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Stemming the Loss of Biological Diversity:
An Assessment of USAID Support for Protected-Area Management

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Foreword

This report is one in a series of assessments of environmental programs in developing countries assisted by the U.S. Agency for International Development (USAID). It looks at the early efforts of selected USAID programs at conservation of biological resources through protecting and managing threatened habitats and wildlife in developing countries.

The report summarizes an assessment of recent steps taken by several developing countries to stem the loss of global biological diversity and the role that USAID has played in the process. The good news is that developing countries have begun to make major gains in incorporating threatened land and marine habitats into officially protected areas that constitute reservoirs for the world's biological resources. Globally, about 5 percent of national land and coastal marine territories is totally or partially protected. Two thirds of that area lies in developing countries.

Developing-country governments are also budgeting more resources to manage habitats they have designated for protection. And modest steps have been taken to reform economic policies that in the past have encouraged the degradation or destruction of ecosystems through extractive harvesting of forest and fisheries resources. Growing local participation in the biodiversity conservation process through proliferation of nongovernmental environmental groups is also heartening.

The bad news is that global biological diversity continues to erode in many unprotected areas. Moreover, some officially protected habitats are too small, fragmented, and degraded to be biologically viable ecosystems over the long run. Developing countries and international donors are beginning to explore better ways to conserve the world's dwindling biological wealth. This report is prepared with the objective of highlighting and assessing some of the approaches that have been applied in early USAID biodiversity programs to provide guidance

and support for current and future efforts.

Summary

Support for conservation of the world's biological diversity has recently emerged as a main component of the development and environment programs of the U.S. Agency for International Development. The world's biological resources, a vast share of which are found in developing countries assisted by USAID, are critical to sustainable global economic and social progress. Still undiscovered plant and animal species may offer solutions to hunger and health problems of this and future generations. Moreover, many of the habitats that house biological diversity also serve as watersheds for hydroelectric power generation and as sources of water for irrigation and drinking.

In 1987 Congress mandated a Tropical Forest and Biodiversity Conservation Program. The program seeks to protect biological resources through the sustainable management of forest, marine, and other wildlife habitats with goals of environmental and economic benefits. To attain these goals, USAID has evolved and begun to implement an environmental strategy that includes strengthening systems of parks and protected areas, particularly biologically rich areas under threat.

In 1993-94, the Agency's Center for Development Information and Evaluation (CDIE) examined early USAID-supported biodiversity conservation programs in six countries. In three of these countries (Costa Rica, Jamaica, and Sri Lanka) USAID supported creating and managing new official parks and protected areas. In the other three (Madagascar, Nepal, and Thailand) USAID provided one or more smaller grants to nongovernmental organizations (NGOs) working with communities around existing protected areas. The grants went toward developing new livelihood activities as alternatives to encroachment into parks for hunting, farming, and timber harvesting. The assessment of that experience is among the Agency's first efforts to measure the results of its early support for biodiversity programs.

Background

This CDIE assessment concentrates on how a few USAID projects have helped developing countries set aside, protect, and manage natural forest and marine habitats for in situ conservation of biological resources in natural habitats where they are found. There are both in situ and ex situ approaches to biodiversity conservation. Over the course of its development assistance efforts, USAID has supported both.

Ex situ conservation of genetic resources covers only a small number of species of current economic value. With its Tropical Forest and Biodiversity Conservation Program, USAID includes in situ approaches to stemming the loss of biological resources in developing countries. These approaches potentially can reach the vast array of plant and animal species (many still unknown to science) that exist in these countries. Assisting in the

creation, protection, and management of officially designated protected areas has been the approach to biodiversity conservation most commonly supported by USAID during the early years of the programs evaluated here.

In degree of protection, these areas range from strictly enforced wildlife sanctuaries or refuges where no unofficial human entrance is allowed to areas designated for recreation or where some limited economic activity is permitted. Such activity might include crop cultivation, animal grazing, recreational tourism, or forest product harvesting.

Globally, area officially designated for protection has increased fourfold during the past 2 decades. By 1990, industrial and developing countries combined had set aside more than 6.5 million square kilometers of land one twentieth of the earth's terrestrial surface. Protected marine habitats add to this total.

Two thirds of these officially protected areas are found in the developing countries of Asia, Africa, and Latin America. But creation of protected areas by law or decree makes them no more than paper parks unless money and trained staff are allocated to manage and protect them. Given all the other social and economic demands they face, developing-country governments have only limited resources to invest in biodiversity conservation. One of the challenges is making the best use of public monies while fostering ways to leverage funds and commitment from additional sources public and private, local and national to achieve sustainable management of the world's biological heritage.

Evaluation Findings

Approaches That Produce Results

Four strategic approaches to conservation of biological diversity in biologically rich areas have emerged from this review. The approaches suggest a decision framework like the one presented in figure 5 on page 13. They are:

Creating officially designated protected areas by (1) setting aside and demarcating terrestrial and marine habitats for the conservation of biological resources, (2) securing public title to and control over protected areas, and (3) planning protected-area systems

Improving protection and management of habitat resources by (1) developing management plans, (2) improving operations where habitats serve as parks, (3) monitoring ecological conditions, (4) assisting in natural regeneration of degraded habitats, and (5) generating revenues to finance conservation-area management and operations

Integrating community development and biodiversity conservation activities in areas surrounding protected habitats by (1) increasing local awareness and understanding, (2) organizing

bordering communities to promote environmental awareness, and (3) introducing new livelihood activities as alternatives to encroaching on protected habitats

Reforming national policies that affect biodiversity conservation by (1) improving public and policymaker understanding of the value of critical habitats and biological resources (2) introducing economic and financial incentives or legal reforms that encourage protection of natural habitats and their biological resources, and (3) orchestrating partnerships between government and nongovernmental conservation groups

Program Performance

The CDIE evaluation of selected projects carried out between 1980 and 1992 found that:

USAID has contributed directly to the inventory of protected habitats in countries where creation of protected areas has been an objective. Still, many officially protected areas are threatened by degradation and fragmentation that limit their capacity to support viable populations of many plant and animal species they were created to protect.

These USAID projects demonstrate that investments are needed not only in improved facilities and infrastructure for protected-area operations but also in increased human and institutional capacity to manage the areas' biological resources. USAID's programs have helped increase capacity to patrol against encroachment (with staff lodging, vehicles, and communications equipment) and to provide assistance to visitors (with roads, trails, and interpretation facilities). Experience with these activities suggests, however, that effective conservation also requires the recruitment and training of staff to prepare management plans, restore degraded habitats, and inventory and monitor wildlife populations.

These projects have shown that awareness of the value of biodiversity conservation can be quickly raised, but changes in practices require the commitment of resources over a much longer period. In Costa Rica, Jamaica, Nepal, and Thailand, environmental messages increased awareness and changed attitudes, even in rural areas with low literacy and income levels. Converting awareness to better conservation practices has, however, proven to be a long-term endeavor. It requires sustained efforts at, for example, introducing new livelihood activities to break the debt-and-poverty cycle that has forced many rural dwellers to encroach into protected areas to log, hunt, fish, or farm for survival. NGOs chosen to run these integrated conservation and development programs also often require time and resources to build skills in rural development, community organization, and technical agriculture to conduct these activities.

USAID's early biodiversity conservation efforts demonstrate that economic and financial incentives will be critical to

sustainability of biological diversity. A spectrum of economic reforms and incentives are needed to sustain these programs. Often requiring reform are national economic policies (such as timber export subsidies) that foster destructive resource extraction practices in biologically rich areas. Project-level activities may be thwarted or their effectiveness diminished in the absence of such reforms. Promising are experiments with environmental trusts and visitor fee and user tax systems to generate revenue to pay a share of the costs of protected-area operation and management.

Recommendations

A number of recommendations emerge from the evaluation. They are:

Foster government partnerships with NGOs to help public agencies extend the reach of biodiversity programs

Promote ways that protected areas can generate revenues that contribute to their operation and management

Identify and promote opportunities for private ventures consistent with sustainable use of biological resources

Support removal of market distortions and reform of economic policies that cause biodiversity loss

Coordinate USAID program resources to ensure effectiveness of Agency biodiversity efforts

Definitions of terms

Definitions of terms used in this report have been drawn from those contained in the United Nations Convention on Biological Diversity, Rio de Janeiro, June 5, 1992.

Biological diversity, or biodiversity. The variability among living organisms from all sources, including terrestrial, marine, and other ecological complexes of which they are part. This includes diversity within species, between species, and of ecosystems.

Biological resources. Includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use of value for humanity.

Ecosystem. A dynamic complex of plant, animal, and microorganism communities and their nonliving environment interacting as a functional unit.

Ex situ conservation. The conservation of components of biological diversity outside their natural habitats.

Genetic material. Any material of plant, animal, microbial, or other origin containing functional units of heredity.

Genetic resources. Genetic material of actual or potential value for humanity.

Habitat. The place or type of site where an organism or population naturally occurs.

In situ conservation. The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

Protected area. A geographically defined area designated or regulated and managed to achieve specific conservation objectives.

Sustainable use. The use of components of biological diversity in a way and at a rate that does not lead to long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

1. Introduction

This report summarizes findings from an assessment of selected U.S. Agency for International Development biodiversity projects. The assessment is based largely on field studies carried out by the Center for Development Information and Evaluation (CDIE) in six countries. In three of these countries (Costa Rica, Jamaica, and Sri Lanka) USAID supported creating and managing new official parks and protected areas. In the other three (Madagascar, Nepal, and Thailand) USAID provided one or more smaller grants to nongovernmental organizations (NGOs) working with communities around existing protected areas. The grants went toward developing new livelihood activities as alternatives to encroachment into parks for hunting, farming, and timber harvesting.

The six case studies concentrate on USAID bilateral assistance programs. Activities in biodiversity conservation funded by more recent central and regional USAID programs (such as the Biodiversity Support Project and Coastal Resources Management Project), while substantial, are considered only where they have directly supported these national programs (see for example Webster 1994).

As a rule, early USAID support for biodiversity conservation started in those countries where there are large numbers of endemic species under immediate threat of extinction. The countries where CDIE conducted fieldwork constitute a purposeful selection of countries with USAID-supported biodiversity programs. That is to say, they were not selected on the basis of random sampling. Still, the six countries represent nearly half of all the countries where USAID launched biodiversity programs during the 1980s. The countries themselves constitute a spectrum of low and medium per capita income levels, a range of social and

political conditions, and large and small development assistance programs.

In Situ and Ex Situ Conservation

The assessment examines USAID support for biodiversity conservation in situ, or on-site, through protection of plant and animal habitats in their natural state. There are both in situ and ex situ approaches to biodiversity conservation. Over the course of its development assistance efforts USAID has supported both (see box 1). Notable ex situ activity has been sustained by USAID support for conservation of food-crop genetic materials, retained today in germ plasm banks by international agricultural research centers. The effect on global food production from conservation of these plant materials has been documented elsewhere (Plucknett 1987).

