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Markets for Biodiversity Services

POTENTIAL ROLES AND CHALLENGES

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Historically, it has been the responsibility of governments to ensure biodiversity protection and provision of ecosystem services. The main instruments to achieve such objectives have been

- direct resource ownership and management by government agencies;
- public regulation of private resource use;
- technical assistance programs to encourage improved private management; and
- targeted taxes and subsidies to modify private incentives.

But in recent decades, several factors have stimulated those concerned with biodiversity conservation services to begin exploring new market-based instruments. The model of public finance for forest and biodiversity conservation is facing a crisis as the main sources of finance have stagnated, despite the recognition that much larger areas require protection. At the same time, increasing recognition of the

roles that ecosystem services play in poverty reduction and rural development is highlighting the importance of conservation in the 90 percent of land outside protected areas. It is thus urgent to find new means to finance the provision of ecosystem services, yet under current conditions private actors lack financial incentives to do so.

Crisis in Biodiversity Conservation Finance

Financing and management of natural protected areas has historically been perceived as the responsibility of the public sector. According to the United Nations Environment Programme, there are presently 102,102 protected areas worldwide, covering an area of 18.8 million square kilometers. Seventeen million square kilometers of these areas—11.5 percent of the Earth's terrestrial surface—are forests. Two-thirds of these have been assigned to one of the six protected-area management categories designated by the World Conservation Union (IUCN).

However, over the last few decades, severe cutbacks in the availability of public resources have undermined the effectiveness of such strategies. Protected areas in the tropics are increasingly dependent on international public or private donors for financing. Yet budgets for government protection and management of forest ecosystem services are declining, as are international sources from overseas development assistance (see Table 1 below). Land acquisition for protected areas and compensation for lost resource-based livelihoods are often prohibitively expensive. For example, it has been estimated that $1.3 billion would be required to fully compensate inhabitants in just nine central African parks.[1] The donation-driven model is often unsustainable, both economically and environmentally. Sovereignty is also an issue: About 30 percent of private forest concessions in Latin America and the Caribbean and 23 percent in Africa are already foreign owned. At the same time, public responsibility for nature protection is shifting with processes of devolution and decentralization, and new sources of financing for local governments to take on biodiversity and ecosystem service protection have not been forthcoming.

Moreover, scientific studies increasingly indicate that biodiversity cannot be conserved by a small number of strictly protected areas.[2] Conservation must be conceived in a landscape or ecosystem strategy that links protected areas within a broader matrix of land uses that are compatible with and support biodiversity conservation in situ. To achieve such outcomes, it will be essential to engage private actors in conservation finance on a large scale. Yet the markets for products from natural areas and forests face at least three serious challenges: declining commodity prices for traditionally important products, such as timber; competition from illegal sources; and poorly functioning, overregulated markets. Thus, private forest owners and landowners need to find new revenue streams to justify retaining forests on the landscapes and to manage them well in the context of declining commodity prices and competition in natural forests from illegal sources of timber.

Rural Development, Poverty Reduction, and Biodiversity

The vast majority of biodiversity resources in the world are found in populated landscapes, and it can be argued that the biodiversity that under-

Table 1. Estimated financial flows for forest conservation (in millions, U.S. dollars)

Sources of finance	SFM (early 1990s)	SFM (early 2000)	PAS (early 1990s)	PAS (early 2000)
Official development assistance	$2,000–$2,200	$1,000–$1,200	$700–$770	$350–$420
Public expenditure	NA	$1,600	NA	$598
Philanthropy[a]	$85.6	$150	NA	NA
Communities[b]	$365–$730	$1,300–$2,600	NA	NA
Private companies	NA	NA	NA	NA

[a] Underestimates self-financing and in-kind nongovernmental organization contributions.
[b] Self-financing and in-kind contributions from indigenous and other local communities.

NOTE: In 1990, there were an estimated 100 million hectares of community-managed forests worldwide. SFM is "sustainable forest management." PAS stands for "protected area system."

