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Compensation and Economic Incentives: Reducing Pressure on Protected Areas

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Although the global social benefits of establishing protected areas in tropical rain forests may outweigh the total costs, the local private costs of restricting access to an important resource may be relatively substantial for residents and communities. The imbalance between costs accruing at the local level and benefits accruing at the national and international levels has raised questions about whether people living in or near protected areas ought to be compensated for their losses, and if so, how compensation should be made.

The issue of compensating residents for lost resources has been discussed, implicitly or explicitly, in many treatments of the relationship between protected areas and local people, as well as in treatments of externalities. (Economists define externalities as actions of consumers or producers that affect the well-being of others in a way that is not reflected through prices or economic transactions.) In the literature on compensation, there is a large difference of opinion on whether compensation should be paid to victims of negative externalities, which include such things as the pollution of air or water and the siting of hazardous waste dumps.

A number of studies have argued for compensation of those people subject to negative externalities, at least in particular situations or through particular mechanisms (Johnson, 1977; O'Hare, 1977; Western, 1982; Knetsch, 1983; Ward, 1986; Tietenberg, 1988; Hodge, 1989; Sullivan, 1990, 1992; Barnett, 1991; Burrows, 1991; McNeely, 1991; Miceli, 1991; Farber, 1992; Pollot, 1993). Other authors, mainly economists, have argued equally persuasively against compensation in many or all situations (Knetsch, 1983; Blume et al., 1984; Baumol and Oates, 1988). Most of the differences of opinion derive from differences in the context of the case examined, the assumptions made, the criteria used for judging the desirability of outcomes, interpretations of relevant laws, and the proposed mechanism for compensation. In the context of protected

areas, most authors have argued in favor of compensating residents (e.g., Western, 1982; Barnett, 1991; McNeely, 1991).

A unique best choice regarding compensation is not indicated in economic and political theory. Few protected area projects have attempted large-scale compensation initiatives; thus, there are few field examples to guide the discussion. In this chapter, we outline the various arguments for and against compensation as they specifically relate to the establishment of protected areas. The word "compensation" here indicates an explicit payment to residents equal to the value of their opportunity costs (i.e., the costs of foregone alternatives) resulting from restricted access to the protected area's resources. Compensation can take the form of cash payments, in-kind substitutes, infrastructure development, provision of social services, or the introduction of alternative production technologies. The focus of this chapter is on people living within or adjacent to protected areas whose daily subsistence and commercial needs have traditionally been met by using the area's resources, rather than on the larger-scale commercial users of these resources (e.g., timber companies, mining companies). The chapter ends by describing the ideal components of an approach that can ensure that residents are not worse off after the establishment of a protected area while at the same time generating local support for conservation.

CRITERIA FOR JUDGING THE NECESSITY OF COMPENSATION

Legality

In general, to compensate individuals for a lost benefit stream is to recognize that the individuals have some right to that benefit stream. Thus, when evaluating the necessity of compensation, one should first consider whether the law dictates that compensation is required. In many developed countries (e.g., the United States, England, Canada, New Zealand, and Norway), there are conditions under which government expropriation of resources or resource attributes is deemed a "taking" and the government must pay "just compensation" to the owners or users (Todd, 1976; Ward, 1986; Willis et al., 1988; Korsmo, 1991; Pollot, 1993). Some developing countries (e.g., Malaysia) also have similar laws (Knetsch, 1983). Some nations have specific laws governing the expropriation of tribal or indigenous lands (e.g., the United States, Australia, Bolivia), for which compensation is usually required (Holt, 1988; Yapp, 1989; Nash, 1993). In most developing countries, more than 80 percent of protected forest area is owned by the government (Gillis, 1991). In countries with large endowments of tropical forest, almost 100 percent of all natural forests is government owned (e.g., Indonesia, Malaysia, Ghana) (Gillis, 1991). The legal codes of most countries do not require compensation when the status of a public resource is changed.

If residents adjacent to protected areas do not have title to the land on which they live, they may have had certain legal rights to the resources on that land, which would strengthen their claim for compensation. However, even if the law does not indicate that compensation should be paid or if the residents had few legal rights to the resource prior to the protected area's establishment, there may be other reasons for compensating residents for the costs they incur.

Efficiency

Most economic analyses of the allocation of land to a protected area would use the criterion of "efficiency" to judge the desirability of the allocation. Economists define an allocation of resources as efficient if the net benefit from the use of those resources is maximized by that allocation. This definition of efficiency has its roots in the concept of potential Pareto-improvement (PPI). A PPI is a change in the allocation of resources that could make, *after compensation*, at least one person better off and no one worse off. (For example, the maximum allowable herd size on public land is reduced by 10 percent, and the increase in benefits to other users of the land is larger than the decrease in benefits to the livestock owners. The gainers gain more than the losers lose, and thus the other users of the area could compensate the livestock owners. Reducing the allowable herd size by 10 percent is therefore a PPI.) At the societal level, an efficient allocation does not require compensation because society as a whole is better off.

Figure 9-1 depicts the optimal allocation of land to a protected area in a region. The y-axis measures dollars and the x-axis measures hect-

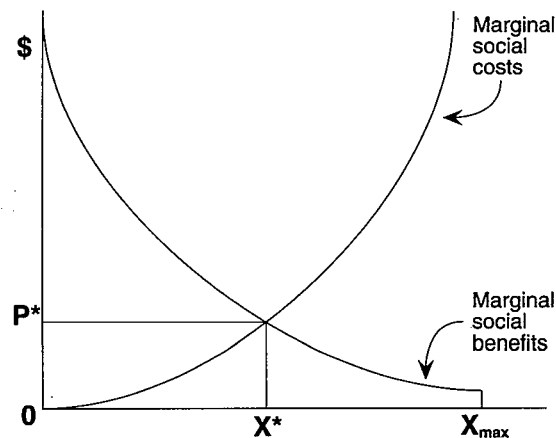


Figure 9-1 Costs and benefits of allocating land to protection.

ares of land allocated to protection, with X_{\max} being the maximum amount of land available in the region. If one assumes that only residents incur costs from protection, the social marginal cost curve can be interpreted as the marginal cost to local residents from supplying hectares of land for protection. If only nonresidents enjoy net benefits from protected areas, the social marginal benefit curve can be interpreted as the nonresident demand curve for hectares of protected land. X^* is the economically efficient quantity of protected area where social marginal benefits equal social marginal costs.

