to use by one and all without restrictions.

What may seem simple at first blush, however, quickly becomes more complex as we add a number of familiar concepts relating to property and property rights. First and perhaps foremost, structures of property rights are made up of bundles of rights that can be and often are separated or combined in complex ways. At a minimum, these bundles include possessory rights or the entitlements of ownership *per se*, usufructuary rights or rights to make use of property in specified ways, exclusion rights or rights to prevent others from using property without permission, and disposition rights or rights to dispose of property according to the wishes of the owner.

The possible combinations and permutations of these bundles of rights are limited only by human imagination.<sup>9</sup> A holder of use rights (e.g., a lessee) may not have possessory rights or exclusion rights and may enjoy only a sharply restricted set of use rights (e.g., the right to live in a house but not the right to sublet the house or to make alterations). Exclusion rights are often limited by the existence of rights of way or entitlements on the part of non-owners to pass over a piece of property for certain purposes (e.g., getting to a landlocked house). Possessory rights can be subdivided as in cases where owners sell or give away development rights while retaining the rest of the bundle of entitlements, or where different parties share such rights as in systems of common field agriculture in which one party is entitled to grow crops on the land, while others have rights to graze cattle on the same land once the crops have been harvested.<sup>10</sup> Arguably most important of all, even relatively full bundles of rights are not unlimited or unrestricted. Owners are not at liberty to use their property for illegal

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8. HAROLD DEMSETZ, *OWNERSHIP, CONTROL AND THE FIRM, VOL. 1, THE ORGANIZATION OF ECONOMIC ACTIVITY* (1988).

9. *PROPERTY: CASES, CONCEPTS, CRITIQUES* (Lawrence Becker & Kenneth Kipnis eds., 1984).

10. Bruce M.S. Campbell & Ricardo A. Godoy, *Commonfield Agriculture: The Andes and Medieval England Compared*, in *MAKING THE COMMONS WORK: THEORY, PRACTICE, AND POLICY* 99 (Daniel W. Bromley et al. eds., 1992).

purposes (e.g., growing cannabis or opium poppies), purposes that impose undue harm on their neighbors (e.g., grazing cattle that regularly wander onto adjacent properties), or purposes that are deemed inappropriate by a recognized public authority (e.g., operating a commercial business in an area zoned for residential uses only).

Most societies impose restrictions on what can be owned and who or what is allowed to occupy the role of owner. Although the idea of owning other human beings is abhorrent to most people today, slavery is an ancient institution. In some parts of the world, arrangements allowing individuals to own other human beings flourish to this day. The distinction between terrestrial systems and marine systems is interesting in this context. Various forms of land ownership have emerged and played influential roles in most societies over several thousand years. But there are few parallel practices pertaining to marine systems or seas and oceans. Some may regard this difference as natural, citing the facts that water is mobile and that many marine resources are migratory. But this argument is not entirely convincing. There is a long history, for instance, of rights to harvest marine living resources in well-defined locations. And where marine resources (e.g., clams or oysters) are more or less sedentary, there is nothing to prevent the emergence of bundles of property rights whose contents are similar to those of familiar arrangements relating to land ownership.

What is the relationship between the types of goods and services discussed in the preceding section and the structures of property rights described in this section? Although there are superficial similarities between the two sets of distinctions, these similarities begin to evaporate as soon as we delve more deeply into the issues at stake. In cases where there is no way to eliminate the condition of non-excludability regardless of cost, for example, individuals have little or no incentive to establish systems of private property. Public goods are apt to take the form of public property, given the fact that overcoming the free-rider problem often requires some sort of intervention on the part of the state. Common-pool resources frequently take the form of common property, especially in settings where the supply of the relevant goods is plentiful relative to demand, so that there is little reason to establish exclusion mechanisms or entry barriers designed to protect the interests of individual users.