SOURCE: A. Molnar, S. J. Scherr, and A. Khare, *Current Status and Future Potential of Markets for Ecosystem Services of Tropical Forests: An Overview* (Washington, DC: Forest Trends, 2004).

pins ecosystem services critical to human health and livelihoods should have high priority in conservation efforts. An estimated 240 million rural people live in the world's high-canopy forest landscapes. In Latin America, for example, 80 percent of all forests are located in areas of medium to high human population density.[3] Population growth in the world's remaining "tropical wilderness areas" is twice the global average. More than a billion people live in the 25 biodiversity "hotspots" identified by Conservation International; in 16 of these hotspots, population growth is higher than the world average.[4] While species richness is lower in drylands and other ecosystems not represented among the "hot spots," the species that play functional ecosystem roles are all the more important and difficult to replace.

Poor rural communities are especially dependent upon natural biodiversity. Low-income rural people rely heavily on the direct consumption of wild foods, medicines, and fuels, especially for meeting micronutrient and protein needs, and during "hungry" periods. An estimated 350 million poor people rely on forests as safety nets or for supplemental income. Farmers earn as much as 10 to 25 percent of household income from nontimber forest products. Bushmeat is the main source of animal protein in West Africa. The poor often harvest, process, and sell wild plants and animals to buy food. Sixty million poor people depend on herding in semiarid rangelands that they share with large mammals and other wildlife. Thirty million low-income people earn their livelihoods primarily as fishers, twice the number of 30 years ago. The depletion of fisheries has serious impacts on food security. Wild plants are used in farming systems for fodder, fertilizer, packaging, fencing, and genetic materials. Farmers rely on soil microorganisms to maintain soil fertility and structure for crop production, and they also rely on wild species in natural ecological communities for crop pollination and pest and predator control. Wild relatives of domesticated crop species provide the genetic diversity used in crop improvement. The rural poor rely directly on ecosystem services for clean and reliable local water supplies. Ecosystem degradation results in less water for people, crops, and livestock; lower crop, livestock, and tree yields; and higher risks of natural disasters.

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Three-quarters of the world's people living on less than $1 per day are rural. Strategies to meet the United Nations Millennium Development Goals in rural areas—to reduce hunger and poverty and to conserve biodiversity—must find ways to do so in the same landscapes. Crop and planted pasture production—mostly in low-productivity systems—dominate at least half the world's temperate, subtropical, and tropical forest areas; a far larger area is used for grazing livestock.[5] Food insecurity threatens biodiversity when it leads to overexploitation of wild plants and animals. Low farm productivity leads to depletion of soil and water resources and increases the pressure to clear additional land that serves as wildlife habitat. Some 40 percent of cropland in developing countries is degraded. Of more than 17,000 major protected areas, 45 percent (accounting for one-fifth of total protected areas) are heavily used for agriculture, while many of the rest are islands in a sea of farms, pastures, and production forests that are managed in ways incompatible for long-term species and ecosystem survival.[6]

Despite this high level of dependence by the poor on biodiversity, the dominant model of conservation seeks to exclude people from natural habitats. In India, for example, 30 million people are targeted for resettlement from protected areas.[7] From the perspective of poverty reduction and rural development, it is thus urgent to identify alternative conservation systems that respect the rights of forest dwellers and owners and address conservation objectives in the 90 percent of forests outside public protected areas. Markets for ecosystem services potentially offer a more efficient and lower-cost approach to forest conservation.[8]

Need for Financial Incentives to Provide Ecosystem Services

There is growing recognition that regulatory and protected area approaches, while critical, are insufficient to adequately conserve biodiversity. A fundamental problem is financial, especially for resources that lie outside protected areas. For these to be conserved, they need to be more valuable than the alternative uses of the land. And for such resources to be well managed, good stewardship needs to be more profitable than bad stewardship. The failure of forest owners and producers to capture financial benefits from conserving ecosystem benefits leads to overexploitation of forest resources and undersupply of ecosystem services.

This reality is hard for many people to accept, because most ecosystem services are considered "public goods." The "polluter pays" principle has argued that the right of the public to

these services trumps the private rights of the landowner or manager. Yet good management has a cost. While the individual who manages his or her resources to protect biodiversity produces public benefits, the costs incurred are private. Under current institutions, those who benefit from these services have no incentive to compensate suppliers for these services. In most of the world, forest ecosystem services are not traded and have no "price." Thus, where the opportunity costs of forest land for agricultural enterprises, infrastructure, and human settlements are higher than the use or income value of timber and nontimber forest products (NTFPs), habitats will be cleared and wild species will be allowed to disappear. Because they receive little or no direct benefit from them, resource owners and producers ignore the real economic and noneconomic values of ecosystem services in making decisions about land use and management.

