

# Incentive-Based Approaches to Nature Conservation\*

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## Abstract

Incentive-based approaches to conservation include taxes on activities that hurt conservation, subsidies to activities that promote conservation, and direct payments for conservation. The applicability of these approaches is discussed and they are compared with the traditional regulatory approach to conservation as well as to devolution to local communities. The rather sparse available evidence on the effectiveness of different approaches is reviewed. The paper concludes that much more experimentation with different approaches is required, and that trials need to be carefully and credibly monitored and documented, if we are to learn which approaches work best in what contexts.

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*Pragmatism seems a better approach to saving the diversity and integrity of life than does a pursuit of a single universal ethic based in a sense of moral superiority or virtue. If we take the narrow—mostly western—view that nature is harmonious unless disturbed by humanity and that protected areas are necessary to ensure the survival of wildlife, there can be no hope for wildlife outside parks. Today, on the basis of biological insights, we know that protected areas themselves are far too small and scattered to avert mass extinction. Take the broader view of nature in continual flux and humans as part of it, and there is far more space for wildlife, if we can rediscover the art of coexistence.*

*David Western*

*In the dust of Kilimanjaro, p xv.*

## **Introduction**

Protected Areas (wildlife sanctuaries and national parks) cover some 155,000 sq km in India (Rodgers, Panwar et al. 2002), which is about 22% out of an area under forest and tree cover of some 700,000 sq km (GOI 2009).<sup>1</sup> These areas are under fairly strict protection, which means that local residents' rights to extract forest produce from them have been extinguished or severely restricted. Extending this strict level of protection to cover larger areas will be expensive and time-consuming since the rights of local residents will have to be acquired through a process of compensation. Moreover, it will, of course, be simply infeasible to extinguish residents' rights to use the forests over the entire remaining 550,000 sq km.

Such lands will, therefore, have to be protected in other ways, if they are to be protected at all. A failure to protect and preserve biodiversity in these lands will jeopardize the entire project of conserving India's biodiversity. It is unlikely that the fragmented "islands" constituted by the Protected Areas will be able to prevent their

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<sup>1</sup> Forest and tree cover is thus somewhat more than one-fifth of the total land area of India.

uncommon species from going extinct if the surrounding landscapes are hostile to their preservation.

Multiple uses of these forest lands outside Protected Areas is inescapable. Incentive-based approaches to conservation are those that seek to motivate local users to modify their land use in ways that are compatible with conservation.

Such modifications will impose costs on local users. Therefore, the government needs to give incentives to local users if they are to adopt these modifications. It is useful to classify these incentives into the following kinds:

1. Restrictions or prohibitions on land uses and activities that harm biodiversity, (the standard approach in Protected Areas, Reserved Forests, etc).<sup>2</sup>
2. Taxes or fees on land uses and activities that harm biodiversity. (No examples from India.)
3. The allocation of rights to revenue streams from biodiversity to local residents who are well-placed to conserve biodiversity, together with the allocation of rights of control (for example, Van Panchayats, Joint Forest Management.)
4. Subsidies to activities that lead to biodiversity conservation as a side effect (eco-development, eco-tourism).
5. Direct payments for the conservation of biodiversity.

Of course, these approaches may be used in combination. Nevertheless, it will be enlightening to consider them separately. We shall discuss these approaches one by one in some detail below. It is worth noting that local residents would clearly prefer the last three approaches to the first two approaches, because the last three approaches

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<sup>2</sup> In fact, my list is quite comprehensive, and covers all approaches to conservation. (1) and (3) in this list are not usually thought of as incentive-based approaches, but of course, all approaches, if they are to be effective, have to provide some kind of incentive, whether negative or positive. It is useful to compare all of them, in order to understand what the “new” incentive-based approaches (2), (4), and (5), have to offer.

