TRAGICALLY DIFFICULT:
THE OBSTACLES TO GOVERNING THE COMMONS

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by

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Abstract

Garrett Hardin's famous article, "The Tragedy of the Commons," recognized the overuse that occurs when resources are freely available to everyone in common. This essay examines why it has often proven so difficult to solve commons dilemmas through regulation, privatization, and other measures. Using fishing, groundwater extraction, and global warming as examples, the essay suggests that stakeholders find it particularly difficult to agree on solutions, even where a universally imposed solution would be in most stakeholders' interests, because people are reticent to accept current losses to avoid future risks, the dilemmas are characterized by significant scientific and social uncertainty, and users heavily discount the probability and cost of future losses. Turning to potential ways around these obstacles, the essay discusses why commons dilemmas cannot be solved purely through legal coercion or changes in environmental attitude. The essay suggests a variety of ways to improve the chances of convincing resource users that there is a problem that must be addressed and then getting them to agree both on a solution and how to allocate the burden of that solution.

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Tragically Difficult:
The Obstacles to Governing the Commons

Barton H. Thompson, Jr.*

In 1968, Garrett Hardin published his famous and oft-cited article, "The Tragedy of the Commons," examining the overuse of commonly shared resources.[1] Hardin chose his title well. The problem of the tragedy of the commons has been recognized since at least the days of Aristotle. But Hardin gave the problem a vivid and visceral name that quickly captures our attention and tells us much of what we need to know.

Anyone who has studied the environment for very long understands the tragedy of the commons. Where resources are freely available to everyone in common, everyone has an incentive to take as much of that resource as they want, even though the collective result may be the destruction of the resource itself. Society as a whole would be better off restraining consumption and preserving the resource. But the individually rational action for each person is to consume to his or her heart's content. Because no one can bind anyone else's actions, not consuming simply makes one a patsy. To each individual, moreover, his or her actions seem insignificant. Holding back will lead to a marginal improvement, if any, in the condition of the

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* Robert E. Paradise Professor of Natural Resources Law, Stanford Law School. This essay was originally delivered as a speech to the Northwest Law School at Lewis & Clark College, where I was the Distinguished Lecturer during the Fall of 1999. Many thanks are due the faculty, students, and alumni of the Northwest Law School for both their tremendous hospitality and their useful feedback on the original speech. This essay also has benefitted from the valuable comments of Josh Eagle and participants in Stanford Law School's Environmental Workshop Seminar and the Stanford Center on Conflict & Negotiation's Interdisciplinary Dispute Resolution Seminar.

[1] Garrett Hardin, The Tragedy of the Commons, 168 Science 1243 (1968).

resource. Even those who recognize and bemoan the oncoming tragedy of overuse will often conclude that it makes no sense not to join others in depleting the resource. The high road leads nowhere. The cumulative result of reasonable individual choices is collective disaster.

Most of the recent academic literature on the tragedy of the commons has examined why some commons do **not** lead to tragic consequences. Elinor Ostrom and others have shown that local communities throughout the world sometimes have been able to avoid the tragedy through the development of local management institutions.[2] Psychologists also have run experiments to determine what conditions maximize the chances that individual resource users will limit their consumption even when trapped in the logic of the commons. These experiments suggest that resource users are more likely to restrict their consumption where they receive prompt feedback on the impact of their extractions, where their behavior is visible to others, where they can communicate with their fellow resource users, and where the users share a group identity.[3] The

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[2] See Elinor Ostrom, Governing the Commons: The Evolution of Institutions for Collective Action (1990); Donald R. Leal, Community-Run Fisheries: Avoiding the "Tragedy of the Commons," 19 Population & Env't 225 (1998). For proof that not all indigenous communities effectively overcome the tragedy of the commons, however, see Craig T. Palmer, Folk Management, "Soft Evolutionism," and Fishers' Motives: Implications for the Regulation of the Lobster Fisheries of Maine and Newfoundland, 52 Hum. Org. 414 (1993).

[3] See, e.g., Peter Kollock, Social Dilemmas: The Anatomy of Cooperation, 24 Ann. Rev. Soc. 183, 194-195 (1998) (communication and group identity); Marilyn B. Brewer & Roderick M. Kramer, Choice Behavior in Social Dilemmas: Effects of Social Identity, Group Size, and Decision Framing, 50 J. Personality & Soc. Psychol. 543 (1986) (group identity); Dale O. Jorgenson & Anthony S. Papciak, The Effects of Communication, Resource Feedback, and Identifiability on Behavior in a Simulated Commons, 17 J. Experimental Soc. Psychol. 373 (1981) (feedback, visibility of resource use, and communication); Robert C. Cass & Julian J. Edney, The Commons Dilemma: A Simulation Testing the Effects of Resource Visibility an Territorial Division, 6 Hum. Ecology 371 (1978) (visibility of resource use).

The cultural universality of the tragedy of the commons also has been questioned. Although commons dilemmas appear to lead to tragic results in most societies, one experiment has suggested that some Southeast Asian cultures may reach more cooperative results. See Craig D. Parks & Anh D. Vu, Social Dilemma Behavior of Individuals from Highly Individualistic and

message of both field work and experimental commons is that tragedy is not inevitable. With the right conditions, resource users can avoid depleting the resource.

My interest, however, is not with the success stories, but with the pathology of the failures. Tragedy may not be inevitable in the commons, but unhappily tragedy remains the predominant outcome. My interest, moreover, is not why commons typically lead to tragedy. Hardin and others have done an excellent job explaining the process by which resource users, left to individual choices, are driven to overuse the resource.[4] My interest is why it has proven difficult for governments, communities, and other institutions to adopt and implement solutions to the commons dilemma–and, even more troubling, why resource users often have been the most vociferous opponents of compulsory solutions.

Academics have not only explained the structural fabric of the tragedy of the commons, but identified a number of workable solutions. One frequently potent solution is to privatize the commons. Both field investigations and social science experiments have repeatedly shown that privatization, where possible, is typically a particularly effective solution to the tragedy of the commons.[5] Where a resource can be privatized, the resource owners will incur the entire cost of overuse and thus carefully husband the resource. A related solution is to unitize the resource:

Collectivist Cultures, 38 J. Conflict Resol. 708 (1994) (finding more cooperative behavior among recent Vietnamese immigrants to the United States, but suggesting that the cooperation might not persist where Southeast Asians competing against individuals from other cultures).

[4] See, e.g., Elinor Ostrom, Ray Gardner, & James Walker, Rules, Games, and Common-Pool Resources (1994); Ostrom, supra note 2, at 1-13; Hardin, supra note 1; C. Scott Gordon, The Economic Theory of a Common-Property Resource: The Fishery, 62 J. Pol. Econ. 124 (1954).

[5] See, e.g., Kollock, supra note 3, at 203 (but noting limitations of privatization); Diane K. Martichuski & Paul A. Bell, Reward, Punishment, Privatization, and Moral Suasion in a Commons Dilemma, 21 J. Applied Soc. Psychol. 1356 (1991); Cass & Edney, supra note 3 (individual territories significantly improved resource management).

organize a single operator to manage exploitation of the resource and divide any profits among the community of resource users or owners. Where privatization or unitization is not possible–and frequently such solutions are not workable for technological or cultural reasons–government or community regulation can limit overuse of the commons. The government can restrict the total number of cattle being grazed in the common pasture, cap extractions of petroleum, or control discharges of pollutants into a surface stream.

Despite multiple workable solutions to the tragedy of the commons, however, governments and other institutions have found it extremely difficult to address many of the most important commons dilemmas facing the world today. Resource users, moreover, have typically been the most vociferous critics of proposed solutions. In a number of important commons contexts, resource users have vehemently denied that there is a problem (despite relatively substantial evidence that a serious problem exists), argued that intervention by the government or other outside institutions is unnecessary (despite repeated failures by the community of resource users themselves to voluntarily or collectively limit resource use), and opposed suggested solutions as unfair and unwise. The question that impels this essay is why it has proven so difficult to implement effective solutions and, more specifically, why resource users have proven not only unreceptive, but affirmatively hostile, to such solutions.

One should not expect that solving the tragedy of the commons should be easy. Just as the tragedy of the commons presents a collective action problem, trying to solve the problem does also. Solving the tragedy of the commons is an example of a public good, because all users of the commons benefit from a solution. No individual resource user may see why it is in her particular advantage to rush out and spend political and other resources trying to solve the

tragedy. Let Joe take the lead, Jill thinks. But of course the problem is that Joe, in turn, waits for Jill to take the lead, and both wait for Bob. The result, according to political economists, is that everyone holds back and nothing gets done.

Many resource users, moreover, might conclude that they are better off in a commons free-for-all than in a world constrained by property rights, unified management, or regulation. Some resource users might decide that they enjoy special advantages over other users in the race for the resource. For example, a particularly expert fisherman might believe that he is likely to land far more fish in an unrestricted fishery before the fishery is exhausted than he would be permitted to land under an imposed allocation. Or a resource user might receive a great deal of psychic value from the competitive character of an unconstrained commons.

Even resource users who favor constraining overall depletion of the commons might conclude that there is no practical means of policing any solution. A characteristic of many of the most perplexing commons dilemmas, such as world fisheries, is the difficulty of determining how much any particular resource user is tapping the commons. The opacity of user behavior is one of the factors that contributes to the tragedy; unable to gauge others' behavior, each user feeds on the fear that others are maximizing their consumption and increases his or her own consumption. The same opacity makes agreed-upon restrictions difficult, if not impossible to enforce. And resource users are likely to advocate solutions only if they are enforceable.[6]

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[6] See Bert Klandermans, Persuasive Communication: Measures to Overcome Real-life Social Dilemmas, in Social Dilemmas: Theoretical Issues and Research Findings 307, 312 (Wim B.G. Liebrand, David M. Messick, & Henk A.M. Wilke eds., 1992) (solutions will not be supported unless individuals believe enough others will obey to make effective). See also Hans-Joachim Mosler, Self-Dissemination of Environmentally-Responsible Behavior: The Influence of Trust in a Commons Dilemma Game, 13 J. Envtl. Psychol. 111 (1993) (finding that mutual restrictions are more likely in a commons dilemma where commitments are public and

But some people *are* willing to take the lead in resolving commons problems, even when the benefits are shared by others. And ending the tragedy will be in the clear interest of many resource users. Absent a solution, the resource upon which the users' livelihoods, and in some cases their lives, depend may be destroyed.[7] Even if a resource user believes that she enjoys a comparative advantage in a race for the resource, races are exhausting and typically require a greater expenditure of resources. Balancing the benefits and costs of an unconstrained commons thus should lead many resource users to want a solution.

The factors that undermine peoples' incentive to cooperate in utilizing a commons, moreover, should not undermine their incentive to support a collective solution that constrains everyone's use of the commons.[8] A resource user trying to decide whether to support a collectively-mandated solution, for example, does not have to worry about becoming a patsy, because everyone will be bound by the solution. Nor will resource users be deterred by the concern that their individual decisions will have only a marginal impact on the health of the resource; unlike unilateral, voluntary actions, the adoption of a universal solution can save the resource.[9]

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verifiable).

[7] See Palmer, supra note 2, at 415 (anthropological study finding that vulnerability of stocks under a self-regulated fishery is a major motivation for fishermen to support governmental restrictions).

[8] See Jonathan Baron & James Jurney, Norms Against Voting for Coerced Reform, 64 J. Personality & Soc. Psychol. 347, 347 (1993) (noting that for many commons solutions, "it is in the interest of most people to support the reform, even if it is not in their interest to cooperate in the absence of coercion"); cf. Douglas D. Heckathorn, Collective Action and the Second-Order Free-Rider Problem, 1 Rationality & Society 78 (1989) (arguing that second-order cooperation is more robust than first-order cooperation).