It does not require a lot of analysis, however, to realize that there is nothing like a perfect match between the distinctions pertaining to types of goods and services and the distinctions among structures of property rights. Government agencies — acting on behalf of the state — can and often do own resources (e.g., forests and hardrock minerals) in the form of public property that are both excludable and rival. It is not only possible but also common in some societies to establish common property arrangements pertaining to resources (e.g., land held in common by a group of owners)



that are excludable and rival. And there is no shortage of mixed systems. Consider the case of an owner of private land who does not own the wildlife living on his land, who has limited use rights to water in a stream flowing across his land, and who has sold the development rights to the land to a land trust or a government agency. Or, to take another example, think of the case of the owner of beachfront property whose private rights extend only to the mean high tide line, who must grant access to the beach to others under some well-established system of publicly defined rules, and who has no rights to the fish and other marine organisms located in the adjacent waters, even if they can be caught with land-based gear.

Equally important is the fact that plans for solving a wide range of problems relating to the environment and natural resources commonly take the form of proposals for altering prevailing structures of property rights in order to eliminate perverse incentives by creating exclusion mechanisms or, less often, by encouraging efforts to increase the supply of goods in order to alleviate conditions of rivalness. Undoubtedly, the most familiar examples feature efforts to avoid or alleviate conditions that give rise to the tragedy of the commons.<sup>11</sup> Well-known but divergent prescriptions, in this context, call for a transition to private property through the creation of exclusion mechanisms (e.g., effective fences) or for a transition to public property through actions on the part of a government agency to claim ownership and impose restrictions on the use of the relevant resources (e.g., rules governing the harvesting of wildlife).<sup>12</sup>

Yet this is not the only condition that can give rise to proposals calling for changes in prevailing structures of property rights. There is a long history of arrangements that permit or even encourage the privatization of publicly owned land and natural resources. Under the provisions of the Mining Act of 1872<sup>13</sup> (which remains to this day the law of the land in the United States), for instance, private individuals can stake claims to public land and, assuming they fulfill a variety of relatively simple requirements, eventually take title to the land in question as private property.<sup>14</sup> On the other hand, many societies have mechanisms for converting private land into publicly owned land. In the United States, the exercise of public authority in cases of this sort is known as the right of eminent domain. In short, there is a plentiful supply of procedures for rearranging structures of property rights, even when there is no change at all in the biophysical properties of the goods or services in question.

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11. The tragedy of the commons is actually misnamed. It ordinarily occurs under conditions of null property in which no rules governing entry exist. There are many cases in which structures of common property are perfectly able to avoid the tragedy of the commons.

12. MANAGING THE COMMONS, *supra* note 2; THE DRAMA OF THE COMMONS, *supra* note 1.

13. 30 U.S.C. §§ 22-54 (2000).

14. CHRISTOPHER MCGRORY KLYZA, WHO CONTROLS PUBLIC LANDS? ch. 3 (1996).

### III. DOMINIUM VERSUS IMPERIUM

Governments acting on behalf of the state can and often do own a great deal of property.<sup>15</sup> In some societies (e.g., Russia during the Soviet period), there is no provision at all for private ownership of resources; the state holds title to all the land and associated natural resources along with most of the means of production. Even in countries in which private property is normal and widespread, the state may hold title to a large proportion of the land base. Between them, the federal government and the provinces in Canada own more than 80 percent of the nation's land in the form of crown lands. Surprising to some is the fact that even in the United States, where the virtues of private property are regularly extolled, the federal government alone owns about one third of the country's land base, including 86 percent of the state of Nevada and over 60 percent of Alaska. Although government ownership of land and natural resources is a perennial source of controversy in many societies, there is no reason to expect that government ownership of these resources on a large scale is likely to disappear or even decline significantly any time soon.

Important as it is, however, ownership in the form of public property is not the only mechanism through which the state can make decisions affecting human uses of natural resources and environmental services. The important distinction here centers on the contrast between what are known traditionally as dominium and imperium.<sup>16</sup> Dominium is straightforward; it refers to the full range of circumstances under which governments or their agents hold title to land and natural resources as forms of public property. But governments acting on behalf of the state can take any number of steps to influence the behavior of owners, users, and managers of property, whether they are individual holders of private property or public agencies responsible for managing certain portions of the public domain. Imperium, as it is often called, refers to the authority of the state to make and implement rules and regulations that require property owners to act in certain ways and that prohibit them from acting in other ways.

