Varieties of Institutional Failure

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Introduction

Over the course of the past thirty years a consensus has begun to emerge that management of resources is basically an institutional problem. If we get the right rules and governance structures, natural resources will be used wisely and conservation goals will be met. However, there is no agreement as to what institutions will accomplish these goals. We have managed to come up with a long list of institutional possibilities. Garrett Hardin began the list in 1968 with the publication of his "Tragedy of the Commons" article. Hardin saw the solution to the tragedy as intervention by government, which might have to be very autocratic and repressive to achieve its goals. His commitment to action by the government is shared by many bureaucrats and professional resources managers. They believe, deep down, that in the last analysis, only action by central governments, and by this they mean "top down" management, will suffice to save resources. A whole series of economists from the late 1950's to the 1970's, working on what had

become known as the “common property problem,” concluded that the primary cause of the destruction and inefficient use of natural resources was the absence of property rights. The solution, from their perspective, was to establish private property rights. Their insights have had no small effect on the management of natural resources. Fisheries management, for example, is essentially an exercise in establishing property rights or simulating property rights through the use of rules concerning licenses, limited entry regimes, ITQ’s [Individual Transferable Quotas] and the like.

A group of anthropologists and other social scientist have reacted to the analysis of Hardin, and others such as A. Scott(1955), Gordon (1954), Cheung (1970), and Johnson (1972), by pointing out that it is “open access” that causes problems, not the fact that resources are owned by communities. Communally owned property can be very well managed. In the 1980's they produced a series of volumes documenting the large number of cases in which resources were managed well at the local level by communities around the world (Berkes, Feeney, McCay and Acheson 1989). This fed into a movement which is very much in vogue at present, namely the call to manage resources “from the bottom” up or by “co-management” regimes in which management responsibility is shared between the government and local level communities.

Last, but certainly not least, others have proposed that it is efficient markets that result in efficient use of natural resources and the conservation of those resources. The Political Economy Research Center (PERC) in Bozeman Montana has produced a number of studies showing how markets have solved resource problems and arguing that free markets can solve still others. A part of the agenda of the so called “Free Market Environmentalists” is to argue against excessive government intervention in resource management.

In summary, then, there are four very different kinds of basic kinds of institutions, which various sets of scholars have argued can solve resource management and conservation problems: (1) private property, (2) government, (3) communal management, and (4) markets. There is a tendency for social scientists and others to lionize one of these and argue that the solution to resource management problems is this particular one.

I would argue none of these is a general solution. All of the institutions I just described will fail to solve resource conservation problems under certain conditions. This is not to say that none of them work. But one of the key question facing resource management at present, is: Under what conditions will each of these different kinds of institutions work? When will they fail? This evening, I would like to concentrate on the failures. I plan to attack this problem by going from institutions about which we know a good deal to those we know little about. Let's begin with market failure and go on to the failure of private property regimes and then to failures of the government. We'll end with the failure of communal governance structures.

Market Failure

According to neo-classical economics, competitive markets operate to allocate resources, goods and services produced in efficient ways. Moreover, if markets are working competitively, there should be no divergence between the goals of individuals and what is optimal for society (Arrow 1951, Debreu 1951). From this perspective, efficient markets are the quintessential invisible hand solution.

Unfortunately, markets are rarely perfectly competitive and efficient. There are several causes. The most common source of market failure is externalities, which are the effects of one's economic decisions on the welfare of others not regulated by prices. In the case of positive

externalities one person is producing goods or services for others for which the producer cannot charge. The owner of a hive of bees cannot charge for the pollination services of his bees. An industrialist who produces smoke and pollutes a river is producing negative externalities, for which he does not have to pay. The costs are being borne by people down wind or down stream who are deprived of a clean environment. Externalities stem from incomplete, insecure property rights or a complete absence of property rights. The famous common property problem is the best known case in point. But the important point is that when externalities exist, it is difficult or impossible to depend on markets to solve resource problems. How do people on the east coast gain compensation for the damage done by acid rain? East coast residents do not own the air, and owners of coal burning plants in the mid-west are allowed to foist negative externalities on them. Who do they deal with? How can they charge anyone for the problems caused by acid rain? Markets will not work in cases where such externalities exist.

