

ASIAN OVERVIEW

Investments Needed for Biodiversity Conservation

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Biodiversity today is being lost at a rate that is two to three orders of magnitude faster than is normal throughout geological history. This rapid rate of loss is due to excessive harvesting of species of economic value; the alteration of natural habitats into domestic habitats (field crops, plantations); the impacts of invasive alien species, including diseases; environmental pollutants; and climate changes. Virtually these are all directly linked to increasing demands of humans on limited natural resources.

Why should governments worry about the loss of species, genetic diversity, and even whole ecosystems? The economic values are sufficient in themselves: genetic resources alone contribute US\$500-800 billion per year to national economies (Ten Kate and Laird, 1999) and ecosystem services may be worth as much as the entire planet's annual Gross National Product (Costanza *et al.*, 1997). But a more fundamental reason is also compelling. Each species has evolved into its current form, with many genetically distinct populations, in relation to numerous other species, processes, and environments. In other words, diversity is not just a characteristic of genes, species, and ecosystems; it is the condition of their possibility of existence. Thus, the diversity of life structures or life itself, explains why scientists believe that decision makers should support appropriate investments to stop the loss of biodiversity.

The *Convention on Biological Diversity (CBD)* was adopted at the

1992 Rio Earth Summit as the major international response to the problem of biodiversity loss. Now ratified by 180 countries, the CBD calls for conserving biodiversity, using biological resources sustainably, and ensuring the equitable distribution of benefits arising from the use of genetic resources. Its Articles outline a series of provisions, including planning, assessment, conservation in ecosystems, incentive measures, exchange of information, research, awareness, access to genetic resources, biosafety, and financial mechanisms. However, the CBD leaves it up to the individual Parties to determine how to implement these provisions; countries are also finding it difficult to put these objectives and provisions into practice. The first step is agreeing to a national biodiversity strategy and action plan (as called for in Article 6 of the CBD), which most countries in the region have prepared, or are still preparing.

This paper highlights some of the key issues arising from this process and suggests some priority investments to ensure effective implementation of the measures identified.

KEY CHALLENGES IN IMPLEMENTING THE CBD

Being so comprehensive, the CBD raises many challenges that have been identified during the five meetings of the Conference of Parties held to date. Many other workshops, seminars, and conferences have been convened to further specify key issues, including some by the Asian Development Bank (see, for example, McNeely, 1995). This section highlights several of the

most important challenges that have been identified.

Designing and Implementing Sustainable Use

While most will agree that sustainable use is a good principle, it is difficult to find actual demonstrations of long-term sustainable use of renewable natural resources such as forests, wildlife, and fisheries. Part of the problem is that "sustainable use" in the abstract is a nebulous concept, because sustainability operates within very specific frameworks. For example, a local community that directly depends upon multiple resources from a nearby forest will have one idea of sustainability, while a timber company based in a capital city and sells logs to a global market may have a different approach to sustainability in the same forest.

The CBD has quite a useful perspective on this issue, defining sustainable use of biological resources as use "*in a way and at a rate that does not lead to the long-term decline of biodiversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.*" Thus, the CBD defines sustainability not in terms of the fish being pulled from the sea, the logs being hauled from the forest, or the medicinal plants being picked from the mountainside, but rather in terms of the impacts of such harvests on biodiversity as a whole.

A critical factor in determining sustainability of use is a rather simple question: "how much is enough?" But this seemingly simple question in fact carries many un-

dertones. Throughout history, most communities have struggled to find sufficient resources to survive. For them, "enough" has been what it takes to live, with a buffer for annual variability. Anything beyond what the family or village required was seen as a surplus. But those who seek maximum profits for investment elsewhere, perhaps in the name of progress, may answer the question by saying, "as much as possible." Clearly, the former attitude is much more likely to be sustainable than the latter, especially since resource-based societies recognize the environmental costs of overexploitation, while the market system encourages such costs to be externalized.

