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Institutions and "The Commons"



Credit: Eric Vidal/EPA/Corbis.

Keywords

- Common property
- Game theory
- Institutions
- Prisoner's Dilemma
- Social Darwinism

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Assess what should be considered
in good environmental 'Commons'
management

Controlling Carbon?

There is a growing consensus on the science of climate change and the urgency of the problem. According to the Intergovernmental Panel on Climate Change, whose job it is to vet the science surrounding global warming, global temperatures are rising, sea-level rise is expected, water availability may be impeded, and extreme weather events are likely to become more common and more severe. These changes will be felt unevenly but no country will be immune to such effects.

Given the widespread and severe nature of the problem, why are global carbon emissions so hard to control? One might think of many good reasons for this to be true. People tend to ignore problems they cannot see, governments are under the influence of oil companies, and so on.

One compelling argument holds that the root of the problem is that carbon quite simply *does not stay put*. With every combustion event (driving a car, burning a log, firing a coal plant for electricity, etc.) the carbon that is released quickly finds its way into the atmosphere. Carbon released in one country is – *instantly* – a burden shared by all countries. From the point of view of any individual country, moreover, carbon reductions are not “free,” since they require creating new rules, potentially reducing or redirecting economic production. A “carbon-reduced” product – whether a car, computer, or vegetable – may be more difficult to produce than its “status quo” counterpart. If such a product is more expensive as a result, it may not be competitive on a global market, especially if it must compete against products produced where carbon reductions have not been imposed. Many governments, including that of the United States, therefore express fear that if they make sacrifices in this direction while others do not, they will no longer be competitive. The benefits of carbon reduction, in a parallel way, would be experienced by all countries, but must be paid for by individual countries.

For many environmental problems, costs are often borne collectively, while benefits accrue to individuals; on the other hand, individual costs may lead to collective benefits. Nations must cooperate where there is no “super-government” to impose environmental laws and where there are few or no punitive measures for not cooperating. Such mismatches mean that hoping for spontaneous global action on climate change might be unrealistic. Arguably, some kind of rules and trust must be established to cooperate when incentives constantly lure people and states to follow their own self interest ... towards collective planetary ruin. In this chapter, we address this persistent and vexing problem: *How, if at all, can rules and norms of global behavior be fashioned to encourage shared costs and collective benefits? At what scale is cooperation possible?*

The Prisoner's Dilemma

Such questions are of universal concern since problems of this sort are ubiquitous. There are countless examples from our own daily ecologies as well as those around the globe.

Neighbors, for example, need to pull weeds from their lawns to keep them from spreading across property lines. By failing to do so, any one non-cooperating neighbor enjoys some benefits from their neighbors' sweaty work (fewer dandelions in their yard), but simultaneously provides an ongoing seed source for dandelions that might spread to the lawns of others.

It is tempting for someone to spill the small quantity of paint left over from renovating a bathroom into a storm drain rather than take the time to dispose of it legally at an approved dump site. Should a single household be the only one to behave in this way, it enjoys a lower labor burden *and* benefits from the healthy environment resulting from the majority of hard-working cooperative neighbors who do not dump paint into public waterways. But since such temptation exists to all, the incidence of paint dumping is far higher than anyone individually desires.

Nor is the situation of a homeowner in urban America or Europe entirely different from that of a villager in rural India. There, the benefits from a community forest include the ability to graze livestock in the shade of trees and the availability of seeds and pods that fall from trees, among other resources. These collectively enjoyed benefits are only available if the trees of the forest are not cut down for fuel or construction timber. It is inviting for any individual household to cut down a tree or two for their own purposes, making only an incremental change in the density and health of the village forest. As long as others refrain from doing the same, these minimal costs are spread across the village and the benefits to the household, which may need to go great distances to collect fuelwood otherwise, are obvious. But again, since the incentive to break the rules is shared by all, and in anticipation of the fact that others may well "cheat" and cut trees, householders might well be tempted to cut trees as soon and as quickly as they can, in an effort to gain resources before their neighbors do.

In all of these cases, cooperation is necessary for the best outcome, but an incentive exists to take a "free ride" and let others invest time or money or restrain their behavior while we do not. Since the incentive exists for everyone, the possibility of total failure always looms.