Another source of market failure is public goods. As Olson (1965) pointed out, public goods are those that cannot be restricted to those who pay for them. National defense is a classic example of a public good. It must be made available to all, including tax cheats and draft dodgers. As a result, individuals have a strong incentive not to pay for such goods and to become free riders on the efforts of others. Under these circumstances, markets will not be effective in allocating such goods. As Olson points out, people will pay for something they can get for free only when special incentives are present. Public parks, national forests, and fisheries have many characteristics of public goods.

Third, another source of market failure are those factors that make the acquisition of accurate information costly or impossible to obtain. After all, market efficiency describes a

situation in which all consumers maximize utility and all firms maximize profits. This is impossible when consumers do not know price of goods or producers send goods to the wrong place in anticipation of demand that never materializes. Opportunism (bargaining with guile), quality problems, and asymmetrically held information all increase the cost of information on prices, and all can lead to gluts and shortages characteristic of market inefficiency or market failure. Several kinds of circumstances can also make information difficult to come by and thus impede market efficiency including "hidden action," "hidden type," [both of which make it difficult to assess what one is getting for one's money] and "unforseen contingencies" stemming from the inability of humans to foresee the future.

A number of social scientists from different disciplines have noted that problems in markets, or exchange systems, lead to the creation of non-market institutions. That is, when people can obtain the goods and services they require by direct exchange with others, they will do so, but when exchange or transactions are difficult, people will turn to other kinds of institutions to do the same job. Nobel Prize winning economist Ronald Coase (1937) began this line of analysis, pointing out that markets and firms are substitutes for each other. Other institutionalists such as Oliver Williamson (1977, 1985), Douglass North (1990), Robert Bates (1994), and anthropologist Fredrik Barth (1981) broadened out this idea to discuss a variety of kinds of institutions associated with different kinds of market failure. But I do not want to dwell on the way that institutions are generated. I want to talk about institutional failure. Back to work.

Private Property

It is one of the basic tenets of the theory of common property resources that private

property rights conserve natural resources because the owners of those resources have an incentive to protect them. By way of contrast, the absence of secure property rights results in high transaction costs, mal-distribution, overcapitalization, and overexploitation (Acheson 1989). Unfortunately, private property rights do not always result in the conservation of resources. Under certain circumstances, people can and will over-exploit resources they own privately, even when property rights are secure. The literature on pastoralists, farmers, and loggers shows that "resource conservation is not always ensured by the private property status of the resource." (McCay and Acheson 1987: 9). The dustbowl conditions of the 1930's, soil erosion in more modern times, and depletion of industrial forests are all cases that underline the fact that at times private landowners are no more responsible than users of open-access resources. Nor are such cases all that rare. What conditions make it rational for owners to over-exploit their own resources? I think there are four such circumstances.[There are two comments before I continue. (1) Here we are on less certain ground since much less work has been done on the failure of private property institutions. (2) We need to ask whether overexploitation of privately owned resources indicates the failure of the institution of private property. It certainly does from the point of view of the society. Overexploitation is not Pareto Optimum or in the long run best interest of the society. The question needs to be asked?]

First, Colin Clark (1973: 630) argues that "A corporate owner of property rights in a biological resource might actually prefer extermination to conservation, on the basis of maximization of profits." This occurs when the growth rate of the resource is less than the interest rate. It makes no sense to borrow money from the bank at 8% interest to invest in a resource that increases in value at only 4% per year. This would not be a rational investment.

Under these circumstances, it would only be sensible to use up the resource as fast as possible, and invest the money obtained in another income stream with higher returns.

Second, long time horizons–in and of themselves-- make it rational to over-exploit privately owned resources. Forests are an excellent example. An analysis done by Mass and Vicary (1991) assessed the returns that could be realized from Maine forest plantations under the most ideal conditions. That is, they assumed that the plantation would be harvested in 50 years, that during those years there would be no outbreak of disease, that stumpage rates would rise steadily, that the land cost nothing, and that there were no taxes. At a 4% discount rate, the NPV was $231.00; at 5% it was $59.05; and at 6% the NPV was -$50.30.. If conditions were less ideal and the discount rate at competitive industry levels, investment in a plantation would lead to substantial losses. I reworked their figures and found that if these trees were harvested in 80 years (it takes 80 years for pine and red spruce to reach maturity), the Net Present Value would be negative at all discount rates above 2%. Under these conditions, there is a strong incentive to cut forests as soon as possible.

Second, it is illogical to invest in slow maturing resources if there are two, three or more generations between investment in the resource and harvest. Baskerville (1995: 96) points out that in the case of New Brunswick forests there is a strong tendency to make decisions with the interests of the current generation in mind. The same point can be made of other resources. Simply put, most people--including most owners of firms--figure that there is little sense investing in a resource that someone else is going to harvest far into the future.