This tension helps explain why very few commercially marketed wild species — be they medicinal plants, tropical timbers, commercially important fish, edible nests of swiftlets, or sweet-smelling extracts for perfumes — are harvested in ways or at levels that are sustainable. With economic globalization, it is increasingly easy to link consumer demand in distant cities with stocks of timber, medicinal herbs, and natural resources in faraway biodiversity-rich regions. Once lucrative markets emerge for a component of biodiversity, local communities alone would find it very difficult to regulate the harvest through customary practices, particularly when politically and economically powerful outsiders are profiting from the resource bonanza (Tuxill, 1999).

It is hard to avoid concluding that the vast majority of resource use in the Asia-Pacific region, or indeed the world, is unsustainable. Corollarily, the unsustainable use of resources, in a sense, subsidizes national development, providing goods and services that are not properly compensated. As resources become more limited due to unsustainable use, development options begin to close off. This puts new pressures on biological resources at the very time

when sustainability is becoming a more urgent concern.

Supporting Indigenous People to Conserve Biodiversity

The CBD has become the most important international instrument for addressing the interests of local and traditional communities. It binds the Parties to respect, preserve, and maintain traditional knowledge and practices (Article 8j), protect and encourage customary use that is consistent with CBD objectives (Article 10c), promote wide sharing and application of traditional knowledge (Articles 17.2 and 18.4), and encourage equitable sharing of benefits arising from traditional knowledge (Article 8j).

Many indigenous groups recognize the value of the CBD for addressing their concerns. For example, in their declaration to the second meeting of the Conference of the Parties of the CBD, indigenous groups from East Kalimantan, the Moluccas, Irian Jaya, and Mentawai (all in Indonesia) said, "*Indigenous people have a right to manage their deep and multi-faceted relationships with the land, regions, and natural resources (including such components as soil, water, air, and oceans) which they have traditionally occupied and used. Indigenous peoples have the right to protection of their intellectual property rights to all forms of their traditional cultures, including their writings, designs, pictures, art forms, knowledge of cultivation, medicines and their entire knowledge about nature.*" Under the CBD, several workshops have been organized, and an *ad hoc* working group has been established to find ways of transforming such views into practical measures.

One example is the Wasur National Park in Indonesia's West Papua province near the border of Papua New Guinea. The savanna habitat that has been managed by people for generations, has strong

mythological, spiritual, and food links to the local people. A part of the sanctuary zone is considered the center of origin of the Marind tribe. This is highly significant and helps support the protection of the sanctuary zone as long as cultural protection is a major consideration and if access for certain Marind people is allowed. The park contains a sprinkling of *dusun*, traditional gardening, hunting or sacred sites, usually owned by a clan or family and originally assigned to the clan by tribal mythology. In recognition of the value of such beliefs as part of the management of the national park, people who traditionally own *dusun* are specifically allocated continued access and carry out traditional management practices. The people residing in the 13 villages within the national park are welcome to remain, and may continue their traditional hunting, especially of the deer population (Craven, 1992). Controlling hunting has quickly reduced the illegal harvest of deer that has been suppressing the domestic animal market. Since then, the local market for beef has immediately improved. Five prominent stands have been established to sell beef in the Merauke market which may be due to the decline of illegal venison and increased demand for beef.

Another example is that protection of sacred forests is a resource conservation practice grounded in religious beliefs, that was abandoned and then revived when the community realized its value in providing ecosystem services. In some parts of Manipur, eastern India, anywhere between 10-30 percent of the land was maintained as sacred groves, which, in modern terminology, are called "forest reserves". According to Gadgil *et al.* (1996), "*While these refugia are no longer considered to be inviolable as abodes of spiritual beings, the system of community-based vigilance and protection is identical to that prevailing with the*

sacred groves. Notably, taboos against extraction of any plant material from these refugia are often total and may extend even to the extraction of rattan which is in much commercial demand." They conclude that human societies at different stages of development employ different mechanisms to promote sustainable use of biological resources and ecological resilience. Small-scale horticultural societies depend on a feeling of respect for the sacred or on social conventions, but the large agrarian societies require state-sponsored regulation, often at the cost of respect for the sacred.

These are just two examples of the multiple social, economic, and management benefits that can result from more effectively incorporating the needs, concerns, and welfare of local people in biodiversity conservation efforts. Many others can be quoted from elsewhere in the region, but it is probably fair to say that much more needs to be done in this regard.