*compensate them for modifying their behavior in ways that promote conservation, while the first two force them to modify their behavior or penalize them if they do not modify it.*

## **1. Restrictions and Prohibitions**

This approach to conservation is the dominant one in India. It arose out of the assertion of the colonial state in the 19<sup>th</sup> century that forests were state property, not the property of village communities (Guha 1983). The colonial state was, of course, primarily motivated by considerations of revenue, not the welfare of the people, in taking this approach. It accordingly created an Indian Forest Service and forest departments in each province for the efficient generation of revenue from forests. This revenue-maximization included measures for forest protection to ensure that revenue continued to flow. These measures were to restrict or prohibit hunting, the extraction of timber, firewood, and other forest produce by local residents. They were enforced by the staff of the provincial forest departments.

This approach to protection was inherited by independent India and has remained the primary method of forest and wildlife protection. It has been supported by non-government conservationists, perhaps because it has been the “only game in town” for conservation. There is another attraction of this approach for conservationists and government managers, but it is mis-leading. The approach appears to be relatively cheap (or it did, before the costs of policing national parks, wildlife sanctuaries and Reserved and Protected Forests rose to their current levels). This perception is mis-leading because the costs of conservation were not really as low as they appeared from some perspectives. They were simply shifted to local residents who were denied the use of forest resources enjoyed by them and their ancestors in the past.

The approach seems to have been at least partially successful. It is clear that, by and large, the densest forests and wildlife populations are in the Protected Areas, generally followed by the Reserved and Protected Forests administered by state forest departments as described above. Areas not given such protection were largely converted to agriculture. However, some forest areas administered by villages and tribes have been protected. These will be discussed in Section 4 below.

The increasing population and economic growth has increased pressure on forest resources from hunting, woodcutting, grazing, and cultivation by local residents, as well as larger scale threats from dam construction, road construction, and mining.<sup>3</sup> Since it is legally easier to divert Reserved and Protected Forests than Protected Areas for industrial purposes, and since the level of patrolling by the state forest departments in Reserved and Protected Forests has proved inadequate for wildlife protection, in particular, there are increasing calls by conservationists for expansion of the Protected Areas to safeguard wildlife populations.

This expansion, has, however, run into the problem that the formerly politically weak residents of forests, many of them Scheduled Tribes, have gradually become more politically conscious and electorally significant. Figure 1 shows that the literacy rate among Scheduled Tribes, who are concentrated in states with the most forest cover, increased by a factor of four between 1961 and 2001. This kind of social change, among other causes, has led to the passing of the Forest Rights Act in 2006, making it more difficult for forest residents to be evicted or for their customary rights of forest produce extraction to be extinguished without compensation. These political trends are unlikely

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<sup>3</sup> In this essay, I do not discuss policies that may reduce the demand for conversion of natural ecosystems to human uses such as agriculture. This is because such policies are unlikely to have substantial effects in the short run. Nevertheless, it is worth bearing in mind that none of the policies discussed in this essay are likely to succeed in the long run if the underlying demand for land conversion continues to increase indefinitely. Reducing this demand involves, first and foremost, a fall in food prices that would induce a decline in the demand for cultivated land, thus allowing some land to revert to a more natural ecosystem. Food prices can fall because agricultural productivity is increased via agricultural research and development or because population declines with increases in education or both. Increasing agricultural productivity and education levels are both desirable for their own sake, of course, but conservationists would do well to bear in mind that they are vital for conservation as well. The willingness on the part of the general public to bear the costs of conservation in the form of foregone mining and industrial projects is also related to the economic security of the people. An economically secure population will be more willing to give up narrowly defined economic gains for the sake of a better environment. Thus, the promotion of economic security, is, in the long run, also important for conservation of the natural environment.

to reverse themselves given the strong socio-economic trends that underlie them. Thus, the expansion of the Protected Area network without adequate compensation for residents of the areas concerned, is now a non-starter. In fact, the future of the dominant approach to conservation, restrictions on forest resource use without compensation for those living in and around forests, is itself in doubt.