If one assumes, for the moment, that the government is interested in maximizing social economic well-being and determines that X^* is the amount actually allocated to the protected area, then compensation to residents is not required for efficiency. The efficient point has been chosen. The gainers could compensate the losers, but the efficiency criterion does not require it.

Since the government simply decreed the protected area, consumers of protected area benefits do not actually have to pay P^* for each protected hectare. Thus, the entire area under the demand curve up to X^* is consumer surplus (i.e., the difference between the amount consumers were willing to pay for the quantity demanded and the amount they actually had to pay). Residents are left with only costs. Thus, although the allocation is efficient, it is highly inequitable—and this has been the cause of many conflicts worldwide between protected areas and local residents.

At first glance, it would seem that if there were some mechanism to force the beneficiaries to pay P^* for each hectare protected, then one could maintain efficiency and compensate residents for their losses—and even give them some additional payment above and beyond their losses. But ecosystem protection is a public good subject to nonrival and nonexclusive consumption. (Nonrival consumption refers to consumption that cannot be divided among individuals; e.g., one citizen's consumption of national defense, does not diminish the amount available for others to consume. Nonexclusive consumption refers to the difficulty or impossibility of excluding nonpayers from using the good.) Because it is not possible to exclude nonpayers from enjoying some of the benefits of the protected area (e.g., Europeans who gain existence values for species protected in the tropics), there is the classic "free-riding" problem that causes markets to underprovide public goods. Hence, the price mechanism is not a workable way to finance protected areas, and governments must use tax mechanisms to force beneficiaries to pay. But the use of tax mechanisms to collect the "willingness to pay" (WTP) reflected in the marginal social benefits curve is problematic in this case, because many beneficiaries live in other countries. (See chapter 8 for a discussion of international transfer of funds to finance protected areas.)

Another way to redistribute some of the consumer surplus to residents would be to ask beneficiaries to pay their WTP for X^* hectares voluntarily to a fund for local residents. This is effectively what happens now in many conservation projects in developing countries. When a nongovernmental organization sets up a protected area project, it is effectively representing its members and paying their WTP for the protection of habitat. A similar comparison can be made for protected area projects funded by multilateral and bilateral governmental donors; they are representing their taxpayers and paying their taxpayers' WTP for the protection of habitat.

Because of nonexclusivity in the consumption of ecosystem protection, free-riding behavior will decrease the effectiveness of this voluntary approach. Since the price bill exceeds the total damage bill (i.e., the area of OP^*CX^* is greater than the area of OCX^*), enough people may pay so that the residents will be compensated for many of their losses. In general, however, it appears that the funds currently generated by donor organizations are insufficient given world conservation and compensation needs.

A number of authors have argued that requiring a government to pay the full cost of its projects will increase efficiency (Johnson, 1977; Ervin and Fitch, 1979; Posner, 1986). They maintain that if land is costless, the government may take land when costs outweigh benefits. The authors then claim that if the government must pay P^* (or the area of OCX^*) to residents, there would be an incentive to protect only X^* .

However, the conclusion of these authors does not necessarily follow in all situations. In the case of protected areas, the conclusion ignores the direct costs of managing and protecting the area and the opportunity costs that certain powerful stakeholders (e.g., commercial timber interests) may bring to the government's attention. Moreover, there are three reasons why the government may choose to take land when costs outweigh benefits: the government is not acting as a maximizer of social economic well-being, the government does not have enough information to calculate X^* , or the government is not using efficiency as the sole criterion when making decisions about protecting biological resources.

If the first is the primary reason, then payment of P^* will not necessarily make the government allocate X^* . A government acting as a maximizer of social well-being equates the marginal benefit of providing another unit of public good with the marginal cost of providing that unit. But if the government is not acting as a social well-being maximizer, then by definition it is not making such calculations. Thus, making it pay for the land is not likely to make it choose X^* .

Making the government pay may induce it to reduce the amount of land allocated to protected areas, but it may then allocate too few hectares to protection (i.e., less than X^*). This appears to have happened

in Norway (Korsmo, 1991). In 1986, a new law mandated full compensation to owners of land subject to expropriation or regulation for conservation purposes. The law resulted in a decrease in the establishment of new protected areas at the same time that many scientific reports were arguing for an increase. In any case, making a nonoptimizing government pay for the land is unlikely to result in the efficient choice of X^* .

If the government is behaving like a social well-being (efficiency) maximizer, but lacks full information on costs and benefits, then it could not know the true value of P^* to pay for each hectare, especially with the imperfect land markets in many developing countries. Making governments pay some price, however, may force them to collect more information on costs and benefits in an attempt to maximize the conservation value of their scarce funds. In making this calculation, the government must include the costs of obtaining the information.

In many cases, the government may have "overallocated" land to protection because efficiency was not the only criterion used to make the decision. Political, ecological, or ethical criteria may also have been part of the decision-making process. If this were the case, then the payment of P^* by the government would not necessarily have resulted in a socially optimal allocation of land to protection.

In conclusion, it appears that it would be difficult to compensate residents for all their costs and still maintain efficiency. However, as mentioned in the discussion, the inequitable distribution of costs and benefits has been a focal point for many advocates of compensation. One could argue that it may be best to sacrifice some efficiency for equity.