Prisoner's Dilemma An allegorical description of a game-theoretical situation in which multiple individuals making decisions in pursuit of their own interests tend to create collective outcomes that are non-optimal for everyone

A popular metaphor for situations such as these is the story of the **Prisoner's Dilemma**. In this tale, so often replayed on contemporary television crime dramas like *Law and Order* or *The Closer*, you are asked to imagine two people charged with a crime, perhaps something like burglary, in which the best evidence that the police have (though not the only evidence) would be the testimony of one of the burglars against the other. Both suspects are taken into custody

by the police and interrogated individually. Each is separately told that if they testify against the other person, they will go free or have a greatly reduced sentence. The logical decision in a perfect world is for both of the suspects to keep their mouths shut. With no one talking, they might each serve a short jail term, if any term at all. The problem stems from the fact that each knows that the other might well "rat" him out. If one chooses not to talk while the other "rats," the reticent one will do hard time while the other one goes free. Since no one wants to be a "sucker" and suffer at the hands of the other, the predictable outcome is that both testify against the other, leading to the worst possible mutual outcome, one in

which both do hard time. Trying to anticipate and avoid the punitive "defection" of the other person, the two partners act in service of the police. Such a situation not only invites each person to "rat" out the other, it actually makes it *rational* to do so, even though the outcome is inevitably bad for everyone, something no rational person would choose if they could control the behaviors of *both* parties.

These sorts of fascinating dilemmas are the province of **game theory**, adopted by thinkers who employ a form of mathematical analysis of decision-making, examining those sorts of situations that might be expressed in game terms. For game theorists, certain games provide models for how people think and behave. Of most interest are games where the crux of the problem is anticipating what the other player might choose to do, where bluffing and second-guessing are paramount. Such is the case of our two prisoners, who individually reach what is ultimately a bad mutual decision because they are trying to *anticipate* what the other prisoner might decide to do. Along these lines, and as established by the refugee scientist John von Neumann after World War II, game theory understands a "game" to be "a conflict situation where one must make a choice knowing that others are making choices too, and the outcome of the conflict will be determined in a prescribed way by all the choices made" (Poundstone 1992: 6).

In game theory, as in the Prisoner's Dilemma, the best outcomes are typically achieved by cooperating while individual incentives tend to lead to a reason not to cooperate. The problem of our two suspects might be expressed in abstract terms by game theorists as in Figure 4.1. These games can be made ever more complicated by introducing quantitative cash rewards and punishments and making the decisions more complex, involving, for example, investment in a public good versus a private bank, and so on. Complex mathematics can be used to predict behaviors, including retaliations, mutual learning, and system collapse.

Game Theory A form of applied mathematics used to model and predict people's behavior in strategic situations where people's choices are predicated on predicting the behavior of others

	Prisoner B "clams up"	Prisoner B "rats"
Prisoner A "clams up"	Both prisoners do light sentences	Prisoner B walks free, Prisoner A goes to jail
Prisoner A "rats"	Prisoner A walks free, Prisoner B goes to jail	Both prisoners do hard time

Figure 4.1 The Prisoner's Dilemma in game theoretical terms. The best outcome, in the upper left, is also the least likely, since each player prefers to avoid the worst individual outcomes, in the upper right and lower left corners, leading to the worst collective outcome, in the lower right.

The Tragedy of the Commons

The first applications of game theory mathematics were directed to the Cold War logic of mutual nuclear annihilation. Funded by the RAND Corporation and the US Pentagon in the 1950s, game theorists asked the unthinkable: Is it rational to strike first with nuclear weapons, not knowing whether and when the enemy might do so? Is it rational to drop the bomb?!

But what might any of this have to do with environment and society? Applying this kind of thinking to our interactions with the natural world leads to some potentially grim and tragic conclusions. For while there is a possibility of cooperation around environmental conservation, there is a potentially overriding incentive to "defect," in the language of

game theory, leading to a general inability to manage or control our consumption and use of the environment, and so to environmental destruction.

Thinking along these lines, Garrett Hardin presented one of the most compelling, persistent, and in some ways problematic arguments linking environment to society through the commons. In his article "The Tragedy of the Commons," published in *Science* in 1968 (where von Neumann is prominently cited), he directed this logic to the problem of overpopulation. He argued that while the advantages for any individual or family of reproducing freely are immediate, their costs are diffused across the planet, increasing incrementally the burden of humanity upon the earth. This is a Prisoner's Dilemma, insofar as some people may choose to forgo more children in the interests of the planet, but others will inevitably "defect" or cop a "free ride." The worst outcome is much more likely (now sometimes called the "Nash Equilibrium" for its mathematical discoverer John Forbes Nash, made famous in the film *A Beautiful Mind*), at least without some form of coercive restraint on people's behavior. Overpopulation, as this logic goes, is inevitable without some form of enforcement mechanism (Chapter 2).