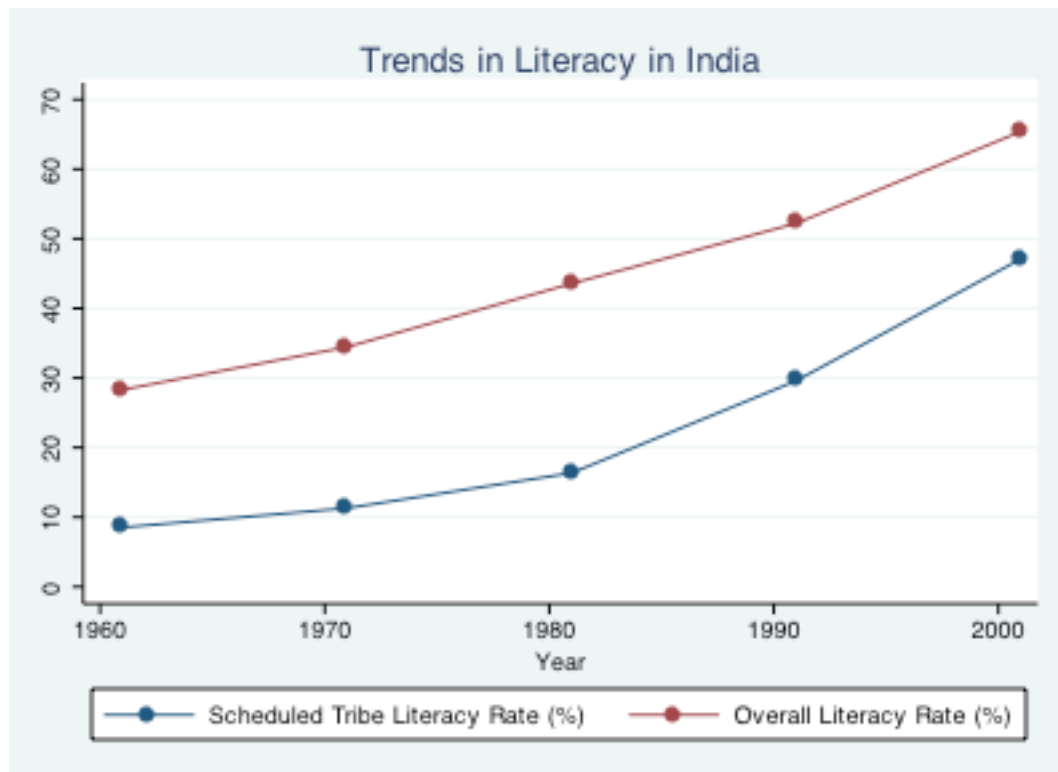


Figure 1

Thus the standard approach to conservation, at least in so far as it concerns wildlife, which is harder to monitor and protect than trees, is now confined to the wildlife sanctuaries and national parks, and even in these, it has suffered some notable setbacks, for example, the recent extinctions of tigers in the Sariska and Panna Tiger Reserves.

I conclude that while strict protection of wildlife sanctuaries and national parks seems to be necessary for the conservation of wildlife and other biodiversity in India, it has become increasingly clear that it is, by itself, insufficient to do the job. Shifting the cost of conservation to those living in and around forests has always been unjust. It is also increasingly inefficient and infeasible.

## 2. Taxes and Fees

The idea behind this approach is simple. If you want to discourage an activity, raise its price by taxing it or charging for it so as to deter people from engaging in it. This approach has not been tried in India at all, as far as I know. Of course, the colonial government had grazing fees, but it is not clear whether these were intended to prevent damage to the forests and grasslands or only to raise revenue.

This approach is attractive in contexts where a total ban on some activity is unnecessary or too costly, but it is beneficial if the activity is reduced. A concrete example is the disturbance to wildlife from road traffic. In the Shencottah Gap in the southern western Ghats, between the Periyar and Kalakkad-Mundanthurai Tiger Reserves, the National Highway 208 runs from Kerala to Tamil Nadu. Heavy and noisy traffic on the road tends to scare off animals like gaur and elephants. Thus the populations to the south, centred in Kalakkad-Mundanthurai and adjoining wildlife sanctuaries are cut off from those centred at Periyar in the north, with the absence of gene flow raising the risk of extinction of the isolated southern populations. Banning road traffic at night has been suggested. But it has the drawback that those who genuinely need to use the road urgently will suffer unduly.