Equity and Ethics

Worldwide, many people are concerned about vertical equity. Vertical equity focuses on the way that the net benefits of a particular resource allocation are distributed among different income-level groups. Thus, it may be possible that a redistribution of wealth through compensation could be socially optimal. The resulting loss in efficiency could be made up for by the gain in social well-being that results from an increase in vertical equity. Given the potentially large amount of benefits from conservation, it is unlikely that the loss to the global society from inefficient compensation will be very significant. Moreover, any loss is likely to be widely distributed, so a small set of individuals will not have to bear the costs from the loss of efficiency.

The recent demands of developing countries for income transfers from the developed countries in order to pay for conservation (Speth, 1990; Haas et al., 1992) mirror similar demands that are arising at the local level. People living near protected areas in developing countries (or their advocates) claim that it is unfair for the residents of developed countries, who destroyed substantial amounts of their resource base to

develop economically, to demand that local residents forego benefits in order to help conserve the scarce remaining biological resources in the world. The ecosystems designated for protection are valuable precisely because of the prior depletion of biodiversity elsewhere, regionally and globally. The residents around protected areas in developing countries are therefore being asked to forego benefits because people elsewhere have already depleted their local biodiversity. Thus, residents in the region of a protected area are being asked to incur costs that the majority of humans did not have to bear. One could argue that in order to mitigate the unfairness of this situation, compensation should be paid to the residents.

One could also argue for compensation on ethical grounds. Non-payment of compensation implies that residents have absolutely no rights to the resources and that their continued use of the forest is criminal. Given that in some cases residents adjacent to protected areas (or their ancestors) have used the resources for centuries, some may argue that the criminalization of these traditional uses is unethical. Others may claim that the efficient point (with or without compensation) should be rejected on ethical grounds because it involves the coercion of a minority by the majority.

In a political-economic context, protecting land generates money for the host government from multilateral and bilateral agencies, from international nongovernmental organizations, and from tourists. Protected areas are often sited in politically and economically marginal areas, where not compensating residents typically costs the government very little (e.g., in votes and tax revenues). Mandating compensation may provide a disincentive to discriminate against politically weak or disfavored groups. If the government is required to pay compensation equal to the full value of the land, it may be dissuaded from taking an excessive amount of land from politically weak groups of individuals. In any case, compensation should only be paid where resident people have a legitimate claim to the land; compensation paid to recent squatters would only encourage encroachment into areas under consideration for parks.

A final point can be made based on the observation by Knetsch (1983) that whether an externality is considered negative or positive depends on the definition of rights. In the discussion of efficiency, we did not attempt to indicate the initial allocation of property rights to the resource because this allocation does not impact efficiency. (If there is a large disparity between the measures of WTP for a change and willingness to accept (WTA) foregoing a change for either residents or non-residents, then the initial allocation of property rights will affect the efficient allocation of protected land. The potential for the existence of this disparity is discussed more fully later in this chapter.) We implicitly assumed that each group had a right to use a unit of land as long as its WTP for that unit is greater than the WTP of the other group. Thus,

the loss of biodiversity beyond the socially optimal level is considered a negative externality. It could be argued, however, that nonresidents have no rights to flows of biodiversity protection. Under this view, when residents conserve biodiversity, they provide a positive externality to nonresidents. If nonresidents wish to consume this positive externality, they must pay (compensate) the residents for it.

Conflict Mitigation

Even if one does not wish to compensate residents on the basis of efficiency, equity, or ethics, compensation may be justified on purely practical management grounds. In many regions of the world, people living closest to the protected biological resources will largely determine how many of those resources will survive. If the costs to residents of establishing a protected area are relatively high and the residents are not compensated for these costs, the magnitude of the conflicts between residents and managers of the protected area could potentially be quite large. Numerous studies throughout the world have shown that conflicts with residents significantly increase the costs of managing protected areas (e.g., West and Brechin, 1991). If these increased costs cannot be defrayed, the protected area will have a difficult future.

Several economists and policy analysts have shown that compensation may be a good political strategy for reducing conflicts over the siting of undesirable public enterprises such as hazardous waste dumps (e.g., O'Hare, 1977; Cordes and Weisbrod, 1979; Newberry, 1980; Sullivan, 1992). In the case of protected areas, it may be far less expensive to compensate residents than to battle them for control of an area's resources, if compensation leads to the relinquishing of claims and prevents further encroachment. Although enforcement has been shown to be effective in some cases (e.g., Kruger National Park, South Africa), in protected areas with large numbers of residents living nearby, the costs of effective exclusion through enforcement alone can be quite high. For example, despite the presence of numerous armed guards around the Royal Chitwan National Park in Nepal, Sharma and Shaw (1993) have demonstrated that illegal use of the park's resources was still prevalent. The administrative costs of enforcing the "efficient" allocation of habitat protection may be extremely high, such that compensating residents would actually lead to greater efficiency. Thus, compensation can be viewed as a means of minimizing enforcement costs for maintaining the protected status of parks and reserves.

Moreover, one could argue that acknowledging local rights can be an important mechanism for creating mutual respect between residents and outsiders. Mutual respect is important for opening constructive dialogues between residents and managers of protected areas. By treating residents as criminals, managers may only make them angry, defensive, and unwilling to cooperate. However, one must be careful to en-

sure that compensation schemes do not create incentives for further encroachment into protected areas.