The article was made more compelling by its use of an agricultural metaphor for the problem. Rather than think directly about people's reproduction, Hardin asked us to "picture a pasture open to all ..." in which numerous herdsmen managed their individual herds. Following precisely the logic of the Prisoner's Dilemma, it is in the interest of each herder to increase the size of their own herd, Hardin argued, since each new animal costs him nothing but gains him much. But since all herdsmen enjoy the same incentive, the inevitable result is a destroyed pasture. Because it belongs to everyone, the resource belongs to no one, and will inevitably be grazed into destruction. In language typical of the article he explains:

Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. (Hardin 1968: 1243)

Conscience and goodwill, Hardin further asserted, were useless in the face of compelling, internal, adaptive, evolutionary logics. Real solutions, however distasteful, must inevitably take some other form. People of the earth must choose either coercion ("mutual coercion mutually agreed upon": p. 1247), to tyrannize ourselves into control, or turn to strict forms of private property and inheritance so that all impacts of poor decision-making will be visited only upon the owner of that property. The former approach was rejected by Hardin, as he concluded that the problem with tyranny is that there is always a possibility that a system of governance will come under the undue sway of one of the users of the commons and cannot itself be controlled: "*Quis custodiet ipsos custodes* – 'Who shall watch the watchers themselves?'" (pp. 1245–6). The latter approach – privatization – was preferred and defended by Hardin since, no matter how unjust it might be (not all rich people are smart people, he pointed out: "an idiot can inherit millions," p. 1247), such a solution was the best one available. This argument for private control of common goods parallels that proposed by those with faith in markets for solving environmental problems (see

Chapter 3). In either case, whether state or private control, some form of *enclosure* was deemed as essential, where an "open access" resource is bounded and given over to control either by individual owners or by a strong state management body.

The power and influence of this argument were enormous, and remain so to this day. It continues to be perhaps the most cited academic article in the social sciences, it provided foundational arguments for fields as widespread as evolutionary biology and economics, and it is typically invoked in debates over environmental scarcity. Because Hardin convincingly used an environmental crisis as his metaphoric example, his essay on population quickly became the key defining metaphor for many people (managers and scholars) in guiding their thinking about *all* environmental problems more generally. Nature in all its forms (fisheries, oil fields, climate systems) might be seen as commons, those difficult-to-enclose systems that invite free riding and defection.

Viewed this way, the solutions to environmental problems do appear to take the form Hardin suggests: either some form of environmental super-police state, or private property rights over all environmental systems or objects. Environmental commons in this way of thinking lead inevitably to tragedy and so must be made into non-commons through the power of law and property. There is close match of this way of thinking with the market logics (i.e., internalizing externalities) reviewed in Chapter 3. This congruence of the two ways of thinking may have made the "tragedy of the commons" easier to swallow in places like the United States and the United Kingdom, where trust in markets (whether rational or irrational) is a long-established part of the culture.

The Evidence and Logic of Collective Action

Exactly at the same time that the logic of the Prisoner's Dilemma and the Tragedy of the Commons was becoming widely accepted, confusing and incongruent evidence was beginning to mount. As anthropologists, sociologists, historians, and geographers observed resource management around the world, they continued to report behaviors that in no way fit Hardin's predictions. Specifically, they found countless examples of complex systems for management of difficult-to-enclose resources – ranging from fish, trees, and pasture to computer processing time – that relied neither upon some form of tyrannical enforcement authority nor upon the assignment of exclusive private property rights to the resources in question. Some other form of management appeared not only possible but actually predominant in natural commons around the world.

Lobster fisheries in Maine, for example, were observed to be supported and maintained less through centralized state law than through the behavior of lobster fishers themselves, who self-limited the number of boats allowed in the fishery and their distribution of traps. Village irrigation systems in southern India were shown to be carefully self-managed systems where irrigators followed careful rules concerning the opening and closing of flood gates to water their fields while keeping the array functioning for the flow of water to downstream users. Tree tenure traditions in East Africa were organized to allow the use of forest products by households who did not hold title to the land on which the trees stood,

while limiting their access to sustain the harvest. Across the world, countless, highly variable systems of institutions appeared to violate the iron laws of the Prisoner's Dilemma through some form of local organization.

Institutions Rules and norms governing collective action, especially referring to rules governing common-property environmental resources, like rivers, oceans, or the atmosphere

Common Property A good or resource (e.g., bandwidth, pasture, oceans) whose characteristics make it difficult to fully enclose and partition, making it possible for non-owners to enjoy resource benefits and owners to sustain costs from the actions of others, typically necessitating some form of creative institutional management

What all of these cases appear to have in common is the presence of some form of **institutions**, understood here as systems of recognized constraints on individual behavior, including formal laws, but also unofficial rules or even strong social norms that guide people's expectations of one another's behaviors, leading to orderly and constrained use of natural resources. Such institutions, even in their most informal manifestations, can be quickly recognized all around us. People typically queue at the box office of a movie theater rather than shove one another in a pack at the ticket window, for example. For more complex problems, sustaining a fishery for example, the rules may be quite complex, and the mechanisms of self-governance and enforcement may be deeply rooted in traditional social systems. Nevertheless, the root principle applies; collective good and environmentally sustainable outcomes were achieved through cooperation.