But ex situ conservation of genetic resources covers only a small number of species of current economic value. It omits a vast range of animal and plant species, many yet unknown to science. USAID now includes in situ approaches to stemming the loss of biological resources in developing countries as part of its strategy for sustainable development. Natural habitat protection and management has been the most common in situ biological diversity conservation activity supported by USAID.

Defining 'Biological Diversity'

This evaluation uses a definition of biological diversity that categorizes the world's plant and animal resources in three ways:

(1) Habitat diversity. Ecosystem characteristics range from polar to tropical, humid to arid, alpine to deep-sea. The characteristics of any given ecosystem dictate the habitats found within it and the spectrum of life forms that live within those habitats. The variety of habitats found within developing countries, in particular, is broad. The goal is to ensure a representative number of each on a global scale.

(2) Species diversity. The variety of plant and animal life within an ecosystem makes up its species diversity. Greater species diversity leads to increased viability of ecosystems and hence greater chances of sustainability of all life forms within that ecosystem.

(3) Genetic diversity. The variety of genetic characteristics within a single species is critical to that species' ability to adapt and survive. Wildlife biologists have begun to identify the minimum population size of a given plant or animal species necessary to provide sufficient genetic variability for its long-run survival. Minimum population sizes can then be correlated with habitat size and habitat quality requirements to determine the scale of land or marine area required to ensure genetic diversity and species survival.

Habitat, species, and genetic diversity must all be addressed in

designing and implementing programs aimed at in situ conservation of biological resources. USAID programs in biodiversity conservation mainly have emphasized creating protected areas national parks, wildlife reserves, and sanctuaries for the conservation of habitats and wildlife threatened with destruction. In a few cases species diversity has been the concern of USAID programs that support protection of specific endangered wildlife. USAID has given less attention to genetic diversity in its in situ programs.

Scope of the Assessment

This report examines the impact and performance of specific efforts at protecting biological diversity in six countries receiving USAID development assistance. In preparing this report, CDIE examined the portfolio of USAID assistance programs. Those programs began in the late 1980s, with explicit objectives in biodiversity conservation. As a group they endeavor to stem the loss of biological resources by setting aside and protecting habitats and wildlife against settlement and other human activity.

Table 1 summarizes the programs examined by CDIE, and table 2 indicates their significance in coverage of protected habitats in study countries. Readers who wish to review the analysis and data behind the findings synthesized here may consult the six country reports listed in the bibliography. What follows is a thumbnail description of activities being assessed.

Thailand. USAID support has concentrated on halting habitat destruction and wildlife loss from encroachment by rural communities bordering national parks. The Agency provided a \$212,000 grant from its private voluntary organization (PVO) cofinancing project to support efforts of a Thai environmental group to set up pilot community development programs in rural villages around the perimeters of Khao Yai National Park. (Khao Yai is one of Thailand's oldest, largest natural forest parks.)

The funding was directed toward forming community conservation groups to increase awareness about habitat and wildlife preservation among rural households bordering national park areas. It also aimed to break a cycle of poverty, indebtedness, and encroachment by introducing new income-producing activities as alternatives to illegal farming, hunting, and logging. At the time of the evaluation, USAID was implementing a new natural resources management project designed to support this early community conservation and development experience through policy reforms aimed at fostering sustainable forest habitat management.

Nepal. The Agency has had a diverse portfolio of biodiversity initiatives aimed at reducing threats to biologically rich areas by human activity. USAID has supported the Government of Nepal in integrating the needs of tourism and local populations with the conservation of its biologically rich heritage. The CDIE evaluation concentrated on activities related to Royal Chitwan National Park. USAID's portfolio of activities has targeted

nongovernmental organizations, awareness and training, ecological research, and protected-area planning to improve the use of Nepal's forest wildlife habitat.

Madagascar. Among the lowest income countries, Madagascar is receiving USAID support to arrest further depletion of its diverse biological resources by discouraging expansion of traditional crop and livestock production. These activities have destroyed nearly 80 percent of the country's forest habitat. Since the late 1980s, USAID has funded a range of grant projects aimed at conserving Madagascar's unique plant and animal resources. The funds work to (1) foster preservation through conservation and development grants to NGOs working in settlements around protected areas, (2) arrange debt-for-nature swaps to finance government and NGO conservation programs, and (3) build comprehensive policy and planning capacity at the national level. The assessment looked primarily at USAID experience in and around Andohahela Nature Reserve, a tourist destination of growing popularity in the nation's southern region.

Sri Lanka. USAID has concentrated on the creation and operation of new protected areas in the Mahaweli River basin area. There wildlife was being displaced as habitats were converted to hydroelectric reservoirs and irrigated systems. USAID provided a \$5 million Mahaweli Environmental project grant to mitigate the environmental damage caused by the irrigation and power-generation schemes. Between 1982 and 1992 the project supported Sri Lankan Government efforts to (1) demarcate, staff, and equip protected habitats in the Mahaweli system; (2) strengthen the planning and management capabilities of Sri Lanka's Department of Wildlife Conservation; (3) develop research and training capabilities; and (4) establish a trust fund to finance conservation programs.

Costa Rica. USAID supports an integrated area conservation program aimed at protecting Costa Rica's biological resources from further destruction by inappropriate farming, ranching, and logging practices. Through the \$7.5 million Forest Resources for a Stable Environment project and a \$10 million local currency endowment fund, the Agency is supporting government efforts to set aside and manage protected forest habitats in the country's central cordillera a range of volcanic mountains forming the Continental Divide. USAID provides technical assistance and funds (through the endowment) for operations of a nongovernmental regional development foundation. It was created to support the Ministry of Natural Resources in managing the region's parks system and promoting reforestation and natural forest management schemes on lands bordering the parks.

Jamaica. USAID's Protected Areas Resources Conservation project provided \$2.95 million to support the creation of a national protected areas system and the country's first two pilot national parks: Montego Bay Marine Park and the Blue and John Crow Mountains National Park. The Agency worked with a U.S. environmental NGO that contributed some matching funds and

technical assistance. Funds went for (1) recruiting park staff, (2) establishing a national wildlife trust fund to support specific conservation programs, (3) establishing a conservation data center to track biodiversity conditions, and (4) conducting rapid ecological assessments and preparing master operating plans for parks.

As is to be expected from a relatively new development endeavor, there is still relatively little quantitative data available on any of the country programs to allow for rigorous cost benefit analysis, valuation, or discussion of economic instruments. What hard data do exist are of questionable reliability. Collection of reliable data is difficult if undertaken retroactively, especially when few benchmarks are established and little data are collected. Therefore, this synthesis report relies primarily on qualitative judgments. These issues are summarized in a description of the evaluation methodology in appendix A.

Also, because of the relative newness of USAID biodiversity programs, this assessment does not attempt to calculate the global impact of USAID efforts. Rather, the report compiles available evidence to suggest what changes social, economic, biological are the outcome of those USAID-supported programs that have been operating long enough to anticipate results. Moreover, the evaluation validates many of the lessons learned from early efforts that are now a part of the Agency's current portfolio of natural resources projects.

This report covers five topics: (1) chapter 2 reviews the background of USAID's growing biodiversity conservation portfolio and the country projects studied in this evaluation; (2) chapter 3 presents a framework for formulating strategies in biodiversity conservation; (3) chapters 4-7 present findings of the strategic approaches supported by USAID; (4) chapter 8 assesses the performance of projects employing these strategies with respect to their relevance, impact, effectiveness, and sustainability; and (5) chapter 9 makes recommendations for future USAID biodiversity programs.

2. Background

Much of the world's biological diversity originates in developing countries. From this diversity have come rich dividends in the form of medicines and basic food crops. Developing countries are discovering that their biological resources can make powerful contributions to long-term economic growth and welfare. Those resources harbor yet-to-be-discovered sources of food, medicine, and other products. They also hold more immediate potential for generating incomes and jobs from new enterprises such as nature tourism.

But biological diversity is under threat. In many developing countries, as well as industrial nations, destruction of plant and animal species is acute. The need of expanding populations for fuelwood and farmland has led to the clearing of forests that

serve as plant and animal habitats. Urban settlement, mining, and overfishing have destroyed coastal marine habitats and with them many still unknown species.

Trends in Protected-Area Growth

Developing countries, with the help of USAID and other donors, are acting to conserve their remaining biological resources. Their actions are reflected in the growing number and area of forest and marine habitats now officially set aside as parks and protected areas.

Data in figures 1 and 2 show rapid growth in the number of officially protected areas and amount of surface area under some form of official protection. In degree of protection, these areas range from strictly enforced wildlife sanctuaries where no unofficial human entrance is allowed to areas where substantial economic activity (such as grazing, tourism, crop cultivation, and harvesting of forest products) is permitted. (Appendix B discusses the categories of habitat protection.)

Area protected has increased fourfold during the past 2 decades. By 1990, developed and developing countries combined had set aside to protect the world's biological resources more than 6.5 million square kilometers of land. That is an aggregate area exceeded in size by only six countries: Russia, Canada, China, the United States, Brazil, and Australia. In 1990, developing countries accounted for 63.8 percent, almost two thirds, of the world's protected areas. They account for 75.8 percent of the world's total land area (see table 3).

Despite the growth of protected habitats, many areas set aside to conserve biodiversity are little more than paper parks consisting only of legislative or executive decrees or lines on maps. Encroachment by neighboring communities continues to degrade protected habitats, and public resources to enforce protection are limited. Moreover, many national policies for example, incentives to increase timber and fisheries production and exports work against efforts to save remaining forest and marine habitats. Missing also are incentives to simultaneously elevate the status of protected habitats as sources of new economic opportunities and as repositories for threatened biodiversity.

USAID's Evolving Support for Biodiversity Conservation

Until the mid-1980s, USAID directed its support for biodiversity conservation through international agriculture research centers that acquire and maintain germ plasm for food crops on which the world's population depends for its survival. Since the early 1960s when the first breeding experiments were conducted to develop miracle varieties of rice, wheat, and corn, these international research centers have collected tens of thousands of plant genotypes from throughout the world. More than 100,000 varieties of wheat cultivars, 94,000 rice cultivars, and 12,000 corn cultivars now make up ex situ germ plasm collections. They

are used today by scientists to develop new varieties of grain crops resistant to pests and diseases and tolerant of a range of growing conditions.

In 1987 Congress mandated a Tropical Forest and Biodiversity Conservation Program. It aims at protecting biological resources through the sustainable management of forest, marine, and other wildlife habitats and seeks both environmental and economic benefits. Figure 3 indicates the growth in USAID funding for this program. Figure 4 breaks down funding by region for cumulative USAID support for biodiversity conservation from FY 1991 through FY 1994.

The Agency has allocated biodiversity conservation program funds among all regions where it conducts its assistance programs. The geographic dispersion has enabled USAID to support preservation of a broad spectrum of terrestrial and marine habitats holding a vast assortment of plant and animal species.

USAID programs have pursued a variety of approaches to biodiversity conservation. They range from information-generating research activities aimed at building basic knowledge about plant and animal populations and their ecologies to action-oriented interventions aimed at creating and managing new protected habitats or reducing threats to specific plant or animal species endangered by expanded human activity. Not included in the Agency's growing biodiversity conservation funding is support for ex situ conservation of plant genetic resources. That activity continues under the Agency's agriculture food and nutrition account.