There exist few examples of actual compensation payments to residents adjacent to protected areas. Most of the examples in the literature are anecdotal descriptions of partial compensation schemes. One of the more descriptive examples comes from Amboseli National Park in Kenya. Western (1982) reports that the Maasai people living around the park were granted a number of compensation arrangements to reduce their antagonism toward the park and the migration of wildlife through their lands during the wet season. In the mid-1970s, the Maasai were promised alternative sources of water and fodder, grazing fees, annual fees to cover losses from wildlife depredations, and mechanisms for deriving more benefits from tourism and the culling of wildlife. Some Maasai also received social benefits, such as schools, which were a byproduct of the development of the park's infrastructure. In just five years, there was a noticeable improvement in wildlife numbers and distribution and a decrease in the numbers of animals poached. Since that time, however, government cutbacks have ended the compensation fees and maintenance of alternative water sources (Wells and Brandon, 1992), and resident-park conflicts continue to threaten the park's viability (*New York Times*, 1991).

Although compensation may be a necessary condition for conflict mitigation, it is unlikely to be a sufficient condition. (We examine the reasons for this later in this chapter.) Moreover, even if compensation is deemed appropriate based on the criteria above, it may still be subject to problems associated with implementation in the field.

PRACTICAL ASPECTS OF COMPENSATION

In addition to determining whether compensation is appropriate, governments face a number of practical aspects that must be dealt with in order to compensate residents appropriately. Indeed, problems associated with any of these aspects may indicate that an explicit compensation program is not the best approach to mitigating the costs incurred by residents and gaining their support for conservation activities. An alternative approach is outlined later in this chapter. The practical aspects that a government faces include strategic behavior, estimating the value of compensation, selecting recipients for compensation, selecting the form of compensation, and generating local conservation support.

Strategic Behavior

The presence or absence of compensation may result in the development of undesirable strategic behavior by residents. Baumol and Oates (1988), referring to victims of "efficient levels" of pollution, argue against compensation on the grounds that it creates strategic behavior

by residents that results in inefficiency. They maintain that "victims typically have available to them a variety of responses to reduce the damages they suffer. . . . [C]ompensation of victims is not economically efficient because it weakens or destroys entirely the incentive to engage in the appropriate levels of such defensive activities" (p. 24). In addition, in many areas where wildlife damage to crops, livestock, and human lives is a problem, the guarantee of full compensation may entice residents to engage in activities that would never have been considered optimal in the absence of assured compensation. Compensation may also reduce the incentives that residents have for engaging in certain behavior changes that may be part of the optimal solution. For example, while it may be more efficient for some residents to emigrate from the area or to intensify production on their current land rather than expand production to new land, compensation may diminish the incentives for such behavior.

Compensation of victims may lead to an increase in immigration to the peripheral zone of the protected area, which may lead to a socially excessive and ecologically damaging amount of economic activity in the peripheral zone. Such immigration also has the potential to increase the costs of compensation to levels far greater than originally anticipated. The incentives for immigration could be diminished if compensation is paid by a lump-sum payment to each household currently living in the delineated peripheral zone, or if all residents are registered and only they and their descendants are eligible to receive compensation benefits over time. However, if compensation is largely made through the provision of diffuse social services (e.g., schools, health clinics, technical assistance), it may be difficult to exclude recent immigrants. Some forms of compensation (e.g., wage employment, road building), especially those that tend to generate income, may lead to more migration to an area than do other forms (e.g., building schools, new techniques for weeding rice paddies). Thus, the effect that the form of compensation will have on migration must be considered. The problem of the protected zone as a magnet for immigration may warrant an exhaustive census of the zone's residents by the protected area managers. In this way, it will be easier for the managers to restrict benefits to current residents and their descendants. A few migrants may still arrive, but they will be relatively easy to locate and manage.

If the government permits the compensation package to be set by negotiation because, for example, it does not know the true value of the costs, there may be an additional incentive for strategic behavior. If each household had to sell its "share" of rights to the government, there may be holdouts who will demand compensation above the true value of their foregone benefits. If negotiation is done on a household-by-household or village-by-village basis, holdouts are likely to be few. But if negotiation is done on a collective basis, with a small number of representatives for a large number of residents, the residents may be able to act as a cartel and force the government to pay more than the actual costs.

There may be another way in which residents can increase the amount of compensation above the value of the true costs. As noted earlier, offering compensation implicitly recognizes the right of residents to exploit the biological resources as they wish. Some may claim that, by offering compensation, the government is, in a sense, rewarding socially undesirable activities ("social" in the sense of the national or global society). Although many authors point to the power difference between the residents and national and international interests as an important source of conflict (e.g., Hough, 1988), it is rarely recognized that the residents have a major source of power—in that the fate of the protected area lies in their hands. If residents recognize this power and realize that they are being "paid off" to not jeopardize the protected area's goals, they may attempt to force the government to pay excess compensation (potentially higher than the value of the global benefits) by threatening to undertake activities detrimental to the protected area, including activities that they normally would not consider profitable.

On the other hand, the lack of compensation may generate undesirable strategic behavior on the part of the residents. In order to establish protected areas, governments often take large portions of land to which residents believe they had rights. Having seen this action, residents may fear that more land will be taken in the future. If residents believe they will be undercompensated in the event of a taking, there may well be an increase in the rate of species depletion to make the land less suitable for biodiversity protection. For example, Ferraro (1994) notes that when the original boundaries of the Ranomafana National Park in southeastern Madagascar were walked by a team of U.S. scientists and Malagasy foresters, a relationship was made clear to many residents—heavily disturbed, deforested land was not considered to be desirable park land. A 1993 revision of park boundaries further reinforced this relationship by allowing many residents to keep cleared land out of the new boundaries. Some residents have thus begun to deforest peripheral-zone forests at an even higher rate in order to reduce the likelihood that the lands will be taken in the future.

By providing households or communities title to the land in the peripheral zone, managers of protected areas may reduce the residents' subjective probability attached to expropriation. The provision of land title may also provide the added benefit of helping current communities to resist any future waves of immigration that may be triggered by the benefits generated by the protected area management program. However, given the general distrust that residents often demonstrate toward the government and the lack of a "just compensation" clause in the legal code of many developing countries, the provision of land titles alone may not significantly reduce residents' fears of expropriation.