Observers of these successfully cooperative systems needed to assemble new stories, metaphors, and theories, however, to better explain what they saw. All of these revisions of "Tragedy" thinking shared one thing: a need to explain how rules and norms were able to constrain behavior and achieve cooperative outcomes.

Chief among these reconsiderations is an effort to try to define the difference between these observed systems and the property imagined in the "Tragedy of the Commons." Acknowledging that the total absence of rules would lead to tragic outcomes, it remains necessary to also acknowledge the existence of forms of property that function through customs, rules, and/or regulations, but not in the form of exclusive private ownership rights. "**Common property**" is a descriptor that includes all of these diverse forms. Different from wholly unowned resources (Latin: *res nullius*), common property (Latin: *res communes*) includes some form of group ownership, so that it is neither open to everyone in the world nor necessarily held exclusively by an individual (Ciriacy-Wantrup and Bishop 1975). Such a group or community of owners may take many forms, of course, to include people who know one another face to face in a village fishery or those more far-flung across a city, who together hold cooperative rights to urban garden plots.

But even where a right can be held by a community, this does not explain how and why members of that group might be able to achieve mutual understandings, agreements, and most importantly constraints. Rather, there must be an underlying logic that allows people to overcome, through collective action, the worst environmental case outcomes of the "Tragedy of the Commons." Returning to the game-theoretical logic of the Prisoner's Dilemma, a generation of "neo-institutionalist" scholars, led by political scientist Elinor Ostrom, began to critically analyze the assumptions of game theory. Specifically, they asked: What if our two hypothetical prisoners had been allowed to speak with one another prior to their interrogation and "get their stories straight"? Would that have changed the outcome? Logic holds that it might. Subsequent economic experiments – in which people played complex cooperation games for money incentives – bore this out as

well. When the players of a game can collude together or negotiate, they are far more likely to cooperate (Ostrom 1990). And where the "payouts" or ecological benefits of cooperation increase, the allure of sacrificing immediate individual gain for larger group benefits improves. Certain conditions seem to make communal management of natural resources quite possible, and indeed likely. In this way, the "neo-institutionalists" (adherents to a school of economics that stresses rules and social organization) do not deny the logical incentives that underpin Hardin's tragedy, but do point to conditions where commons are not "free" but instead governed by rules that encourage cooperation.

Nor was this "discovery" of cooperation really all that new. Indeed, in 1888, geographer, explorer, and anarchist philosopher Peter Kropotkin published his classic book *Mutual Aid*, an account of the evolutionary advantages of within-species cooperation, documenting collective action amongst wild animals and insects and simultaneously tracking it through the history of civilization. Accepting that competition between species is an essential part of Darwinian evolution, he argued from a range of evidence that cooperation was equally essential. Rejecting **social Darwinism**, which holds that competition between people is both natural and advantageous, Kropotkin's book painstakingly documents how cooperation in tribes, cities, factories, and farms has led to technological innovation, increased productivity, and the rise of effective forms of self-governance around the world. In typically emphatic language, he rejects social Darwinism as pseudo-scientific, on the evidence of the countless institutions he observed around him, just as Ostrom and other institutionalists would again later:

Social Darwinism The use of Darwinian evolutionary theory to explain social phenomena; as individuals are viewed as naturally and inherently competitive and selfish beings, social Darwinism typically rationalizes war, poverty, and hierarchically stratified social systems

the nucleus of mutual support institutions, habits, and customs remains alive with the millions; it keeps them together; and they prefer to cling to their customs, beliefs, and traditions rather than accept the teachings of a war of each against all, which are offered to them under the title of science, but are no science at all. (Kropotkin 1888: 261)

Later, the economist John Commons reiterated this conclusion, suggesting that all economics, and so all relationships between people and nature, were guided by institutions, which he defined as: "collective action in control of individual action." Rather than countless individuals acting out their individual personal *preferences*, economics was instead directed by laws, rules, and norms. An efficient economy, and a sustainable one by implication, is one that "overcomes scarcity by cooperation" (Commons 1934: 1–6). Collective action, it has long been maintained by institutional thinkers, is the rule and not the exception.

Crafting Sustainable Environmental Institutions

A century later, however, it is clear that not all forms of communal resource management succeed. Environmental "tragedies" do indeed occur, most commonly in one or a combination of the following situations: 1) when laws poorly match the ecological systems they

Box 4.1 The Montreal Protocol

Chlorofluorocarbons (or CFCs) are artificial chemical compounds that have a range of industrial uses, including applications in refrigeration and fire fighting and uses ranging from solvents to propellants in spray cans. Part of the chemical revolution of the 1920s and 1930s, CFCs were viewed as a flexible, cheap, and efficient set of chemicals and they were widely used throughout the twentieth century. The most exciting thing about these chemicals, from an economic point of view, was that they are highly non-reactive; they break down only very, very slowly.