3. A Framework for Formulating Strategies

Most of the activities examined here represent discrete projects implementing different strategies for the conservation of biological resources contained in specific parks and protected areas. Projects in Madagascar, Nepal, and Thailand implemented integrated conservation and development strategies aimed at halting encroachment by communities bordering protected areas. Projects in Costa Rica, Jamaica, and Sri Lanka worked with government agencies and NGOs to create and operate new protected areas.

More recently, USAID has initiated several programmatic responses to biodiversity conservation needs. They include steps to create a policy environment more conducive to conservation of biological resources in broader land-use contexts of which protected areas are one component.

This assessment looks at how selected USAID projects have helped participating countries set aside, protect, and manage natural forest and marine habitats for in situ conservation of biological resources. The social change model that emerges from observing these programs suggests that USAID and other donors can help reduce the loss of biological diversity by support for

Creating officially designated protected areas. This includes setting aside and demarcating terrestrial and marine habitats for the conservation of biological resources, securing title and access to protected areas, and planning protected-area systems.

Improving protection and management of protected-area resources. Activities include developing management plans, improving operations where habitats serve as parks, monitoring ecological conditions, assisting in natural regeneration of degraded habitats, and generating revenues to finance protected-area management.

Integrating development and conservation activities in areas surrounding protected habitats. This involves organizing local communities to promote environmental awareness and introducing new income-producing activities as alternatives to encroaching on protected habitats to hunt, log, and farm.

Reforming national policies that affect biodiversity conservation. This means improving public and policymaker understanding of the value of critical habitats and their biological resources, orchestrating partnerships between government and nongovernment conservation groups, and introducing economic and financial incentives or legal reforms to discourage destructive activities.

The analytical approach used for assessing these interventions is laid out in appendix A. It assumes these USAID-supported interventions will create conditions that (1) foster more responsible practices by those who currently abuse biological resources in critical habitats and (2) ease the work of those responsible for protecting and managing conservation areas. In turn, these practices will stem the loss of biological resources and improve the long-term socioeconomic welfare of current and future generations.

The assessment identifies evidence linking interventions supported by USAID with changes in the practices and biophysical and socioeconomic conditions in and around protected habitats where biological resources are threatened. Table 4 summarizes the specific activities under each intervention USAID has supported.

If there is a clear need to conserve biologically rich areas in a particular country, and the institutional and political environments are relatively favorable to donor support, what steps should be taken next? CDIE findings suggest a decision framework like the one presented in figure 5 to identify recommended development assistance strategies for in situ biodiversity conservation in protected areas. The decision framework consists of four branches, none of which should be neglected in formulating programs. Questions leading to the strategies are the following:

Have sufficient areas been set aside for biodiversity conservation? This question was raised in all of the country case studies and is reflected on a global scale by the dramatic

increase in parks and protected areas. The rapid conversion of land and degradation of habitats in many countries implies that creation and demarcation of protected areas may be an essential immediate step. Although parks should never be the only biodiversity conservation strategy, in most countries they have a vital role in the protection of key species and ecosystems.

Are existing protected areas well managed? Those case study countries that addressed this question tended to focus on the operational features of biodiversity conservation for example, equipping rangers to patrol and building up infrastructure for tourists. USAID has given less support to inventorying species populations, monitoring habitat conditions, and developing both the management plans and capacity for the protected-area management.

Are there external threats to habitat survival? All USAID programs recognize that in situ conservation of biological diversity poses constraints on human settlements bordering protected areas. At the very least, protected land or marine areas impose limits on many income-producing activities. Education and awareness campaigns have been the most popular tools to reduce external encroachment into newly demarcated protected areas. Where population pressures are not great, posting park signs and notices has been effective. Where greater pressures exist, some programs have emphasized alternative livelihood measures, whereas others have looked to protected areas as new sources of income and employment.

Do national policies encourage biodiversity conservation? USAID biodiversity programs have limited their efforts to policy reforms that are directly related to them. The most frequently promoted reforms have been for generating revenues and engaging local participation in protected-area management. The absence of efforts at reforming pricing and market policies (such as agricultural and export subsidies) that promote habitat conversion to unsustainable uses has rarely been addressed. Project-level activities may be thwarted in the absence of reform of economic distortions that work against efforts in biodiversity conservation.

The decision questions have no hierarchical order. A user of the strategy framework should address each question in formulating a program. If the answers to either the first, second, or fourth questions are no or to the third question is yes, then the boxes to the right indicate the appropriate mix of strategies and specific activities to remedy deficiencies.

4. Creating Protected Areas

Setting aside land and marine areas as natural habitats for conservation of biological diversity involves three basic steps:

Designating the areas to be protected

Securing stewardship authority over resources within the areas

Planning and regulating economic activity in and around the areas

Designating Official Protected Areas

USAID biodiversity programs in Costa Rica, Jamaica, and Sri Lanka have included support for creating and demarcating officially protected habitats and parks. Only rarely has USAID provided funds for purchase of land from owners or compensation to users. Instead, the Agency has funded training, equipment, technical assistance, and facilities construction to leverage commitments from recipient governments to set aside protected areas.

In Sri Lanka a comprehensive assessment of the Mahaweli irrigation scheme's potential adverse effect on wildlife habitats led to USAID's Mahaweli environmental project and designation of 225,000 square kilometers of newly protected habitat, about one third of the national total. The seven new protected areas make up nearly 45 percent of the lower Mahaweli basin. USAID funding for early technical studies and later support for park infrastructure development and ranger training was sufficient to secure a major increase in land designated as officially protected habitat. USAID secured similar commitments in Madagascar and Jamaica.

Several of the countries studied have set aside for biodiversity protection a portion of their territories that exceeds the world average of 4.8 percent and even that of most developed countries (7.2 percent). They are Costa Rica (12 percent), Sri Lanka (12 percent), Thailand (10 percent), and Nepal (9 percent). Madagascar and Jamaica lag, both setting aside 3 percent by 1992.

Two of the countries have set ambitious targets for the land area they hope eventually to incorporate into protected-areas systems. Costa Rica aims at establishing 25 percent of its total land for protected habitats and an additional 15 percent for commercially managed forests. Thailand hopes to restore forest cover to up to 40 percent of its land area and assign about half that area to protected wildlife habitats and watersheds.

Securing Stewardship Authority Over Protected Habitats

Land acquisition must be handled carefully to avoid future problems that will dilute conservation efforts. Such problems have occurred in areas of Latin America where those who clear land can claim title to it. Failure to give prompt compensation for lands later demarcated within protected areas has led to legal obstacles and social hostility that are slowing progress in consolidating habitat areas. In Costa Rica, landowners in newly designated parks have simply continued to log or farm under protection of law.

Problems in mapping and in title verification of landholdings within Costa Rica's central cordillera regional parks and along park borders have also slowed acquisition of private lands. At

the time of the assessment 26 percent (17,657 hectares) of the land in USAID-supported parks was privately held, not yet purchased and incorporated into park boundaries. Landowners bordering the park fear they might wake up one day and find their lands also demarcated within an expanded protected-habitat area. This concern in some areas has caused landowners to accelerate deforestation in an effort to get as much income from the land and to reduce it to farmland before such an eventuality might occur. Boundary demarcation and land-tenure inventorying have progressed with USAID support, but there remains considerable room for improvement.

In Asia, where settlers are less likely to have legal claims to forest lands that are generally reserved as public domain, assistance in resettlement is vital to avoid future encroachment by those displaced. When Sinhalese and Tamil settlers and long-resident Vedda ethnic-group members were displaced from Sri Lanka's newly formed Madura Oya Park, some continued to farm on the edges of the park and encroach across its borders to hunt. They lacked alternative livelihoods.

USAID programs have indirectly helped developing-country governments compensate people whose lands have ended up inside newly created habitats. The Sri Lankan government gave priority and material support to most of the 1,500 families resettled outside Madura Oya Park. Those given irrigated rice lands in the USAID-supported Mahaweli irrigation system quickly settled into new lives no longer dependent on park resources.

Planning and Regulating Land Use

Protected habitats often are islands in a sea of other land uses, particularly cropland, pastureland, and timberland. Building on linkages among habitats and between habitats and adjacent lands through biological corridors, private reserves, and natural and artificial forests can increase the likelihood that ecosystems will evolve naturally and survive. For example, biological corridors in Sri Lanka and buffer zones in Costa Rica allow for movement of migratory wildlife. Biological corridors make sense for the animals particularly when mammals, birds, and insects have established migration routes and they make sense for people by limiting crop and livestock losses and human injuries that arise when wildlife have nowhere to go but through farms and fields.

The use to which lands adjacent to protected areas are put also influences the health of the habitat (see box 2). Farmers, for example, protect their crops with chemical pesticides that seep into local groundwater and then enter food chains on which wildlife depends. In Madagascar fires set to clear crop stubble and weeds have blazed out of control and led to forest fires in the Andohahela Nature Reserve. In Thailand emerging commercial ventures such as golf courses, resorts, and tourist facilities may contribute solid and liquid wastes that can affect the quality of protected habitats.

USAID-sponsored activities have highlighted the importance of planning and regulating uses of these buffer areas. But in cases reviewed by CDIE, the Agency has actively supported integrating parks with the regional landscape only in Costa Rica. That country has reorganized its conservation system into nine regional protected areas that link protected lands with the lands around them (Umaña and Brandon 1992) (see box 3). USAID has assisted in less formal approaches to integrating parks and surrounding areas in Madagascar where planning skills and capacity are more limited.

CDIE focused on Costa Rica's volcanic central cordillera region, where USAID is supporting use of geographic information system baseline maps of roads, streams, population distribution, general vegetation types, physical features, land-use hydrology, and agrarian/resettlement areas. From the data, the government has been able to undertake integrated land-use planning and management employing maps of proposed biological corridors and critical management zones. However, Costa Rica is the exception in its advanced use of integrated land-use planning for biodiversity conservation.

Sri Lanka has largely ignored the regional potential for change. In the Mahaweli system, though, other USAID projects did support some local-level technical changes. These included introduction of (1) conservation farming practices as alternatives to slash-and-burn methods, (2) integrated pest management to reduce toxic-chemical buildup in areas near parks, and (3) fast-growing tree varieties as sources of fuelwood.

Ideally, the Mahaweli environmental project would be on the cutting edge of land-use planning because it was developed as part of a massive, well-funded regional development and irrigation program. Yet planning for biodiversity has been poorly integrated into the regional development agenda. Without corridors to interconnect large tracts of land with nearby protected areas and provide a full spectrum of habitat types of adequate size, habitat requirements of many wildlife species will not be met.

In Madagascar an integrated land-use approach could help ensure that resources are better used. This may include regulating uses of buffer zone land or expanding protection to areas where intensive farming, grazing, or forestry is inappropriate. The existing system of protected areas is insufficient for widespread biodiversity protection, and even if it is successful, many important areas of prime habitat will be lost. While protection of small areas is likely to be more successful in Madagascar owing to high levels of endemism and the small range needed to maintain many of the species, successful biodiversity conservation will require effective management of lands outside of parks. USAID's use of national environmental action plans in its Africa country programs is a promising approach to better land-use management.