To reduce residents' fears, the government could guarantee compensation at the level of the full private—that is, financial—value of land in its optimal use. In order to assure the residents that compensation

will in fact be forthcoming, the government could enter into an agreement with residents that would establish that if the government wishes to take more land, it will pay a specified dollar amount to the owners. If residents do not trust the government to honor its agreement, however, the threat of this strategic behavior persists.

Estimating the Value of Compensation

If the government, after considering the potential strategic behavior in the presence and absence of compensation, still believes that compensation may be appropriate, then the proper value of the compensation must be estimated.

Very little detailed research on the local impact of establishing protected areas has been conducted, particularly in developing countries (Dixon and Sherman, 1990; Ghimire, 1991; Geisler, 1993). There has been even less research done on quantifying these impacts at a level that would permit some estimate of appropriate compensation (Western, 1982; Ruitenbeek, 1992; Ferraro, 1994; Kramer et al., 1994). Ferraro (1994) highlights how difficult it is to estimate the value of the costs incurred by residents, particularly in areas only partially integrated with the national economy.

One of the more technical problems, but one that is very important, is the estimation of economic impacts based on the residents' WTP to prevent the protected area, or on their WTA the protected area. Space limitations preclude a full discussion of this issue, but the analyst's choice of method can have a significant effect on the estimated level of appropriate compensation. Although some economists assert that in most cases the differences between the two measures are small or are the result of poor survey design (e.g., Randall, 1987; Arrow et al., 1993), the results of several empirical analyses point to large differences between the alternative value measures. Knetsch (1990) and Meyer (1979) together cite 15 studies that showed hypothetical WTA values that were 1.4–20 times larger than hypothetical WTP values. Although some economists state that WTP is the most appropriate measure (e.g., Russell, 1982), neither measure has been demonstrated to be superior. The existence of this disparity, however, indicates that assessments of losses as perceived by the residents may be seriously understated if WTP measures are used, and thus compensation payments based on such measures may not fully offset losses in the well-being of residents.

Ferraro (1994) and Kramer et al. (1994) provide frameworks for evaluating the economic costs to residents near protected areas. The WTP of residents can be approximated indirectly through the use of market and "shadow" prices (Ferraro, 1994; Kramer et al., 1994), or directly by using contingent-valuation techniques to query residents. The WTA of residents can be approximated directly through the use of contingent-valuation techniques (Kramer et al., 1994), or indirectly by convening

"focus groups" that include representatives of the residents and of protected area managers. The most appropriate measure will depend upon the ultimate use of the results, time and money constraints, and the particular region in which the protected area is located.

The relative weights attached to each criterion used to evaluate the necessity of compensation will also affect the final value of the compensation package. For example, while concerns over equity may require that residents be compensated for all costs they have incurred as a result of the protected area, overall social well-being (efficiency) may require a limitation of compensation for substantial losses. Ultimately, the final level of compensation is a political decision that will have to be derived through dialogue between residents and managers of protected areas. The economic estimates can provide bounds or starting points for the bargaining process.

Selecting Recipients of Compensation

Determining who shall receive compensation is often a difficult decision, and the choice depends on what criteria are used for determining the necessity of compensation. If conflict mitigation is the primary goal, only those residents deemed to be a threat to the goals of the protected area ought to be compensated. If compensation is driven by equity and ethical concerns, all affected residents ought to be compensated. There may be substantial numbers of residents who fall just over the line (physical or otherwise) dividing recipients from nonrecipients. If so, what types of conflicts will this generate? Should future generations be compensated? How will the recipient be defined, as an individual, a household, a village, or some larger unit? Given the great fluidity in the composition of many of these units even over short periods of time (e.g., households), some units may be easier to define than others.

In addition to these issues, results in Ferraro (1994), Kramer et al. (1994), and Shyamsundar (1993) indicate that costs to residents living near protected areas vary considerably. To pay each household the value of its losses, it would be necessary to know each household's costs, but making such a rigorous assessment on a household-by-household basis would be prohibitively expensive. Some method must therefore be used to approximate the losses, and the manner by which the approximations are made can have great impact. One concern is that if the loss to the average household is used as the standard payment per household, a significant number of people are going to be undercompensated and thus not satisfied, while others will be overcompensated, which may not be the most effective use of scarce conservation funds. Payment schemes in which a significant share of the population is undercompensated, but at least partially compensated, may appear to be "second-best" solutions. Since real-world policy typically relies on second-best solutions, however, such a compensation package should not necessarily

be rejected. If compensation is provided to the village or other appropriate social unit, then many of the difficulties of sorting out individual household shares could be avoided by project managers.

Selecting the Form of Compensation

Once the recipients of compensation have been defined, the managers (and residents) must then consider the form in which the compensation will be delivered. There is a wide range of choices—compensation could be delivered as cash, alternative land or resources, new technologies, employment opportunities, social services, infrastructure development, or a combination of several forms. In order to choose the most appropriate form, several questions need to be answered. Would residents be allowed to decide on the form of compensation according to their values and their preferences? Since each compensation package may have its own negative impacts on the resident population (e.g., dependency on income transfers), how should the project deal with these impacts?

To what extent is each possible form of compensation a substitute for the lost resources of the protected area? For example, if residents have lost the means to stay above a minimum income requirement, it is hard to imagine how a school or a health clinic, while perhaps desired by residents, will substitute adequately for lost resources. On the other hand, if the value of the lost resources is well established, it could be argued that cash compensation would more than substitute for the lost resources because cash has the added benefit of being far more liquid and mobile than natural resource assets. Moreover, if residents are risk-averse, they would rather have cash equal to the expected value of the foregone activities because the cash is certain. In rural areas of many developing countries, however, markets are highly imperfect, and thus residents may not be able to transform cash into the resources they need, or may be able to do so only at much higher prices than anticipated.