[9] Cf. Kollock, supra note 3, at 200 (noting that cooperation increases in commons dilemmas where people "can have a noticeable effect on the outcome").

Experimental simulations of commons dilemmas confirm these intuitions. Participants in the simulations behave far more cooperatives when choosing whether to support a universal solution than when choosing whether voluntarily to restrict their resource use. Even participants who refuse to limit their consumption in the face of clear evidence that the resource is being depleted will vote to eliminate free access to that resource if overuse becomes bad enough. Trapped in a commons dilemma, participants will continue to compete for the resource until the resource is depleted. But given the opportunity to limit capture, a majority of participants realize at some point that it is in their rational self-interest to solve the commons dilemma.[10]

Yet in real life, many commons dilemmas have proven impossible to resolve. Not only is it difficult to get people to actively support solutions to commons dilemmas, but the people with the most to lose if the commons is destroyed often combine together to oppose proposed solutions. The questions are why resource users so frequently oppose proposed solutions and whether there are any steps that increase the chance of enlisting the support of resource users in solving the tragedy cycle in which they are trapped.

I. THREE EXAMPLES

Three examples of current commons dilemmas – depletion of the world's fisheries, groundwater overdrafting, and global climate change – illustrate the frequent opposition of resource users to solving the tragedy of the commons. In each of the examples, a reasonable case

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[10] See, e.g., David M. Messick et al., Individual Adaptations and Structural Change as Solutions to Social Dilemmas, 44 J. Personality & Soc. Psychol. 294 (1983) (extreme overuse led 70% of participants to vote to eliminate free access, even though extreme overuse did not lead to voluntary reductions in individual harvests); C.G. Rutte & H.A.M. Wilke, Social Dilemmas and Leadership, 14 Eur. J. Soc. Psychol. 105 (1983); see also Charles D. Samuelson & David M. Messick, Individual and Structural Solutions to Resource Dilemmas in Two Cultures, 47 J. Personality & Soc. Pscyhol. 94 (1984).

can be made that governmental or collective intervention through the delineating of property rights, unification, or regulation is in the long-term interest of the majority of resource users. Yet the resource users often actively oppose seemingly reasonable solutions. These examples are particularly troubling because the resources in all three cases are crucial to either regional economies or, in the case of global climate change, world environmental security.

A. Depletion of World Fisheries

Ocean fisheries are one of the world's most important resources. The fisheries are a major source of both sustenance and employment, particularly in the developing world.[11] And the ocean is the habitat for a far older, richer, and more diverse set of species than we find on land. Unfortunately, as Carl Safina has recently illuminated in his elegant book *Song for a Blue Ocean*, ocean fisheries are prime examples of commons, and the resulting overuse of these commons is having increasingly tragic consequences.[12]

Modern technologies now enable fishermen to go wherever the fish are found, and to identify, track, and catch the fish with a relentless efficiency. The resulting tragedy has been dramatic. According to the United Nations Food and Agriculture Organization, seventy percent of the world's commercially important marine fish populations are currently in urgent need of managed conservation.[13] Nine of the world's 17 major fishing grounds are in serious decline; four have been commercially fished out.[14] In the United States' coastal waters, the National

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[11] See Lisa Speer et al., Hook, Line, and Sinking: Crisis in Marine Fisheries 123-124 (Natural Resources Defense Council, Feb. 1997).

[12] See Carl Safina, Song for a Blue Ocean (1998).

[13] See United Nations Food & Agricultural Organization, Marine Fisheries and the Law of the Sea: A Decade of Change (1994) (44% of fish stocks considered intensively to fully exploited, 25% considered overexploited, depleted, or recovering).

[14] See Kimberly A. Wade-Benzoni, Thinking About the Future: An Intergenerational

Marine Fisheries Services (NMFS) has reported that of the limited number of fish species whose status is known, one-third are either overfished or approaching an overfished condition.[15] And NMFS expects that the percentage of overfished stocks will increase in the future.[16]

One might expect that fishermen would strongly support efforts to eliminate overfishing. Not taking any action might ultimately mean the closure of the very fisheries upon which the fishermen are currently reliant for their livelihoods. Indeed, many commercial fisheries are already closed or producing lower harvests, with serious economic repercussions for the fishermen and for the communities in which they live. Canada had to close its commercial groundfishery off Newfoundland in 1992, leading to the loss of some 40,000 jobs, the withering of local communities, and a social welfare bill exceeding $1 billion.[17] The Grand Banks and Georges Bank, once among the greatest fishing grounds in the world, are also now effectively closed.[18] Worldwide, all of the major regional fisheries, with the lone exception of the Indian Ocean fisheries, are producing significantly lower catches than 10 years ago. In a number of fisheries, the yields have dropped 30 to 50 percent from their peaks.[19]

Perspective on the Conflict and Compatibility Between Economic and Environmental Interests, 42 Am. Behav. Scientist 1393 (1999).

[15] See U.S. National Marine Fisheries Service, Report to Congress: Status of Fisheries of the United States (1998).

[16] See Victor R. Restrepo, Pamela M. Mace, & Fredric M. Serchuk, The Precautionary Approach: A New Paradigm, or Business as Usual?, in National Marine Fisheries Service, Our Living Oceans: Report on the Status of United States Living Marine Resources 2 (1999).

[17] See Seaweb, Background: Global Fisheries <www.seaweb.org/background/book/fishery.html. (visited Feb. 4, 2000).

[18] See Carl Safina, The World's Imperiled Fish, Sci. Am., Nov. 1995, at 46, 48.

[19] See id. at 48-49.

How have fishermen responded? Some local fishing communities have taken steps to self-regulate themselves.[20] The United States also has taken some steps to address the fishing tragedy, often with the support of at least a segment of the fishing industry. In 1976, Congress passed the Fishery Conservation and Management Act, known as the Magnuson Act, which established an exclusive fishery conservation zone that is effectively off limits to foreign fishing vessels, and also established eight regional management councils with authority to establish management plans for endangered fisheries.[21] In 1996, Congress strengthened the Magnuson Act through the Sustainable Fisheries Act.[22] The Sustainable Fisheries Act tightens restrictions on overfishing and requires management plans to include a timetable for ending overfishing and rebuilding overfished stocks within 10 years.[23]

Fishing interests, however, have actively fought the inclusion of stronger management and enforcement provisions in the Magnuson Act. Fishing organizations throughout the United States, moreover, have worked to undermine effective implementation of the Act. Fishing interests control the regional management councils and typically have opposed management efforts that would significantly reduce catches.[24] As of early 1999, regional councils had adopted a total of only 39 fishery management plans.[25] Many of the species classified as overfished are still awaiting plans, and most of the existing plans are decidedly inadequate. According to a

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[20] See Ostrom, supra note 2; Leal, supra note 2.

[21] 16 U.S.C. §§ 1801 et seq. For a useful description of the Magnuson Act, see Michael J. Bean & Melanie J. Rowland, The Evolution of National Wildlife Law 148-192 (3d ed., 1997).

[22] Pub. L. No. 104-297, 110 Stat. 3559 (1996).

[23] 16 U.S.C. § 1854(c)(4).

[24] See Bean & Rowland, supra note 21, at 192 (regional councils have been "criticized for 'institutionaliz[ing] special interests in fishery management,' resulting in allowable catch quotas that are not biologically based but instead attempt to satisfy all those who want to fish").

[25] See Marine Fish Conservation Network, Missing the Boat (Jan. 1999).

1995 National Marine Fisheries Services report, very few fishery management plans have been successful in preventing overexploitation of their respective species.[26] And the 1996 Sustainable Fisheries Act is unlikely to change that in the immediate future. Despite the 1996 Act's attempt to limit overfishing and restore fisheries, many of the plans that have been adopted in the wake of the 1996 Act permit continued overfishing for the immediate future.[27] The Marine Fish Conservation Network, a coalition of conservation, fishing, and environmental organizations, believes that all of the plans adopted in the wake of the 1996 Act are inadequate to rebuild stocks within 10 years, as required by that Act.[28]

B. Groundwater Overdrafting

Compared to the attention that fishery problems has received, little attention has been paid to the worldwide threats to groundwater, even though groundwater is an equally important world resource. Thirty percent of the world's freshwater reserves are groundwater. If you exclude those freshwater resources that are locked up in glaciers and permafrost, groundwater constitutes over ninety-nine percent of the world's freshwater reserves. Groundwater satisfies about a quarter of the off-stream water needs of the United States, and groundwater use actually exceeds surface water use in over half a dozen states, ranging geographically from Florida on the East Coast to Hawaii in the Pacific.[29] Groundwater use, moreover, is growing relative to surface water use. From 1985 to 1995 groundwater use increased ten percent in the United States.

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[26] See United States National Marine Fisheries Service, Our Living Oceans 1995: Report on the Status of U.S. Living Marine Resources (Feb. 1996).

[27] See Marine Fish Conservation Network, supra note 25.

[28] See id..

[29] Groundwater is particularly important to farmers and rural communities–furnishing 95 percent of the drinking water for rural residents, and almost 45 percent of the water used for irrigated farmland. See Payal Sampat, Groundwater Shock, World Watch, Jan. 1, 2000, at 10.

During the same period, surface water use declined slightly.[30] As noted by the Western Water Policy Review Advisory Commission in its 1998 final report, "groundwater supplies are often deemed superior to surface water supplies in terms of public health protection, technical simplicity, economy, and public acceptance."[31]

Unfortunately, groundwater is also a natural commons. Absent legal constraints, each user has an incentive to pump as much as he or she needs, even when the cumulative result is a rapid depletion or overdrafting of the groundwater aquifer. Here, again, the extent of the tragedy is enormous. Nationally, water users in the United States extract about 75 million gallons a day of water from groundwater aquifers. Compare that to the total national recharge of only 60 million gallons of water per day.[32] Such overdrafting of aquifers can have adverse consequences to both the users of the groundwater and third parties. Overdrafting lowers the water table, forcing water users to pump the groundwater up greater distances at greater cost; any water extracted beyond the aquifer's annual recharge is lost to future use (just as with the mining of nonrenewable resources); overdrafting of coastal aquifers can lead to salt water intrusion and the irreversible contamination of the aquifer. Overdrafting also can lead to subsidence and dessertification of the surface.[33] Because of the importance of groundwater to world agriculture, some believe that groundwater overdrafts are the single biggest threat to world food production.[34]

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[30]For general statistics on world and national groundwater, see Peter H. Gleick, The World's Water, 1998-1999: The Biennial Report on Freshwater Resources (1998).

[31] Western Water Policy Review Advisory Commission, Water in the West: Challenge for the Next Century 3-8 (June 1998).

[32] See Barton H. Thompson, Jr., Water Allocation and Protection: A United States Case Study, in Earth Systems: Processes and Issues (W.G. Ernst ed., 2000).

[33] See id.

[34] See Sandra Postel, When the World's Wells Run Dry, World Watch, Sept. 1, 1999, at 30.