Imposing a high enough toll, on the other hand, will allow those who have to use the road urgently to go ahead, while deterring less price-conscious users enough for them to postpone their use to the daytime. At the same time, the toll will raise some revenue, and this can be used to help build overpasses and underpasses for animals to use at night.

Another example where a fee can be usefully used to reduce over-use is in the entry fee for national parks and sanctuaries. It is clear that some of our national parks and sanctuaries suffer from excessive tourist traffic that causes congestion, disturbs wildlife, and reduces the utility of the experience for tourists. Raising the entry fee in such cases will reduce use while bringing in revenue that can be used for conservation purposes. Of course, indiscriminately high entry fees may not always be a good idea for a number of reasons. For example, public support for conservation is likely to wane if the public is priced out of national parks altogether. Thus reducing numbers has to be

balanced against other considerations. For example, discounts for Indians, students, senior citizens, and residents of the locality may be a sensible compromise. It is by visiting national parks and enjoying nature that young people will develop a taste for nature and the outdoors and be more motivated to conserve it.

### **3. Devolution of management and control to local communities**

The third approach, devolving rights of use and control to local communities, can be beneficial for conservation because local users, once they are given secure rights to exploit forest produce, then have a reason to conserve forests. However, unlike the case with private ownership, community ownership is subject to the problem of the commons. This arises because individual incentives to conserve common property are weakened by the possibility that other right-holders in future may reap the benefits of an individual's restraint in harvesting today. This problem can be overcome if there is good local governance. Good governance, of course, cannot be taken for granted as the large literature on commons management has shown.<sup>4</sup>

State management of forests has been the traditional solution to the commons problem. But it is not without its problems. Delegating the responsibility for forest management to the agents of the state will work well only if the political system is capable of ensuring that they are accountable to the people at large. It is clear that the political system has been less than successful at this task. The question of whether governance of forests is better at the state or at the local level has no obvious answer.

Local management of forests has been tried in the case of the Van Panchayats of Kumaun and, more recently, in Joint Forest Management in most of India. It has also been the practice all along in most of the hill areas of north-eastern India. The Van Panchayats of Kumaun (in the Uttarakhand Himalaya) are the most studied example of legally sanctioned community management in India (Somanathan 1991; Agrawal 2001).

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<sup>4</sup> One of the winners of the 2009 Nobel Memorial Prize in Economics, Elinor Ostrom, received the award for her research on the commons.



The system began in 1930 and has expanded to cover more than a third of the forest area. It has resulted in lower logging damage than in adjacent comparable Reserved Forests and equivalent canopy cover, biomass, and regeneration (Baland, Bardhan et al. 2010) at a small fraction of the cost (Somanathan, Prabhakar et al. 2009). What this shows is that a well-designed system for local management of forests can result in far more cost-effective conservation than management by state forest departments.

Guidelines for Joint Forest Management by state forest departments and community groups were issued by the Government of India in the 1990's. The idea was to restore degraded Reserved or Protected forests by forming Forest User Groups from local communities and giving them some rights of user if they protected the forest. The devolution of management has been much more limited than in the case of the Van Panchayats of Kumaun and Forest User Groups generally have less tenure security and less control of the forests they manage. Unlike the case of the Van Panchayats, there do not appear to be any systematic studies that compare Joint Forest Management with management by the state forest departments while controlling for confounding factors. My subjective assessment of the case study literature is that Joint Forest Management is generally seen as less effective at forest conservation and provision of benefits to local people than are the Van Panchayats of Kumaun. In many cases, they appear to have made no substantive difference to the system of forest management by state forest departments.