As with the estimation of the value of the compensation package, the form of compensation should be ultimately determined through negotiations between protected area managers and residents. If the government decides to pay compensation to residents, it may be appropriate to answer a final question, especially if one of the criteria used for evaluating compensation is "conflict mitigation": will compensation help achieve the conservation goals of the protected area?

Generating Local Conservation Support

To the degree that it reduces conflicts between the management of protected areas and the people living nearby, compensation will have a positive effect on conservation. There is always the problem, however, that the residents may not be satisfied with mere compensation, given

the magnitude of the benefits that they perceive outsiders to be receiving. Residents want to maximize their well-being. If it is difficult to link compensation to not damaging the protected area, residents may feel justified in asking for more than full compensation. If their demands are not met, they may take the compensation offered and continue using the resources as they did in the past.

Linking compensation to the promotion of resident behavior conducive to the goals of the protected area may be difficult, for several reasons. Such a linkage would require the government to offer compensation benefits spread over time and provided directly to each household. In this way, the benefits could be cut off if the household did not abide by its agreement to give up its claim to the protected area's resources. If a lump-sum initial payment (or extension of technology) is made or compensation is paid to large groups of households (in cash, schools, clinics, and the like), it would be difficult to exclude particular households. One could attempt to create a self-enforcing scenario by dictating that the entire community be cut off if one of its members violated the compensation agreement. But the ability of a community to penalize its members would vary across and within regions. Moreover, if the government did cut off an entire community's benefits, the same problem that necessitated compensation in the first place would continue to exist—that is, resource-hungry residents attempting to secure their future by exploiting the protected area's resources. If only a small number of households or villages do not abide by the agreement, it may be relatively easy (although perhaps not ethical) for the government to repress these households or villages with force, but there is no reason to automatically believe that this number would be small.

Moreover, many households are extremely poor. Compensating them for their foregone benefits would still leave them poor. If poverty is the primary factor driving them to exploit the protected resources illegally, compensating them is not likely to reduce their demand for these resources. On the other hand, although the underlying poverty-related roots of resource degradation would not be removed through compensation, not compensating the residents would only exacerbate their need to degrade the resources.

Thus, compensating residents will not necessarily generate local support for conservation endeavors, without which the protected area's future will always be unstable. Nor is compensation likely to change resource-use patterns in the peripheral zone in a significantly positive way. It may only be a matter of time before these resources are depleted and residents begin to demand the use of resources within the protected area. Even if development activities in the peripheral zone are able to increase incomes significantly, the result may be the same. Given current population growth rates and the residents' own desires to improve their economic well-being, residents will likely clear most of the peripheral zone within a few generations if their development is not some-

how linked to protected area conservation. In the absence of local support for conservation, the residents will have little reason not to begin cutting down the forest within the protected area.

SUMMARY OF POSITIVE AND NEGATIVE ATTRIBUTES OF COMPENSATION

This discussion indicates that there are some good arguments for compensating local residents, but there are some equally strong arguments against doing so. The various aspects of compensation are summarized in Table 9-1.

The relative strength of compensation as a strategy for safeguarding protected areas will be evaluated according to the weights that decision makers attach to the various aspects listed in Table 9-1. In some cases, it would appear that the benefits of compensation outweigh the costs, particularly if conflict mitigation is an important criterion for managers of protected areas. In other cases, however, it may be concluded that the costs of a compensation approach (e.g., the possibility that pressure on the protected area will increase because of compensation) outweigh the benefits. Moreover, it may be that an explicit program of compensation is not the most cost-effective way to achieve particular positive aspects of compensation listed in Table 9-1.

Table 9-1 Summary of positive and negative aspects of compensation

Positive aspects	Negative aspects	Implications for parks and protected areas
Mitigation of inequity	Encouragement of undesirable strategic behavior	Limited potential for generating local conservation support
Mitigation of conflict	Significant complexity in estimating true costs and designing compensation program	
Mitigation of certain strategic behavior	Strong potential to reduce efficiency or to raise the cost of protection	Limited potential for changing the underlying factors contributing to the degradation of resources
Potential mitigation of discrimination against less powerful groups	Implied recognition of resident rights to use protected resources	

Ideally, managers of protected areas would implement an approach that embodies the positive characteristics of compensation and avoids the negative, while accomplishing the conservation goals set for the protected area. It would seem that if such an approach existed, the choice of compensating residents or not compensating residents would be a moot one. In the next section, we argue that an explicit focus on modifying the incentive structure facing rural households living in the vicinity of protected areas can be such an approach.

TOWARD A MORE EFFECTIVE APPROACH: THE USE OF ECONOMIC INCENTIVES

Anecdotal cases throughout the world give strong indications that if resident populations are opposed to the conservation goals of a protected area, the job of protecting the area's ecosystems is made considerably more difficult, if not impossible. It is known that residents attempt to maximize their well-being. They are guided by their preferences (material and nonmaterial) and are constrained by their available natural resources, labor, capital, and knowledge, as well as by the sociopolitical environment. Managers of protected areas and other collaborators may be able to modify these preferences or constraints in order to link the conservation of resources within and outside protected areas to the maximization of resident well-being. At the very least, it may be possible to affect resident behavior so that the protected area's conservation objectives are not perceived by residents to be significantly impeding the maximization of their well-being. The modification of resident behavior can be achieved through a package of economic incentives—both positive and negative—that can influence the well-being of residents. These incentives might include government interventions such as subsidies, expanded opportunities for education, and law enforcement.

Although many proponents of conservation appear to be uncomfortable with or skeptical of the use of economic incentives, they often fail to recognize that economic incentives are driving the degradation in and around protected areas. Thus, in order to protect these areas, it will be necessary to alter these incentives in ways that promote conservation goals.