The Ogallala or High Plains Aquifer which underlies portions of seven states in the central-south portion of the United States is both the biggest aquifer in the United States and a good illustration of the tragic consequences of unconstrained groundwater withdrawals. The Ogallala supplies about a quarter of all the irrigation water needs in the United States.[35] The Ogallala also is one of the most overdrafted aquifers in the United States. By 1990, groundwater supplies in the Ogallala aquifer had dropped almost a quarter from their early 20th century levels. In parts of Texas, Oklahoma, and Kansas, the groundwater tables for the Ogallala had dropped 140 feet by 1990.[36] Some hydrologists predict that, at the current pace, most of the aquifer will be depleted this century, leaving several million acres of farmland without a ready source of water.[37]

Worldwide large portions of China, India, Pakistan, North Africa, and the Middle East are experiencing serious overdrafting problems.[38] Saudi Arabia currently pumps five times the amount of water from its groundwater aquifers as are naturally replenished into the aquifer. Most experts estimate that water in Saudi Arabia aquifers will last only about another 25 to 100 years.[39]

One might expect that the farmers and other water users who are dependent on groundwater would eagerly embrace limits on overall groundwater withdrawals. As just described, unconstrained groundwater use and the resulting overdrafts primarily injure the groundwater users themselves. As groundwater tables drop, pumping costs increase until, at

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[35] See Gleick, supra note 30.
[36] See id.
[37] See Thompson, supra note 32.
[38] See id.; Postel, supra note 34.
[39] See Thompson, supra note 32.

some point, groundwater users can no longer afford to pump the water. At that point, the groundwater users must either find an alternative source of water (which today are typically not available), find a way of proceeding forward without water, or close up shop.[40] Between 1974 and 1989, about a third of all the irrigated farmland overlying the Ogallala aquifer went out of production because the cost of getting the ground water out of the aquifer increased so much as a result of overdrafting.[41] In coastal regions of California and the Southeastern United States, unconstrained groundwater use sometimes has led to salt water intrusion, threatening the entire groundwater resource.[42] The other major costs of groundwater overdrafting – surface subsidence and desertification – fall on overlying property owners, and most groundwater users are also overlying owners.

In a small fraction of cases, groundwater users from the same aquifer have united to restrict groundwater pumping. Some states also have taken action in light of these problems (although frequently over the objections of groundwater users). Between 1980 and 1989, fifteen states adopted groundwater laws or policies addressing problems of overdraft.[43] But many states have not acted, including two of the largest groundwater using states in the nation–Texas and California.[44] Where states have acted, moreover, they have generally addressed the problem far

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[40] See Postel, supra note 34.

[41] For similar reasons, up to a quarter of India's grain harvest may be in jeopardy. See Postel, supra note 34.

[42] See, e.g., Gordon Smith, Sea Water Seeps: Water Wars Rage, San Diego Union-Tribune, Jan. 8, 1995, at A-1.

[43] See William Blomquist, Exploring State Differences in Groundwater Policy Adoptions, 1980-1989, Publius, Spring 1991, at 101, 102.

[44] Texas, alone among the United States, continues to follow a rule of "absolute ownership" that permits overlying owners to pump to their hearts' content. See Sipriano v. Great Spring Waters of America, 1 S.W.3d 75 (Tex. 1999). Although California technically proscribes groundwater overdrafting, weak enforcement mechanisms continue to lead to considerable

too late and ineffectively. Most states have put off addressing the problem until after years of serious overdrafting, and the resulting regulations have often been little more than window dressing. As the Western Water Policy Review Advisory Commission said in its final report, "Achieving sustainable groundwater use remains one of the major water management challenges facing the western United States."[45] The international picture is no different. Few national governments have made a comprehensive effort to regulate groundwater overdrafting; many do not even require monitoring of groundwater extractions.[46]

An example of the problems that states have confronted in addressing groundwater overdrafting is the Arizona Groundwater Management Act of 1980.[47] For years, Arizona had dramatically overdrafted its major aquifers. Farmers and other groundwater users, however, opposed regulation until a state supreme court decision threatened to curtail some groundwater uses entirely and the federal government threatened to end its funding of the Central Arizona Project unless Arizona addressed its groundwater problems. Even then, then Governor Bruce Babbitt had to intervene personally to get agreement on state legislation among the warring factions of groundwater users. Water observers have often praised the resulting Arizona Groundwater Management Act for addressing the state's groundwater problems.[48] But in truth, the Groundwater Management Act does not require Arizona groundwater users to reduce their

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overdrafting in the Central Valley and other portions of the state. See City of Los Angeles v. City of San Fernando, 537 P.2d 1250 (Cal. 1975); Katz v. Walkinshaw, 74 P. 766 (Cal. 1903); Benjamin R. Vance, Total Aquifer Management: A New Approach to Groundwater Protection, 30 U.S.F. L. Rev. 803, 810 (1986).

[45] Western Water Policy Review Advisory Commission, supra note 31, at 3-6.

[46] See Postel, supra note 34.

[47] Ariz. Rev. Stat. Ann. §§ 45-411 et seq.

[48] See, e.g., Philip R. Higdon & Terence W. Thompson, The 1980 Arizona Groundwater Management Code, 1980 Ariz. St. L.J. 621, 666 (touting the Act as a "remarkable achievement").

withdrawals of groundwater to an amount equal to the natural recharge of the aquifers until 2020–forty years after the original passage of the Act.[49] And it's questionable whether the standards of that act are tough enough to meet even that distant goal.[50]

C. Global Climate Change

The danger of global climate change presents a slightly different form of commons dilemma. Rather than taking something *out* of the commons, in this case people are putting something *in* – SO_2 and other greenhouse gases. And virtually everyone is contributing to the problem; it is not simply a narrow class of the population that is feeding the potential tragedy. But global climate change is still a classic example of the tragedy of the commons. Since atmospheric use is free to all, businesses, individuals, and governmental entities throughout the world use it as a great waste repository, resulting in the tremendous threat today to the world's climatic system.

The potential adverse consequences of global warming outstrip even the problems that are confronting us through depletion of the world's fisheries and groundwater aquifers. Atmospheric concentrations of carbon dioxide, the most important of the greenhouse gases, are now about 30 percent over pre-industrial levels.[51] An independent scientific panel estimates that the Earth's surface temperature already has increased between 0.7 and 1.4 degrees Fahrenheit

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[49] See Ariz. Rev. Stat. § 45-562(A).

[50] See Joseph L. Sax, Robert H. Abrams, & Barton H. Thompson, Jr., Legal Control of Water Resources 505-506 (2d ed., 1991); Robert J. Glennon, "Because That's Where the Water Is": Retiring Current Water Uses to Achieve the Safe-Yield Objective of the Arizona Groundwater Management Act, 33 Ariz. L. Rev. 89, 93-101 (1991).

[51] See Stuart Eizenstat, Stick with Kyoto: A Sound Start on Global Warming, Foreign Affairs, May/June 1998, at 119.

since the start of the 20th century.[52] The intergovernmental panel on climate change has warned that, without intervention, average global temperatures will increase further anywhere from 2 to 6.5 percent Fahrenheit by the end of the next century.[53] Such warming, if it occurs, is likely to cause the sea level to rise and inundate coastal areas, particularly in the southern hemisphere. It also could worsen droughts and rainstorms, cause more heat waves and floods, increase precipitation generally, and shift climatic and agricultural zones.[54]

Given the growing understanding of the risk of global climate change, one might think that the world's population would come to a rapid agreement on an effective solution. And indeed the world has taken some action. At the 1992 Rio Conference, delegates from over 140 countries endorsed the Framework Convention on Climate Change.[55] And five years later, parties to that convention adopted the Kyoto Protocol, setting specific targets and timetables for reducing emissions of green house gases from the twenty-four industrial countries of the OECD and from the European countries of the former Soviet Union.[56]

But no knowledgeable observer believes that the Kyoto Protocol is adequate to meet the risk of global climate change. First there is serious doubt whether enough countries, including the United States, will end up ratifying the Kyoto Protocol in order to bring it into effect.[57]

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[52] See So It's Not the Humidity: Experts Agree that the Planet's Getting Warmer, U.S. News & World Report, Jan. 24, 2000, at 49.

[53] See id.

[54] See generally Stephen Henry Schneider, Laboratory Earth: the Planetary Gamble We Can't Afford to Lose (1997).

[55] See United Nations Conference on Environment and Development, Framework Convention on Climate Change, reprinted in 31 I.L.M. 849 (1992); Nanda, supra note ?, at 321.

[56] See Conference of the Parties to the Framework Convention on Climate Change, Kyoto Protocol, reprinted in 31 I.L.M. 22 (1997); Nanda, supra note ?, at 321; Richard N. Cooper, Toward a Real Global Warming Treaty, Foreign Affairs, March/April 1998, at 66.

[57] See Hermann E. Ott, The Kyoto Protocol: Unfinished Business, Env't, July 17, 1998, at

Second, and far more importantly, most observers agree that the Kyoto Protocol was at best a quick political fix.[58] The protocol does not constrain emissions of developing countries and, without such constraints, the protocol is unlikely to make an effective cut in the emission of greenhouse gases.[59] The U.S. Department of Energy estimates that, even if all industrialized countries ultimately comply with the Kyoto Protocol, carbon emission in the year 2010 will still be 32 percent greater than they were in 1990 (compared to a 44 percent increase if the industrialized countries do not comply).[60]

Tremendous political obstacles stand in the way of an effective world solution. Despite the scientific evidence of global warming, the population of the United States–which would probably need to make the greatest current sacrifice to effectively address the problem–is largely unconcerned about the issue. As late as 1997, only slightly more Asians were worried a "great deal" about global warming (24 percent) as were not worried at all (17 percent).[61] The American public, moreover, does not believe that the United States should take any action to address global warming unless all countries contribute equally to a solution, and the Clinton Administration has promised not to seek Senate ratification of the Kyoto protocol until developing nations agree to "substantial participation."[62] Yet developing countries do not believe that they have any

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[58] See Henry D. Facoby, Ronald G. Prinn, & Richard Schmalensee, Kyoto's Unfinished Business, Foreign Affairs, July/August 1998, at 54.

[59] See id.; Nanda, supra note ?, at 332-333; Cooper, supra note 56.

[60] See Energy-Carbon Emissions Predicted to Increase Substantially by 2020, DOE Report Says, 21 Int'l Envt. Rep. (BNA) 439 (1998).

[61] See Jeffrey J. Rachlinski, The Psychology of Global Climate Change, --- Ill. L. Rev. —, --- (2000) (citing a November 1997 survey by the Pew Center for People and the Press).

[62] See id. (citing November 1997 survey by the Pew Center for People and the Press showing that 70 percent of respondents believed that all countries, regardless of wealth, should make the same emission reductions); Facoby, Prinn, & Schmalensee, supra note 58 (describing

responsibility to address the problem because, even though global warming is most likely to harm the developing world, the vast majority of historic greenhouse emissions have emanated from the developed world.[63] Not only did developing countries successfully oppose being subjected to the restrictions of the Kyoto Protocol, but they even killed a provision that would have let them *voluntarily* opt into the protocol.[64] Finding a formula for reducing and capping emissions that is acceptable to all nations will be a herculean task.[65]

II. UNDERSTANDING THE OBSTACLES TO SOLVING THE COMMONS

Why has it proven so difficult to adopt solutions to these commons tragedies? Why have the people who would seemingly benefit from a mandated solution often actively opposed them? When locked in a political battle over fishing, groundwater use, or global climate change, it is often tempting to blame the people themselves. The people who are opposing a solution, it is tempting to believe, are selfish, short-sighted, anti-environmental, and/or overly focused on immediate material gain. But most of the people trapped in commons dilemmas are good people who want to do what is right for their community, for society at large, and for the environment.

Carl Safina in *Song for a Blue Ocean* goes out of his way to give readers a sense for the morality of the fishermen who are the root of the overfishing problem. Fisherman after fisherman in his book describes how they love the very fish that they're catching. The fisherman

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Clinton Administration position).

[63] See Nanda, supra note ?, at 329.

[64] See Facoby, Prinn, & Schmalensee, supra note 58 (provision struck from protocol because of opposition of China, India, and other key developing countries that opposed any provisions that might lead to limits on their emissions).