A lower-cost approach to securing conservation is to pay only for the biodiversity services themselves, by paying landowners to manage their assets so as to achieve biodiversity or species conservation.

Mechanisms are needed by which resource owners are rewarded for their role as stewards in providing biodiversity and ecosystem services. Anticipation of such income flows would enhance the value of natural assets and thus encourage their conservation. Compared to previous approaches to forest conservation, market-based mechanisms promise increased efficiency and effectiveness, at least in some situations. Experience with market-based instruments in other sectors has shown that such mechanisms, if carefully designed and implemented, can achieve environmental goals at significantly less cost than conventional "command-and-control" approaches, while creating positive incentives for continual innovation and improvement. Markets for ecosystem services could potentially contribute to rural development and poverty reduction by providing financial benefits from the sale of ecosystem services, improving human capital through associated training and education, and strengthening social capital through investment in local cooperative institutions.

New Market Solutions to Conserve Biodiversity

The market for biodiversity protection can be characterized as a nascent market. Many approaches are emerging to financially remunerate the owners and managers of land and resources for their good stewardship of biodiversity (see Table 2 on page 37). Market mechanisms to pay for other ecosystem services—watershed services, carbon sequestration or storage, landscape beauty, and salinity control, for example—can be designed to conserve biodiversity as well. However, in general, biodiversity services are the most demanding to protect because of the need to conserve many different elements essential for diverse, interdependent species to thrive. Figure 1 on page 38 illustrates potential market solutions and some of the complexities involved.

Land Markets for High-Biodiversity-Value Habitat

National governments (in the form of public parks and protected areas), NGO conservation organizations (for example, The Nature Conservancy), and individual conservationists have long paid for the purchase of high-biodiversity-value forest habitats. Direct acquisition can be expensive, as underlying land and use values are also included. Local sovereignty concerns arise when buyers are from outside the country—or even the local area—or where extending the area of noncommercial real estate reduces the local tax base. New commercial approaches are being developed to encourage the establishment of privately owned conservation areas, such as conservation communities (the purchase of a plot of land by a group of people mainly for recreation or conservation purposes), ecotourism-based land protection projects, and ecologically sound real estate projects being organized in Chile.[9] These build on growing consumer demand for housing and vacation in biodiverse environments.

Payments for Use or Management

A lower-cost approach to securing conservation is to pay only for the biodiversity services themselves, by paying landowners to manage their assets so as to achieve biodiversity or species conservation. It is likely that the largest-scale payments for land-use or management agreements belong to one of two categories. One encompasses government agroenvironmental payments made to farmers in North America and Europe for reforesting conservation easements. The other category describes management contracts aiming to conserve aquatic and terrestrial wildlife habitat. In Switzerland, "ecological compensation areas," which use farming systems compatible with biodiversity conservation, have expanded to include more than 8 percent of total agricultural land. In the tropics, diverse approaches include nationwide public payments in Costa Rica for forest conservation and in Mexico for forested watershed protection (see the box on page 38).