Third, uncertainty about availability of the resource can lead to overexploitation. For example, fishing takes place in a very complex and even chaotic environment in which a large

number of factors affect recruitment, growth rates, and reproductive success, including food supply, pollution, factors affecting the nursery and breeding grounds, and community predation. In addition, the effect of human predation is not known with certainty. Therefore, large changes in stock sizes and catches can occur unpredictably for reasons that no one is certain. Forests and stocks of animals are also subject to periodic outbreaks of diseases that can strongly affect forest stocks and species mix. In some cases, it is possible to specify the probability of such events occurring, but in other instances even that is impossible. As a result, when biological systems are unpredictable, people have little incentive to conserve the stocks of such species. It is irrational for people to invest in such stocks or curb their own exploitive behavior when it is uncertain that these activities will result in any payoff?

Last**,** economic competition and low profit margins can also force owners of resources to over-exploit them. Farmers may know that rotating crops is a wise strategy, and owners of forest land might be fully aware of the advantages of selective cutting. But their economic situation might be so precarious that they are forced to forego such strategies in an effort to stay in business in the short run, even though this will degrade their property in the long run.

Any one of these circumstances can motivate owners of natural resources to over-exploit them, or fail to maintain them at optimal levels. But even worse, often two or more of these circumstances can occur together, creating very strong incentives to damage privately owned resources.

In Maine, many of these circumstances exist in the forest industry (Acheson 2000). The rate of cutting is not sustainable. Many decisions of owners of Maine forests stem from the fact that investing in forests does not give high returns given the long time horizons involved and the

slow growth rate of trees in this area. All knowledgeable observers admit that the return on Maine forests is no more than 6%. Moreover, regardless of what discount rate is used, the Net Present Value of investing in Maine forests is very low or even negative.

The forest contractors get around this problem by reducing the duration of an investment to a few months by purchasing land, stripping it of trees and then selling the land. They are not tying up expensive capital for long periods in slow growing trees. This strategy effectively reduces the cost of waiting to nothing, and passes the costs of heavy, unsustainable harvesting levels onto future owners and the public.

The industrial land owners (i.e. the pulp and paper industry) face a more difficult set of circumstances. In addition to the problems stemming from the low returns on investment in forest land, they have had to contend with vastly increased competition and cut throat price competition. Demand for magazines and newsprint has declined, and prices for paper products are very volatile (Legasse 1997; McDonald 1997). Moreover, Maine mills face increasing competition from the modern mills that have been built in the southern part of the U.S. and in foreign countries. Moreover, pulp is a commodity whose price can‘t be increased by advertising. The paper companies have reacted to this situation not by investing in the most modern technology to maximize output and efficiency. Rather, they have sought to keep profits at acceptable levels by keeping costs low.

They have lobbied the government for a variety of services such as fire control, and spruce budworm spraying and low land taxes. They have cut costs by keeping investment in mills low and by running their mills continually (three shifts for 365 days a year). Most important, the paper companies are cutting their forests heavily, using low cost techniques such

as clearcutting and poor quality partial cuts. These strategies avoid the full costs of investing in sustainable forests.

The pulp and paper companies own such a large percentage of Maine and Maine's forests that their activities are affecting the health of the forests as a whole. McWilliams (1997:1) points out that in the 1990's total growing stock volume decreased by seven percent, and the current cut to growth ratios was 1 to .8 indicating that for every cord of wood cut only .8 cords were growing back. A simulation modelling study done by officers of the Maine Forest Service demonstrated that the growth to removals ratio would be negative well into the 21st century, assuming the use of both current cutting practices and improved harvesting practices (Gadzik, Blanck and Caldwell 1998). The situation in the northern counties of Maine, which are primarily owned by the paper companies, is much worse. In all of these counties the cut to growth ratio was 2 to 1 or higher indicating at least twice as much wood was being cut as was growing back. In Piscataquis County it is 3.6 to 1. As a result, the quality of stands has decreased, the amount of land in hardwoods has increased, the percentage of land in large saw timber has decreased from 39% to 34% from 1959 to 1995; in that same period the amount of land in seedlings and saplings increase from 14% of total forest acreage to 25% (Gadzik, Blanck and Caldwell 1998; 3-4; McWilliams 1997: 177-178.).