Building a Positive Relationship Between Biodiversity and Forestry

Forests are of outstanding value for biodiversity, local communities, national economies, and even the world at large. Because forests are so important to so many disparate interests, their management is often controversial. In most parts of the Asia-Pacific region, forests are owned by the State, and concessions to log the forests or convert them into plantations are allocated to private companies, State enterprises, or even the military. Managing the forests in this way has brought considerable economic benefits to the State, but has not always been a sustainable enterprise and has often led to overexploitation, loss of biodiversity, and conflict with local people.

The issues are complex. For example, the conventional argument of forest analysts is that increasing the costs of timber to log-

ging companies and processors will induce loggers to use the forest more efficiently. This is because reducing waste in forests and factories means that fewer logs will be needed to produce the same amount of products, which, in turn, would help save the forests. However, recent research in Indonesia carried out by CIFOR has found that increasing the cost of large diameter logs of commercial species encourages using smaller diameter logs and non-conventional species, for example, the use of small-spindle rotaries by plywood producers. Lowering export taxes and expanding wood-chip technology also makes it profitable for companies to log many forests that they would otherwise have left to biodiversity, or to local people. It appears that the only way companies can profitably log the large and rapidly increasing area of forests that are in their second rotation is by doing it illegally and/or in a non-sustainable fashion. This also applies to many unlogged forests with low-value timber. Sustainable forest management for commercial timber production of such forests is often not economically attractive. This explains why illegal and non-sustainable logging practices are so widespread. Under such circumstances, it would appear that no changes in concession duration or forest regulations could convince companies to manage their forests sustainably because they would lose money. As such, large areas of forest that timber companies had previously considered of marginal value may be depleted or even destroyed.

What would then be the impact of such logging practices on biodiversity? Drawing on a wide range of studies, Johns (1997) concludes that logging of mature forest commonly leads to a local increase in species diversity as structural and associated microclimatic changes create patches of habitat and food

resources attractive to species typically resident of secondary forest and forest edges. However, populations of many taxa that are residents of forest understories markedly declined and remained locally low or absent for many years. He further concludes that the most appropriate way of managing tropical forests is to have small undisturbed forest areas preserved within a larger matrix of production forest, a prescription that is being tried in Malaysia. On the other hand, commercial loggers have been notably reluctant to adopt sustainable forestry practices because they earn greater profits when they externalize more of the costs. The return from investments in future timber production — a function of the growth rate of commercial species, the costs of silvicultural treatments, the expected market prices of timber and the discount rate — is usually much lower than the currently widespread practice of harvesting marketable trees at an unsustainably rapid rate and investing the profits elsewhere (such as in logging operations in West Africa or South America in the case of Asian logging companies). Due to such factors, sustainable forestry is still little more than a pipe dream in tropical Asia, and biodiversity is paying the price.

So are governments. Unsustainable use of forests is forcing governments to make expensive policy adjustments. For example, disastrous 1998 floods in the Yangtze river valley has led China to allocate US\$2 billion to reforest barren hills in the upper reaches of the river, and to ban logging in most of Sichuan Province. Since September 1998, Sichuan has banned logging in 4.6 million hectares of state-owned forest areas along the upper and middle reaches of the Yangtze and Yellow Rivers; timber output was reduced to 2.14 million cu m by the end of 2000, a 38 % reduction from 1997. The Central Government and commercial banks will allocate funds to help 220,000 affected forest workers in the region move into af-

forestation, forest protection, and other industries. The Government of China is determined to increase forest coverage in the country from 13.9 percent to 19.4 percent within the next ten years (CCICED, 1999), in order to help recover the many economic and environmental benefits of biodiversity-rich forests.

In seeking to better serve both production and biodiversity objectives, conservation planners are maximizing the area/perimeter relationship of conservation areas through the following means:

- protecting large forest remnants rather than small ones where possible;
- rebuilding connectivity among small adjacent protected areas by recovering intervening habitat and promoting reforestation of the landscape; and
- minimizing perimeter increases due to irregularity in reserve shape.