Conservation agencies are organizing direct payments systems, such as

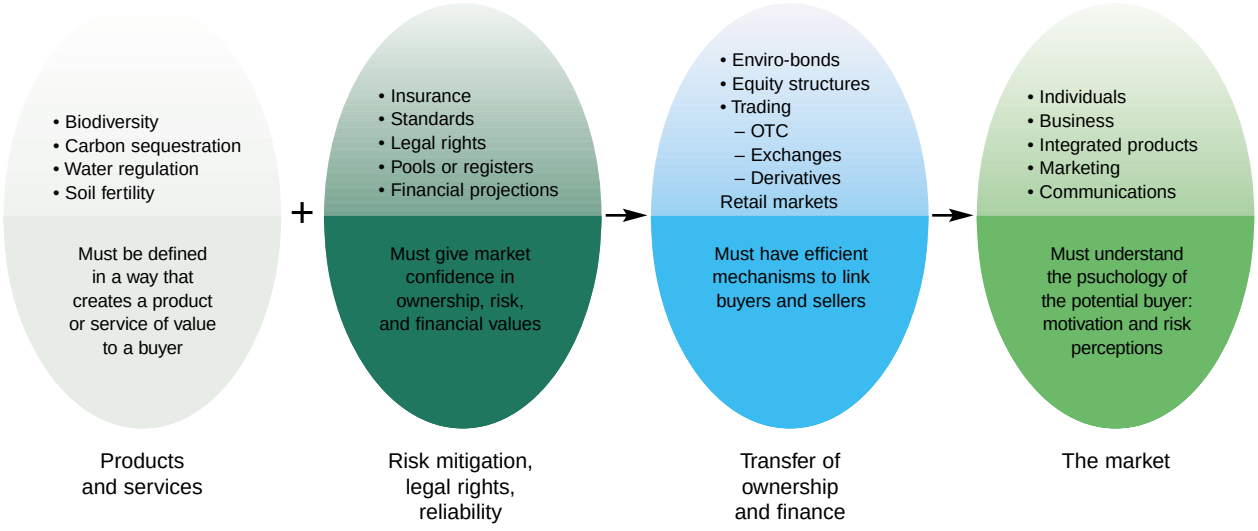
conservation concessions being negotiated by Conservation International, and forest conservation easements negotiated by the *Cordão de Mata* ("linked forest") project with dairy farmers in Brazil's Atlantic Forest. The dairy farmers in the latter example receive, in exchange, technical assistance and investment resources to raise crop and livestock productivity. Some countries that use land taxes are using tax policies in innovative ways to

Table 2. Types of payments for biodiversity protection

Type	Mechanism
Purchase of high-value habitat	
Private land acquisition	Purchase by private buyers or nongovernmental organizations explicitly for biodiversity conservation
Public land acquisition	Purchase by government agency explicitly for biodiversity conservation
Payment for access to species or habitat	
Bioprospecting rights	Rights to collect, test, and use genetic material from a designated area
Research permits	Right to collect specimens, take measurements in area
Hunting, fishing, or gathering permits for wild species	Right to hunt, fish, and gather
Ecotourism use	Rights to enter area, observe wildlife, camp, or hike
Payment for biodiversity-conserving management	
Conservation easements	Owner paid to use and manage defined piece of land only for conservation purposes; restrictions are usually in perpetuity and transferable upon sale of the land
Conservation land lease	Owner paid to use and manage defined piece of land for conservation purposes for defined period of time
Conservation concession	Public forest agency is paid to maintain a defined area under conservation uses only; comparable to a forest logging concession
Community concession in public protected areas	Individuals or communities are allocated use rights to a defined area of forest or grassland in return for commitment to protect the area from practices that harm biodiversity
Management contracts for habitat or species conservation on private farms, forests, or grazing lands	Contract that details biodiversity management activities and payments linked to the achievement of specified objectives
Tradable rights under cap-and-trade regulations	
Tradable wetland mitigation credits	Credits from wetland conservation or restoration that can be used to offset obligations of developers to maintain a minimum area of natural wetlands in a defined region
Tradable development rights	Rights allocated to develop only a limited total area of natural habitat within a defined region
Tradable biodiversity credits	Credits representing areas of biodiversity protection or enhancement that can be purchased by developers to ensure they meet a minimum standard of biodiversity protection
Support biodiversity-conserving businesses	
Biodiversity-friendly businesses	Business shares in enterprises that manage for biodiversity conservation
Biodiversity-friendly products	Eco-labeling

SOURCE: S. J. Scherr, A. White, and A. Khare, *Current Status and Future Potential of Markets for Ecosystem Services in Tropical Forests: An Overview* (Washington, DC: Forest Trends, 2003).

Figure 1. New market solutions to conserve biodiversity



NOTE: OTC ("over-the-counter") trading involves direct negotiation with buyers and sellers rather than an official stock market.

SOURCE: D. Brand, "Emerging Markets for Forest Services and Implications for Rural Development, Forest Industry, and Government," presentation to the Katoomba Group Meeting, "Developing Markets for Ecosystem Services," Vancouver, October 2000.