This is not to say that all forest landowners are doing a bad job managing their land in Maine. The culprits are the industrial landowners (i.e. pulp and paper companies) and the forest contractors. But they own such a large percentage of the state that their poor forest practices have strongly affected the quality of the forests in Maine as a whole. I want to remind you that virtually all of this land is privately owned. (Only a small percentage is owned by the federal and

state government.) It is private owners who are treating their own forests in this way.

Government

Governments do wonderful things. We have come to depend on them for a huge variety of services and goods. In the past few decades, we in the United States have come to look to the government to be our primary bulwark against environmental pollution and degradation. There is little question that these efforts by government have borne fruit. Our environment is much cleaner now than it was a few decades ago. Many of us in this room can recall the time when many major rivers in the U.S. were literally open sewers. Those rivers are much cleaner now due to the actions of the government agencies.

There are many people in the U.S.-- especially professional managers and the conservation community--who assume that resources can only be managed by the government. I have no doubt that they have a strong argument. But government can also fail in the resource area–sometimes massively. One of the best examples is fisheries management. Very large numbers of marine fisheries in the world are in a state of crisis. Many of these have been under scientific management choreographed by central governments for decades (McGoodwin 1990). Something has gone desperately wrong in these cases. Moreover many forests under government control have apparently not been well managed. I do not need to go very far from home to find examples. The ground-fisheries of the Gulf of Maine are at 500 year lows. They are truly in desperate condition. The forests on Crown land in New Brunswick have apparently not been managed well either.

One thing to note is that governments generally attempt to preserve resources in two

ways: first they have been buying up large amounts of land and resources to create parks, national forests, and biosphere reserves; second, they have passed laws and regulations designed to protect resources. They generally have not been doing either for very long. In the U. S., as we all know, the first national parks go back to the administration of Teddy Roosevelt in the early years of the 20th century. Virtually, all of our important environmental legislation, including the Clean Air Act, the Clean Water Act, and the Fisheries Conservation and Management Act were enacted only in the 1970's. During most of our history, resource management was not a primary goal of the government. I believe that is still the case in many, but not all, of the countries of the Third World, and in countries in the ex- Soviet block.

It is important to make a distinction between the destruction of resources in cases where governments do not perceive of conservation of natural resources as a primary goal, and cases where governments have accepted the responsibility for conserving resources. There are different kinds of government failure involved in both.

In the literature on the Third World, several causes of government failure have been stressed in the literature. The first, as has been noted by innumerable commentators on the Third World, is corruption. There are huge transaction costs involved in monitoring the enforcers. When this is not done, enforcers can act with their own selfish interests in mind. When they are supposed to enforce conservation laws, this can mean over exploitation of resources. Another problem is inefficiency. A third is conflict between bureaucracies, where one part of the government undermines efforts by another part to save resources (Gibson 1999).

Another source of problems lies in the interests of the state, as people such as Douglass North (1981) and Jack Knight (1992: 190) have noted. The goals of owners of resources are to

get rules that will give them "distributional advantage." The goals of officers of the state are different: "an economic interest in revenues, and political interest in maintaining a level of aggregate growth sufficient to satisfy social actors necessary to maintain power. The rights that satisfy the most powerful resource owners may differ from those preferred by the state" (Knight 1992: 190). But the interests of the state and of owners of resources may coincide as well. The result can be exploitation of resources unimpeded by the government, or even augmented by the government. An example is afforded by the administration of Porfirio Diaz in Mexico–the period between 1876 and 1910. One of Diaz's primary goals was the development of his country. With this end in mind, he arranged for the British to build railroads, Standard Oil of New Jersey (Rockefeller) to develop the oil fields in the Gulf of Campeche, British and American mining and timber harvesting companies to open mines and exploit the tropical forests of southern Mexico. Diaz did have some success in modernizing the country. But the actions of his government also resulted in impoverishing the Mexican working class, buttressing of the debt peonage system on haciendas, and the virtual destruction of the tropical rain forests of Chiapas and Campeche (Collier and Quartiello 1994).

In modern states, there is less outright corruption (I trust and hope) but there certainly continue to be instances in which the government consented to allow resources to be damaged with revenue and political support in mind. In my own state of Maine, the paper companies had such influence in the legislature that they got virtually all of the laws and subsidies they wanted. For this reason, William Osborne (1974) called Maine the "paper plantation." The result was a set of laws that subsidized the paper companies and gave them *carte blanch* to do what they wanted with a sizeable percentage of the state. People in the legislature were passing such

legislation with the best of intentions in mind: jobs, communities, and development. This has not resulted in sustainable forest practices to say the least. In retrospect, it is a case of government failure.