Affecting Resident Behavior

Broadly speaking, in order to affect resident behavior to promote conservation, it is necessary to encourage households to reduce the amount of labor, capital, and natural resources that they allocate to activities that threaten the conservation goals of the protected area. It is preferable that residents reallocate these inputs to activities that do not reduce the biodiversity in protected areas or peripheral zones.

In general, there are five ways to promote such reallocations (Ferraro and Kramer, 1995): (1) compete for the labor currently allocated to

destructive activities, (2) compete for the capital currently allocated to destructive activities, (3) compete for the biological resources currently being depleted to nonrenewable levels, (4) increase the information available to residents, and (5) encourage residents to adopt proconservation preferences. Since capital is usually not a large input into rural household production in the tropical developing countries, we will focus on the other four mechanisms.

In order to compete for the labor currently allocated to destructive activities, protected area projects can attempt to increase the opportunity costs of investing labor in destructive activities. By making production on lands already in use more profitable, or by creating new economic activities that do not depend upon the destructive use of biodiversity, protected area project personnel can encourage residents to reallocate labor away from destructive activities and toward nondestructive activities.

A protected area project can draw labor away from destructive activities in several ways. First, it can make labor more productive in activities that do not substantially deplete biodiversity. Labor productivity can be increased by introducing new labor techniques or complements to labor (e.g., affordable fertilizer) that improve labor productivity, by introducing entirely new production activities in which residents could more profitably invest some of their labor, and by improving markets and infrastructure in ways that make the output from desirable activities more profitable than the output from undesirable activities.

Second, a protected area project can reduce household discount rates by improving access to competitive credit markets or by increasing income. (The discount rate is the numerical way for comparing current and future costs. It is generally considered to be the premium that individuals are willing to accept for substituting present consumption for larger consumption in the future.) A decrease in the household discount rate makes it more profitable for a household to invest its labor in activities that will produce benefits in the future, as do many conservation-friendly activities. Third, a protected area project can increase residents' demand for leisure by increasing income. Fourth, the project can improve education services in the region. Residents who are better educated can take advantage of other employment opportunities, including those found in urban areas away from the threatened biological resources.

Finally, a project can use force as a negative incentive to prevent households from engaging in certain activities. Enforcement essentially makes investing labor in alternative activities that are legal more profitable than investing labor in illegal activities. The use of enforcement as part of a portfolio of incentives has received little attention during the past decade, partly because negative incentives were used almost exclusively during previous decades, with little success and considerable controversy (see chapter 1). Protection based on purely positive

incentives is the ideal. But given the many constraints on devising effective positive incentives that achieve conservation objectives (as described below; also see Ferraro and Kramer, 1995), it is probably impossible to devise a system of protection in most areas based solely on positive economic incentives. This does not mean that reducing a protected area's dependence on elaborate enforcement activities is not a desirable objective. But the more a protected area can depend on self-enforcing conservation-friendly behavior by the resident population, the more likely will biological resources be protected over the long term.

When attempting to encourage residents to reallocate labor away from undesirable activities and toward desirable activities, two important questions should be asked: which labor is the proposed intervention competing for, and will the intervention absorb this labor? Rural residents of developing countries typically engage in a wide variety of economic activities throughout the year, each with its own particular requirements in terms of timing and the sex, age, and productivity of the workers. Such requirements placed on labor inputs, combined with the existence of a labor market, make a strategy based on labor competition difficult. Simply because activity A produces higher returns to labor (all other returns being equal) than activity B does not mean residents will reduce their allocation of labor to activity B. For example, suppose the goal is to reduce the amount of labor allocated to swidden (formerly called slash-and-burn) agriculture, which demands labor in April, July, October, and December. Introducing a more profitable activity that requires labor during other months will not compete for labor being devoted to swidden agriculture.

In order to compete effectively for labor, the managers of protected areas must have exceptionally good knowledge of the labor calendar, of the possible ways that households can alter this calendar, and of the sex-specific and age-specific aspects of labor allocation. The managers also must understand which activities, among all those practiced during a particular period, are the least profitable and which are the most profitable in terms of labor investment (an introduced activity may absorb labor away from a desirable activity rather than an undesirable activity).

Another strategy that protected area projects can implement to promote conservation is the introduction of alternative uses of threatened biodiversity—that is, uses that raise the opportunity costs of depleting the resources to nonrenewable levels. Projects can implement this strategy in several ways. They can increase the net benefits derived from the use of biodiversity by transferring new technologies, or by improving markets, prices, or infrastructure. They can actively aid the discovery of unexploited but potentially valuable biological resources. They can facilitate the participation of the resident population in the benefits to be derived from tourism or other nonconsumptive uses (e.g., biodiversity prospecting). All of these initiatives can help to increase the benefits derived from the nondestructive use of biodiversity.

In order for this strategy to be successful, however, several complementary conditions must be present. Residents must have secure rights to the benefits that result from not engaging in destructive activities. The economically profitable rate of use must be a biologically sustainable one. And for some activities, local institutions must be capable of coordinating the behavior of multiple households.

Protected area projects can also affect household behavior to promote conservation by altering residents' preferences or by offering residents new information that may encourage them to allocate more resources to conservation. Projects can achieve these two objectives through conservation education or the promotion of goodwill.

The ultimate goal of economic incentives is to make investments of labor, capital, and biological resources in desirable economic activities and investments in undesirable activities mutually exclusive. In other words, residents must be faced with a choice—they can either allocate their resources to the desirable activities and make \$X, or they can allocate them to the undesirable activities and make \$Y. They cannot do both sets of activities. If X is greater than Y, the level of economic activities that threaten biodiversity will decrease.