This blessing proved to be a curse, as soon as it was discovered that the chlorine in CFCs, when exposed to the atmosphere, broke down ozone, leaving behind more trace chlorine for hundreds more such reactions. Such ongoing reactions can lead to whole gaps in the ozone layer shrouding the earth: an ozone hole. That hole in the stratosphere was observed by scientists in the 1970s and became a source of grave concern. Because atmospheric ozone keeps deadly radiation from reaching the earth, and because trace amounts of CFCs can destroy lots of ozone, and since CFCs are otherwise so non-reactive that they can survive in the atmosphere for more than a century before becoming inert, it was determined by the late 1980s that the world had an extremely serious problem on its hands. Worse still, by that time, CFCs were employed in an unimagi-

nable range of economic activities, with many industries depending heavily on the chemicals; chemical companies in particular defended their product.

If this was not bad enough, the ozone crisis represented a classic common property problem and a prisoner's dilemma. The cost for any firm or country to switch to alternatives was extremely high, so unless everyone stopped using CFCs at once, the opportunities and incentives to "free-ride" – by continuing to use CFCs and underselling other countries and companies with cheaper goods and services – were extremely high. While some individual countries and states (Oregon, for example) did create their own bans on CFC use, the problem could not be solved without collective action.

Remarkably, the world community overcame the cost and difficulty of coordinating their actions and sat down for an international meeting in Montreal in 1987. They signed a treaty in that year that resulted in a global reduction (indeed a near-total worldwide ban) on most CFCs. This Montreal Protocol was strengthened over the years with follow-up meetings and decisions, and the treaty represents perhaps the single most effective global environmental agreement in history. Many look to the successes of the Montreal Protocol as a model for future global agreements, especially surrounding the very different problem of climate change and greenhouse gas emissions.

are intended to govern, 2) when rules are not supported by sufficient social and political authority to be respected by the people who are expected to obey them, and 3) when norms fail to materialize at all because environmental conditions change too quickly.

So to understand how "the commons" actually works, institutional thinkers have stressed certain rules or principles that tend to lead to sustainable outcomes. In any real-world commons, the central challenge of managing the resource sustainably focuses on a number of discrete grounded problems, each of which poses difficult questions. Consider, for example, the problems of managing a fishery. Here is a resource that is largely invisible, highly mobile, depletable (if overfished), and impossible to enclose. For institutionalists, the central challenge becomes: *How do fishers avoid a "free-for-all" where each mounts increasing efforts to compete for dwindling resources, removing fish faster than the rate at which the fish population can reproduce?* The broad challenge now defined, we are immediately confronted with a slew of other questions:

- How do fishers keep the number of fishing boats to a reasonable level?
- How do fishers compensate individuals for time or effort expended in managing the fishery?
- How does the group reach decisions about what rules are fair?
- How do they know if rules are being followed, given that fish populations are hard to track and count?
- What do they do to rule breakers who over-harvest fish at times the group have decided to be restricted?
- How do they solve conflicts over rights?
- What keeps any locally crafted system from being nullified by a higher authority from the central state or "federal" level?

As most commons management challenges share similar sets of issues, general design principles for management of such resources have been developed. Following Ostrom (1992), successful commons management must include the following.

Boundaries

The resource and the user group should have clearly defined boundaries. That means that the fishery in our example should be a specific territory or population of fish rather than a nebulous area. Equally important, the fishers who have rights to use the fishery by necessity must be specified; it cannot be open to anyone with a boat that simply sails into the area from elsewhere.

Proportionality

Costs accrued in managing should be in line with benefits. People who bear the costs of organizing or monitoring our hypothetical fishery should enjoy equal or higher access rights than those who do not. There should be some form of compensation for any investments in equipment or labor that members of the commons commit to the group.

Collective choice

Arrangements need to be in place so that the specific rules for managing the resource are made by the resource users themselves and/or can be modified through some kind of deliberative group forum. Fishers, in our example, should be able to set the limits for fishing together.

Monitoring

Some system of monitoring needs to exist so that people's behaviors and uses are known to the group and so that the status of the resource itself is checked in order to allow for adjustments. This means that some resources must be dedicated to keeping an eye on what vessels are coming and going from the fishery and to taking a reliable sampled census of

fish stocks. In line with previously noted principles, the costs of such activities need to be borne fairly throughout the group, and the system for implementation should be decided collectively.

Sanctions

Sanctions must be imposed on violators, but these should be graduated, meaning that the system should encourage voluntary compliance with rules, have low punishments for first offenders, and only turn to coercion as a last resort. For our fishery, this means that fishers should expect to monitor one another and comply with rules voluntarily. Should a fisher be found in violation of a limit on the amount of fish they take or some other provision (through the monitoring system established above), they can be encouraged to return to compliance without undue or disproportionate duress or expulsion.