The forest edge itself is being protected against structural damage, fires, and colonization by exotics, leaving a natural buffer zone of forest that could be managed to resemble a natural ecotone rather than an abrupt edge. Forests will also be better able to conserve biodiversity by diversifying and promoting less intensive types of land use in the surrounding areas, controlling the use of fire, minimizing the application of toxic chemicals, and controlling the introduction of exotic plant species (Gascon *et al.*, 2000).

Mobilizing Economic Benefits from Genetic Resources

An important motivation behind the CBD was to mobilize economic benefits from genetic resources as these become more valuable from the results of biotechnology, and to ensure that a fair share of the benefits are retained by the "owners" of the genetic resources. For example, the existence of undiscovered pharmaceuticals for modern

medicine has received considerable attention from conservationists, who use the argument as a justification for conserving tropical forests. Gentry (1993) suggested that drugs in tropical forests are worth \$900 billion, but Mendelsohn and Balick (1995) consider this estimate too high because it used gross revenues, rather than net revenues, to value the drugs. Correcting this error, they estimated that each new drug is worth an average of \$94 million to a private drug company and \$449 million to society as a whole. Based on recent experience in searching for new drugs, they estimated that the higher plants in the world's tropical forests contain about 375 potential pharmaceuticals, of which about one in eight has already been discovered. This suggests that a complete collection and screening of all tropical plant species should be worth about \$3 - 4 billion to a private pharmaceutical company and as much as \$147 billion to society as a whole. Numbers like this convince governments to want a cut of the action.

Genetic resources historically have been considered as belonging to all of humanity, but under the CBD, they belong to the countries where they are found. Many governments have become increasingly aware of the potential economic value of their biodiversity, and are now closing their borders to bio-prospectors because of fears about "bio-piracy." One result is that despite the valuable genetic resources still available in tropical rain forests and other species-rich habitats, pharmaceutical companies are investing less in bio-prospecting activities that historically have led to important new pharmaceuticals. Intellectual property rights issues and the lengthy approval processes involved have discouraged many pharmaceutical firms, so the new access regimes developed under the CBD have had the perverse effect of reducing investments in developing new products from the

genetic resources in the tropical countries. Instead of nurturing new investments and equitable distribution of benefits, the measures have perversely accelerated investments in bio-engineering that do not depend on wild biodiversity and instead keep more of the profits with the industry.

Today's bioprospector must meet the CBD's Article 15 requirements for prior informed consent, access on mutually agreed terms, and the fair and equitable sharing of benefits; address issues of intellectual property rights; obtain appropriate visas and permits to collect, enter land, and export and import materials; satisfy phytosanitary (for plants) and CITES requirements; and ultimately meet regulatory requirements for product safety and standards. The result is that the amount of genetic material crossing borders has significantly declined, and genetic resources for agriculture that previously were a freely available public good are now becoming proprietary, being exploited for private profit by multinational biotechnology companies.

Further, as the rising tide of humanity reduces the extent of natural vegetation everywhere in Asia, those who are interested in genetic resources will need to look increasingly to legally protected areas as the last reservoir of plants, animals, and microorganisms with enormous genetic significance. Equally, those who are charged with managing these areas will need to accommodate their management approaches so that sustainable supplies of genetic resources can be provided. Thus, a new partnership needs to be formed between private industry, those institutions involved in biotechnology (including relevant ministries, indigenous peoples, and rural communities as well as universities, botanical gardens, and research institutions), and those institutions involved in the conservation of biological diversity (including protected area management authorities and

non-government organizations or NGOs). One possible approach is to use intermediaries, including botanical gardens, universities, research institutions, NGOs, and even commercial brokers who could collect, identify, and guarantee re-supply of promising materials; acquire government approval for collections; broker benefit-sharing agreements; and ensure that any benefit arising are shared fairly and equitably in the source country and with the local communities who are maintaining the sources of genetic resources. Benefits are likely to be maximized when governments create incentives for new, varied, and equitable partnerships based on the use of genetic resources and on the shared and realistic expectations of the partners.