It is easy to see that imperium is a powerful force in most societies and that it can affect – sometimes drastically – the incentives of the holders of both private property and common property. It is imperium that allows government agencies acting on behalf of the state to regulate or impose restrictions on the actions of holders of property rights. We like to believe, especially in the case of private property, that owners are free to use their

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15. RETHINKING THE PUBLIC LANDS (Sterling Brubaker ed., 1984).

16. BRUCE ACKERMAN, PRIVATE PROPERTY AND THE CONSTITUTION (1972).

property as they see fit, whether or not their choices turn out to be good or bad. But there are obvious limitations on this freedom, and both the extent and the depth of the resultant restrictions vary across space and time. To take just a few prominent examples, property owners usually must apply for permits to build on their land, comply with rules regarding the treatment of wildlife residing on their land, and grant access to their property to a variety of actors authorized by the state to go onto the property.

In modern societies, restrictions imposed on property owners through the authority granted to the state via imperium have proliferated in many directions. But the largest categories of these restrictions and the most significant with regard to the issues under consideration in this essay involve zoning and taxation. Governments from the local level to the national level place many restrictions on the activities of owners under the rubric of zoning. Whole areas may be zoned for a single use (e.g., commercial or residential use); owners are subject to a wide range of rules pertaining to the siting, design, and construction of buildings; there are generally extensive regulations prohibiting or requiring specified actions (e.g., respecting the rights of neighbors) on the part of owners. It is the exercise of this authority that has given rise to intense controversies regarding what are often called regulatory takings. All agree that the state has the authority to impose some regulations on property owners. But how far can the state go in imposing such restrictions before it is required to compensate owners for the loss of value of their property? There is no correct answer to this question. Cases involving alleged takings appear regularly on the dockets of courts, and new decisions can affect the threshold beyond which legitimate regulations turn into regulatory takings.

It is imperium again that gives the state the authority to levy taxes on property. In many systems, governments — especially local governments — rely on property taxes as their principal source of revenue. It would be politically (as well as economically) unwise to tax property too heavily, and government agencies frequently use taxes to pursue goals other than securing revenue (e.g., the introduction of current-use programs to provide land owners with incentives to maintain agricultural land). Not surprisingly, moreover, controversies centered on property taxes regularly make their way onto the agendas of legislatures and the dockets of courts. Still, the fact remains that all states assert the authority to tax property not only to raise revenue to cover the costs of their own operations but also to influence the incentives of property owners to choose desired courses of action.

It is interesting to observe in passing differences between systems of land tenure and systems of sea tenure that are relevant to this discussion. While the development of use rights to various marine resources (e.g., clam beds, choice fishing holes) is relatively common, there are few cases in

which actors claim full bundles of property rights—in the form of either private property or public property—to marine systems.<sup>17</sup> Indigenous peoples sometimes develop complex systems of sea tenure, and the extension of coastal state jurisdiction may gradually lead to changes regarding sea rights. But for the moment, the authority granted as a matter of imperium must do almost all the work in regulating human activities affecting marine systems in such a way as to avoid socially undesirable outcomes (e.g., severe depletions of fish stocks, marine pollution). One interesting consequence of this situation is that governments seldom seek to impose taxes on users of marine systems or collect royalties from the harvesting of valuable marine resources (e.g., fish, crustaceans, kelp). In the United States, for instance, the costs of implementing and enforcing regulations governing the harvesting of fish far outweigh any revenue the government derives in the form of rents, royalties, or taxes from the marine fisheries.