[65] See Cooper, supra note 56 (arguing that there is unlikely to be a generally acceptable principle for allocating emission rights, dooming the Kyoto approach to failure).

often label themselves conservationists; they decry obviously destructive activities; virtually all claim that they would be "the first guys to stop fishing, if we thought the fish were really in trouble." Farmers say the same thing about their water resources. People world round say the same thing about the climatic balance that nurtures and protects them.

If you believe what these resource users say, the problem is not the people locked in the commons dilemmas but the situations in which they find themselves. When put in a commons dilemma, most of us behave in a similar fashion. To help understand and overcome the difficulties involved in gaining support for commons solutions, we must therefore turn away from attribution of blame and look to recent research conducted by psychologists, economists, sociologists, and anthropologists both in the field and in experimental simulations on why people sometimes do not behave in their best interest.

Although each of my three examples has its own unique characteristics that make a solution difficult, they share three important common features that make it difficult for people to act “rationally” in trying to come up with an acceptable solution to the tragedies that they encounter. First, solving each dilemma requires people to reduce the level of resource use that they historically have enjoyed. Second, each dilemma is characterized by significant scientific and social uncertainty. Finally, each dilemma involves an intertemporal trade off: to what degree are people willing to sacrifice today in order to preserve resources for the future?

A. Framing: Losses Versus Gains

The first point might seem obvious, indeed overly obvious. If the user of a common resource did not have to sacrifice anything to avoid the tragedy of the commons, the tragedy would be easy to resolve. But my premise is not simply that the tragedy is difficult to resolve

because solutions typically involve giving up higher consumption today in order to preserve the resource in the long run. In the cases that I've discussed, many "rational" resource users should find the necessary tradeoff worthwhile. The problem is that most resource users view the tradeoff as requiring them to give up a current right, which encourages them to accept a high degree of risk to avoid the current loss.

Psychologists have long recognized that the framing of an action as either a gain or a loss can make a difference. In particular, people are more risk adverse when dealing with gains (they prefer sure payoffs to gambles) and more willing to take risks when dealing with losses (they will risk a lot to avoid a sure loss). In evaluating proposed solutions to commons dilemmas, most resource users appear to start with their historic level of resource use and ask how the solution impacts that level of use. They thus see most proposed solutions, such as caps on use, as constituting losses, rather than reduced gains. The solutions, in the eyes of the resource users, require the users to give up something that they currently have.[66] And as researchers have predicted, the resource users therefore willingly risk sizable future losses to avoid sure immediate losses. Experimental simulations of commons dilemmas have repeatedly found that participants have a harder time resolving the commons in a loss framework than in a gains framework.[67] In

[66] At a theoretical level, one can view virtually any solution to a commons dilemmas as involving either a gain or a loss. See Christel G. Rutte, Henk A.M. Wilke, & David M. Messick, The Effects of Framing Social Dilemmas as Give-Some or Take-Some Games, 26 Brit. J. Soc. Psychol. 103, 103-104 (1987). For example, fishing quotas could be viewed as providing fishermen with a positive right to a certain number of fish (a gain). If viewed from this perspective, the solution might look quite good: fishermen are getting a sure gain today, rather than gambling on the future viability of the stock. Or, as the text suggests, the same solution could be viewed as a loss. In practice, resource users seem to use historic use as their frame of reference and thus view the solutions as mandating an immediate loss.

[67] A number of the experiments have compared standard "commons dilemmas" (where subjects must decide how much of a new resource pool to take) with "public goods dilemmas"

real life, moreover, resource users believe that they have achieved their historic level of resource use through their own industry and skills, strengthening the framing effect and making them even more willing to risk potentially catastrophic future losses to avoid a sure cutback in their current use of the resource.[68]

Governments make the problem worse where they recognize property rights in common access to a resource, as many states have done with groundwater. Property rights can help solve the tragedy of the commons where they result in the effective internalization of the cost of excessive harvesting, but they turn harmful when they reinforce a sense of entitlement to an unlimited harvest. Not only do property rights reinforce the framing effect,[69] but they often cause resource users as a matter of fairness to reject out of hand even the suggestion that they should reduce their current usage. Property rights are sensible and important societal tools, but in thinking about potential solutions to the tragedy of the commons, resources users often convert property rights from practical tools into absolute moral rights that prevent them from thinking carefully about the potential benefits of averting the tragedy.[70] Property rights, moreover, may

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(where subjects must invest their resources for a future benefit), finding more cooperation in the former than in the latter. See, e.g., Jane Sell & Yeongi Son, Comparing Public Goods with Common Pool Resources: Three Experiments, 60 Soc. Psychol. Q. 118 (1997) (but finding that greater cooperation is short-lived in multiround, dynamic games); Christopher McCusker & Peter J. Carnevale, Framing in Resource Dilemmas: Loss Aversion and the Moderating Effects of Sanctions, 61 Org. Behav. & Hum. Decision Processes 190 (1995); Brewer & Kramer, supra note 3.

[68] Cf. [George Loewenstein & Samuel Isaacharoff, Source Dependence in the Valuation of Objects, 7 J. Behav. Decision Making 157 (1994) (finding that people value possessions more that they obtained through their own skill)].

[69] Cf. McCusker & Carnevale, supra note 67, at 200 (noting that social norms can change reference points for framing purposes).

[70] Cf. Baron & Jurney, supra note 8, at 348 (noting role of rights-based norms in generating opposition to coerced reform of commons dilemmas).

focus resource users on their individual interests rather than on total societal well-being, undermining social norms of cooperation and reinforcing the very dichotomy that underlies the tragedy of the commons.[71]

A. The Problem of Uncertainty

The second problem that prevents people from thinking "rationally" about solutions to the tragedies of the commons is uncertainty. Commons dilemmas are often plagued by two types of uncertainty. First, there is *scientific* uncertainty regarding the current health of the resource, the impact of human actions on the resource, and the potential future of the resource. Second, there is *social* uncertainty regarding what is a fair or proper means of allocating the burden of trying to save the commons.

All three of my examples of commons dilemmas involve significant scientific uncertainty. All involve hidden resources. Fisheries are cloaked beneath the ocean. Groundwater is concealed beneath the surface of the Earth. Although we can see the results of climate change, we cannot see the climate process itself and thus cannot see how our actions actually impact the climate. To varying degrees, moreover, science is uncertain about how grave of a danger each resource actually faces. We probably know the most about groundwater, but often there is still considerable uncertainty regarding the safe yield of any particular aquifer. Extreme scientific uncertainty characterizes our knowledge of most fisheries; indeed, we do not know the status of 544 fish species in the United States–60 percent of the fish that U.S. fisheries

[71] See Eric van Dijk & Henk Wilke, Is It Mine or Is It Ours? Framing Property Rights and Decision Making in Social Dilemmas, 71 Org. Behav. & Hum. Decision Processes 195, 197-198, 204-206 (1997).

target commercially.[72] Although virtually all scientists agree that we are affecting the climate, scientists sharply disagree on the nature and extent of the likely impact of that climate affect and on its implications for the world's peoples.[73] In all of these settings, scientists often give the impression that there is even more uncertainty than there really is by qualifying their opinions. Scientists are trained to be a cautious lot, and to many resource users, that cautiousness often sounds a lot like uncertainty.

Unfortunately, where there is scientific uncertainty, people faced with a tough solution to a commons dilemma engage in tremendous wishful thinking. If scientists estimate that there are between 1,000 and 30,000 fish in any given population, most fishermen assume there are 30,000 fish in that population. The fishermen find confirmation for their views in their own personal experience, no matter how unsupportable. One good day of fishing will convince them that the more cautious estimates are wrong. The fact that fish are hard to catch the rest of the year serves as evidence merely that fish are getting smarter and learning to stay away from the boats.

Scientific simulations of fishery problems duplicate this phenomenon. As uncertainty increases over the exact size of a pool of fish, participants in fishery simulations overestimate the likely number of fish and boost their harvesting accordingly.[74] Uncertainty over the regeneration

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[72] See Restrepo, Mace, & Serchuk, supra note 16, at 2 (but noting that the stocks of unknown status constitute only a small percentage of the total commercial landings in the U.S.).

[73] See Facoby, Prinn, & Schmalensee, supra note 58 (noting uncertainty regarding nature and extent of climate change and its impact on human health, ecosystems, and economies).

[74] See Sylvia G. Roch & Charles D. Samuelson, Effects of Environmental Uncertainty and Social Value Orientation in Resource Dilemmas, 70 Org. Behav. & Hum. Decision Processes 221, 222 (1997); Donald W. Hine & Robert Gifford, Individual Restraint and Group Efficiency in Commons Dilemmas: The Effects of Two Types of Environmental Uncertainty, 26 J. Applied Soc. Psychol. 993 (1996); Amnon Rapoport et al., Social Dilemmas With Uniformly Distributed Resources, in Social Dilemmas: Theoretical Issues and Research Findings 43 (Wim Liebrand, David Messick, & Henk Wilke eds., 1992); David V. Budescu, Amnon Papoport, & Ramzi

rate of the fish population leads to a similar jump in harvesting.[75] According to some psychologists, mathematic misperceptions might be at work. Because people often have found in the past that mean and variance are positively correlated, they mistakenly believe that increased variance inherently justifies an upward shift in their estimate of the size of both current and future fish populations.[76] But a more likely explanation is that people use uncertainty to willingly fool themselves that the commons is in better shape and under less threat than it is in fact.[77] Once one resource user engages in wishful thinking, moreover, the wishful thinking might have a spiraling effect. When faced by ambiguity, people often look to the statements and behavior of others to see how to resolve that ambiguity. To the degree that some resource users either claim that the common pool is large or act as if it is large by using a large quantity of the resource, their behavior thus may signal to other resource users that they should resolve the ambiguity in pool size by assuming a high level of the resource also.[78]

Assuming resource users believe that there is a problem, they will confront the difficult problem of determining the fair means of allocating the burden of solving the tragedy. In each of my examples, this is difficult because the tragedy is asymmetric. People contribute in different degrees to the problem, and people benefit to different degrees from a solution. In these settings,

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Suleiman, Resource Dilemmas With Environmental Uncertainty and Asymetric Players, 20 Eur. J. Soc. Psychol. 475 (1990).

[75] See Hine & Gifford, supra note 74, at 1003-1006.

[76] Id. at 1005.

[77] Id. at 995-996 & 1005-1006. See also Cooper, supra note 56 (prior history with international efforts to contain contagious diseases suggests that "absence of scientific consensus" on global climate change will make agreement on a solution difficult).

[78] Cf. Arjnan Wit & Henk Wilke, Public Good Provision Under Environmental & Social Uncertainty, 28 Eur. J. Soc. Psychol. 249, 254-255 (1998) (noting the role of social signaling in decisions regarding how much to contribute toward the production of a public good).

there are multiple ways to allocate the burden of reducing resource use and no generally accepted societal norms for how to choose between the various allocations. What, for example, is the fairest means of limiting emission of greenhouse gases? All nations could reduce their 1990 emissions by an equal percentage on the principle that everyone should share the burden equally. All nations could be limited to a uniform per capita emission level on the principle that each nation should share in the resource equally. Those nations that would be hurt the most by global warming could undertake the bulk of the necessary reductions on the principle that those who benefit the most should make the biggest contribution to a solution. A myriad of potential rules could be suggested, each with its own reasonable justification.