PRIORITIES FOR INVESTMENT

Better understanding about biodiversity, ecosystem functions, biotechnology, and genetic resources is essential to addressing the objectives of the CBD, but they are not sufficient in themselves. The previous section has indicated some of the challenges, involving social, economic, and political issues along with the more straightforward biological concerns. This section suggests several major priorities for investment (drawn especially from McNeely, 1999), although these need to be refined for specific application in specific areas. These priorities focus on *in situ* conservation of wild biodiversity, which is receiving inadequate investment in the Asia-Pacific region today. Converting them into effective action may require skills such as facilitation, negotiation, public policy, food security, human rights, and economics - skills that typically are different from those traditionally associated with conservation institutions.

Building a Strong Economic Foundation for Conserving Biodiversity

Protected areas provide the major strategy for many conservation

efforts especially for the critically important wild biodiversity. These areas have usually been seen in primarily biological or ecological terms, but recent studies indicate the economic importance of land managed for conservation objectives (McNeely, 1999). Whenever benefits from protected areas are seriously examined, it becomes apparent that the benefits outweigh their management costs by a considerable margin, often up to a factor of ten or more. Although protected areas can be significant revenue sources for the national economy, they are deteriorating because of insufficient investment that ensures their continued productivity.

Part of this lack of investment arises because protected areas are basically public goods, being provided to everyone, rather like education, defense, and law and order. Because many of the economic benefits of protected areas are available to all, fewer incentives exist for any one individual, community, or commercial firm to conserve the resource than would seem to make sense from the perspective of society as a whole. Indeed, private benefits from converting socially valuable protected areas to other uses are often substantial.

On the other hand, many biological resources within protected areas are potentially private goods, whose use is rival, whose control can be made exclusionary, and whose value is commercially marketable (for example, genetic, tourism, and water resources). The means of capturing these economic benefits can help deliver the potential financial benefits of the protected area, especially if market prices can be charged for the full range of benefits provided by protected areas (Shah, 1995).

For example, based on a survey instrument, Swanson *et al.* (1999) recommended that the admission for tourists to Wolong Panda Reserve be increased from \$7 to \$25, generating revenues of \$1.68-2.17 mil-

lion per year (as compared to the current budget of \$250,000). They estimate that total revenues from the development of managed tourism could range between \$32-43 million per year, even with very modest development. They also found a considerable willingness to pay on the part of foreign visitors for panda conservation, for example, in the form of a "panda conservation stamp" on entry visas with differential charges for different parts of the world (reflecting differences in willingness to pay). Using 1995 tourism arrival figures, they estimated that such stamp would generate nearly \$58 million per year. They also concluded that the recreational and other values associated with the panda can generate substantial amounts of revenue, estimated at an aggregate amount of \$106.7 million per year for Wolong Reserve.

What activities should be funded from government allocations as opposed to activities that should be covered by various kinds of user fees? The distinction between public and private benefit is a useful guide. Generally, the taxpaying public should pay for the costs of establishing and maintaining protected areas (a public good) while those personally or commercially benefiting from the use of such areas should pay for the associated costs. Thus, governments may decide that user fees should pay for goods and services such as camping, water, information, access, and genetic resources. The problem however is that only those goods and services that can be given a monetary value will earn income, potentially leaving other values ignored, even if they are in the public interest. Further, some very valuable functions of protected areas, such as watershed protection, are politically difficult to capture through market mechanisms. While collecting fees from the sale of hydroelectricity from a dam whose watershed is protected is feasible, few governments are willing to charge farmers the full costs

of high-quality irrigation water emanating from a protected area.

A major issue is funding of individual sites as opposed to funding of entire protected area systems. Some protected areas will be more financially profitable than others, especially those that are very popular with international tourists like Nepal's Chitwan National Park or those linked to major hydroelectric projects such as Nakai-Nam Theun in Laos. Others will provide significant benefits to farmers in terms of watershed protection, but the government might wish to subsidize these benefits. These subsidies should be recognized for what they are, and compensatory payments should be provided to the protected areas. But if governments decide that protected areas must be more self-reliant, they should enable protected areas to retain the funds earned from user fees and charges such as for gate, bio-prospecting and even water use.