An interesting effect that USAID biodiversity programs have had

on land-use planning is represented by Jamaica's experience in creating a first-ever national parks and protected-areas system for the country. Once the first two pilot parks were up and running under the new protected-areas system, Jamaica's environmental movement began to note how extensive was damage inside the parks because of economic activities outside them. The Natural Resources Conservation Authority was able to single out poor land-use planning and ineffective enforcement of existing land-use plans around Montego Bay Marine Park as a major cause of pollution that was destroying marine ecosystems. Similarly, demarcation of Blue and John Crow Mountains National Park has generated public concern and government action over the effects of poor land-use practices from mining, logging, and farming in and around the park.

Parks and protected areas, as Jamaica's recent experience demonstrates, can serve as useful instruments for assessing the ecological impact of planned and unplanned land use. By tracking the health of parks and protected areas and of the plant and animal populations within them, planners can monitor the environmental impact of changing land-use patterns and introduce measures early enough to halt practices that threaten biological resources.

5. Managing Protected Areas

Developing-country efforts to set aside officially protected habitats often have resulted in little more than creating paper parks based on legislative or executive decrees, lines drawn on maps, and NO TRESPASSING signs tacked to trees. The problem has been a lack of financial and human resources allocated to park protection and management. USAID has supported improved protected-area management through the following activities:

- Developing management plans
- Improving park and protected-areas operations
- Monitoring wildlife populations and ecological conditions
- Assisting natural regeneration of degraded habitats
- Building financial solvency

Developing Management Plans

Management plans define what activities infrastructure development and maintenance, patrolling and protection, ecosystem monitoring and research, staff recruitment and training, visitor education and services are needed, to what degree, and at what resource cost. They are also the basis for establishing what protection and use measures are appropriate for different ecological conditions within protected areas.

In the country programs evaluated, USAID projects have largely neglected activities aimed at developing sound and systematic plans for the management of protected habitats. Rather, the Agency has pursued a series of ad hoc initiatives without any explicit long-term objectives. In only two of the six countries

(Nepal and Jamaica) was there evidence of an easily accessible management plan to guide decisions appropriate to biodiversity conservation.

Lack of management plans means that it is difficult to determine appropriate protected habitat use. For example, Thailand's Khao Yai National Park, a fragile habitat for the Asian elephant, has not only hosted researchers, students, and nature tourists; it has also served as a site for motorcycle rallies and as a stage for Chinese Western movies and for Woodstock-style events to promote the environment. Such activities may be compatible with a protected area whose primary mission is recreation, but they clearly conflict with one that has a primary mission of conserving biodiversity.

Improving Park and Protected-Areas Operations

Developing countries manage most of their protected habitats as national parks hosting visitors for recreational, educational, and research purposes. The dual use of habitats for conservation and for hosting visitors provides an opportunity to generate revenues for developing-country governments. It also enhances public awareness of the value of habitats and their wildlife. USAID has helped countries operate parks for dual use by funding construction of infrastructure for park staff and visitors and by training and equipping staff to serve visitors and patrol against misuse.

In Sri Lanka, USAID funded construction of more than 50 structures (90,000 square feet) for park rangers and visitors in the four national parks and related wildlife areas of the Mahaweli irrigation system. The Agency also supported road construction and upgrading. The project did little to meet the need for vehicles and communications equipment to allow park staffs to move around and do their jobs. Several of the rangers did not even have bicycles to transport them over their extensive patrol areas.

Training for park staff was part of the USAID projects in Jamaica, Madagascar, Nepal, and Sri Lanka. Field staff in Madagascar have received technical and communications training inadequate for them to carry out their extension role. Training in Jamaica and Nepal has been effective and well integrated into the overall park management process. In both countries it has led to development of professional cadres of park and wildlife service staff. In Sri Lanka the USAID-supported Giritale Training Center has provided limited staff training.

In all countries the capacity of park staffs in environmental education activities is limited. Private sector tour operators provide these services in Nepal and Costa Rica, where visitation is high.

As a rule the projects gave little attention to developing effective enforcement in protected-area management. The exception is in Madagascar, where nature protection agents are hired from

local communities with the dual role of educating and patrolling.

This can be contrasted with the extreme approach taken in Royal Chitwan National Park, where until recently the Nepalese army had primary responsibility for park protection. Progressive local enforcement measures such as those initiated in Madagascar need to be combined with improved management to ensure improved habitat protection and management.

Nepal is one country where USAID has dedicated long-term funding toward linking biological research to development of species and park management plans. USAID funding has supported baseline data collection that has greatly enhanced Nepal's conservation of endangered species, especially the tiger, crocodile, sloth bear, and rhinoceros.

In 1973 USAID support for the Tiger Ecology project helped increase knowledge of the ecology of the tiger and its prey. In 1984 the USAID-supported Smithsonian Nepal Terai Ecology project began examining ecological relationships between habitats, invertebrates, vertebrates, and humans. Research on rhinos and the threat to them from epidemics and poaching within Royal Chitwan National Park established a sound scientific basis for moving the animals to secure areas.

This species-based information has provided the necessary scientific guidance for planning park management that addresses the requirements for the species, the ecosystem as a whole, and the human and financial resources needed to ensure their survival.

Monitoring Wildlife Populations and Ecological Conditions

Basic biological inventorying and monitoring systems were absent in all projects but Nepal and Jamaica. In Nepal, USAID has helped establish a viable research support capacity in the Chitwan area.

Research supporting wildlife monitoring has become replicable elsewhere in the country as part of the emerging park model that Chitwan represents. In Jamaica, USAID has helped a U.S. environmental NGO introduce rapid ecological assessments for the country's new national protected-areas system and pilot national parks.

Assisting Natural Regeneration

Many habitats set aside for biodiversity conservation have been degraded and their wildlife populations decimated by earlier human occupation. Some forested areas have been cleared and farmed. Some native wildlife species have been hunted out and depleted. Pollution has destroyed many coral reefs. Exotic species of plants and animals have been introduced by earlier human occupation; some have remained and thrived, outcompeting native species and disturbing the feeding and nesting needs of wildlife.

The Monteverde Cloud Forest Reserve in Costa Rica demonstrates how effective habitat and wildlife restoration programs can be in returning pastureland to rain forest. Modest USAID grants have helped this process along in Costa Rica. Projects in other countries studied generally ignored such activities. Only in Sri Lanka, where USAID made investments in chain-link fences and wild-elephant roundups, did the evaluation find any other attempts at wildlife management.

Building Financial Solvency

The sizable tracts of real estate set aside as habitats for the conservation of biological diversity require substantial amounts of money to manage and protect. Newly created areas often require major investments, if not to purchase title to any land in private hands, then often to build roads and facilities for staff and visitors. Even well-established protected habitats and parks have recurring costs of maintenance and operation.

In none of the evaluation study countries did governments feel they had sufficient funds to manage and protect their biological resources adequately. National park systems were uniformly understaffed, ill equipped, and poorly funded. Given the broad financial demands from health, education, and other social program areas, it is unlikely there will be a significant increase in public funds for protecting and managing the growing areas set aside for biodiversity conservation.

USAID has worked to identify and capture other funding sources for habitat management and protection. Specifically, the Agency has supported two types of activities to build greater financial solvency for the management and protection of biological habitats. They are (1) revenues from entrance and commission fees and (2) formation of endowments and trusts.

Revenues from entrance and commission fees. Traditionally, any funds generated from park entrance fees and sales commissions have gone directly into national treasuries where they have been reallocated in annual budget cycles. With USAID support, Nepal and Costa Rica are experimenting with retaining a share of park entrance fee revenues for use in covering annual operating expenses. Both countries have initiated reforms within the context of USAID projects to ensure that some tourism dollars remain in the parks. The projects are paying off. In Costa Rica, for example, dependency on external donors for overall park budget dropped during 1992-94 from 61 percent to 52 percent; for operating costs dependency decreased from 27 percent to 11 percent.

Revenues from visitor fees start to flow only after a park has been set up to provide for needed amenities and the park has been discovered by enough people to make it an attractive tourist destination. No mechanisms have been set up in Thailand or Sri Lanka to fund long-term maintenance of parks. Although USAID projects are attempting to make some aspects of biodiversity conservation self-financing through such things as user fees and

biodiversity prospecting, these mechanisms will not provide the financial requirements for the majority of parks worldwide.

Revenues from endowments and trusts. In Costa Rica, Jamaica, Madagascar, and Sri Lanka, USAID has helped set up trust funds to provide long-term financing for biodiversity conservation. In Costa Rica, USAID has helped the government set up a \$10 million equivalent local currency endowment to support NGO activities in and around the central cordillera region's national parks. The fund will be managed independently of the environmental NGO whose operations it will finance. This separation will leave the NGO free to concentrate on its biodiversity responsibilities and not be distracted by the burden of financial management.

In Madagascar, USAID eased the first debt-for-nature swap in Africa through a \$1 million grant to the World Wildlife Fund. The loan repurchase reduced Madagascar's foreign debt burden by \$2.1 million. An additional debt swap for approximately \$1.9 million is being put into place. Accrued interest now supports most program activities, and this financial sustainability has enhanced institutional commitment.

In Sri Lanka, USAID funded the creation of the Wildlife Trust in 1991 with an initial \$500,000 contribution. In Jamaica a \$300,000 debt-for-nature swap launched an endowment fund operated by a local environmental NGO. The organization has succeeded in attracting further private sector corporate donations to add reserves from which it will meet operating expenses.

6. Integrating Conservation and Development

Integrated conservation and development programs (ICDPs) support special activities that address the needs of nearby communities by combining biodiversity conservation with social and economic development. ICDPs are based on the premise that protected-area management must reach beyond traditional conservation activities inside protected-area boundaries to address the needs of local communities outside. ICDPs achieve their conservation goals by promoting development and providing local people alternative income sources that do not threaten parks or their resources (Wells and Brandon 1992).

ICDP activities supported by USAID include:

Organizing communities to foster environmental conservation

Conducting conservation awareness and education activities to raise local environmental understanding

Introducing new income-producing activities as alternatives to habitat encroachment

Organizing Community Groups

Community conservation and development activities require management-intensive mobilization of local organizations, the private sector, and public agencies. Local participation and support are critical for involving communities in areas where forest habitat encroachment is a problem. Benefits of a participatory approach include (1) increased project effectiveness; (2) increased capacity of stakeholders to take responsibility for project activities; (3) greater cost sharing through local contributions of land, money, or labor; and (4) greater commitment of stakeholders to achieving project goals (Wells and Brandon 1992).

USAID has depended heavily on international NGOs to organize local community groups for ICDP activities. In the process, the Agency has helped create and strengthen indigenous NGOs. The Agency's greatest success with local organizations has come from supporting an NGO's work in Thailand. There, 3 years after USAID funding ended, moderately sized village groups are operating with ongoing support and direction from an environmental NGO. These local village institutions are not yet autonomous, but a strong linkage between the NGO and local groups has endured.

Of 10 village organizations started by the project, activities continue in 7 villages at a relatively high level with membership (nominal and active) at or above one third of village households. The project also helped draw government agencies and private businesses into project villages.