#### IV. PUTTING THE PIECES TOGETHER

What can we learn from this exercise in clarifying individual concepts and sharpening distinctions among constellations of concepts widely used in analyses of human/environment relations? Do the expected benefits outweigh the time and energy required to clear up a variety of misconceptions? In this section, I seek to answer these questions by taking a new look at several issues that lie at the core of efforts to understand human/environment relations and that have provoked long-running controversies. Specifically, I address the tragedy of the commons, the free rider problem, and the problem of regulatory takings.

The tragedy of the commons is not fundamentally a consequence of reliance on common property systems. Rather, the problem to which this concept applies occurs in situations featuring resources that are scarce in the sense that demand exceeds supply and that do not lend themselves to the introduction of affordable exclusion mechanisms or other restrictions on human use. Consider a finite fish stock in this connection. So long as supply demonstrably and reliably exceeds the demand of all the members of the user group, the absence of rights and rules may not matter much. In other words, a system of null property may be perfectly acceptable under these circumstances. The problem occurs when rising demand exceeds supply. Now, individual users will experience perverse incentives to harvest as many fish as they can because they are aware that other members of the

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17. ROGNVALDUR HANNESSON, *THE PRIVATIZATION OF THE OCEANS* (2004).

group will harvest any fish they leave.<sup>18</sup> For the same reason, individual users will have no incentive to reserve a certain quantity of fish to ensure that the stock remains healthy and productive over time.

What is to be done? It turns out that any of a number of institutional arrangements can solve or at least mitigate this problem. Institutional innovation in such forms as individual transferable quotas (ITQs) can create a form of private property and, in the process, alleviate the perverse incentives arising from the condition of non-excludability. But this is not the only way to alleviate conditions conducive to the tragedy of the commons. The creation of public property or at least arrangements encompassing rights to control use through the exercise of regulatory authority can serve to avoid the tragedy of the commons. In effect, government agencies can impose a wide array of restrictions on the actions of resource users, including the introduction of ITQs, if that is deemed desirable in specific situations. Common property systems also can and often do give rise to restrictions on the behavior of individual users that serve to avoid or alleviate the tragedy of the commons. In effect, the owners of common property can decide as a group to impose certain rules or restrictions on the actions of individual members of the group in the interest of eliminating the perverse incentives associated with the condition of non-excludability.

Granted, there are a number of ways to create and implement the exclusion mechanisms needed to avoid the tragedy of the commons. But is one system somehow superior to the others?<sup>19</sup> Proponents of private property, public property, and common property all believe in the virtues of their preferred solution. Each option has its attractions. But each also can cause serious trouble. Privatization can lead to outcomes that are grossly unfair. Governments often lack both the capacity and the will to manage public property well. Common property systems work best in situations where the sense of community is strong and social pressure is capable of controlling behavior effectively. Similarly, biophysical conditions may make one or another of these approaches (in)effective. Where extensive areas are required to implement ecosystem-based management, private property does not work well as a means of avoiding the tragedy of the commons. When the areas involved are large and government agencies are poorly endowed with capacity and resources, individual users may exploit the relevant resources without worrying about the impact of enforcement

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18. H. Scott Gordon, *The Economic Theory of a Common Property Resource: The Fishery*, 62 J. POL. ECON. 124 (1954).

19. NEIL KOMASAR, *LAW'S LIMITS: THE RULE OF LAW AND THE SUPPLY AND DEMAND OF RIGHTS* (2001); COLE, *supra* note 6.

operations. And common property arrangements are generally inadequate to manage human uses of highly migratory resources.

Although it is possible to use similar analytic models to analyze the two situations, the free rider problem presents a challenge that is quite distinct from the tragedy of the commons. Whereas the tragedy of the commons has to do with perverse incentives that lead users to overexploit natural resources, the free rider problem centers on the lack of incentives needed to induce individual actors to contribute toward supplying a public good (e.g., cleaner air, an intact stratospheric ozone layer, forests that can support biological diversity, healthy stocks of fish). Even in cases where taking effective action to produce a public good will lead to Pareto superior outcomes, individual members of the group can and often do reason that they will be even better off if the contributions of others are sufficient to ensure that the good is supplied, while they withhold their own contributions. If most members of the group reason in this reflexive way, the result will be either a failure to supply the good altogether or, at best, a Pareto inferior level of supply.