One means of determining appropriate levels of support for a protected area system is to do a thorough financial analysis of the full range of economic benefits provided by each protected area and by the national protected area system. This full financial assessment could then be compared with alternative uses of the land and the management costs of the protected areas. The mismatch between economic values of protected areas and investments being made in them would then be clearly identified, providing a strong basis for justifying additional investments in the protected area system. These investments can be generated through measures such as those identified in McNeely (1999).

Designing Robust Institutions for Conserving Biodiversity

A system for conserving biodiversity needs diversity in institutional approaches. Government

conservation institutions in many Asia-Pacific countries claim an exclusive mandate to manage conservation areas and activities but lack the necessary human, financial, and technical resource capacities to carry out that mandate effectively. But protected areas support biological processes that often operate at small scales, which vary dramatically in climate, elevation, structure, and importance from one site to the next. An over-emphasis on centralized protected area agencies can undermine institutional mechanisms at smaller scales, such as traditional approaches to conservation based on local knowledge about specific complex interactions and concerns about natural capital that can be applied in daily life. Clearly, this is not an either-or situation; instead, it calls for creating new systems of governance for protected areas, with different institutions having different responsibilities at different scales. Simply stated, large-scale, centralized governance units do not, and cannot, have the variety of response capabilities — and the incentives to use them — that large numbers of local institutions can have (Ostrom, 1998).

Decentralizing both management and funding will also help cure one of the perennial problems of protected area management — the lack of incentives for attracting and keeping the most energetic and qualified personnel working at the local level rather than in the cities. It is important to seek basic organizational principles that will lead to the most appropriate and effective institutional arrangements for managing protected areas, appropriate to the national setting, such as those outlined in McNeely (1999).

Governments should also give careful consideration to establishing parastatal institutions, in conjunction with a National Conservation Trust or other such financial mechanisms. Such institutions could be more efficient and cost-effective

than the current institutions that are in place.

Providing Incentives for Private Commercial Sector Contribution to Biodiversity Conservation

A major challenge is how to link private sector operations with the benefits provided by protected areas and other biodiversity-rich areas. The private sector has proven extremely effective in avoiding costs (they are effective "free riders"). While some kind of government regulation is certainly required, an appropriate level of competition will lead to a better product at the best price, enabling entrepreneurs to enter the marketplace with new ideas and new approaches that are consistent with the national protected area objectives established by the government.

The private sector also needs to have very clear rules that apply equally to all competitors. Environmental standards should be clear and explicit, and be sufficiently powerful to ensure that the resources of protected areas are well-managed, but not so strict as to serve as a disincentive to investment. More positively, tax breaks or other economic incentives for contributions to protected areas could generate greater private sector support.

Governments, the private sector, NGOs, researchers, local communities, and other stakeholders should work together to agree on objectives and set targets that recognize the realities under which business operates. These targets should encourage efficiency and cost-effectiveness, permit flexibility of responses to meet goals, allow for gradual introduction of any new regulation so that business would have time to adjust, be fair and equitable across business sectors, and provide transparency of compliance so as to eliminate free riders (WBCSD, 1997).

Governments should also design and implement economic instruments that encourage actions toward national objectives for protected areas. Numerous economic incentives for conservation are available for use by governments (McNeely, 1988; OECD, 1997). For example, governments could direct agricultural subsidies to private sector activities, which promote behavior that is consistent with the requirements of protected areas. Tax policies can also encourage businesses to provide support to protected areas, for example, through enabling charitable donations to be deducted from corporate taxes and considering support to protected areas as a normal business operating expense. Similarly, disincentives such as fines or taxes for inappropriate corporate behavior should be part of the package.

Relatively little has yet been done in the region to stimulate the creative efforts and energies of small biodiversity-based rural businesses, which are micro-scale and where much innovation can take place. For example, investment through a dedicated fund could facilitate private sector development of enterprises based on sustainable use of biological resources and conservation of biodiversity in and around protected areas. This will also help ensure a more equitable distribution of benefits arising from such use, thereby achieving all three objectives of the CBD. Commercialized microenterprises based on biological resources could become critical components in developing buffer zones around protected areas; if planned and developed carefully, they can help safeguard the protected areas and generate revenues for the local communities. It would seem most appropriate for the private sector to take the lead in this field, working closely with interested NGOs with connections at both the grassroots and at the marketing level, and with the local

communities who will be the key producers.