One lesson that emerged is that external support must be sustained over a period of at least 5 and often up to 10 years. The process of building community participation must eventually obtain the support of a range of government agencies and nongovernmental organizations to achieve sufficient momentum for spread and sustainability.

USAID's biodiversity program in Madagascar has initiated a strategy for involving PVOs and national-level NGOs in protected-area management. The strategy supports (1) direct grants to PVOs, (2) funding for both large comprehensive grants and smaller more focused grants, (3) teaming relationships between principal operators and other NGO partners in ICDPs, and (4) institutional support to encourage networking among local environmental NGOs. Creating and strengthening national-level NGOs has limited success at the field level, in part because there are few formal mechanisms for local participation or working with local associations.

USAID support in Nepal has been one significant factor in supporting the shift to a people-oriented approach in national park management. Successive amendments to the National Parks and Wildlife Conservation Act demonstrate a steady increase in sophistication regarding local people's resource needs and the role of parks in supplying them. An umbrella grant to a PVO has served to strengthen smaller NGOs in the Chitwan area.

The USAID program in Costa Rica's central cordillera conservation

region lacks a formal policy for institutional strengthening of grass-roots organizations or local participation. Moreover, there is no strategy to involve local environmental education organizations in the region, or for coordinating with research institutions on protected-area management. This can be contrasted with USAID-funded projects in Costa Rica's Osa Peninsula protected area. It promotes natural resource management through local NGOs or community associations in forestry, agriculture, and nature tourism.

Conducting Conservation Awareness and Education Activities

Conservation begins with awareness awareness, first, of what needs to be protected; second, what benefits come from its protection; and finally, how it needs to be protected. USAID has channeled resources to raising conservation awareness and education through a variety of agents including NGOs, teachers, village-level extension workers, and information devices for tourists.

In Thailand, environmental awareness messages were found to be effective at increasing knowledge and changing attitudes even in rural areas with low literacy and income levels. During the 3-year period of USAID grant funding, staff members of the Environmental Awareness Mobilization project organized environmental fairs; speeches by park officials; talks by project staff, teachers, and monks; and education programs for schoolchildren in villages around Khao Yai National Park. Project staff also developed an extensive inventory of training materials films, posters, videos, information bulletins used by numerous environmental NGOs and the news media both inside and outside Thailand. Indicators of environmental awareness in villages around Khao Yai ran upwards of 95 percent after the second year of project activities.

A village-level approach in Madagascar's Andohahela project has yielded mixed results. It has worked best when there was planning, coordination, and oversight by the government and responsible NGOs. The project depends on motivation of individual teachers, project staff, and village nature protection agents. Informally, agents increase environmental awareness through their daily contact with villagers. Formal project mechanisms have supported teacher training and activities in primary schools and village-based project personnel whose main duties involve awareness raising.

In Nepal, USAID-supported Environmental Camps for Conservation Awareness have reached youths at 13 sites in eight districts. Pilot initiatives show that this type of awareness strategy is highly effective and could be replicated. USAID funding allowed the Nepal Conservation Research and Training Institute to expand its research role to include education, awareness, and outreach activities.

In Sri Lanka the Wildlife Trust set up with USAID funds was to provide continued funding for a number of activities. They were

to include facility renovations, public school awareness programs, an urban-based environmental lecture series, and operation of a staff training center. Administrative and operational problems have impeded conservation awareness work, however, and there has been no coordination with environmental NGOs.

Introducing Alternative Livelihood Activities

The principal assumption of alternative livelihood interventions is that integrating economic development with park conservation will give local people a stake in the protection effort and help them become active stewards of the protected area. Enhancing local incomes is often the most significant development component of projects. This intervention is often intertwined with village-level approaches to introduce new, more appropriate technologies that will stabilize or improve land uses adjacent to parks.

When possible, productive strategies should be linked to larger regional or national initiatives. It is also important to link productive activities to conservation via education. Calling attention to the role of forests in keeping watersheds intact, for example, may help gain farmer support. Absence of such explicit linkages often results in failure to produce desired conservation outcomes (Brandon and Wells 1992).

In this regard, conservation NGOs inexperienced with development work but with a strong sense of urgency to do something often produce ineffective technical interventions. Interventions carried out without adequate sociological or technical preparation result in misunderstandings on the part of villagers and frustration all around.

USAID-sponsored activities in Thailand and Madagascar emphasized increasing local livelihood. In Madagascar, Andohahela project activities designed to stabilize land uses (as with reforestation) were complemented by activities such as small livestock production, market gardening, and chicken raising to transform rural incomes and provide alternatives to destructive practices.

These activities, however, have been hampered by poor prior identification of technical, marketing, or social issues. In a Malagasy poultry project, for example, villagers had unanswered technical questions about chicken raising, did not know to whom the chickens belonged, and were unclear about the potential market for eggs. Even if such issues are worked out, clear and direct linkages between the alternative livelihood and park conservation are needed if this strategy is to stop long-term encroachment.

In Thailand the Environmental Awareness Mobilization project has made technical assistance and support for improved farming methods as well as new household livelihood activities the centerpiece of its activities. It has also established a supervised loan fund to finance these activities and provide new

credit sources as an alternative to traditional money lenders. Program participation rates range from 60 to 90 percent among the 1,100 households in the target villages.

Ten rural communities around the perimeter of Khao Yai National Park have established conservation and development action groups aimed at increasing environmental awareness. New rural farm credit and income-generating activities cattle fattening, tree-crop production, community forestry have been adopted by more than 300 local households in project villages. Participants have replaced illegal hunting and tree harvesting with more profitable and stable sources of livelihood from farm-based activities and using formal rather than high-cost informal credit sources. These new livelihood activities have enhanced living conditions and given households more economic self-reliance.

However, the need to integrate livelihood strategies into regional initiatives is demonstrated by high rates of natural population growth and in-migration. At issue is whether new income-earning activities can be generated fast enough to employ the growing population. If not, a new generation of potential forest encroachers is likely to emerge.

In Nepal, community development and alternative livelihood activities have been initiated, but adoption rates remain insufficient to have a major effect. Household biogas technology was introduced around Royal Chitwan National Park to decrease pressure on the forests for fuelwood, but adoption has been limited. Six forest plantations totaling 172 hectares have been established with support from USAID and other donor agencies. Opening the park to limited grass harvesting has provided local people with tangible economic benefits the value of the grass as a usable or salable commodity and the equivalent of some 2,000 work-years of employment annually.

At the same time, however, uncontrolled tourism in forests surrounding Chitwan park has led to heavy fuelwood use and forest clearing for construction. Grass cutting for cooking and discharge of latrine and toilet wastes directly into local rivers have degraded the environment as well. No formal plan exists to identify and stabilize effects from tourism in communities surrounding Chitwan.

The most successful form of long-term livelihood may be that of Madagascar's nature protection agents, hired through local funds generated from a debt-for-nature swap. A total of 380 agents (more have been hired by tour operators) have been recruited and trained for both regulatory and awareness-raising activities among village populations. Nature protection agents are recruited either from the region or from the actual villages for which they are responsible. There is an important and direct economic benefit to the village of one or more salaried workers who receive pay regularly.

Tourism has served as another force to link villagers to parks. In Thailand and Jamaica, project villagers have trained to be

park tour guides as new sources of employment. In Costa Rica, USAID helped arrange for local communities to benefit from access to contracts for park maintenance, improvements, and food and craft concessions.

Tourism around Nepal's Royal Chitwan National Park has had a generally positive influence on employment. About 1,000 people have gained direct employment in tourist centers. Five hundred more are employed as guides, laborers, native dancers, restaurant employees, and shopkeepers. Seven concessions within the park employ 635 local residents.

The evidence does not indicate that alternative occupations such as tour guides and concession operators will generate jobs for more than a small share of households around protected areas. However, these few new stakeholders in habitat survival become invaluable allies in park protection. This experience suggests that motivation of local stakeholders is an important element in the design of programs that include park-based alternative livelihood activities.

7. Reforming National Policies

While the activities of local people often represent the most obvious threats to parks, many underlying reasons for high rates of biodiversity loss are ultimately attributable to factors far removed from park boundaries. For example, inequitable land distribution and poor land utilization may push people into frontier areas. Nationalization of forests or lack of clear tree ownership or fishing rights often undermine participation in conservation measures such as plantations, nurseries, and community woodlots (Brandon 1994).

Alternatively, economic incentives may reward destructive and illegal activities within parks or on other protected lands, particularly in regions where alternative sources have already been depleted. Unemployment, large rural migrations, rapid shifts in income distribution, changes in prices of land or agricultural products all have the potential to affect biodiversity conservation.

The most important ingredient for modifying a policy environment to achieve successful conservation is political commitment. Legislative and jurisdictional reform within countries is often needed to correct perverse policies. Such reforms can come about only through political will. Therefore, it is important to verify with governments that an expressed interest in conservation is supported by a willingness to undertake legislative policy and institutional reform.

The major national-level interventions that USAID has supported to foster biodiversity conservation are:

Improving administrative procedures for biodiversity conservation

Reforming policies to provide incentives for biodiversity conservation

Promoting partnerships, coordination, and advocacy among public and private sector institutions

Improving Administrative Procedures

National park and wildlife conservation agencies and offices responsible for directing protected-area operations tend to lack political influence, financial resources, and well-trained personnel. Consequently, they are often relatively ineffective. Their capacity is further eroded by the unclear jurisdictional control over their role, inadequate legal powers, and lack of political influence. Government agencies often have overlapping or unclear jurisdictions over parks, wildlife, forests, and other natural resources. Such overlap complicates management of biodiversity conservation.

Lack of regional coordination and conflicting uses can be particularly complicated over lands outside of park boundaries. These can be especially problematic when other government agencies with sectoral interests (such as the ministries of forestry, tourism, agriculture, or transportation) want to undertake such activities as logging or road-building in areas adjacent to parks. Realignment of agencies and their activities is often needed to clear up jurisdictional conflicts among government agencies with competing portfolios. USAID has sponsored the creation of new management institutions in Nepal, Costa Rica, and Madagascar.

In Nepal, USAID support helped create a Department of National Parks and Wildlife Conservation to combine parks and wildlife management into one portfolio. It reduced bureaucratic procedures to encourage autonomy and more direct access to international funding. USAID also sponsored training of senior staff members as a way of increasing their knowledge of social sciences, communication skills, and community forestry.

In Costa Rica, creation of the regional protected-area system gave USAID an opportunity to support a regional approach to biodiversity conservation within the central cordillera volcanic conservation area. USAID used technical and financial assistance to help create an independent nongovernmental organization that helps direct and coordinate activities within the protected area.

The regional NGO has essentially acted as an extension of the Costa Rican Government in conducting monitoring, planning, and management.