A NEW FUND TO FINANCE FOREST ECOSYSTEM SERVICES

The Mexican government recently announced the creation of a new fund to pay indigenous and other communities for the forest ecosystem services produced by their land.[1] Indigenous and other communities own approximately 80 percent of all forests in Mexico—totaling some 44 million hectares—as collectively held, private land. The Mexican Forestry Fund has been under design since 2002, guided by a consultative group with government, nongovernmental organization, and industry representatives. The purpose of the US$20 million fund is to promote the conservation and sustainable management of natural forests, leverage additional financing, contribute to the competitiveness of the forest sector, and catalyze the development of mechanisms to finance forest ecosystem services. Operational manuals are being prepared, and priority conservation sites have already been identified. The fund proposes to pay $40 per hectare (ha) per year to owners of deciduous forests in critical mountain areas and $30 per ha per year to other forest types.

1. Comisión Nacional Forestal (CONAFOR), presentation given at the Mexican Forestry Expo, Guadalajara, Mexico, 8 August 2003.

encourage the expansion of private and public protected areas.

Payment for Private Access to Species or Habitat

Private sector demand for biodiversity has tended to take the form of payments for access to particular species or habitats that function as "private goods" but in practice serve to cover some or all of the costs of providing broader ecosystem services. Pharmaceutical companies have contracted for bioprospecting rights in tropical forests. Ecotourism companies have paid forest owners for the right to bring tourists into their lands to observe wildlife, while private individuals are willing to pay forest owners for the right to hunt, fish, or gather nontimber forest products.

Tradable Rights and Credits within a Regulatory Framework

Multiactor markets for ecosystem services have been successfully established, notably for sulfur dioxide emissions, farm nutrient pollutants, and carbon emissions. These create rights or obligations within a broad regulatory framework and allow those with obligations to "buy" compliance from other landowners or users. Developing such markets for biodiversity is more complicated, because specific site conditions matter so much. The United States has operated a wetlands mitigation program since the early 1980s in which developers seeking to destroy a wetland must offset that by buying wetland banks conserved or developed elsewhere. A similar approach is used for "conservation banking," described in the box on page 39.

A variant of this approach is being designed for conserving forest biodiversity in Brazil by permitting flexible enforcement of that country's "50 percent rule," which requires landholders in Amazon forest areas to maintain half of their land in forest. This rule is also applied in other regions in Brazil, where lesser proportional areas are set aside for forest use. Careful designation of comparable sites is required.

Another approach, biodiversity credits, is under development in Australia. In this system, legislation cre-

ates new property rights for private landholders who conserve biodiversity values on their land. These landholders can then sell resulting "credits" to a common pool. The law also creates obligations for land developers and others to purchase those credits. The approach requires that the "value" of the biodiversity unit can be translated into a dollar value.

Biodiversity-Conserving Businesses

Conservation values are beginning to inform consumer and investor decisions. Eco-labeling schemes are being developed that advertise or certify that products were produced in ways consistent with biodiversity conservation. The global trade in certified organic agriculture was worth $21 billion worldwide in 2000.[10] International organic standards are expanding to landscape-scale biodiversity impacts. The Rainforest Alliance and the Sustainable Agriculture Network certify coffee, bananas, oranges, and other products grown in and around high-biodiversity-value areas. The Sustainable Agriculture Initiative is a coalition of multinational commercial food producers (Nestle, Dannon, Unilever, and others) who are seeking to ensure that all of the products they purchase along the supply chain come from producers who are protecting biodiversity. In 2002, more than 100 million hectares of forest were certified (a fourfold increase over 1996), although only 8 percent of the total certified area is in developing countries, and most of that is in temperate forests.

Current Market Demand

Available information suggests that biodiversity protection services are presently the largest market for ecosystem services. A team from McKinsey & Company, the World Resources Institute, and The Nature Conservancy estimated the annual international finance for the conservation market (conservation defined as protecting land from development) at $2 billion, with the forest component a large share of that.[11] Buyers are predominantly development banks and foundations in the United States and Europe.

A study by the International Institute for Environment and Development (IIED) of 72 cases of markets for forest biodiversity protection services in 33 countries found that the main buyers of biodiversity services (in declining order of prevalence) were private corporations, international NGOs and research institutes, donors, governments, and private individuals.[12] Communities, public agencies, and private individuals predominate as sellers. Most of these cases took place in Latin America and in Asia and the Pacific. Only four cases were found in Europe and Russia and one was found in the United States.