The hill areas of north-eastern India make an interesting contrast with the rest of the country, in that the state forest departments administer only a minority of the forest lands with the rest being administered by communities in diverse ways. Again, there are no studies comparing conservation outcomes between state and community-managed forests that carefully control for confounding factors.

While appropriately designed local institutions for forest management may improve upon the management of Reserved and Protected forests, they will generally not have sufficient incentives to conserve biodiversity. This is because while the local community gains from some aspects of conservation, such as assured nearby supplies of fodder,

firewood and timber, they do not benefit from all the external benefits of conservation. These include hydrological benefits at regional scales, and biodiversity and carbon sequestration benefits at global scales. In particular, it appears to be the case that communities are not good managers of faunal resources. Instances of active wildlife management by local forest management institutions in India are rare. The protection of certain species by a few communities for religious reasons, such as the blackbuck by the Bishnois of Rajasthan, tend to be exceptions that prove the rule. It doesn't help that existing legislation makes no provision for community management of wildlife.

This is only to be expected from an economic point of view, because it is difficult to perceive wildlife numbers, and therefore difficult to know whether it is one's own hunting that is causing wildlife populations to fall. Moreover, wildlife tends to stray outside local boundaries, so its protection today will not guarantee its availability tomorrow to any particular village. The benefit of wildlife conservation tends to be largely external to small communities.

Thus, when there is management by local communities, additional policies will usually be needed to provide sufficient motivation for them to conserve all aspects of natural resource values. This brings us to the relatively new approaches to conservation: explicit attempts by the state to subsidize or pay people who live in the vicinity of forests to conserve biodiversity.

#### **4. Subsidies to Activities that are complementary to conservation**

There are many possible policies that fall under this description. I mention two prominent ones here. The first is subsidies to alternatives to firewood or to more efficient stoves that use less wood. This could help in forest conservation in situations where firewood collection is a significant contributor to forest degradation. Such is the case in the western and central Himalayas (Baland, Bardhan et al. 2006-07). Baland et al's econometric estimates based on their survey data from Himachal Pradesh and Uttarakhand are that a 100-rupee subsidy to a cylinder of cooking gas (assuming a base price of Rs 300/cylinder) would reduce firewood use by 22% while a 200-rupee subsidy would reduce use by 40%. Such a policy would have other important benefits as well. It

would reduce indoor air pollution, which more than doubles the risk of acute respiratory infections and other serious diseases.

Subsidies to gas have been tried in some “eco-development” programmes of the government of India, but their effects on forest preservation have not been properly measured and documented.

Whenever an intervention is carried out, it is important to conduct trials that build in the measurement of effects in their design so that the impact of such policies can be measured. This is really crucial as the example of the national programme for improved chulhas (cookstoves) shows. Launched in 1985, the programme was said to have resulted in the installation of 35 million cookstoves before it was closed in 2002. Independent evaluations, however, suggested that improved stoves often did not reduce pollution emissions (Smith 1989). The programme also suffered from low adoption and high rates of dis-use (Venkataraman, Sagar et al. 2010) and was dis-continued in 2002. Finally, it is not clear if the programme succeeded in its primary aim of reducing fuelwood use. Field tests conducted by the Tata Energy and Research Institute in Rajasthan, Tamil Nadu and West Bengal showed, on average, greater consumption of fuelwood by the improved stoves in the former two states, and less in West Bengal, with the average fuelwood saving from the three being negative (Kishore and Ramana 2002). If evaluation and monitoring had been built in from the start, these problems may have been avoided.

The Ministry of New and Renewable Energy has now launched the National Initiative for Advanced Biomass Cookstoves. It remains to be seen whether the new technologies now available will be more cost-effective than LPG.