In Madagascar and Jamaica, USAID helped create protected-areas management structures that also include significant roles for NGOs. Responsibility for park management is still evolving in both countries. In Madagascar the government's National Office for the Environment is expected to integrate environmental concerns into national development policies and programs by

working with the sectoral ministries, which retain implementation responsibilities. At the time of the CDIE assessment, an institutional home for the National Office for the Environment had not been established, and relationships to existing institutions such as the Department of Water and Forests remained unclear. USAID has played a central role in creating the National Association for the Management of Protected Areas, an NGO that has assumed day-to-day management of the country's protected-areas program from an understaffed and inefficient government bureaucracy. Management for individual protected areas was further devolved to operators U.S. environmental NGOs and university research institutions.

Development of the Madagascar model has been largely donor driven and has taken place with only modest political support from the government. Rather than integrating support for conservation within the national government, support and responsibility have been turned over to fledgling national institutions and international organizations. As yet it is unclear whether devolving authority and personnel from the government to an NGO is a better strategy than strengthening such agencies.

Jamaica's Natural Resources Conservation Authority oversees all national environmental functions, including a national parks system. With neither the staff nor the budget to run the two pilot parks that USAID helped establish, the body engaged a national environmental NGO, the Jamaica Conservation and Development Trust, to assist in park management and pay a share of operating costs. The trust draws its funds from an endowment capitalized from a USAID-sponsored debt-for-nature swap to pay ranger salaries and park operating expenses.

So far, this government NGO partnership has been effective in extending public reach in operating the two new pilot parks. However, striking the appropriate balance between the NGO activities and the public sector management responsibility is tricky. Tensions can arise when NGO expertise and resources surpass those of national governments.

Reforming Policy

Economic policy reform is often a prerequisite to the success of field-based initiatives and institutional arrangements needed to improve biodiversity conservation. Sound economic policy appears to be consistent with sound ecological policy. For example, appropriate price and tax policies in granting forest concessions or for fuelwood has been shown to reduce destructive deforestation substantially (Binswanger 1989, Mahar 1989).

USAID's recent application of valuation techniques to assess the range of costs and benefits of environmental services, such as those shown in table 5, has allowed policymakers to better link habitat protection with national economic growth. Other tools, such as green national accounting, link resource issues to national accounting systems. Green accounting systems support the sectoral analysis needed to better value and allocate rural

resources. They can therefore contribute substantially to changing the perceived value of areas such as forests (which were once regarded by policymakers as valueless) and provide an economic justification for biodiversity conservation. USAID had not linked the use of these economic tools with any of the biodiversity efforts under way in the six county case studies.

National environmental action plans have increased officials' attention to identifying policy changes needed for sound biodiversity conservation. USAID provided support to the World Conservation Union to prepare and begin implementation of Nepal's National Conservation Strategy. The strategy identified gaps in the protected-area systems and the need to undertake comprehensive planning for protected areas and to integrate them with surrounding areas. The strategy has since been picked up by Nepal's National Planning Commission. Nepal's national conservation strategy is also reflected in the master plan for the forestry sector program for genetic conservation (1988).

USAID supported the crafting of additional legislation in 1993 to establish a new category of protected area in Nepal, the buffer zone area. This 1993 Buffer Zone Management Amendment authorizes user group committees to manage and use resources found in those protected-area environs designated as buffer zones. The amendment also provides for sharing 30 to 50 percent of park revenue with local people. This revenue-sharing arrangement is designed to promote community support for conservation and community-based management of resources.

In Costa Rica, USAID has supported passage of legislation that grants the Parks Service use of a share of funds collected from visitors. This new revenue management system will enable the parks system to retain and use 75 percent of the revenues generated from entrance fees and concession licenses and contracts.

In Madagascar the major policy change supported by USAID was the shift of protected-area management coordination from the government to an NGO. As discussed earlier, it is unclear if such a shift will create support among government leadership that will be necessary for conservation. Other policy support has gone toward liberalizing the national airline's monopoly on flights into the country to expand the influx of nature tourists.

Promoting Coordination, Partnerships, and Advocacy

USAID experience suggests there are three determinants to elevating biodiversity conservation among the competing demands placed on governments. The first is effective coordination among public and private sector groups involved with biodiversity conservation and among politically important government agencies. The second is close partnerships between local, national, and international NGOs and between the private sector, NGOs, and government. The third is strong advocacy for conservation and park protection within the government, among the general public and educated urban elites, and among local populations living

adjacent to parks.

Except for Nepal, USAID has not had any strategy to promote all three determinants in any of the projects evaluated. In Nepal, USAID support has strengthened both the parks department and NGOs, creating an active constituency for conservation both within and outside the Nepalese Government. The Agency also sponsored partnerships between international NGOs and local affiliates. This has paid off in keeping strong support for conservation within the Nepalese Government while fostering experimentation with several approaches to protected-area management throughout the country.

In the other countries, USAID support for improved coordination, partnerships, and advocacy has been spotty and has yielded little. Next to Nepal, USAID's most comprehensive effort has been in Madagascar. Through a centrally funded four-country project, USAID has also supported the Malagasy Committee for Development and the Environment, a consortium of Malagasy NGOs. The committee's mission is threefold: (1) to assist in the exchange of information among its members, (2) to serve as a voice for the NGO community, and (3) to help strengthen member NGOs through training and other means. This organization is not yet financially sustainable and has only started achieving its objectives. The USAID strategy to promote partnerships has had only limited success. That is because most international groups are not working in equal partnership with national NGOs and are therefore not ensuring the continuity of operations in the long term.

USAID's role in Costa Rica has been much easier than in other countries. In Costa Rica strong support for conservation and institutional mechanisms to encourage partnerships between national and international NGOs and the government already existed. The major challenge is developing both public and private consensus or informed consent in planning and implementation.

In Thailand support to an environmental NGO has increased the level of public awareness and, in the private sector, advocacy for conservation. But the Thai Government, which has the resources to promote the spread of such activities, has involved itself in only a limited way. The lack of formation of partnerships or involvement of the Thai government is due in part to the lack of clear delineation of which government agency would have the responsibility for directing conservation programs. The major impediment to spread and replicability appears to be a shortage of organizational and political leadership. This demonstrates the need to strengthen and involve both governmental and nongovernmental sectors if investments are to be effective over the long term and have a broader impact.

In Sri Lanka, USAID support has heightened awareness and expanded institutional capacity. The government, however, has yet to organize, equip, and train itself to manage a viable forest habitat protection system or have any coordination among public agencies charged with addressing environmental concerns. Greater

coordination among government agencies, more active support from environmental NGOs, increased private sector and community-based resource management initiatives, and greater participation with the forest and wildlife management scientific community all these are needed before any mandate for biodiversity conservation in Sri Lanka will emerge.

8. Program Performance

This chapter summarizes CDIE findings on how well USAID-supported biodiversity interventions in the study countries have performed from three perspectives: impact, effectiveness, and sustainability.

(1) Impact of biodiversity programs examines (a) changes in land use and in biophysical conditions of the ecosystems set aside and protected for conservation of their biodiversity and (b) changes in the socioeconomic conditions or well-being of those living in or around protected habitats.

(2) Effectiveness assesses how well program activities have worked as measured by (a) who shares in their costs and benefits and (b) the degree to which they are likely to enhance protected-area management.

(3) Sustainability addresses whether USAID contributions have built the institutional capacity, financial base, and economic incentives that can ensure long-term survival of threatened ecosystems and their biological resources.

The programs reviewed by CDIE in Madagascar, Nepal, Sri Lanka, and Thailand represent USAID's earliest approaches to biodiversity conservation. Newer initiatives under way in these countries, (and in Costa Rica and Jamaica) have incorporated lessons learned from these and other earlier USAID experiences. Therefore, findings here that performance has been limited should not be taken to suggest that USAID has not posted progress with its biodiversity programs. Indeed, there is a learning process within the Agency that builds on each generation of biodiversity conservation initiatives and leads to more effective approaches that promise greater success.

Program Impact

Evaluation of program impact is limited by the lack of benchmark data collected at program outset and measurable goals toward which programs are targeted. Also, the Agency has yet to adopt clear, quantifiable indicators to measure accomplishments of biodiversity conservation programs. The evaluation has based its treatment of impact to two criteria: (1) likely conditions if USAID funding for biodiversity had been absent and (2) how well interventions contributed to protection, relative to what would be generally acceptable targets.

The majority of USAID activities reviewed by CDIE have not yet

borne fruit; the expectation of many biodiversity projects is that they will not demonstrate measurable results for 10 to 20 years. Projects in Costa Rica, Madagascar, Nepal, and Sri Lanka have laid the groundwork for future outcomes. Nearly all continue to receive ongoing support from USAID and other donors and are evolving in orientation and emphasis as new needs arise and lessons are learned and adopted.

Biophysical Impact

Land-use trends in Costa Rica and Thailand illustrate one of the biophysical impacts that USAID and other biodiversity programs can have. Figures 6 and 7 show that land area officially designated as protected habitats rose significantly from 1970 through 1990. This increase was accompanied by a discernible reduction in the rate of deforestation for the period.

In Sri Lanka it is unlikely that there would even be protected areas in the Mahaweli region in the absence of USAID support. Basic steps such as boundary demarcation, increased physical infrastructure, and mobilization of patrols were implemented. Some 225,000 hectares of land were protected in this way. Newly created protected areas have enabled some plant and animal species to survive Mahaweli irrigation and power system development, but habitat degradation and fragmentation continue to threaten with extinction the Asian elephant and other species endemic to the country.

USAID biodiversity programs have slowed destruction of habitats by human settlement, though encroachment does continue in some areas. Except in selected instances such as Costa Rica's Monteverde Cloud Forest Reserve (where USAID has provided only modest support) there has been almost no systematic follow-up to habitat protection with assisted natural regeneration programs in degraded areas. Still needed is regulation of land use in buffer zones and biological corridors outside protected habitats.

In Madagascar, boundary lines, clearings, and firebreaks around many protected areas are helping stabilize forestlands and wildlife populations. Links between development and conservation remain weak, however, in part because of the limited manpower and skills among Malagasy conservation agents charged with teaching modern farming skills. Farmers' cultivation, grazing, and gathering practices in and around protected areas have yet to change significantly.

In Nepal, amendments to the National Parks and Wildlife Conservation Act enable local communities to benefit from nonconsumptive access to park and buffer zone resources and from revenue sharing. Investments in biogas generation have introduced an alternative energy source, though the technology has yet to be widely adopted.

Socioeconomic Impact

USAID has also had an impact on the socioeconomic conditions of

those affected by its biodiversity programs. In Thailand, Nepal, and Jamaica, local community groups have emerged from USAID support for alternative livelihood activities in villages bordering protected areas. These have resulted in local employment that acts as an incentive for continuing group activities. In Madagascar villagers have been employed as nature protection agents directly responsible for habitat conservation. New farm enterprises have emerged from programs in Thailand and Nepal. In Jamaica, employment has come from expansion of tourism to the parks, which has generated demand for park guides and lodging.

Sometimes the socioeconomic outcomes are mixed. In Sri Lanka, for example, the effect on households resettled onto irrigated farms from newly demarcated areas has been positive, but farm units appear too small to support more than one generation through agricultural production. That threatens a return to habitat encroachment and destruction. Displaced tribal groups, however, have had little to fall back on but a small amount of government welfare and whatever revenues they could beg from tourists taking their pictures.