In the modern era when governments have taken primary responsibility for conserving natural resources, other more subtle forces work against sustainable resource use. Anthropologist James Scott in his new book *Seeing Like a State* (1998) focuses on describing the failure of state enterprises designed to better the human condition in the 20th century, and the underlying causes of that failure. He analyzes such diverse phenomena as China's great leap forward, Soviet collectivization, which resulted in massive starvation, and to less lethal mistakes such as compulsory Villigization in Tanzania, the planning of certain cities such as Brazilia, and agricultural modernization in Europe and the United States that has resulted in crop epidemics.

Scott says that four factors underlie these disastrous mistakes by governments. First, states must make complex, diverse social and ecological phenomena "legible." They invent tax lists, land maps, census data, etc. to make the society they are in charge of legible and hence controllable from the top. To do this they have to simplify very complex phenomena. Second, he says is "high modernism", an uncritical and unskeptical faith in science and technical progress. [Note this is faith, not scientific practice.] The practitioners of high modernism are unwilling to admit to the high degree of uncertainty and complexity that surrounds human and ecological phenomena. Legibility and "high modernism" only become "lethal," he says, when they are combined with a third force--namely a powerful, highly centralized state willing and eager to use its power to bring these high modernistic schemes into being. Last, is a "prostrate civil society that lacks the capacity to resist these plans."

Now you say that Scott is taking about Soviet Russia and Communist China, and that this could not happen here in modern democratic states. Yes, he is talking about Stalinist Russia and Mao's China, but he is also talking about failed schemes in such places as Israel, Brazil, France, Ireland under British rule, and in the U.S. [U.S. industrial agriculture].

You say that this could not underlie the problems that we are having with resource management. I am not so sure. Let us examine the disaster that has befallen groundfish in the Northwest Atlantic in the past few decades. Canadian groundfish stocks off Newfoundland are at 500 year lows. There is strong reason to believe that much, if not all of, the fault for this disaster can be traced to decisions of the Canadian government. The facts I have on this case come largely from Chris Finalyson, an anthropologist now working for the Maine Department of Marine Resources, who described the disaster in Newfoundland in a book entitled *Fishing for Truth (1994).* Basically cod in Newfoundland for centuries were caught very near shore in fish traps, and by hook and line technology. The cod fishery gave an average sustainable yield of 300,000 metric tons per year.

In the 1970's, the Canadian government decided that it was going to develop the economy of Newfoundland and improve the lives of its citizens, a large number of whom were dependent on the dole, by developing the ground-fishery. To this end the Canadian government built a fleet of 170 large trawlers capable of taking far more than 300,000 metric tons of groundfish. Fisheries spokesmen, such as Cabot Martin, repeatedly warned the government that the fishery could not sustain this level of catch, but the position of the DFO (Department of Fisheries and Oceans) was that the stock could support a high total allowable catch.

In the early 1980's catches were very high. However, by 1989 it was clear that cod stocks

were in serious trouble. In 1991, the Canadian government stopped all directed fishing for cod. The stock has not recovered yet. This disaster was not only caused by the huge catches that destroyed the breeding stock, but also by the use of trawling gear--large nets towed along the bottom--which are highly unselective, and which also does a lot of damage to the bottom.

Note that it is easy to make the case that the elements Scott says cause failures by government are present in this case. A highly powerful, centralized government determined to foist a "high modernist" scheme on a poor, and relatively powerless Province. The Canadian Department of Fisheries and Oceans is highly centralized and has been given a lot of power. The plan was supported by scientists, unwilling to admit the complexity and uncertainty of predicting fish stocks, and a bureaucracy all too willing to ignore local knowledge about catch levels and practices such as use of fish traps.

Participation by industry and people at the local level does not always work either. I remind you of what has happened with the groundfish of New England. Since 1977 the ground-fishery of the Gulf of Maine has been managed by the New England Regional Fisheries Management Council, a group containing federal fisheries officials and representatives appointed by the governors of the New England Coastal States. The ground-fishery has plenty of representatives on this body. The Council develops fishery management plans, which it recommends to the National Marine Fisheries Service and the U.S. Secretary of Commerce. The Council's recommendations are enforceable after the Secretary of Commerce accepts them. It is aided in its decisions by data supplied by federal and state scientists. Has this more decentralized system worked well? It has not. Stocks of many of the species managed by the Council, including cod and herring, are at all time lows.