Finding New Approaches to Local Community Involvement

Much more needs to be done to build support from local communities for protected areas. This will require a challenging combination of incentives and disincentives, economic benefits and law enforcement, education and awareness, employment opportunities in and outside the protected area, enhanced land tenure and control of new immigration (especially where the buffer zones are targeted for special development assistance). The key is to find the balance among the competing demands, which usually requires a site-specific solution.

For example, in Indonesia, nesting colonies of hundreds of thousands of swiftlets are strictly protected on two islets, Singa and Borong. Their nests are made almost entirely of saliva and are the basis of bird's nests soup, one of the most expensive dishes in Asian restaurants. Nests may fetch nearly \$2000 per kilo. Interestingly, the fully protected nesting grounds are becoming overpopulated, forcing the swiftlets to seek other nesting sites, including in residential areas. It was reported that a man who bought an empty house several years ago for \$675 was able to sell it later for over \$56,000 because a colony of swiftlets had set up home there. Many people living by the national park have constructed simple three- or four-storey structures to attract swiftlets; once a colony is established, nests can be harvested about every two months.

Relocating communities from protected areas has characterized the past establishment of protected areas. The modern perspective however, recognizes that relocation can cause severe negative social, economic, cultural, and even ecologi-

cal impacts. An important principle is first to do no harm. Relocation should be used only as a last resort after careful study and planning, and only where it is clearly documented that resident peoples are truly detrimental to the objectives of the protected areas, and where adequate alternatives and mitigating measures have been established for the improvement of the standard of living of those relocated (West and Brechin, 1991). Some communities may be pleased to move under such conditions.

A key factor is the stability of rural communities, implying that governments need to be particularly cautious when contemplating major efforts at relocating people to another part of the countryside. People who have developed long-term relationships with particular settings, and have developed knowledge on how to manage the resources contained within those ecosystems, are likely to have very different relationships with the land and its resources than are the new immigrants who have no particular linkage to local resources and often receive considerable subsidies from outside. The new arrivals are frequently responsible for more destructive land-use practices than are the long-term residents; but new technologies and new markets are expected to change the behavior of local villagers irrespective of their traditional conservation practices.

At a minimum, local communities need to be deeply involved in buffer zone development activities, and should be consulted on any decision that affect them. In many cases, giving the local people preferential treatment in terms of employment within the protected area (including seasonal or project-based employment), providing economic incentives to establish tourism or other income-generating activities in the buffer zone, and ensuring an appropriate flow of benefits from the protected areas to the surrounding

land can help build a positive relationship between protected areas and local communities.

In other cases, it might be most sensible to return the full management responsibility for, at least, the buffer zones to the local community, so that community-owned forests would serve some of the functions of protected areas. These may be managed under forest stewardship contracts between government agencies and local communities. Successful project interventions in buffer zones need to address community priorities, providing incentives such as material benefits that would build long-term partnerships rather than dependency. Successful projects add diversity to the development options available to the local community and build community self-reliance. While economic incentives compensate local communities for opportunity costs, such compensation should improve access to suitable productive resources like better agricultural land or technology, which can provide continuity between prior modes of production and opportunities for economic improvement. This is far better than simply providing cash.

Most rural communities in and around protected areas are anxious to find new ways to earn income. While they generally retain effective control over at least minor forest products, the local communities are seldom legally entitled to these historical rights, leading to a degree of insecurity that militates against sustainable utilization as well as fostering conflict between local people and the protected area. Because this impulse can have negative impacts on protected areas, many Integrated Conservation and Development Projects (ICDPs) are actively seeking alternatives to resource harvesting and land conversion. For-profit enterprises involving local communities around protected areas can either build dependence on local resources or seek

to reduce such dependence. Generally speaking, enterprises within a protected area should be basically non-consumptive, such as tourism or limited collection of genetic materials, while those in the buffer zone can be both non-consumptive and consumptive. An important decision is the choice between coupling and de-coupling the economic interests of local people from the ecological interests of the protected area. Projects in buffer zones, such as plantations of fast-growing trees that relieve the pressure on forest timber, cash-crop initiatives, butterfly farms, investment in better farming practices and so forth, are designed to shift the economic interests of local people away from exploiting resources in the protected area.