Program Effectiveness

The costs and benefits from environmental actions seldom accrue to the same groups. Biodiversity conservation efforts are no exception; their costs and benefits are distributed widely and unevenly at three levels (Wells 1992). The broadest level is global or transnational and affects all people regardless of where they reside. National or regional level costs and benefits are those that accrue to a particular country or region within a country. They extend beyond the boundaries of a protected area but not beyond the borders of a country. Finally, there is the local level, where the costs and benefits are concentrated adjacent to the protected area.

Early USAID involvement in most of the case study countries appears to have been based in large measure on the rationale that future transnational benefits of preventing loss of biological diversity were sufficient to warrant investments in conservation measures such as parks and protected areas. The evaluation did note that in some instances demarcating an area as something special and directing international attention and resources to it began to elevate local and national awareness of the hidden value of biological resources. In these cases, people changed their destructive behavior toward those areas. Demarcation also precipitated new nature-based economic activity, which generated tangible benefits. But the fact remains that early ventures into biodiversity conservation were driven more by the Agency's global concerns over the value of biological resources than by concern for more immediate local and national benefits.

Substantial costs from the creation of protected areas are likely to be imposed on local residents. These costs result from the residents' loss of access to land or marine areas for income-producing activities such as farming or fishing. Moreover,

land claims by individuals or groups have been ignored during the creation of official protected areas. In Jamaica and Sri Lanka resettlement was one option to eliminate human enclaves. In Costa Rica's central cordillera conservation area, where private citizens have claims to land, fair compensation for expropriation of land for parks has slowed the process of protected-area formation.

Through several of its projects USAID tried to increase the benefits from park protection and biodiversity conservation to residents at local levels. In Sri Lanka protected areas play an important role in protecting soil erosion in the Mahaweli irrigation and hydropower watershed. In Nepal the grass resources inside the park have a high economic value to local households for home construction and animal feed. It can be argued that if Royal Chitwan did not exist, most of these grasses would have been overutilized and would be more scarce. Thailand has not yet grappled with the trade-offs between recreational and biodiversity uses within Khao Yai National Park, nor has it dealt with the concern that the park is not large enough to support its resident wildlife populations.

In both Nepal and Costa Rica, USAID projects have defined formal mechanisms to increase benefits from conservation particularly through revenue sharing to surrounding communities. No such formal mechanisms were established in the other countries reviewed.

The most effective interventions have occurred at the management and policy levels. Promising protected-area management interventions are boundary demarcation, infrastructure development and maintenance, and provision of a stable financial base for park operations. All these interventions relate to what can be done with some technical and financial support they are largely physical interventions. Setting out boundary markers and park entrance signs, encouraging patrols or aerial reconnaissance of areas, building roads or structures these tend to be the easy interventions that require no substantial human resources and so do not necessarily require widespread stakeholder involvement.

The USAID projects have given mixed attention to interventions preparing management plans, addressing the needs for staff training in protected-area management, and conducting wildlife inventories and monitoring habitat conditions. All these interventions are critical to achieving any returns from investments in protected-area infrastructure, facilities, and equipment.

Successful interventions also occurred where USAID supported changes that created enabling policies for biodiversity conservation. Fiscal reforms for revenue sharing and creating new institutions for biodiversity management were among the most significant accomplishments of the programs supported by USAID. These policy reforms often led to a changed national-level atmosphere that was not only more aware of the importance of

biodiversity conservation and park management but was more willing to try new approaches. These new approaches include debt-for-nature swaps, trust fund creation, and NGO management of protected areas.

Integrated conservation and development projects (ICDPs) adjacent to protected areas are the interventions with the most in common with much of the Agency's rural development portfolio but they have also been the least effective. This confirms the findings of other studies on the ICDP approach, which suggest that it is likely to take substantial resources and a great deal of time before such efforts demonstrate a payoff (Wells and Brandon 1992). ICDP interventions require combining some of the most difficult aspects of both wildlife conservation and rural development.

One drawback to this cluster of interventions is that environmental NGOs have demonstrated only limited knowledge of how to implement such activities, and developing-country governments and donor agencies have yet to coordinate across programs to mobilize needed skills and resources. Linking conservation and development components is essential; however, getting the links between project components to be clear and effective is unlikely to come about without significant trial and error.

The greatest ICDP successes have tended to come with activities that are more technically based and less rooted in behavioral change. For example, the USAID project in Costa Rica had started defining how to manage regional land use, although early efforts were largely based on developing the technical knowledge and maps of the area to guide future decision-making. ICDP approaches that have directly employed people or addressed livelihood concerns have shown the greatest promise.

Implementors of ICDPs face a quandary: how to help communities bordering protected areas to develop without that assistance becoming a magnet that pulls yet more people into the area (Brandon and Wells 1992). All the ICDP implementors recognized this danger but none had a well-defined strategy for addressing it. One solution it comes from a Karen tribal leader in Thailand is to aim at health and education services rather than capital projects such as roads and electricity. Roads and power bring more people, more products, debt, and the need to exploit the forest to support a new lifestyle. Health and education, the tribesman argued, provide the key to a better life for new generations who desire to find jobs outside the area.

Program Sustainability

The evaluation examined three dimensions of sustainability for biodiversity programs. The first is biophysical whether the protected area has the characteristics likely to lead to the long-term conservation of habitats, species, and genetic resources. The second is institutional whether the capability and resources exist to protect and manage parks without outside help.

The third is financial whether countries can muster the financial wherewithal to provide effective management of protected areas and to retain control over resources generated through innovative financing schemes, such as debt-for-nature swaps, trust funds, and visitor revenues.

Biophysical sustainability

Biophysical sustainability of protected areas has not yet been ensured in any of the countries evaluated. Securing biological sustainability means more than simply creating areas off limits to human activity. It means designing the areas in such a way that the necessary ecological web of flora and fauna within them stays intact. Keeping lands next to protected areas in compatible uses, linking protected areas through buffer zones or biological corridors, and making protected areas as large as possible are key components of biological sustainability.

USAID biodiversity programs have made progress in helping developing countries set aside land and marine areas as protected habitats, but they have not given sufficient attention to how biologically sustainable these areas are or will be. Poor analysis and planning have led, in some cases, to the wrong areas or insufficiently large areas being set aside.

Understandably, there has been a rush to set aside land and marine areas before they are irreparably degraded, or lost altogether. This rush has occurred ahead of the collection of information needed to determine if the right areas of the right sizes have been selected for restricted human activity as a protected habitat. Variables that determine the area selected include above all the survival requirements of the plant and animal species they contain from the standpoints of the area and quality of habitat (see box 4).

Figures 8 and 9 show the distribution of protected habitats by size in Sri Lanka and Thailand. The habitats are so degraded and fragmented that animal human conflicts are frequent. From the standpoint of stemming the loss of major animal species, expenditure of scarce resources on these locations is wasted in the absence of steps to consolidate and upgrade ecosystems.

Land uses outside of most of the protected areas are not yet stable or compatible with biodiversity conservation at USAID-supported sites. Costa Rica, Madagascar, and Nepal have started to consider challenges to the viability of their protected areas. In Costa Rica and Madagascar, the basic steps are being taken to ensure the biological viability of areas, although more basic research is needed to do this effectively. Effective research and monitoring in Nepal's Chitwan National Park have provided the necessary information to manage the ecosystem and specific wildlife within the park and to undertake translocation of wildlife populations to safeguard them.

Institutional Sustainability

Where USAID has tried to create or strengthen institutions to manage and administer biological diversity, it has often been successful. Institutional viability is closely related to the degree of democratization and governance. Balance between NGOs and government and private sector is often important as is support at local, regional, and national levels. In some countries, strengthening NGOs but omitting governments may lead not to change but to stagnation.

In three of the six countries Costa Rica, Jamaica, and Madagascar USAID has helped to create or support institutions that have the potential to play a substantial conservation role in the future. In Madagascar, NGOs and PVOs are now broadly accepted in government circles for their contributions of additional human and financial resources. In Costa Rica and Jamaica, USAID has further strengthened similar partnerships between public agencies and environmental NGOs.

USAID sponsorship of these partnerships has enhanced institutional viability by fostering mutual support, particularly where skills and resources are complementary. In Costa Rica, Jamaica, Madagascar, and Nepal, NGOs act as extensions of government agencies. They reach protected areas with management and services in ways neither could do alone. However, approaches that involve mobilization of local communities have been limited in all the programs.

The value of partnerships in promoting protected-area management is emerging as one of the most important messages from other reviews of protected areas (Wells and Brandon 1992). There is evidence that partnerships between NGOs, governments, and international development institutions are taking place at many levels. These partnerships are leading to new management structures, funding mechanisms, and financial and technical support for conservation.

Financial Sustainability

The experience of most biodiversity projects suggests that building human capital resources and local institutions capable of sustaining project activities requires financing over many years. Few of the USAID-supported activities will ever generate sufficient revenues to cover operating, let alone development, costs. Thus there will be a long-term need to generate money for operating and maintenance expenses of protected areas.

Recognizing this need, several of the USAID programs put into place mechanisms for long-run financial sustainability. These range from policy reforms, which allow revenue capture for protected-areas operations (Costa Rica) and for revenue sharing with local communities (Nepal), to trusts and endowments (Costa Rica, Jamaica, Madagascar, Sri Lanka). But enactment of legislation and creation of financial mechanisms does not automatically ensure that these funds are well spent. Nor do they ensure that protected areas can count on stable funding bases, especially when revenue is to be derived from grants or tourism.

Although environmental endowments provide a cushion from which specific programs can develop financial sustainability, external effects such as inflation and escalating program costs may diminish the long-term financial security they are meant to provide.

USAID's experience with trust funds in Costa Rica, Jamaica, and Sri Lanka suggests that to avoid potential problems, several issues must be addressed during trust formation and capitalization:

The trust must retain the flexibility intended at its inception.

It must be able to explore and test innovative environmental strategies without government intervention. It should not fund budget shortfalls of government agencies.

Roles of the governing board members and trust administrators must be clearly defined.

Governing board members' qualifications should be germane to the trust's environmental goals and operating needs.

Candidates for governing board membership should have full knowledge of the demands of trust management on their time and be willing to commit that time.

Leadership of the governing body should rotate periodically among members to avoid concentration of power.

Policy reforms to allow for revenue capture and distribution have been promoted in Costa Rica and Nepal. In Costa Rica, parks can retain and use 75 percent of the revenues generated from park entrance fees and concession licenses/contracts for direct protection and management activities. In Nepal USAID supported enactment of legislation for buffer zone and revenue sharing. In both Nepal and Costa Rica, however, future operating revenues for conservation will be vulnerable to the ecotourism market and to external factors such as war, recession, and natural disaster.

9. Recommendations

Several global changes have important implications for the way USAID conducts biodiversity conservation programs in the future. One important change in the earth's physical landscape is the fragmentation, isolation, and degradation of wildlife habitats caused by continued expansion of human population, settlement, and economic activity. With the exception of a few large forested areas in Africa, North America, and South America, most habitats are now fragmented islands of biological diversity surrounded by human activity, largely commercial or subsistence agriculture. Many of these island habitats are degraded by farming, logging, and hunting within them. Marine habitats are coming under increased pressures from urban and industrial pollution as well as overfishing.