Unfortunately, where there are multiple fairness rules, people suffer from what some psychologists have labeled "egocentric interpretations of fairness."[79] Each person assumes that the rule that benefits *them* is the fairest. As a result, agreeing on a common solution becomes difficult if not impossible.[80] In one group of fishing simulations, for example, researchers found that most participants were able to agree on equal reductions in catches where the dilemma was symmetric so that the participants benefitted equally from cooperation. If a participant balked at an equal reduction, the other participants were able to argue effectively that any approach other

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[79] See Kimberly A. Wade-Benzoni, Ann E. Tenbrunsel, & Max H. Bazerman, Egocentric Interpretations of Fairness in Asymmetric Environmental Social Dilemmas: Explaining Harvesting Behavior and the Role of Communications, 67 Org. Behav. & Hum. Decision Processes 111, 112-114 (1996). Asymmetric interpretations of fairness arise in a variety of common, everyday contexts. Each members of a family believes that he is carrying more than his fair share of work around the house. Students in seminars each believe that they contribute more to class discussions than they actually do.

[80] See Baron & Jurney, supra note 8, at 348 (noting importance of fairness perceptions in evaluations of potential commons reforms). Not surprisingly, asymmetric interpretations of fairness are one of the major barriers to the negotiated resolution of any dispute. See Wade-Benzoni, Tenbrunsel, & Bazerman, supra note 79, at 113, 125.

than an equal reduction was unfair; the outliers, moreover, quickly dropped their opposition when their position was criticized.[81] Where the dilemma was asymmetric, however, both egocentrism and harvesting levels increased.[82] Explaining the phenomenon to people, moreover, does not cure the problem. When told of the phenomenon, people assume that others' fairness perceptions suffer from an egocentric bias, but not their own.[83] The problem, moreover, is not merely theoretical. As emphasized in Part I, biased interpretations of fairness have plagued efforts to address global climate change. Developing countries have argued that the developed countries should resolve the problem because they are overwhelmingly "at fault" for current greenhouse gas levels and have more resources with which to address the problem, while developed countries have argued that it is only fair that all nations share in the burden because all will benefit.[84]

The scientific and social uncertainties, when combined, also permit resource users to indulge in what some psychologists have called "self-enhancing attributional biases" or what I like to call a "halo effect." Because bad behavior is hard to define and determine, everyone assumes that they are more cooperative than they really are. In one experimental simulation of a fishery, for example, 84 percent of the participants thought that they had acted in a socially "cooperative" fashion, even though a review of the results of the experiment showed that a majority of the participants had engaged in varying degrees of gluttonous behavior.[85] Seventy

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[81] See id. at 112, 124 & n.12 (57% cooperation rate).
[82] See id.
[83] See id. at 125.
[84] See Cooper, supra note 56.
[85] See Brian P. O'Connor & David B. Tindall, Attributions & Behavior in a Commons Dilemma, 124 J. Psychol. 485 (1990).

seven percent of the participants thought they had been "cooperative" even though they had not left sufficient fish for an optimal fishery; 32% reported they had been "cooperative" even though they had taken more than a proportionate share of *all* the fish in the fishery.[86]

Not surprisingly the halo effect frequently does not extend to people's evaluations of other resource users, particularly where the other resource users are outside the person's own community.[87] To the extent that the user of a resource believes that there is a problem at all, the source of the problem is always the other guy. New England fishermen of blue fin tuna blame the decline in tuna stocks on long line fishing boats in the Gulf of Mexico, who blame the

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[86] The researchers classified the participants' behavior as "cooperative" or "noncooperative" using three different standards of cooperation: (1) "share" (whether participants took more than their share of all the fish in the fishery in any found of the fishing game), (2) "status quo" (whether participants took more fish than needed to preserve the initial status quo of the fishery), and (3) "ideal world" (whether participants ensured sufficient fish at the end of a round to provide for optimal yield). The percentage of participants who thought they had been cooperative even though they were not by the "share," "status quo," and "ideal world" standards respectively were 32%, 73%, and 77%. Id.

See also Robert Gifford & Donald W. Hine, Toward Cooperation in Commons Dilemmas, 29 Canadian J. Behav. Sci. 167, 174 (1997) (noting that "harvesters' definitions of cooperation often lead them to believe they are cooperating when, based on an objective measure such as a sustainability formula, the harvesters are seriously degrading the resource"); Donald W. Hine & Robert Gifford, 26 Eur. J. Soc. Psychol. 429, 443 (1996) (noting a stronger tendency to self-serving attributions among heavy harvesters in a commons dilemma).

[87] See Wade-Benzoni, Tenbrunsel, & Bazerman, supra note 79, at 125; Robert Gifford & Donald Hine, "I'm Cooperative, But You're Greedy": Some Cognitive Tendencies in a Commons Dilemma, 29 Canadian J. Behav. Sci. 257, 261 (1997). The perception of others within the community is less predictable. In the experiment just described in the text, the researchers found that subjects believed that the other participants were more "cooperative" than in fact they were when measured by any objective criterion (although the optimistic attribution of cooperation was somewhat less dramatic than where subjects were rating their own cooperation). While 84% of the subjects rated themselves as "cooperative," only 74% rates others as cooperative. See O'Connor & Tindall, supra note 85. See also Hine & Gifford, supra note 86, at 432 (suggesting that attributional biases will be similar for self and others, but more biased toward self).

problem on Mediterranean fishermen catching the blue fin tuna when the fish cross the Atlantic, who blame the problem back on the fishermen in New England.

This one sided halo effect makes it even more difficult to solve the tragedy of the commons in at least two ways. First, the halo effect magnifies the egocentric interpretation of what solution is fair. Where participants in a resources simulation are told that a shortage of the resource is attributable to a purely natural phenomenon, it is much easier to get them to limit their usage of the resource than when they are told that the shortage is attributable to a manmade cause.[88] Where participants believe that the shortage is the result of a purely natural cause, they think that it is fair they undertake part of the burden of the shortage. But where the participants believe the shortage is manmade, they assume that it is somebody else who is the true culprit and that the true culprits should have to cure the problem. Second, when you have this type of a one-sided halo effect, it becomes much harder to appeal to people's altruism or conscience because resource users already think that they are acting in the social good.[89] As discussed in Part III(A), this problem is central to the question whether we can try to increase support for solutions to commons dilemmas by trying to change resource users' environmental views.

A. Intertemporal Tradeoffs

Getting resource users to come to grips with the tragedy of the commons is also difficult because the resource users have to engage in an inter-temporal trade off: should they accept a

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[88] See Christel G. Rutte, Henk A.M. Wilke, & David M. Messick, Scarcity or Abundance Caused by People or the Environment as Determinants of Behavior in the Resource Dilemma, 23 J. Experimental Soc. Psychol. 208 (1987).

[89] As Donald Hine and Robert Gifford have observed, scientific uncertainty may "provide a context in which individuals can act in their own self-interest, yet fool themselves, others, or both into believing that they were trying to act in the best interests of the group." Hine & Gifford, supra note 74, at 1005-1006.

loss today in order to avoid a bigger loss at some point distant in the future? Homo sapiens do better than most mammals at considering the future consequences of their current actions, but not much better. We do care about the future, including the well being of future generations.[90] But we suffer from a variety of temporal anomalies. In particular, individuals trapped in a commons dilemma appear to extravagantly discount the future consequences of their current actions.

I want to avoid the standard debate about whether or not private discount rates are appropriate for making inter-temporal trade offs involving environmental consequences. As others have discussed, there is a tremendous debate over whether market discount rates are socially proper, particularly when discounting across generations. Professor Cass Sunstein, for example, has argued that market discount rates do not fully account for effects on future generations, since future generations are not involved in the discounting decision.[91]

My concern is that people have difficulty dealing with the need to make *any* sacrifice to avoid future losses that are uncertain and difficult to quantify. Several factors may be at work here. First, people tend to be myopic in evaluating the discounted future value of current conservation measures.[92] In the energy crunch years of the late 1970's and early 1980's, a number

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[90] See Wade-Benzoni, supra note 14 (citing evidence that people do feel an obligation to future generations).

[91] Cass K. Sunstein, After the rights Revolution: Reconceiving the Regulatory State 86 (1990). See also Stewart E. Sterk, Foresight and the Law of Servitudes, 73 Cornell L. Rev. 956, 958-959 (1988) (noting that future generations are not involved in setting current market discount rates); Barton H. Thompson, Jr., People or Prairie Chickens: The Uncertain Search for Optimal Biodiversity, 51 Stan. L. Rev. 1127 1158-59 (1999) (noting concerns over the intergenerational appropriateness of market discount rates).

[92] According to some psychologists, energy consumer's heavy bias toward the present is not unusual. "'Impatience' or 'myopic preferences' are pervasive in human economic behavior, and subjective rates at which future gains or losses are discounted are well in excess of what would be economically rational." Charles Vlek & Gideon Keren, Behavioral Decision Theory and Environmental Risk Management: Assessment and Resolution of Four "Survival"

of experiments were run looking at people's willingness to purchase energy efficient appliances. It should have been easy, one might think, for people to make rational tradeoffs between the increase in the current purchase price of an appliance and the future energy savings they would enjoy by buying that appliance. Governmentally mandated labels supplied consumers with all the basic information necessary to make those tradeoffs. But the studies found that people nonetheless were highly biased towards buying the cheaper, energy piggish appliances. Depending on the particular study, the "applied discount rates"–the discount rates reflected in the actual purchases people were making–ranged from a low of 17 percent (a high discount rate, even for the inflation-prone 1970s) to an astronomical 243 percent.[93] The studies concluded that people had trouble making complex discounting decisions, so they focused more on the most obvious statistic confronting them–how much could they save by buying the cheaper appliance. In a similar fashion, resource users confronted by a commons dilemma may decide that it is easiest to treat current harvesting decisions as if they were the last.[94]

Dilemmas, 80 Acta Psychologica 249 (1992).

[93] See, e.g., Mark Ruderman, Mark Levine, & James McMahon, Energy-Efficiency Choice in Purchase of Residential Applicances, in Energy Efficiency: Perspectives on Individual Behavior (Kempton, Willett, & Neiman eds., 1986) (air conditioners: 17%; gas water heaters: 102%; freezers: 138%; electric water heaters: 243%); Dermot Gately, Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables: Comment, 11 Bell J. Econ. 373 (1980) (45-300% depending on assumed cost of energy); Jerry Hausman, Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables, 10 Bell J. Econ. 33 (1979) (air conditioners: 25%).

[94] See Elizabeth A. Mannix, Resource Dilemmas and Discount Rates in Decision Making Groups, 27 J. Experimental Soc. Psychol. 379, 382 (1991). The larger sums at stake, however, might lead resource users to engage in a more considerate tradeoff. Cf. George Loewenstein & Richard H. Thaler, Anomalies: Intertemporal Choice, J. Econ. Persp., Fall 1989, at 181, 183-184 (finding that discount rates are more reasonable where large sums are at stake).

Second, several experiments have shown that people tend to minimize their perceive risk of future losses, particularly where the risk is characterized by sizable uncertainty.[95] Interestingly, this result is in marked contrast to the way that people generally respond to the tradeoff between current and future losses that are *certain* to occur. Psychologists have found that most people tend to employ lower discount rates when choosing between losses than between gains; indeed, some subjects demonstrate negative discounting when choosing between losses, preferring an immediate loss over a delayed loss of the same amount.[96] Distant losses, in short, appear to weigh far more heavily in peoples' decisionmaking than distant gains. But where the loss is risky and uncertain, people often act as if there's virtually no future risk to them at all in such situations. Why the reversal?

A major reason almost certainly is that, when confronted by an uncertain future, most people assume that they will be able to avoid, reduce, or ameliorate future risks. We tend to be optimists about the future, at least where taking precautionary steps today is costly.[97] Part of the optimism is an unrealistic belief that risks will befall others but not ourselves. A number of experiments, for example, have shown that people faced with various health risks, such as cancer

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[95] See Gideon Keren & Peter Roelofsma, Immediacy and Certainty in Intertemporal Choice, 63 Org. Behav. & Hum. Decision Processes 287, 290-291 (1995); Marjorie K. Shelley, Gain/Loss Asymmetry in Risky Intertemporal Choice, 59 Org. Behav. & Hum. Decision Processes 124 (1994); Vlek & Keren, supra note 92, at 263-64; [Bjorkman, 25 Scandanavian J. Pscyhol. 31 (1984)].