Indigenous peoples however, are not always effective custodians of wildlife. For example, the Simlippal National Park in the Indian state of Orissa is seriously threatened by an annual mass slaughter of endangered animals by local tribal peoples. The hunting spree, which has been a regular feature for centuries, involves hunters setting the forest floor on fire to encircle the animals, which are then killed and eaten. While both the government and conservation NGOs, such as World Wildlife Fund (WWF), are loudly protesting against this tribal behavior, the local people are financially destitute and depend on the hunt for necessary nutrition. They argue that the hunting ritual is a vital part of their cultural tradition, although the tradition arose at a time when the population of India was much lower and the wildlife habitat was much more extensive.

While decentralization is now a popular response, removing national parks from a central government control to that of local communities is seen by some as a return to tribalism and a retrograde step for countries seeking to build a strong national identity. Indeed, in many cases, the government is more likely

to be interested in sustainability than individual local groups driven only by their self-interest.

By contrast, some activities are designed to enhance the dependence of the local communities on the natural resources or ecological services to be conserved. For example, nature-based tourism will bring revenues as long as the local environment is well-preserved and attractive to tourists. Selling hunting rights to tourists is viable and lucrative only for as long as the protected area is sustaining a sufficiently abundant wildlife population (and the protected area regulations permit such use). Medicinal plants can be collected in the wild only for as long as they are not overexploited, and so forth. Whether a "coupling" solution is likely to be more effective than a "de-coupling" one, or whether a combination of the two is preferable, can be established only within a specific ecological and socio-economic context. A general point here is that the greater the interaction of a community with the biological resources of the forest, and the greater the proportion of the community that gains or loses from that interaction, the more likely is the success of co-management projects.

It is possible that some local communities have a limit on their perceived needs; once their basic needs are met, they will reduce their impact on protected area resources. This rosy assumption is far from a generality and most communities contain at least some individuals who happily will try to exploit more from a system than can be supported in a sustainable way, even if the social costs far outweigh the private benefits. This means that protected area management needs to be based on a clear understanding of rules and regulations, and effective means of enforcing them through various kinds of incentives (such as employment, clean water, various kinds of linked development, and so forth), and dis-

incentives (such as public ostracism, fines, and jail terms).

Building a more positive relationship between local communities and those responsible for conserving biodiversity can be done through the following steps:

- Identify all critical interactions (physical, biological, economic and cultural) that link biodiversity to local communities, regional landscapes, and private enterprises.
- Understand the meanings and values that local communities attribute to biodiversity.
- Inform local populations about the national and international significance of local biodiversity and strive to develop a sense of pride in the conservation measures being implemented.
- Provide benefits that compensate for any opportunity costs paid by local communities because of the conservation measures, over and above the benefits the conservation provides to them.
- Conduct planning as an open process that provides opportunities for all stakeholders to express their opinions and views about the future of the region's biodiversity.
- Avoid preconceived ideas about how things have to be done, because most problems have multiple solutions. Give priority to local solutions for local problems.
- Use advisory councils with members who can contribute to maintaining open communication with local populations and enterprises and who are sensitive to local values within the region (after Zube, 1995).

CONCLUSION

A recent study found that the majority of protected areas in tropical countries are reasonably successful at stopping land clearing, and, to a lesser degree, effective at mitigating logging, mining, hunting, fire, and grazing. The effectiveness of

protected areas correlates with basic management activities such as enforcement, boundary demarcation, and direct compensation to local communities, suggesting that even modest increases in funding would directly increase the ability of protected areas to protect tropical biodiversity (Bruner *et al.*, 2001). Many countries in the Asia-Pacific region now have mature protected area agencies, but the challenge of conserving biodiversity extends far beyond protected areas into forestry, fisheries, agriculture, tourism, and many other sectors of modern society. The investments that have been discussed in this paper will be successful only if they are part of an overall national commitment to sustainable forms of development. ●

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