Several responses to this problem have been discussed at length in the literature.<sup>20</sup> If the group is privileged in the sense that one member alone values the good more than the cost of producing it, the free rider problem may become irrelevant. Selective incentives in the form of excludable goods (e.g., permits to use a wilderness area) may suffice to elicit contributions from individuals that are sufficient to produce the public good in question (e.g., maintaining the ecological integrity of the wilderness). In cases where individual members of the group are influenced by the logic of appropriateness in contrast to the logic of consequences, they may feel obligated to contribute their fair share of the cost of supplying a public good, regardless of the existence of the perverse incentives underlying the free rider problem.<sup>21</sup>

In many cases, however, the solution to the free rider problem will take the form of an exercise of imperium on the part of a government agency acting on behalf of the state. Fundamentally, in other words, this is a matter to be dealt with via regulatory authority rather than a matter of creating or exercising property rights. Consider in this light cases in which the state imposes restrictions on owners or operators of power plants in the interest of producing clean air or on timber companies in the interest of maintaining the integrity of ecosystems surrounding areas subject to logging. Clean air and properly managed ecosystems are, more often than not, public goods. But there is no sense here that the solution to the free

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20. OLSON, *supra* note 1.

21. James G. March & Johan P. Olsen, *The Institutional Dynamics of International Political Orders*, 52 INT'L ORG. 943 (1998).

rider problem lies in replacing existing structures of property rights. Rather, the most effective approach often lies in imposing restrictions designed to change the incentives of relevant owners, whether they are holders of private property, common property, or even public property.

The problem of regulatory takings grows out of legitimate efforts on the part of the state to regulate the behavior of owners of private property or even common property. The root of the problem here is that owners of private or common property can and often do act in ways that produce side effects or externalities that are harmful to others. Sometimes these side effects are more or less local in character. Classic cases involve grazing cattle that damage the neighbors' crops, carrying out commercial activities that pollute the neighbors' drinking water, or constructing eyesore structures that ruin the neighbors' views. But negative externalities can also occur on a much larger scale. The erection of tall smokestacks to fulfill requirements relating to local air pollution, for example, is a major source of long-range transboundary air pollution. Ultimately, global problems like climate change arise from the same sort of perverse incentives. Until and unless restrictions are imposed, owners of private or common property have no incentive to internalize the costs of external effects arising from their efforts to use their property in pursuit of their own goals.

One approach to solving or at least alleviating this problem is to augment bundles of property rights in such a way as to incorporate duties requiring the avoidance of injuries to others into use and disposition rights. In fact, this approach is widely employed from the local level right up to the level of international society. Principle 21 of the 1972 Stockholm Declaration<sup>22</sup>—repeated as Principle 2 of the 1992 Rio Declaration<sup>23</sup>—for instance, reads in part that “States have...the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”<sup>24</sup> As in many other walks of life, however, property owners have perverse incentives to deemphasize the concerns of neighbors in their efforts to maximize net gains for themselves accruing from the use of their property. And this tendency ordinarily becomes stronger as the neighbors become more distant in space or time and the contributions to relevant side effects caused by individual owners become harder to separate from those of others. Small

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22. U.N. Conference on the Human Environment, Stockholm Declaration, June 16, 1972, UN Doc. A/CONF.48/14, princ. 21, 11 ILM 1416 (1972).

23. U.N. Conference on Environment and Development, Rio Declaration on Environment and Development, June 14, 1992, UN Doc. A/CONF.151/5/Rev.1, princ. 2, 31 ILM 874 (1992).

24. *Id.* at 876.

wonder, then, that it is hard to impose duties on owners of private property that are effective in avoiding global problems like the depletion of stratospheric ozone or severe disruptions of the Earth's climate system.