[96] See George Loewenstein & Drazen Prelec, Anomalies in Intertemporal Choice: Evidence and an Interpretation, in Choice Over Time 119, 122 (George Loewenstein & Jon Elster eds., 1992); George Loewenstein, Anticipation and the Valuation of Delayed Consumption, 97 Econ. J. 666 (1987); Richard Thaler, Toward a Positive Theory of Consumer Choice, 1 J. Econ. Behav. & Org. 39 (1980).

[97] See Max H. Bazerman, Don A. Moore, & James Judson Gillespie, The Human Mind as a Barrier to Wiser Environmental Agreements, 42 Am. Behav. Scientist 1277 (1999).

from radon exposures in their homes, optimistically discount the personal risk to them.[98] A greater factor is people's optimistic belief that they will be able to control the risk. A homey example is the interest rate on credit cards. When you last applied for a credit card, did you consider the interest rate that the credit card company will charge you if you fail to pay your bills on time? Most people, studies have shown, are far more concerned about whether they will receive frequent flyer mileage on their credit card or get a discount at their local grocery store than they are about the interest rate charged on outstanding balances. One of the reasons, observers believe, is that most people do not think they are going to have future debts. Or if they recognize they will have future debts, they think they will be able to write them down fairly quickly.

Psychological studies have found that this innate optimism about the future is even more pronounced in business settings.[99] Business managers, who have typically advanced to their current positions because they have been successful in overcoming problems in the past, also believe that they can effectively control the odds and magnitudes of future risks.[100] One suspects that fishermen and farmers, who have repeatedly confronted and overcome severe risks in their businesses, might be particularly prone to believe that they can avoid future risks.

We as a society have frequently reinforced resource users' natural sense of optimism by bailing out the people who take on risks and turn out to have bet wrong. Most groundwater users, if you talk to them about over-depleting their aquifer, will tell you "yes, it's a problem, but

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[98] See, e.g., [Neil Weinstein, Mindset, Optimistic Bias About Personal Risk and Health Protection Behaviour, 4 Brit. J. Health Psychol. 289 (1999) (radon exposure)].

[99] See Shelley, supra note 95, at 151.

[100] See id. at 152.

we don't worry too much about running out of groundwater because if we end up depleting our aquifer, the government will bail us out." Based on past experience, groundwater users believe that the government will build a project to import needed water if the farmers ultimately run out of economically withdrawable groundwater. In a similar fashion, fishermen expect that the government will provide "transition relief" if a fishery is ultimately depleted.

A final reason for expecting high discounting of the future risk of resource tragedy is people's uncanny ability to either totally ignore problems that are not immediate and visible – what Sandra Postel has called the "out-of-sight, out-of-mind syndrome"[101] – or to see them in their rosiest light. The phenomenon here is similar, but slightly different from, people's overoptimism. When I agreed a year ahead of time to deliver the speech from which this essay grew, I knew that I would have to spend considerable time researching, writing, and polishing the talk. But it seemed like a lot less work a year ahead of time than when I finally sat down to prepare the talk, and I quickly put the issue out of my mind because it was so far off in the future. If I had seriously thought about how much work would really be involved, I might have hesitated a bit more before agreeing to give it. I was not tricked by an overoptimistic belief that I could avoid the work or be more efficient than I had been in the past (although I probably hoped that I would be more efficient, despite all evidence to the contrary from my past efforts at writing speeches). I simply conveniently forgot how much work is really involved, the same way that women forget the pains of childbirth when they decide whether to have another baby. In a similar fashion, resource users may well find it easy to put future problems out of their mind. As Sandra Postel again has noted, "When looking at say, a field of golden wheat, it can be difficult

[101] Postel, supra note 34

to imagine why crops like that can't just go on forever."[102] Even where resource users think about the problem, they are likely to "underimagine" the consequences of overusing the resource, placing the best face on the potential tragedy. Indeed, most resource users do not even have a past experience upon which to draw in trying to imagine the import to them of exhausting the fishery or aquifer. Resource users may find it even more difficult to imagine the full scope of the negative impact where future generations will suffer the consequences.[103]

III. REFLECTIONS ON PROMOTING SOLUTIONS

After hearing these obstacles to getting user buy-in to the effective governance of the commons, some readers may conclude that in most cases the only realistic way of ending the tragedy of the commons is to find ways of imposing a solution from outside.[104] Many of the obstacles are immovable and will continue to make it difficult to get resource users to buy into solutions. "Mobilize the citizenry against the unjustifiable depletion of important resources," the political activists may therefore say. "Head to the courts," the legal activists may shout. And indeed environmental organizations over the past decade or two have used the Endangered Species Act and other environmental legislation to motivate some resource users to give at least the appearance of trying to solve overuse of their resource. In the early 1990s, for example, the Sierra Club sued to restrict groundwater withdrawals from the Edwards Aquifer under the Endangered Species Act.[105] As the Sierra Club charged, overdrafting of the aquifer threatened

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[102] Id.

[103] Cf. Wade-Benzoni, supra note 14 ("the simple fact that future generations are 'others' (and not ourselves) who are typically unidentifiable and vague in definition prevents their needs from being immediate and pressing to us").

[104] See Postel, supra note 34 (suggesting that the public trust doctrine be used to impose restrictions on groundwater extractions through either legislation or judicial action).

[105] The history of the Edwards Aquifer dispute is told in Todd H. Votteler, The Little Fish

the Texas blind salamander, which lives in the aquifer itself, and four other listed endangered species reliant on springs fed by the aquifer. When the Sierra Club won the first round in court,[106] Texas responded by creating the Edwards Aquifer Authority to manage withdrawals from the aquifer and instructing the Authority to reduce total withdrawals to 450,000 acre-feet per year.[107]

But for several reasons, we cannot look to courts or legislatures alone to provide effective and sustainable solutions to our remaining commons dilemmas. First, in international commons like global warming, there is no outside entity that can impose a solution. Negotiation with resource users is the only way to achieve a solution. Second, even for domestic commons, outside imposition of a solution may often be unlikely. There may be no cause of action to support a lawsuit. The Endangered Species Act, which has proven the most useful legal mechanism to date, helps only where a listed species is threatened by the overuse of the commons. In many cases, moreover, it may be difficult to get nonresource users sufficiently interested in the commons dilemma that they will be willing to expend political or legal capital pursuing an outside solution.[108] Few environmental organizations, let alone the general citizenry, have shown much interest in the depletion of groundwater in farming regions of the western United States. Finally, outside solutions will fail unless there is effective implementation and

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That Roared: The Endangered Species Act, Groundwater Law, and Private Property Rights Collide, 28 Envtl. L. 845 (1998).

[106] See Sierra Club v. Lujan, 36 E.R.C. (BNA) 1533 (W.D. Tex. 1993).

[107] See S. 1477, 73d leg., Reg. Sess. (Tex. 1993). Unfortunately, the Authority has not yet effectively implemented the legislature's mandate. See Votteler, supra note 105, at 878-879.

[108] Part of the problem may be that the general public simply is ignorant about the threatened state of many commons. Cf. Cass & Edney, supra note 3, at 383-384 (suggesting that the government publish daily announcements of the status of critical resources). But even when informed, members of the public frequently seem indifferent.

compliance, and typically the government will need the support of the resource users to get effective implementation and compliance.[109] Lawsuits and political pressure may be important–even crucial–in encouraging local resource users to discuss the problem they confront and consider solutions to the problem. The Edwards Aquifer illustrates this catalytic value. But for the reasons listed, society cannot give up efforts to get resource users themselves to support effective solutions.

A. Trying to Change Environmental Norms Is Not a Sufficient

So what steps can be taken to turn resource users into supporters, rather than opponents, of commons solutions? Let me start provocatively by debunking the popular view that we can solve commons dilemmas, as well as a rash of other environmental problems, by changing people's environmental ethics. What we really need to do, a number of observers seem to suggest, is to get everyone to read Aldo Leopold and his *Sand County Almanac*.[110] If people developed a stewardship ethic toward the earth and all its inhabitants, the commons would never lead to tragedy. Inculcating a new environmental ethic seems immensely attractive: enforcement problems no longer loom ominously because people will naturally do what is right; indeed laws themselves may be unnecessary; and changing behavior through education rather than edict "fits nicely into the model of the enlightened citizen, who makes his or her own decisions."[111] Indeed, the approach "has only one disadvantage: too often it does not work."[112] And there are reasons to believe that the approach will be particularly ineffective in resolving commons dilemmas.

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[109] See Wade-Benzoni, Tenbrunsel, & Bazerman, supra note 79, at 125 (people who have not accepted a solution as fair are unlikely to implement it).

[110] See Aldo Leopold, A Sand County Almanac, and Sketches Here and There (1949).

[111] Klandermans, supra note 6, at 307.

[112] Id. at 307-308.

A problem at the very outset is figuring out how to change resource users' environmental views. Psychologists simply do not know enough about the processes by which we form environmental norms to offer useful advice on how to change them.[113] What psychologists do know is that changes in norms, if they occur, are most likely to come from within the communities of resource users, not from the outside. And that will not be easy to achieve without first gaining an initial foothold of support from within the communities.

Even if we could change the environmental attitudes of resource users, we run squarely into another problem: experimental simulations of commons dilemmas suggest that a person's environmental attitude typically does not significantly affect the person's willingness to support a solution to commons dilemmas. In fishing games, researchers have examined the degree to which environmental attitude affects participants' willingness to cooperate in keeping harvests down. Environmental attitude has been measured in a number of manners. Researchers have asked participants to complete questionnaires that measure the participants' concern for the environment; they have asked subjects how they would behave in various hypothetical situations (e.g., whether they would pick up someone else's litter); several weeks after a game, they have sought participants' help in an environmental cause (e.g., a Saturday recycling campaign). However measured, environmental attitude has not been a statistically significant explanatory variable in the participants' behavior in the fishing dilemma.[114]

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[113] See Kollock, supra note 3, at 193-194;

[114] Jeffrey M. Smith & Paul A. Bell, Environmental Concern and Cooperative-Competitive Behavior in a Simulated Commons Dilemma, 132 J. Soc. Psychol. 461 (1992). What does appear to matter is how the participant scores on the Machiavellian personality scale, which measures competitiveness versus cooperativeness. People who are highly competitive perform far worse, in terms of social optimization, in commons dilemmas. See id. An interesting question is whether industries typified by commons dilemmas, such as fishing and

Two things may be at work here that are relevant to resource users' willingness to support solutions to commons dilemmas.[115] First, as Gerhard Hardin recognized in his original 1968 article, self-interest often swamps environmental concerns in commons dilemmas.[116] Many people have an amazing ability to shove their environmental values to a remote corner of their conscience when their economic interests are at stake. Researchers in the early 1980s, for example, found that residents of Perth, Australia, who had stated in a survey that people bear a personal duty to conserve energy continued to consume high levels of electricity even when told of their high consumption and given tips on how to conserve.[117] Residents cut their electricity use only when researchers informed them of the inconsistency between their behavior and their reported conservation values, and even this reduction did not persist beyond two weeks.[118]

If the power of economics was the only factor at work, perhaps there would still be hope for solving the commons through attitudinal change. We could try to inculcate even stronger environmental values and constantly remind resource users of any inconsistency between their behavior and their environmental ethics. But a second, less remediable factor is at work in many

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farming (which is the major user of groundwater), attract more competitive participants.