The basic cause of the problem is over fishing. Over fishing has been permitted, even encouraged by the council, by the development of rules which can be evaded or which favor the large boats–the ones that take the most fish. The result is a set of accidental after effects that are quite damaging to the stocks.

Two examples will suffice. In 1977, the council produced its first groundfish plan which called for managing the stocks based on three month quotas. A quota would be set for a three month period. When that quota was taken, all fishing would be stopped. In January 1978 the plan went into effect. It was a stormy winter, and the small boats from Maine and New Hampshire could not get out. Within weeks the entire three month quota had been taken. The lesson was clear: the catch would go to the largest and best equipped boats. Large numbers of owners replaced their older boats with larger boats with better fishing gear and fish finding electronics. The result was a quota race which produced a fleet capable of putting far more effort on the stocks. By the early 1980's the stocks were showing signs of trouble (Acheson 1984).

In the 1990's, the groundfish stocks, especially those on Georges Bank, were in very bad condition. The council produced rules to exacerbate the problem. Basically the Georges Bank stocks were fished by large vessels, and these stocks were in bad condition. The inshore banks were fished by small vessels, and the stocks there were in much better shape. In 1994, the New England Council passed Amendment 5 calling for management by days at sea. At this point, many of the large vessels began to fish inshore banks because they did not want to waste valuable "days at sea" traveling to the offshore banks. Then the Council produced Amendment 6 closing all fishing on parts of Georges Bank with little thought about where the 200 large boats that fished there would go. Predicably, they went to the inshore banks and quickly fished those out as

well. Given the history of the last 25 years, it is difficult to escape from the conclusion that the Regional Council is a case of institutional failure--another case where the government has failed in attempts to manage resources.

Scott's analysis again appears to apply, if not quite so closely. Groundfish are managed by the federal government, from the top down, over the entire range of the stock. The primary scientific tools involved are stock-recruitment models, which have many of the traits of "high modernistic schemes." The ground-fishery has not been well enough organized to oppose what they considered ineffective and costly management proposals. As a result, the industry has developed a gold rush mentality, which has enhanced the over fishing problem.

These few examples make no pretense at describing all of the kinds of government failure. Much more needs to be done in this area.

Local Level Management

I am not going to say very much about the failure of local level management efforts. I personally have great hopes for co-management or bottoms up management. Pinkerton and Weinstein's book *Fisheries that Work* (1995), Fikret Berkes (ed) *Common Property Resources: Ecology and Community-Based Sustainable Development* (1989), Elinor Ostrom's book *Governing the Commons* (1990), and the book edited by Bonnie McCay and myself *The Question of the Commons* (1987) give a number of cases of successful local level management. But I have no doubt that it is very difficult for local groups to generate successful local level or co-management institutions. These can fail easily.

There are a number of circumstances that can cause such failure. Most important, efforts at local level management will fail if the rules put in place benefit people [free riders] who did

not make the sacrifice in the cause of conservation. This can occur when groups are large, when people have not built up social capital and know who to trust, where boundaries cannot be enforced, and where people do not have to live with the consequences of their actions. All of these factors will lead to rules that are unenforceable and defection from the norm will follow.

There is no large literature on the failure of co-management or local level management regimes. One should be developed. I know from looking at the papers being given here that a large number of local level management experiments and efforts are underway in many areas of the world. Some of these will succeed; many will fail. I would urge you to do something that is very difficult--namely, when a project fails to describe those failures. We need a set of case studies of both successes and failures if this effort is to go forward.

Conclusion

Let me conclude where I began. Several kinds of institutions can be used effectively to manage resources. Markets, property rights, government, and local level or co-management can all be effective. They can also fail. None of them is a universal solution to the problems we face. One of the key questions that social scientists interested in resource management need to answer is: When and under what conditions will each of these kinds of institutions succeed in conserving resources. Under what conditions will they fail? This is not an easy question to answer.

I would like to end by suggesting that what is needed is a far more sophisticated type of analysis than we have now. We need to determine the exact characteristics of resources and the problems they are having. Then we need to match to those problems specific kinds of institutions capable of solving those problems. Moreover, we cannot expect that these resource

problems can be solved by a simplistic use of markets, or local level management, or government, etc. We are going to need to combine various elements of property rights, government control, local control and markets in ways that we have not imagined could be done. This is going to require some very creative thinking.

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