Under the circumstances, there is an understandable tendency to turn to the state, calling for the exercise of regulatory authority to impose restrictions on the actions of property owners that cause more or less severe damage to others.<sup>25</sup> Early on when the capacity of owners to harm others was limited largely to local impacts, governments developed and made use of the nuisance doctrine to protect adjacent property owners together with doctrines involving the common good to protect larger public interests from the harmful side effects of the activities of private property owners. But in this age of long-range impacts and interference in global systems, such doctrines are incapable of coming to terms with the consequences of harmful side effects. As a result, regulatory restrictions have become more stringent, and public authorities imposing these restrictions have become more distant from the actors whose behavior they seek to influence. Both of these developments have caused serious problems. Stringent restrictions lead to complaints about regulatory takings and growing pressure to find ways to safeguard the rights of property owners as well as to protect the interests of the general public. Distance makes it harder and harder for regulators to devise restrictions that are sensitive to local conditions. There is no simple—much less correct—response to either problem. Those responsible for protecting rights and imposing rules must seek to strike a proper balance on a case-by-case basis.

## V. CONCLUSION

What are the take home messages arising from this effort to sharpen distinctions and use them to shed light on a range of familiar problems? Two answers to this question seem particularly compelling. First, it is clear that in efforts to solve a variety of classic problems associated with human/environment relations not only does one size not fit all, but also there are apt to be multiple approaches to the development of solutions.<sup>26</sup> To take a single example, any effort to avoid or alleviate the tragedy of the commons must include the creation of some sort of exclusion mechanism or system for rationing available supplies of the relevant good(s) or service(s) among prospective users. But it turns out that there are distinctive ways to meet this condition under structures of private property, common property, or public property. This is not to say that there are no differences

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25. CASS SUNSTEIN, *AFTER THE RIGHTS REVOLUTION: RECONSIDERING THE REGULATORY STATE* (1990).

26. KOMASAR, *supra* note 19.



among the various strategies available for solving such problems. A number of solutions that perform more or less equally well from the perspective of conservation may differ considerably in terms of other criteria like efficiency, equity, or robustness. What this means is that those responsible for managing human/environment relations will want to start out with an effort to diagnose the problem, seeking to identify the main features or characteristics of the situation at hand.<sup>27</sup> They will then be in a position to consider the pros and cons of a range of possible solutions and to select the solution that offers the best fit with the characteristics of the case under consideration.

Beyond this, it is essential to bear in mind that we have entered an era of human-dominated ecosystems.<sup>28</sup> There is ample evidence to support the conclusion that human actions have played an important role in the dynamics of ecosystems – especially local systems – for some thousands of years. Yet it is indisputable that human actions today have become major driving forces in large-scale ecosystems, including a number of the Earth's essential life support systems. The role of human actions as drivers in planetary processes such as the depletion of stratospheric ozone, the loss of biological diversity, and disturbances of the Earth's climate system are only the most familiar of these large-scale phenomena. The implication of this development is that we must accord the highest priority to efforts to solve or avoid the tragedy of the commons, the free rider problem, and the harmful impacts of side effects as they arise in connection with human/environment relations. For the most part, success in this endeavor will depend on our ability both to understand the sources of perverse incentives and to devise systems of rights and rules or, in other words, governance systems capable of altering incentives sufficiently to alleviate problems of this sort. Some governance systems dealing with human/environment relations are far more effective or successful than others; there is no guarantee that our efforts to solve problems of this sort in specific cases will produce the desired results. Nonetheless, there is no substitute for broadening and deepening our understanding of the nature of these arrangements along with the factors that control their performance under real-world conditions. This in turn means that we need to sharpen our tools and to minimize misunderstandings attributable to confusion relating to key concepts, like rights, rules, and common pools.

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27. ORAN YOUNG, *THE INSTITUTIONAL DIMENSIONS OF ENVIRONMENTAL CHANGE: FIT, INTERPLAY, AND SCALE* ch. 7 (2002).

28. Peter M. Vitousek et al., *Human Domination of Earth's Ecosystems*, 277 *SCIENCE*, 494 (1997).