Starting about 15 years ago the Government of India launched “eco-development” programmes with World Bank funding. These have not had very clearly stated objectives. Propaganda in favor of conservation in villages surrounding National Parks appears to be a significant component of most eco-development programmes. Common sense suggests that we should not expect much from this. Support for livelihoods that do not involve extractive use of forests appears to be another major component of the programmes, at least as stated. Most such programmes appear to involve infusions of loans or small

amounts of capital for investments in non-forest related businesses. Again, a hard-headed economic view suggests that such attempts are likely to fail because such small amounts of capital tied to particular sectors may not be the sole constraint (or even one of the constraints) that prevents people from entering occupations with higher returns. Moreover, it is very difficult for outsiders to evaluate business opportunities and the one-size-fits-all model in which governments are constrained to work implies a very high probability of failure. Eco-development is thus not likely to be much of “eco” or “development”. Casual observation from sites in Kerala suggest that the principal benefit that local people actually derive from the program is employment. This sort of unemployment insurance is of value in itself, but is unrelated to conservation. One component of these programmes that does make sense, at least in theory, is subsidization of LPG as an alternative to fuelwood in areas where fuelwood pressure is a significant component of forest degradation. However, I have been unable to find any evaluations of such programmes in practice. In fact, so-called “integrated conservation and development programmes” have been tried in many developing countries, but we have little reliable evidence on their efficacy because not enough attention has been paid to constructing appropriate control groups (groups that were not included in the programme, but nevertheless monitored to provide a benchmark against which to assess the effects of a programme). To illustrate this difficulty Ferraro and Pattanayak (2006) cite a study by Struhsaker, Struhsaker et al. (2005) that concludes that protected area success was not correlated with the presence of integrated conservation and development programs. Ferraro and Pattanayak (2006) point out that this could be because integrated conservation and development programs tend to be tried in areas where human pressures on parks are high. Thus, they are tried in an adverse environment and this could be masking the positive impact that they produce when a cross-section of parks is examined.

A second major policy that falls under the heading of subsidies to activities that are complementary to conservation is the promotion of eco-tourism. Here the idea is that eco-tourism will give people residing around forests a stake in conserving biodiversity and that this will lead to better protection of biodiversity. For this to actually be the case, several conditions need to be met. First, eco-tourism itself has to be a viable business proposition. If it is not, then its promotion will fail in the absence of continuing

subsidies. Continuing subsidies cannot be ruled out; after all, if we want conservation, then we as taxpayers had better be willing to pay for it. But they do raise the question, then why subsidize eco-tourism, why not pay forest residents directly to conserve biodiversity? So promoting eco-tourism requires that it be a viable business proposition and that only temporary barriers like information, training, and access to capital prevent forest residents from taking to it. Next, it has to be the case that the government or conservation NGO's are able to supply the missing capital and training. Finally, it has to be true that those residing near forests and benefitting from eco-tourism actually feel that biodiversity conservation will maintain their incomes and are able to take actions such as reporting poaching or engaging in local political activity to ward off threats to biodiversity. Or revenues from eco-tourism may be taxed to raise revenue for protective activities.

Eco-tourism has become a big business in several African countries. In many cases, it clearly has helped protect wildlife by giving ranchers and communities who benefit from tourism a strong incentive to conserve wildlife on their lands. In India, we need to experiment with eco-tourism as a deliberate strategy to conserve wildlife on the outskirts of national parks and sanctuaries that already attract large numbers of visitors. Unfortunately, over-centralized government policy-making deters experimentation. In the current policy framework, forest areas adjoining wildlife sanctuaries and parks are usually Reserved or Protected Forests in which local community management is ruled out. An experiment that allowed such an area to be governed by a local consortium of villages in order that the residents profit from tourism revenue might result in effective protection of the forest at a much lower cost than the government could achieve.

### **5. Direct payments for conservation**

Rather than indirectly motivating communities to protect wildlife by subsidizing infrastructure for eco-tourism, or providing them with sources of livelihood that remove their reasons to extract forest resources, economists have advocated directly paying private landowners and communities for the eco-system services that they provide by maintaining natural vegetation on their lands (Ferraro and Kiss 2002). This approach,

most commonly called “Payments for Eco-system Services” or PES, avoids the problems associated with integrated conservation and development projects mentioned above. Paying for conservation directly may enable funding agencies to get more conservation from any given budget because money will not be spent on programmes that are not directly related to conservation.