Advantages of Economic Incentives

When applied correctly, positive economic incentives (those that are actively endorsed by residents) ensure that the protected area's establishment does not negatively affect vertical equity, since, by definition, residents would have to be at least as well off as they were before the protected area was established. If residents are better off after the application of economic incentives, many of the ethical concerns can also be mitigated. Positive economic incentives also reduce conflict, since residents would by their own choice prefer to engage in alternative activities rather than in their current undesirable activities.

The use of incentives, both positive and negative, also reduces the probability of much of the strategic behavior described earlier. Since residents are not being explicitly compensated for each of their losses, there is no incentive to engage in risky activities that would never have been optimal in the absence of assured compensation. Although an increase in economic opportunities will undoubtedly attract immigrants, the positive incentives, in the presence of secure rights to benefits, ensure that most immigrants are likely to adopt the more profitable, proconservation activities. Moreover, the immigration that is often stimulated by the absence of clear property rights in a region will be discouraged. The use of enforcement as a negative incentive can also be used to discourage immigrants from engaging in undesirable activities. Furthermore, attempts by residents to force the government to pay excess compensation will be short-lived, since residents will soon see that if they do not adopt the alternative activities, they will be worse off.

The use of economic incentives also reduces the problems associated with identifying the recipients of compensation, since properly applied incentives should make most residents better off than they were previously. Moreover, the use of incentives can reduce the burden of estimating the costs to residents as a result of the protected area's establishment. Although it is helpful to have a good idea of the magnitude of these costs when considering plans for protected area projects, detailed information on costs and their distribution is not needed. However, in order to design an effective incentive package, it is necessary to clearly understand resident preferences and constraints. Similarly, although it is no longer necessary to choose the appropriate form of compensation, the choice of the appropriate form of incentives may be much more difficult.

Finally, the successful application of economic incentives ensures that the conservation objectives of the protected area will be achieved, because the incentives will make desirable and undesirable activities mutually exclusive. Using incentives to control the use of peripheral-zone resources can similarly ensure that biodiversity in these areas is not reduced to levels that cannot meet the needs of both the residents and the protected area.

Finding the Linkages

The paucity of good examples from the field that demonstrate the ways in which economic incentives can promote conservation suggests that the correct application of incentives is not easy. The inability of protected area projects to promote the desired behavioral changes that will reduce pressure on biological resources is largely a result of the lack of understanding of how households interact with natural resources and of how one can affect household behavior in the desired ways. Ferraro and Kramer (1995) demonstrate in detail how a more precise conceptualization of household behavior can help the designers of protected area projects to identify more effective incentive packages. However, this research also indicates that there are many potential pitfalls. Protected area projects must not only be based on a clear understanding of how residents use resources (a difficult task) but also on how sociocultural aspects of production, imperfect markets, and government policies can affect the current incentive structure. Moreover, project designers and managers must clearly understand the ways that households can combine inputs (e.g., labor and money) to produce outputs (e.g., crops and forest products). Without this understanding, projects that create incentives for desirable activities may simultaneously increase the incentives for undesirable activities even further. Finally, those involved with protected area projects should be aware of the potential interactions among households, so that they can ensure that the identified threats are not simply displaced to other locations or times.

Despite these difficulties and the current lack of examples demonstrating the efficacy of economic incentives, the use of economic incentives should not be rejected. As we noted, it is economic incentives that are largely driving the current degradation of tropical ecosystems, and thus it is necessary to affect those incentives to halt the degradation. In order to improve the application of economic incentives in the field, we propose that protected area project personnel, government employees, scientists, and representatives of donor organizations do the following:

- Elaborate current hypotheses and assumptions about linkages between protected area projects and household behavior in order to capture more fully the actual circumstances in the field. Unless very precise conceptual linkages can be made between project interventions and the decision-making process used in households, the success of an economic incentive package will be highly improbable.
- Undertake quantitative analysis to further clarify how households may react to proposed protected area projects (see Ferraro and Kramer, 1995). There is a glaring lack of quantitative information that project participants can use to clarify their hypothesized linkages.
- Isolate the key aspects of various approaches that have ambiguous effects (e.g., income increases) and attempt to create an incentive package that reinforces the positive aspects of the interventions and mitigates the negative ones.
- Recognize that strong enforcement of protected area regulations must be brought back into the overall strategy in many regions. Enforcement should be viewed as part of a comprehensive package of positive and negative incentives.

In conclusion, if it is possible to successfully implement a package of positive and negative incentives that makes residents better off as a result of the protected area's establishment, then an explicit compensation program is not necessary. In some cases, however, compensation may be the most cost-effective way to encourage residents to permit a protected area to exist. In other cases, the optimal strategy may consist of a mix of explicit compensation payments and economic incentives (e.g., one that ensures compensation for any future lands taken and that provides residents with incentives to conserve currently protected areas). Protected area project personnel should strongly consider the costs and benefits of each approach. The only way to improve understanding of how economic incentives and explicit compensation programs affect protected areas is to apply them in the field, after having carefully considered the points raised in this chapter, and then monitor and evaluate their impacts.

The ideal way to ensure the long-term integrity of a protected area is to make it in the residents' self-interest to be actively interested in the area's conservation. Note that the word "actively" implies that residents do not simply ignore the protected area because they have more

profitable activities in which to engage their household resources. Rather, this means the residents actively have a stake in maintaining the protected area in ways that achieve the area's conservation objectives. Only certain types of economic incentives can create this behavior. Scientists and the managers and other workers in protected area projects have begun to identify a few of these special incentives (e.g., revenue sharing), but the linkages are still not very strong. Identifying more incentives that encourage residents to actively support protected areas, and extending the use of these incentives in both scope and intensity, should be priorities for future research. The future of protected areas in tropical rain forests may depend in no small measure on how much we can learn about using economic incentives, and ultimately on how well we apply the lessons learned on a worldwide scale.

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