[115] A third factor may also contribute to the insignificant impact of environmental attitude: anonymity. Environmental attitudes might be activated in part by the fear of shame. Where participants in commons dilemmas are anonymous (as they typically are), they might not feel as reluctant to abandon their environmental norms than if other participants knew of their behavior. See, e.g., Jorgenson & Papciak, supra note 3, at 375 (noting that identifiability can help promote more cooperation in commons dilemmas due to the "presence of greater inhibition about behaving selfishly"). This factor would be irrelevant where the question is the support of a solution because the decision of a participant to support a solution generally would be visible.

[116] See id. at 467 (noting that self-interest appears to be a better predictor of behavior than environmental attitude).

[117] S.J. Kantola, G.J. Syme, & N.A. Campbell, Cognitive Dissonance & Energy Conservation, 69 J. Applied Psychol. 416 (1984).

[118] Id.

commons: the scientific and social uncertainties outlined in Part II permit resource users to justify a wide range of behaviors as consistent with their environmental beliefs. Scientific uncertainty allows resource users to believe that there is really no environmental problem.[119] As Professor Kimberly Wade-Benzoni and colleagues have observed, moreover, the "self-serving bias" allows individuals the "illusion of consistency" between an attitude of concern for the environment and behavior that contradicts this concern.[120] Resource users, in short, resolve any dissonance between their behavior and their environmental attitudes by interpreting their behavior in the most favorable environmental light.[121]

Environmental attitudes can be influential in some contexts. We all know of situations where environmental education on issues such as recycling, littering, or eating “dolphin safe” tuna has made a difference in peoples behavior.[122] But in these situations, the cost of engaging in the beneficial behavior is relatively low, and there is no uncertainty concerning whether you are behaving consistently with the environmental norm. In some cases, environmental attitudes might even be strong enough to convince people to make significant sacrifices to preserve the environment, although it is hard to find significant, widespread examples.[123] In most commons

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[119] Cf. Hine & Gifford, supra note 74, at 1006 (scientific uncertainty undermines norms of cooperation).

[120] Wade-Benzoni, Tenbrunsel, & Bazerman, supra note 79, at 125.

[121] See also O’Connor & Tindall, supra note 85, at 486 (“Appeals to conscience and altruism may not work if people already think they are cooperative”).

[122] See, e.g., Cass Sunstein, Social Norms and Social Rules, 96 Colum. L. Rev. 903, 906-907 (1996) (recylcing norms); Suzanne C. Thompson & Kirsten Stoutemyer, Water Use as a Commons Dilemma: The Effects of Education that Focuses on Long-Term Consequences and Individual Actions, 23 Env’t & Behav. 314, 315 (1991) (finding that education on the long-term consequences of high water use, along with an ethics campaign featuring bumper stickers like “If what runs low, who cares? We all do!,” can lead to reduced consumption in lower/middle-class communities, but finding no impact in middle/upper-class communities).

[123] See, e.g., Smith & Bell, supra note 114, at 466-467 (noting that some participants in a

dilemmas, however, the combination of compelling personal self-interest and scientific and social uncertainty will make it very difficult to garner support for meaningful solutions merely through changes in resource users' environmental attitudes–even assuming that we can influence those attitudes. To get resource users to support commons solutions, society must directly attack the impediments elaborated in Part II.

A. The Three Steps To a Solution

Getting resource users to support effective solutions to commons dilemmas typically will require three steps. The first step is getting resource users to agree that there is a problem and that the problem is serious enough to require a coercive solution. The second step is getting resource users to agree on the general structure of a solution to that problem. And the third and final step is getting resource users to agree on how to allocate the burden, if any, of that solution.

These three steps interact in ways that can be either helpful or problematic. If resource users focus prematurely on the last two steps, for example, they are likely to resist agreeing that there is a problem serious enough to justify a coercive solution. If fishermen assume that any solution to a dwindling stock of fish will involve dramatic reductions in the amount of fish they can catch, the fishermen are likely to look for evidence that the fish stock is not in bad shape. Whether consciously or subconsciously, they will engage in wishful thinking about the size of the stock. Concomitantly, if fishermen agree that there is a serious problem that needs to be addressed, they are more likely to think creatively about a solution and agree to share in the burden of a solution. As discussed earlier, while resource users are likely to risk large, but

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fishing game stated that they would have engaged in more socially cooperative behavior if the resource was something that they felt strongly about, such as whales).

uncertain future losses in order to avoid current costs, the temporal dynamic changes if resource users become convinced that the future loss is certain. While people heavily discount future losses that are uncertain, they use surprisingly low discount rates to evaluate the tradeoff between current and future losses that are inescapable.[124] Increasing the perceived certainty of future losses therefore may dramatically increase resource users' willingness to sacrifice current income to avoid future losses.[125]

In a similar fashion, the more that resource users focus on how the burden of any solution will be allocated, the more difficult it will be for the resource users to develop an effective solution. Rather than thinking creatively about solutions that might minimize the total economic impact, each resource user will focus strategically instead on how to ensure that they are stuck with as little of the burden as possible. To use the terminology of dispute resolution, the resource users will focus on "claiming" rather than on "creating."[126]

In an ideal world, we might be able to compartmentalize and tackle each step seriatim – focusing first on whether there is a problem; then if there is a problem, brainstorming potential solutions to the problem; and only last tackling the difficult but inevitable distributional issues. But unfortunately the three steps are inherently intertwined and cannot readily be separated.[127] Unless a resource user is exceptionally naive, he or she will recognize that the answer to earlier questions will affect the answer to later questions. If agreement is reached that a fishery is in

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[124] See notes ??? supra and accompanying text.

[125] See Vlek & Keren, supra note 92, at 263-264.

[126] See David A. Lax & James K. Sebenius, The Manager as Negotiator: Bargaining for Cooperation and Competitive Gain (1986).

[127] See, e.g., id. (emphasizing that the "competitive and cooperative elements" of negotiation – i.e., claiming and creating – "are inextricably entwined" and that "[n]either denial nor discomfort will make it disappear").

decline because of overfishing, the likeliest solution will be some form of limitations on fishing. And the shape of a particular solution is likely to partially determine how the burden of that solution will be allocated. Dealing with the issues seriatim therefore will not do the trick because resource users will be looking ahead, consciously or subconsciously, to the later issues.

We can structure discussions with resource users, however, to minimize the impact of allocative concerns on the resource users' willingness to agree that there is a serious problem that needs to be addressed and to creatively brainstorm potential solutions. Discussions, for example, might begin by agreeing on general rules or norms for any ultimate allocation of costs; some allocations might be ruled out as unacceptable at the very outset. Through such "preagreement agreements," we might effectively reduce and circumscribe resource users' concerns about how the resolution of other issues ultimately will affect them; this in turn can produce a more open discussion of the problem and potential solutions.[128] Once agreement has been reached on the problem and potential solutions, the dialogue can return to a more detailed consideration of the allocation issue.

a. Getting Resource Users to Recognize There Is a Problem.

Getting resource users to agree that there is a problem that must be addressed requires addressing at least two current problems. First, we need to eliminate or at least reduce the scientific uncertainty that currently permits resource users to engage in unjustifiably wishful thinking. Second, we need to find a means of reducing resource users' deep discounting of future

[128] Cf. Andrew J. Hoffman et al., A Mixed-Motive Perspective on the Economics Versus Environment Debate, 42 Am. Behav. Scientist 1254 (1999) (discussing the advantages of "presettlement settlements " in helping participants overcome "pseudosacred barriers" and the "fear of a slippery slope").

losses. As discussed in Part II, the two problems are interrelated. One of the reasons why resource users substantially discount future losses is because the losses appear to be uncertain.

a. Reducing uncertainty.

Perhaps the most obvious means of trying to eliminate the uncertainty is to devote more resources to scientific research into unresolved commons dilemmas.[129] Financial support for basic environmental research in the United States is shockingly low. Without more research on fisheries, on groundwater resources, and on other resources involved in commons dilemmas, the state of these resources often will remain highly uncertain.

But more research by itself may not eliminate the uncertainty that currently undermines efforts to solve commons dilemmas. First, uncertainty will inevitably plague even relatively exhaustive commons research. No one, for example, should expect that scientists will conclusively prove a connection between current emissions of greenhouse gases and climatic changes or know the exact condition of a particular fish stock. Uncertainty unfortunately is inherent in environmental science. The most that we might expect from scientific research in many settings is scientific agreement that there is a significant risk of a particular catastrophe such as global warming. But given the temporal optimism discussed in Part II, the *risk* of a commons tragedy, no matter how certain, may not convince many resource users of the need for immediate and costly action to avert the risk.

Second, even if scientists could eliminate many of the inherent uncertainties in their research, new scientific information may not change the views of resource users. Distant events

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[129] See Gifford & Hine, supra note 74, at 1007 (noting that desirability of reducing perceived uncertainty through additional scientific study of commons resources); Roch & Samuelson, supra note 74, at 232 (same).

may inevitably seem uncertain to resource users, no matter what scientists predict. As psychologists have noted, "uncertainty is encapsulated in *any* future outcome."[130] Errors in past scientific predictions, moreover, may give resource users a cognitive justification for discounting the credibility of current forecasts.[131] Of greater concern, resource users might pick and choose information from scientific studies to reaffirm their existing beliefs about the current threat to their resource. In one famous experiment examining students' views on the death penalty, researchers found that people with strong opinions on complex social issues are inclined to assimilate empirical studies in a biased fashion, accepting at face value data and other findings that support their opinions while critiquing and discounting those data and findings that conflict with their opinions. When 48 undergraduates were exposed to empirical studies on the death penalty, the undergraduates' views became more, not less, polarized.[132] Where resource users already have formed strong views concerning the condition of their resource, "biased assimilation" also may undermine efforts to convince the resource users of threats to their resource.[133]

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[130] Keren & Roelofsma, supra note 95, at 290 (emphasis added) (also arguing that reducing uncertainty will not reduce discounting of remote future conditions because the future is inherently uncertain). See also Wade-Benzoni, supra note 14 (uncertainty is associated with any event that may occur in the future).

[131] See Hine & Gifford, supra note 74, at 1007.

[132] See Charles Lord, Lee Ross, & M.R. Lepper, Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence, 37 J. Personality & Soc. Psychol. 2098 (1979). The two studies provided to the undergraduates in this experiment, however, were themselves conflicting–one study appearing to show that capital punishment provides effective deterrence, the other study appearing to undermine this conclusion. An open question is whether people with strongly held views will also pick and choose information from within a single consistent study.

[133] Thankfully, there is a growing body of evidence that people with moderate, rather than extreme, views do not suffer from the same degree of biased assimilation as the subjects in the capital punishment experiment. See Robert J. MacCoun, Biases in the Interpretation and Use of

Recognizing these obstacles, we cannot give up the effort to convince resource users that future catastrophe is certain enough to justify solving the commons. Each new scientific study makes it harder for resource users to ignore reality and thus brings us closer to a solution. To maximize the value of additional scientific research, however, we also must improve the way in which environmental research is communicated to resource users. Today most scientists leave the interpretation of their research to the decisonmakers. This permits decisionmakers to interpret the data in the rosiest possible light, even where unwarranted. Worse, spokesmen for various interests spin the data to promote their own agendas. Scientists, moreover, often are extremely cautious in how they present their studies, emphasizing the uncertainties and assumptions of their work. Indeed, the best scientists often are the most cautious. But as suggested earlier, this leads resource users to discount the scientific research where antithetical to the users' perceived reality.