Of course, this approach will only work if it is feasible to monitor conservation outcomes so that payments are made only when conservation is achieved, and not made when it is not. Thus, there are two conditions necessary for such an approach to work. It must be technically and economically feasible to monitor conservation outcomes, and condition payments on those outcomes, and the program must be designed well, so that land managers, whether individuals or communities, have the incentive to actually engage in conservation.

Payments for ecosystem services have been used in developed countries such as the United States and the Australian state of Victoria. They work by paying landowners to take actions on their land that help preserve native vegetation. The programs are designed to be cost-effective by employing auctions. Farmers are invited to place sealed bids for conservation actions that they will take specifying how much they would like to be paid for the actions. The bids are ranked on the basis of conservation value for money, and the highest bids that exhaust the budget or meet a minimum cutoff are accepted. The attractiveness of the auction design is that it minimizes the cost of achieving any given level of conservation since those farmers for whom it is least costly to carry out conservation actions will be the ones selected to carry them out. Thus, any given conservation budget will be able to go further and achieve more conservation.

These programmes involve relatively easy to monitor vegetation protection and payments to individuals. A more ambitious programme to protect carnivores (wolverines and lynxes) from poaching in northern Sweden has been in place for a few years (Zabel and Holm-Muller 2008). In this programme, large fixed payments are made to indigenous communities of Sami reindeer herders whenever a government biologist verifies a carnivore reproduction on a community’s land, with lesser (but still substantial)

payments being made for the confirmed regular presence of adults of the endangered species. The Swedish government programme replaced compensation payments made by the government when reindeer were killed by predators.

A few developing countries, Colombia, Mexico, China, and Costa Rica have government-sponsored PES programs. As yet, there do not appear to be any reliable evaluations of the effectiveness of the Colombian and Chinese programs (Pattanayak, Wunder et al. 2010). An independent study found that the Mexican Payments for Hydrological Environmental Services programme resulted in participating landowners deforesting their properties 10% less on average than matched control farmers and accounting for increased deforestation in non-enrolled properties (Alix-Garcia, Shapiro et al. 2010). Pattanayak et al (2010), after reviewing several studies, concluded that the Costa Rican programme appeared to be poorly designed, with a very small impact on conservation, mainly because payments went to farmers who had no intention of deforesting their lands in any case.

The PES approach to conservation has begun in India in a small way. Small soil conservation programs in which downstream buyers paid upstream sellers are reported to be proposed or ongoing in a few valleys in some states (Huang and Upadhyaya 2007). These are essentially payments for hydrological services.

The Nature Conservation Foundation (NCF) based in Mysore has taken the lead on payments for wildlife conservation in Himalayan meadows. In 1999, in the Spiti valley in Himachal Pradesh, the NCF reached an agreement with the village of Kibber to set aside about 5 square kilometers or 6% of the village's total rangeland to be free from grazing in exchange for payment. The use of the set-aside by wild sheep (*bharal*) tripled in four years (Mishra, Allen et al. 2003). By 2007, the area set aside had tripled (Bhatnagar, Seth et al. 2007). The NCF has entered into a similar arrangement with villagers in Ladakh for conservation of the Tibetan gazelle (Bhatnagar, Seth et al. 2007).

Another example is a pilot PES project that has begun in the Shencottah Gap in southern India. Biologists from the Foundation for Ecological Research, Advocacy, and Learning (FERAL), Pondicherry in collaboration with economists from the ISI, Delhi

(myself) and the University of Melbourne, are developing techniques for monitoring wildlife populations and using the data for conditioning payments to community groups for wildlife protection. Major funding for the project is from the Critical Ecosystem Partnership Fund. The object is to develop well-documented, transparent, and replicable protocols for achieving and measuring conservation outcomes from the programme.