Conflict resolution

Social mechanisms must be developed to resolve conflicts between users. There are many possibilities for mutual complaints in a common property system, and in the case of our fishery, a robust management system would allow a low-cost way to work out mutual grievances without turning towards expensive litigation or calling in higher-order authorities. These mechanisms might be a small council of respected citizens, a mediation system using an outside third party, or any number of other socially appropriate systems.

Autonomy

For a common property management system to work, it is essential that it is allowed at least some measure of autonomy from higher or non-local authorities. Imagine dedicating several years of careful work in developing a community management system of fishers described above, only to have a government official from a distant municipality arrive, review the rules, and begin meddling with their specifics. Where this can be expected to happen, it is unlikely fishers would take the time and effort to craft such a system in the first place.

Given the apparent complexity of making common property systems work, it would seem they would be very rare indeed! Nothing could be further from the truth. The world is brimming with "commons," once a neo-institutional eye is brought to bear on the question. Indeed, it is a sad commentary on our prevailing collective wisdom that cooperation is treated as an oddity or an exception, when indeed it is quite often the rule.

Ingenious flowing commons: Irrigation

Most of the world's crops, including almost all of the vegetables and many of the grains you probably consume, come from irrigated fields. Getting water to food plants might be the oldest problem in civilization. Indeed, the difficulties in maintaining and managing irrigation have occupied environmental managers for thousands of years. One of the great-

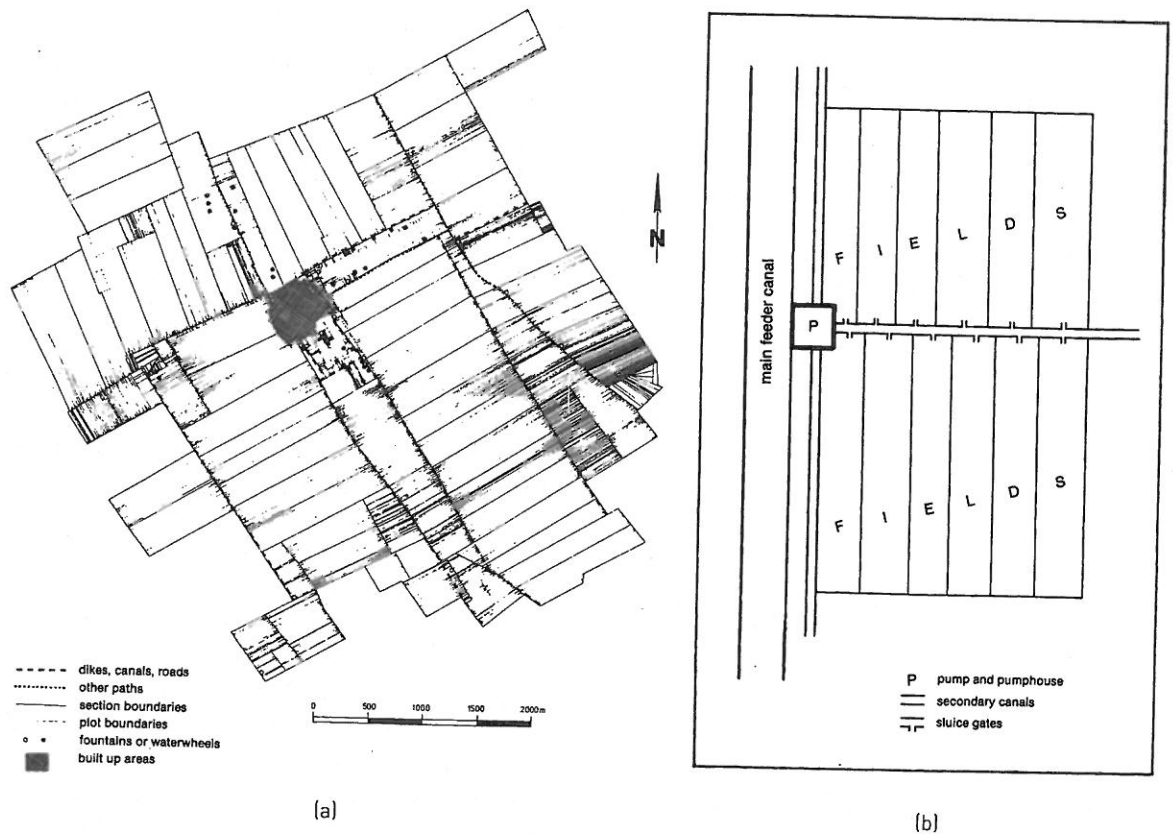


Figure 4.2 Irrigation systems are labyrinths of sluices, canals, and gates, which test the limits of people's ability to cooperate in managing environmental goods. This example, from the village of Musha in the Nile Valley, shows the interrelationships of one private field to the next, tied together by the mutual need for water held communally. *Source:* Turner and Brush (1987), pp. 227, 235.