Encouraging scientists to become active advocates in trying to convinced resource users of the need to solve commons problems, while tempting, is probably neither workable nor desirable. First, such advocacy arguably runs counter to two of the major scientific norms deeply embedded in our society: *distinterestedness*, which cautions scientists to put aside all biases in conducting their investigations, and *organized skepticism*, which encourages scientists to scutinize and critique all findings.[134] Even if active advocacy does not actually violate these norms, it can give the appearance of violating them. For these reasons, academic and scientific institutions affirmatively discourage activism, and any scientist engaging in activism risks not

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Research Results, 49 Ann. Rev. Psychol. 259, 267 (1998).

[134] See [Robert K. Merton, The Sociology of Science (1973)]; MacCoun, supra note 133, at 260.

advancing in their career. Second, for similar reasons, scientists who today engage in active advocacy risk undermining the credibility of their work in the eyes of anyone not inclined to accept it. As psychologists have documented, people appear naturally prone to reject views contrary to their own as products of the researcher's personal biases.[135] Perceived violations of the norms of science may provide resource users with confirmation that the researcher is biased (as well as an easy means for interest representatives to undermine the researcher's findings).

A less risky means of ensuring that resource users cannot downplay scientific findings is to provide an objective forum for interpreting the findings. Governmental agencies cannot play this role, for their interpretation of the data is quickly written off as driven by the agencies' agendas. What many commons disputes need is something akin to, but more visible and transparent than, the National Academy of Sciences where committees of scientists can review the relevant scientific evidence and develop policy-relevant recommendations regarding that evidence. In the global climate change arena, the Intergovernmental Panel of Scientists arguably plays this role. Similar scientific bodies for fisheries, groundwater, and other common resources could make it more difficult for resource users consciously or subconsciously to assume that there is less scientific consensus and certainty than actually exists.

b. Reducing temporal discounting.

An equally important goal is to find ways of overcoming resource users' discounting of future risks and forcing them to take the problems of commons overuse as seriously as they take

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[135] See MacCoun, supra note 133, at 263 (people are quick to "shoot the messenger" where the message is inconsistent with preheld views). Part of the reason is that people engage in a naive realism, assuming that their own views are objects and that contrary views must therefore be the result of prejudice or bias. See id. at 264.

the cost of eliminating that overuse. One possible means of doing this is to try to make future risks more visceral to resource users, so that they see the need for current sacrifices. By helping users to visualize future risk, we may be able to shrink the temporal distance between current actions and future disasters and reduce the psychological discounting discussed in Part II.[136] Visualization, however, will require us to go beyond data to analogies; to pictures; to grinding into people exactly what it will mean if a fishery is closed because of overuse, if groundwater users must fallow or dry-farm their land because groundwater has become too costly or contaminated, or if global warming modifies disease vectors in North America. Proposed solutions to commons dilemmas often trigger fundamental fears of resource users – in particular, the fear that the solution will rob the resource user of control over his future and prevent the resource user from bringing in necessary income. Bringing alive the future can help people see beyond these present concerns and fear the future.[137]

c. Focusing on present costs.

One means of trying to overcome simultaneously the problems of both uncertainty and temporal discounting is to focus on the *current* drawbacks of an unconstrained commons. Long before a resource is destroyed, overuse of the resource is likely to generate serious costs. Given the risk that a fishery or groundwater aquifer will be depleted, for example, banks may stop

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[136] See Vlek & Keren, supra note 92, at 264 (suggesting that discount rates can be reduced by making the future more salient and thus decreasing the psychological distance to the future).

[137] Cf. Wade-Benzoni, supra note 14 (noting importance of "vividness" in establishing sympathy for events that will befall future generations); Roch & Samuelson, supra note 74, at 232 (suggesting that the use of "vivid images" is important in achieving restraint in commons dilemmas); George Loewenstein, Out of Control: Visceral Influences on Behavior, 65 Org. Behav. & Hum. Decision Processes 272 (1996) (emphasizing the importance of visceral factors and "vividness" on decisionmaking).

loaning money to fishermen or farmers. Finding fish or pumping groundwater may become more expensive as fish become harder to find and groundwater must be pumped from a greater depth. Each of these costs of overuse is definite, rather than uncertain, and immediate, rather than distant. Resource users therefore may find these costs a more compelling reason than the risk of even a future catastrophe to find a solution to the commons dilemma.

2. Finding Effective and Sustainable Solutions.

Once resource users become convinced that there is a problem that needs to be addressed, much of the resistance to solutions should disappear. Brainstorming creative solutions, however, will still be important in overcoming remaining barriers and in reducing the overall cost of the solution to resource users.

A key starting point is to emphasize to resource users that maintaining the status quo is a choice no different than any action that they might take. Inertia has a powerful psychological influence. To most people, maintaining the status quo is the presumed natural position against which any other action must be justified. In commons dilemmas, resource users therefore view any use restrictions as involving an immediate loss (since the status quo is used as the framework) which, as discussed in Part II, encourages them to gamble that the status quo will not lead to a larger future loss. By emphasizing a different starting point -- for example, no use of the resource -- proponents of a solution may be able to break resource users out of the loss framework and place all potential decisions, including maintenance of the status quo, on a level playing field. Because the status quo seems so natural, getting resource users to shift their framework will not be easy, but it is possible.

Solutions that are attentive to both the business and cultural needs of resource users are also likely to be more readily accepted. For example, in the global warming context, early proposals to immediately and dramatically reduce emissions ignored the capital cycle of the energy sector and of other industries with high emissions of greenhouse gases. Putting off the major reductions until a slightly later date can significantly reduce the cost of compliance as well as change the framing of the impact, without seriously impacting the ultimate benefits of the solution.[138]

Solutions must also recognize that many professions, such as fishing and farming, are more than simply ways of making money. For example, it is often assumed that one kind of regulation will fit all fisheries. But there are a myriad of factors that attract people to fishing, and each fishery offers a slightly different permutation of attractions, based on both the physical characteristics and traditional culture of that fishery. Members of some fisheries, for example, are motivated by the lure of competition; they like the competition against the ocean, the competition against the fish, and the competition against other fishers. Members of other fisheries are motivated by independence. They like the ability to fish when they want. One solution to fishery problems – the setting of individual quotas (where you tell each individual fisherman how much they can catch in a year and let them catch it whenever they want) – might work well for those fishermen who are motivated by independence. In fact, fishermen motivated by independence might favor having quotas because quotas actually gives them more independence. With quotas, the fishermen do not have to worry about trying to catch the fish

[138] See Cooper, supra note 56 (demand for new power plants will be modest for next 20 years, but replacing existing power plants would be "dauntingly expensive").

before anyone else does; they have all year, whenever they want, to catch the fish. But individual quotas will not work in a fishery where the fishermen like fishing because they are motivated by competition. There we are going to have to find a solution that fits within the cultural melee of that particular fishery.[139]

The most acceptable solutions also are likely to maximize the freedom of resource users and, in the case of fisheries and groundwater aquifers, involve local control of the resource. Researchers have found that resource users employ a number of criteria in evaluating proposed solutions. One is effectiveness: will the solution succeed in avoiding overuse.[140] But another critical criteria is freedom.[141] Even in a crisis, resource users try to retain some degree of personal control over their resource decisions.[142] Where resource users defer to a regulatory authority, moreover, they prefer authorities that they trust and know, who share common attributes, and who treat them with dignity and respect.[143] In most cases, that means local

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[139] See Palmer, supra note 2, at 417-418.

[140] See Charles D. Samuelson, A Multiattribute Evaluation Approach to Structural Change in Resource Dilemma, 55 Org. Behav. & Hum. Decision Processes 298, 301 (1993).

[141] See Mark Van Vugt & David De Cremer, Leadership in Social Dilemmas: The Effects of Group Identification on Collective Actions to Provide Public Goods, 76 J. Personality & Soc. Psychol. 587, 588 (1999); Samuelson, supra note 140, at 301. This criterion suggests that, where possible, privatization should be considered as a solution. See Samuelson, supra note 140, at 319-320 (noting that preferred solution among participants was privatization because it "allows for private autonomy").

[142] Resource users may value discretion and autonomy more highly than future security. See Susan C. Nunn, The Political Economy of Institutional Change: A Distributional Criterion for Acceptance of Groundwater Rules, 25 Nat. Resources J. 867, 877 (1985).

[143] See Van Vugt & De Cremer, supra note 141, at 588; Tom R. Tyler & Peter Degoey, Collective Restraint in Social Dilemmas: Procedural Justice and Social Identification Effects on Support for Authorities, 69 J. Personality & Soc. Psychol. 482, 482-484, 493 (1995). See also Stephen E. White & David E. Kromm, Local Groundwater Management Effectiveness in the Colorado and Kansas Ogalalla Region, 35 Nat. Resources J. 275, 175-276 (arguing that local groundwater management is only feasible approach).

regulation. There is a potential tension here, because local regulation and retained freedom may increase the chances for defection and thus decrease the chances of success. But some degree of tradeoff may be necessary.

Finally, market mechanisms often will be an essential element of an effective solution. However the burden of a solution is ultimately allocated, there are likely to be benefits from trade. Some people want the right to acquire more of the resource. Others will willingly give up some of their rights for a high enough price. Market mechanisms – such as transferable quotas, water transfers, or tradeable emission rights – can provide added value to both groups, making the pain of a solution more acceptable. Market mechanisms also provide resource users with additional freedom because they can use the market to increase their individual use.

Not surprisingly, most effective solutions to commons dilemmas have incorporated some type of a market mechanism. Consider, for example, the Texas legislature's response to lawsuits over the overdrafting of the Edwards Aquifer. Having concluded that groundwater withdrawals must be reduced, the legislature faced the difficult question of how to allocate the reductions. The legislature ultimately concluded that, for equitable and political reasons, reductions must be allocated proportionately to current withdrawals: all current users should cut back their withdrawals by an equal percentage. But this allocation was unlikely to be efficient. Some users easily could manage with significantly less water, while other users would find it costly to cut current withdrawals at all. To ensure efficiency, the legislature therefore linked the proportionate reductions with the creation of a water market through which those who found it easiest to reduce

groundwater withdrawals could sell their groundwater rights to those who needed all the groundwater they could get.[144]

3. Allocating the Burden.

Even resource users agree that there is a problem that needs to be addressed and help brainstorm efficient solutions, the daunting task will remain of getting the resource users to agree to a particular allocation of the burden of that solution. Many commons negotiations founder on exactly this issue. Due to egocentric interpretations of fairness and halo effects, resource users are likely to start from quite different perspectives on the fairness of various solutions. Thankfully, however, experimental studies have shown that dialogues among resource users can help overcome such self-serving interpretations of fairness. As resource users learn more about others' perceptions of fairness, and the reasons for those perceptions, the user's own view of the fairest result grows less biased.[145] These studies suggest that once all the users of a commons come together, start talking, and learn what others believe to be fair, they do adjust their own perceptions of fairness to a less biased position. The process of dialogue is neither easy nor speady, but these studies give us some hope that constructive dialogue can help resource users ultimately agree on a solution.

IV. CONCLUSION

After reading this essay, a scientist friend who is actively involved in global climate change proceedings told me that the essay was overly optimistic, that the essay actually understates the obstacles involved in getting people to recognize that a problem exists and then

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[144] See Votteler, supra note 105.
[145] See Wade-Benzoni, Tenbrusel, & Bazerman, supra note 79, at 114.

agreeing to a solution. I hope that is not true. I do not think it is true. Global climate change, along with the depletion of the world's fisheries and groundwater aquifers, are simply too critical not to find effective solutions. To solve them, however, we will need to focus greater attention on how to motivate the human imagination to see and care about the risks, to be creative in structuring new and workable solutions, and in overcoming the inevitable fight over who should bear the brunt of the burden. And we will need to keep plugging away, no matter how pessimistic we might become at some points.