Ultimately, funding for these programs would have to come from governments since only they can guarantee the continuing funding necessary for their maintenance. On smaller scales in locales with high conservation value, NGO's could establish trust funds that would ensure a sustainable source of funds to maintain such a programme in perpetuity. However, as yet, NGO's have not been willing or able to make the necessary long-run financial commitments, although the examples given above show that efforts have begun on an experimental basis. There are many areas in which private lands are interspersed with forests or other habitats of high conservation value, but which have no easily observed charismatic species that would attract tourists in large enough numbers for tourism to be a source of funding for conservation. In such areas, eco-tourism would be unworkable or insufficient by itself to generate the necessary incentives for conservation. Direct payments would appear to be the only way that the value that society places on biodiversity could be transferred to the people in a position to take conservation actions.

The FERAL-ISI-University of Melbourne Shencottah Gap project in the southern Western Ghats mentioned above is a good example of such an area. The Shencottah gap is a mosaic of remnant moist and dry deciduous forests interspersed with rubber, tea, teak, areca nut, pineapple, paddy and other farms. The gap lies between the protected areas of Periyar and its adjoining Reserved Forests to the north and the Kalakkad-Mundanthurai Tiger Reserve and adjoining protected areas to the south. Large mammal movement between these protected areas is increasingly rare owing to the rapid pace of development in the intervening mosaic of multiple-use forests, plantations and small settlements. Both habitat conversion and poaching have contributed to this situation. The 150-200 elephants and 6-8 tigers in the Agasthyamalai hills to the south of the gap are at



much greater risk of extinction as long as gene flow between them and the populations to the north is cut off.

While eco-tourism in this area could contribute to local people taking an interest in wildlife preservation, it is unlikely by itself to give them sufficient incentives to contribute to anti-poaching efforts. Thus, PES has a natural role to play. As usual, PES by itself is unlikely to restore connectivity fully. The national highway 208 constitutes another barrier that has to be dealt with, as discussed in Section 2 above.

If such payments for wildlife conservation to communities turn out to be feasible, effective and economical, then this raises exciting possibilities, not only for conservation in the larger landscape outside national parks and wildlife sanctuaries but also within them. A substantial part of the government budget for national parks is being devoted to pay the costs of resettling inhabitants to locations outside the parks. It may well turn out to be cheaper and lead to better conservation to instead make incentive payments to some or parts of these communities to preserve wildlife within the parks. This argument has been made for the particular case of the Himalayas by Bhatnagar (2008), but it very likely applies more widely.

## **Conclusions**

Different approaches to conservation all have strengths and weaknesses, and these are context-dependent. It is unlikely in the extreme that a single approach to conservation will constitute the best one all over India. Thus, a portfolio of conservation strategies is required. Conservation policy in India has been dominated by a single approach: Regulation by the state. Although Joint Forest Management has been adopted as a part of official policy all over the country, in most states, governments have been unwilling to grant tenure security, autonomy, and revenue flows to local managers, thus undercutting the incentives of local organizations to put effort into conservation. Lessons need to be learned from relatively successful instances of local management, such as the Van Panchayats of Kumaun, and these institutions adapted as necessary to other parts of India. These can be tried and monitored on a trial basis before expanding them to larger areas. This is true for the other incentive-based approaches mentioned above as well.

What is critical in this process is that the trials be carefully designed, and transparently monitored and documented so that learning from them can proceed. Most integrated conservation and development projects in India have suffered from insufficient documentation and monitoring and poor design.

Establishing the impacts of a program on carbon sequestration through careful monitoring and putting it on a solid scientific basis could draw in international funds from carbon markets. This is another good reason to involve non-government scientists in the design of any trial programme from the start. It is necessary to credibly establish impacts so that international funding for programme expansion can be secured. For example, establishing the sequestration benefits from providing access to clean fuels in lieu of firewood could secure funding for the expensive but enormously productive task, from the point of view of human health, air pollution, regional climate change and agricultural productivity, and forest conservation, of replacing firewood with modern fuels.

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