est challenges in managing irrigation is that, typically, many water users are connected through the same complex system of ditches and walls, through which water flows from the highest point (the system "head") to its lowest fields (its "tail"). Fields may be held privately, but the irrigation water must be managed collectively. Such systems are labyrinths of sluices, canals, and gates, requiring that each user follows a careful set of rules that allow them their share of the water for a time, but also maintenance of the supply so other users, especially downstream, get their fair share as well (Figure 4.2). The opportunities for system failure are obvious. If one person at the head of the system fails to open or close a gate after they use their supply of water, the downstream user will receive none. If all parties do not work together to flush the system as a whole, the water can become salty, leading to the loss of the crops of all farmers. These difficulties notwithstanding, the world is filled with local irrigation systems where multiple users cooperate in the actions, make decisions together, monitor the infrastructure, and achieve equitable outcomes with little waste or loss of precious water.

Wildlife commons: Collective management through hunting

Even the world's wildlife can be considered a kind of commons. In the United States, where herds of elk and other important species were in serious decline a century ago, management has worked to develop common property solutions to problems of over-hunting. Historically, since such animals were wide-ranging and the property of no single land owner, they could be hunted with impunity, leading to population declines in the late 1800s. Current systems of management in states like Montana utilize many of the principles of common property design. Limits are placed by the government on the number of hunters and the number of hunting licenses in any given year based on extensive monitoring of game populations. Preferences for licenses are given to residents of the state. While the overall limits are set by officials, all the rules are overseen through a collective review process that includes Montana hunters themselves. The result is a system where a potential "open access" resource (free-ranging elk) is made into "common property" by 1) excluding some potential outside users, 2) establishing rules and limits, and 3) reviewing and overseeing these rules through consultation with resource users themselves. Versions of this system are in place across the United States.

The biggest commons: Global climate

But not all commons are local, like irrigation, or regional, like elk herds. This brings us full circle to the problem of governing the climate. The global climate has all the qualities of a common property system headed for failure: exclusion is difficult and costs to defer depletion of the collective good can be high to individuals, firms, or states. By treating the global climate as common property, it is possible to think about it in a new way, however. As a commons, we can imagine climate as a shared good, and that people polluting it might constrain their behavior through some kind of collective agreement.

Clearly the possibilities for collective action exist, and many new systems to manage the problem have emerged in the last decade, including the Kyoto Protocol (see Chapter 9). That agreement essentially imposes a mutual set of restrictions that countries must follow on their emissions, with mechanisms for crafting rules and making decisions even in the absence of any kind of higher authority; there is no real "world government" to enforce global agreements, after all.

The problems facing the common property of a fishery are largely similar to global climate, of course. It is hard to monitor who is doing what. Sanctions are difficult to impose on free-riders who do not comply with the rules or on users of the resource (polluters) who are not part of the agreement (e.g., the United States). The presence of collective choice systems for setting and revising the rules is also unclear, beyond the fact that signatories participate in negotiation rounds to work out provisions. For these reasons, an institutional analysis of the climate problem sheds light on the prospects for success in controlling climate change by identifying areas where creativity will be necessary to solve it as a common property problem.

Are All Commoners Equal? Does Scale Matter?

As attractive and effective as an institutional perspective appears to be, it is not without detractors. At their core, these criticisms revolve around some of the assumptions that common property theory inherits from game theory. Specifically, these theories, as embodied in the Prisoner's Dilemma and the Tragedy of the Commons, assume individual free agents of relatively similar power in both determining the outcome of the game and making choices to cooperate. In a world of complex political power and inequality, such assumptions are unrealistic and potentially dangerous.

Consider the ways that access to resources and the rules that govern them have been heavily influenced by social and political conditions surrounding, for example, gender. In many places ownership or inheritance of property is traditionally patriarchal and patrilineal, meaning women cannot own, or at least not inherit, property. At the same time, women's labor may be essential for the maintenance or use of commons, including the drawing of water, the management of irrigation infrastructure, the tending of community gardens or forests, among many others. What this means for common property management is important, since matching rules with users and developing systems of collective choice becomes extremely difficult in places where not all users have equal access or responsibilities.

For these reasons, developing common property management regimes in village India, for example, can be difficult. Here, traditional decision-making bodies (called *panchayats*) tend to be dominated by men, and usually men from elite families or castes. If these decision-making bodies are the ones that make the rules about access to village pastures for grazing, they may be viewed as totally illegitimate by the people who use the resource, including women and more marginal groups who tend cattle. If, on the other hand, new collective decision groups are formed to make new rules, and these groups include women and more marginal groups, they might still be dominated by historically powerful communities, again leading to a lack of legitimacy. In either case, a weak authority may lead to indiscriminate use of the grazing lands by people who feel excluded or, worse, view the establishment of rules as effectively representing a taking-away of their traditional rights. Forming clear common property systems may be desirable in complex power-laden contexts, but it may not be easy by any means (Figure 4.3).