The good news, on paper at least, is the growing share of endangered habitats that have come under official protection. This protected real estate, however, presents formidable management challenges to developing-country governments already confronted by long social development agendas and limited financial resources.

Important changes have taken place in the political landscape as well. Most significant, perhaps, is the heightened awareness among government decision-makers of the potential value of their diverse national biological resources and habitats. Governments are beginning to bring economic policies into line with these concerns and to remove market distortions (for example, subsidized fisheries) that continue to destroy natural habitats and their biological resources by fostering extractive activities.

Another promising development on the political scene is the emergence in many developing countries of NGOs concerned with long-run environmental stewardship. Many environmental NGOs started out as advocacy groups with the goal of alerting the public in general and policymakers in particular to the importance of biodiversity protection. Some have begun to engage actively in conducting biodiversity programs themselves, in ways that help extend the reach of public agencies with limited human and financial resources. Also, international networks of donors, NGOs, and developing-country governments are becoming valuable vehicles for exchanging experiences about what works and why.

Combined, these physical and political changes present challenges and opportunities for USAID in managing its future support for conserving biological diversity. A number of recommendations for enhancing the impact and performance of USAID biodiversity programs emerge from the evaluation:

Foster government partnerships with NGOs and PVOs to help public agencies extend the reach of national biodiversity conservation programs. USAID should support public partnerships with national and international NGOs to mobilize complementary talent and funding. USAID programs can also foster community and group participation in conservation, in restoration of degraded forest habitats, and in operation of tourist lodges and transport and guide services. Involving local communities (as, for example, parataxonomists and nature guides) enhances commitment to conservation.

Promote ways of managing protected areas to generate revenues that contribute to their operation. Where wildlife and its habitats are becoming popular attractions for domestic and international tourists, Agency resources can support the design and implementation of measures to mobilize revenues from visitor fees and taxes. Lodging, food, and souvenir concessions can also generate revenues and cover a share of park operating costs. Contracts for prospecting of new food and pharmaceutical products are another potential vehicle for generating revenues to fund

biological diversity conservation. Such income-generating enterprises increase the commitment of public and private stakeholders in protecting biologically rich areas.

Identify and promote opportunities for private investments consistent with sustainable use of biological resources. Wildlife and its habitats are becoming popular investments for domestic and international firms in such ventures as nature tourism and bioprospecting for new pharmaceutical drugs. USAID programs can support efforts to convert areas around protected terrestrial habitats into sites for farm forestry, tourist facilities, artisan crafts, plant nurseries, and game ranches. Areas around marine sanctuaries are popular for recreational resorts and sport fishing. These private ventures enhance public awareness of the value of biological resources, generate tax and concession revenues for protected-area operations, and create jobs and incomes for local households and communities. Of course, programs should recognize the need for regulatory and fiscal reform and better enforcement to avoid potential environmental damage from overdevelopment of tourism resorts and facilities.

Support removal of market distortions and reform of other economic policies that cause biodiversity loss. USAID can enhance the effectiveness of its biodiversity programs by identifying for reform those pricing and market policies that promote habitat conversion to unsustainable uses.

Coordinate USAID program resources to enhance effectiveness of Agency biodiversity conservation efforts. For example, USAID microenterprise programs can finance nature tourism ventures; agriculture and agribusiness programs can generate new farm and off-farm alternatives to habitat encroachment; policy reforms can remove market distortions that undervalue biological resources and lead to their destruction; and democracy and governance programs can increase capacity of NGOs and public agencies to address conservation needs.

Appendix A: Evaluation Methodology

CDIE assessments of environmental programs are aimed at answering two central questions: Has USAID made a difference? and, if so, How well did it do it? The hypothesis of the environmental assessments is that USAID, through the right mix of program strategies, can affect local conditions and practices in ways that produce favorable long-lasting changes in the biophysical environment and in the socioeconomic welfare of cooperating countries. This appendix describes the process used to test this hypothesis in USAID programs aimed at protecting biological diversity.

Impact: How much?

The assessment seeks to establish plausible associations between USAID program strategies or activities and the benefits to the human population that result from improved environmental quality

and better natural resource management. In answering the first question Did USAID make a difference? the assessment has attempted to document what happened or can be expected to happen from USAID assistance. The evaluation examines the relationships between environmental impact and USAID program investments using a five-level analytical framework (see figure A1.)

In the assessment framework, level I describes the "program strategies" that USAID and the host government employed to conserve biological diversity through forest and marine habitat protection programs. These strategies include strengthening habitat protection and management staff and institutions, identifying critical habitats and promoting necessary protection and management practices, raising general public awareness about the value of wildlife habitats, and promoting habitat management as part of a national land-use planning.

The information is collected and organized in four cross-cutting strategies employed by USAID: (1) strengthening institutional capacity, (2) introducing technological change, (3) fostering environmental education and awareness, and (4) adopting environmentally sound economic, regulatory, and tenure policies. The operating hypothesis is that by successfully carrying out development programs that create enabling conditions in these areas or by successfully recognizing and building on preexisting conditions, meaningful progress toward the conservation of biological diversity will be made.

At level II, "program outputs" are the conditions that have resulted from implementing these strategies. Examples: public agencies or NGO services have trained staff equipped to oversee protection of wildlife habitats and their use and management . . . critical wildlife habitats are demarcated and brought under management and protection schemes . . . literature is published and disseminated to tourists, indigenous populations, and other wildlife habitat users on sustainable management . . . official agreements are in place with local organizations for the sustainable management of wildlife habitats.

The level III "program outcomes" resulting from changes in level II conditions are the adoption of practices and technologies by target groups. Examples: habitat visitors conduct themselves in an environmentally responsible fashion . . . dwellers in and around habitats farm, hunt, and harvest products in ways that ensure quality of plant and wildlife is sustained or enhanced.

Levels IV and V "program goals" constitute the biophysical and socioeconomic changes expected to result from the adoption of level III program outcomes or practices. Level IV and level V goals can be viewed as mutually supportive: each contributes to the sustainability of the other (and in many respects each flows from the other).

For the purposes of the evaluation, level IV "biophysical goals" are the specific environmental objectives of the program being assessed. Level IV indicators measure environmental conditions

and biophysical changes that contribute to producing the strategic objective. Examples: plant and animal wildlife populations are stable or growing . . . habitats are stable or naturally rejuvenating themselves.

Level V "socioeconomic goals" represent the development goals and are generally associated with sustainable increases in income, profits, remunerative employment, overall well-being, or production. Although access to income data is difficult, the continued involvement of beneficiaries in the program can be used as vote with their feet proxy indicators of improved farm incomes and profits, at least at the time of the evaluation.

Performance Scales: How Well?

In answering the second question How well? CDIE's primary concern is the efficiency, effectiveness, and sustainability of the program.

Where data exist, the evaluation measures program efficiency by using monetary estimates of the flow of benefits to calculate an economic rate of return for those USAID and host government program investments to which benefits can reasonably be attributed. Because benefits occur into the extended future, their value must be annualized and adjusted to net out all costs and expressed as a discounted net present value to compare with project investment.

To assess program effectiveness, the evaluation examines how well USAID-sponsored techniques or services are reaching intended target groups and whether there is equity or bias in access and participation by these groups. An example of an effectiveness indicator would be the makeup of participating groups according to resource endowments and social status (for example, farm size, gender).

Examination of sustainability is important at all program levels (see figure A1). Evidence of sustainability includes continuation of activities, regulations, or institutions beyond the termination of USAID technical and financial assistance either on their own internal momentum or with host government or other donor assistance. Level II indicators include how long NGOs have continued to operate independently of outside support or how successful local NGOs have been in obtaining outside funding support for their operations. Level III indicators include the economic viability of new enterprises introduced to dwellers around the perimeters of protected areas and the financial soundness of park management and protection programs. Level IV indicators include evidence that native plant and animal populations are stable and growing, that exotic species are under control, and that feeding and breeding grounds are remaining in or returning to their natural state.

Data Collection Procedures

CDIE employs a variety of primary and secondary sources of data

to construct the chain of events linking program activities to impacts, examine major evaluation issues, and identify lessons learned.

In preparation for the fieldwork, CDIE collected and analyzed relevant secondary data and information available in Washington or in host countries from a range of sources including project documents, technical reports, and special studies. CDIE's fieldwork methods combine an examination of changed and changing conditions at the national policy, planning, and institutional levels with a more in-depth evaluation of one case where a site-specific protected-area program has been operating with USAID support. Data collection methods included direct observation, analysis of secondary sources, and key informant, focus group, and informal interviews.

Evaluation data collected in the field will form the basis for a country case study synthesizing lessons learned from USAID programs in fostering conservation of biological diversity through protection and management of protected forest and marine habitats. The case study experience will in turn contribute to a global assessment of USAID biological diversity programs.

In addition to a review of program and project documentation (see bibliography, which includes all documents cited in this assessment), data collection includes field visits to document implementation efforts. These include nonstatistical evaluation of the biophysical state of habitats under improved management practices and a comparison of conditions in areas that have not experienced USAID-supported interventions.

Following each field site visit, team members gather to discuss their findings. A structured checklist is applied to these discussions to ensure team consensus on key points relating to program performance. In addition, the team develops a roster of key technical, institutional, social, and economic indicators for evaluating program impact at each site. The team members use this roster to strengthen their consensus on the assessment of field sites. The consensus-building checklist and the key indicators lists are on the following pages.

Appendix B: Land Use and Protection Categories

Category I. Scientific Reserve/Strict Nature Reserve

Areas possessing some outstanding ecosystem, features, or species of flora and fauna of national scientific importance or that are representative of particular natural areas. Natural processes are allowed to take place in the absence of any direct human interference. Public access is limited; only scientific research and educational use is permitted. Land ownership rests with government agencies or nonprofit institutions.

Category II. National Park

Relatively large areas of national or international significance that have not been materially altered by humans. These areas are managed to protect their inherent features for the long term. Public access is permitted for recreation and study. Lands are owned by government agencies.

Category III. National Monument/National Landmark

Areas containing one or more natural features of outstanding national significance that, because of uniqueness or rarity, should be protected. Public access is permitted for recreation and study. These areas are managed to protect their inherent features for the long term. Land ownership is by central or other government agencies or by nonprofit organizations.

Category IV. Nature Conservation Reserve/Managed Nature Reserve/Wildlife Sanctuary

An area set aside for protection of specific sites or habitats to ensure continued well-being of resident or migratory fauna of national or global significance. The primary purpose is protection of nature. Sustainable renewable resource utilization may play a secondary role in the management of a specific area. The area may require habitat manipulation to maintain optimum conditions for the species, vegetation community, or natural feature. Lands may be owned by various levels of government or by nonprofit organizations or be in private hands.

Category V. Protected Landscape or Seascape

Two main types of areas fall under this broad category. First are landscapes possessing special aesthetic qualities that result from interaction between human beings and the land. Second are primarily natural areas under intensive human management for recreational and tourism use. Lands may be privately held or be a mix of public and private ownership.

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