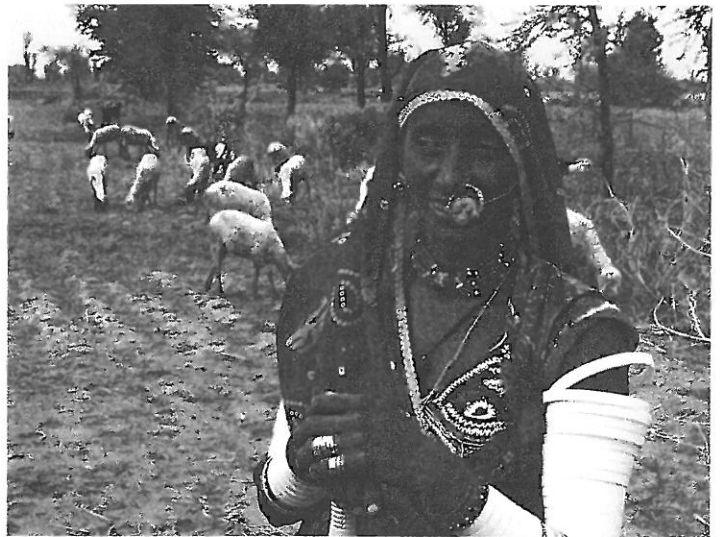


Figure 4.3 A woman tending her herd in India. In many parts of the world the responsibility for using common property and the control over the rules of the commons are often split along lines of gender, class, or race, portending problems for management.

This insight (from the field of feminist political economy: see Chapter 7) can be extended to all commons, whether users are differentially empowered because of income, race, or a host of other discriminatory factors. Under such conditions, the dynamics of the commons become dramatically more complex and sometimes untenable. Social difference and social power make collective decision-making far more difficult, since parties may not trust one another and because the self-imposed group rules determined from common property management may suit the interests of only a small proportion of commons users. Bear in mind that the first and foremost rule of common property resource management is the bounding and exclusion of some potential user populations (Ostrom 2002). Where such exclusions are founded on basic inequalities, many people will be less inclined to cooperate and failure becomes inevitable. So while “getting the rules right” is the favored approach for an institutional solution to environmental crises, some problems, especially problems of power, come far prior.

A final problem of institutional analysis emerges from disagreement over the degree to which the lessons of the countless local common property regimes around the world can easily transfer to larger problems, spread over more diverse populations, at scales beyond the daily experience of people. Some have argued that collective action can only occur in small groups, where face-to-face interaction builds trust, as in an irrigator community. Other evidence suggests, however, that distant people can come together in cooperative regimes, because they are united by the common property they share, as in the case of the atmosphere and climate system.

Can we “scale up” from the local commons to the global commons? It is possible that the future of the planet rests on the resolution of this very question.

Thinking with Institutions

In this chapter, we have learned that:

- Many environmental problems appear intractable because they are prone to problems of collective action.
- Coordination around such problems fails owing to the “Prisoner’s Dilemma,” a metaphor describing the tendency of individuals to rationally seek their immediate gain at the expense of greater gains that might have been made through cooperation.
- Such failure to cooperate around environmental problems typically leads to a “Tragedy of the Commons” where collective goods (e.g., air, water, biodiversity) are degraded.
- Evidence exists from around the world, however, that people succeed at cooperating to preserve common property.
- Theories of common property have therefore emerged, which stress that Hardin’s tragedy might occur where there are absolutely no owners or responsible parties, but most commons are owned and controlled by groups as common property.
- By crafting and evolving social institutions that direct cooperative behavior on common property, communities can overcome commons tragedies.

- Barriers to institutional formation and collective action emerge from social, political, and economic inequities, which make cooperation difficult or impossible.

Questions for Review

1. What is the inevitable and "tragic" behavior exhibited by the herdsmen in Hardin's hypothetical grazing commons?
2. For Hardin, what are the only two options for averting "tragedies of the commons"? Which option does Hardin prefer, and why?
3. Describe a real-world example of a common property resource that is not (tragically) overexploited (use the term "institution/s" in your answer).
4. In a valuable ocean fishery, how can well-crafted boundaries help create a manageable *res communes* (while keeping it from degenerating into an unmanageable *res nullius*)?
5. Why might the atmosphere stand as the most difficult to manage of all imaginable common property resources?

Suggested Reading

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Exercise: A Commons Nearby

Name a common property resource you have access to. This might be an environmental resource (a local park) or a shared good (a computer network). With whom is access to