Three-quarters of the cases in the IIED study were international markets, and the rest were distributed among regional, national, and local buyers. International actors—as well as many on the national level—who demand biodiversity protection services tend to focus on the most biodiverse habitats (in terms of species richness) or those perceived to be under the greatest threat globally (for example, places like the Amazon, where there are a high number of endemic species and where habitat area has greatly declined). Most of the private corporations were interested in eco-labeling schemes for crops or timber, investment in biodiversity-friendly companies, horticultural companies concerned with ecosystem services, or pharmaceutical bioprospecting. Such private payments are usually site-specific. Local actors more commonly focus on protecting species or habitats of particular economic, subsistence, or cultural value.

Projected Growth in Market Demand

The fastest-growing component of future market demand for biodiversity services is likely to be in eco-labeling of crop, livestock, timber, and fish products for export and for urban consumers. In 1999, the value of the organic foods market was US$14.2 billion. Its value is growing at 20–30 percent a year in the industrialized world,

CONSERVATION BANKING IN THE UNITED STATES

Amendments to the United States Endangered Species Act in 1982 provided for an "incidental take" of enlisted species, if "a landowner provides a long-term commitment to species conservation through development of a Habitat Conservation Plan (HCP)." These amendments have opened the door to a series of market-based transactions, described as conservation banking, which permits land containing a natural resource (such as wetlands, forests, rivers, or watersheds) that is conserved and maintained for specified enlisted species to be used to offset impacts occurring elsewhere to the same natural resource.[1] A private landowner may request an "incidental take" permit and mitigate it by purchasing "species credits" from preestablished conservation banks. Credits are administered according to individuals, breeding pairs, acres, nesting sites, and family units. Conservation banking has maximized the value of underutilized commercial real estate and given private landowners incentive to conserve habitat.

California was the first state to authorize the use of conservation banking and has established 50 conservation banks since 1995. Other states, including Alabama, Colorado, and Indiana, have followed suit. In April 2002, the Indiana Department of Transportation, the Federal Highway Association Indiana Division, and four local government agencies finalized an HCP for the endangered Indiana bat as part of the improvement of transportation facilities around Indianapolis International Airport. These highway improvements will occur in an area of known Indiana bat habitat that is predicted to experience nearly $1.5 billion in economic development during the next ten years. Under the HCP, approximately 3,600 acres will be protected, including 373 acres of existing bat habitat.

1. A. Davis, "Conservation Banking," presentation to the Katoomba Group-Lucarno Workshop, Lucarno, Switzerland, November 2003.

as the international organic movement is strengthening standards for biodiversity conservation.[13] Pressures continue to increase on major international trading and food processing companies to source from suppliers who are not degrading ecosystem services. Donor and international NGO conservation will continue to expand as NGOs begin to establish entire research departments aimed at developing new market-based instruments. Voluntary biodiversity offsets are also a promising source of future demand, as many large companies are seeking ways to maintain their "license to operate" in environmentally sensitive areas, and offsets are of increasing interest to them.

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The costs of and political resistance to land acquisition are rising. Construction of biological corridors in and around production areas is an increasingly important conservation objective. At the same time, however, many of the most important sites for biodiversity conservation are in more densely populated areas with high opportunity costs for land. Thus we are likely to see a major shift from land acquisition to various types of direct payments for easements, land leases, and management contracts.

A rough back-of-the-envelope estimate suggests that the current value of international, national, and local direct payments and trading markets for ecosystem services from tropical forests alone could be worth several hundred million dollars per year, while the value of certified forest and tropical tree crop products may reach as much as a billion dollars. While this is a large and significant amount, it represents a small fraction of the value of conventional tropical timber and other forest product markets. For example, by comparison, the total value of tropical timber exports is $8 billion (including only logs, sawnwood, veneer, and plywood), which is a small fraction of the total exports and domestic timber, pulpwood, and fuelwood markets in tropical countries. NTFP markets are far larger still.[14] The total value of international trade for NTFPs is $7.5 billion–$9 billion per year, with another $108 billion in processed medicines and medicinal plants.[15] Domestic markets for NTFPs are many times larger (for example, domestic consumption accounted for 94 percent of the global output of fresh tropical fruits 1995–2000.[16] Nonetheless, these rough figures are quite interesting when compared with the scale of public and donor forest conservation finance summarized in Table 1.

Scaling Up Payments for Biodiversity: Next Steps

Markets for ecosystem services are steadily growing and can be expected to grow even more rapidly in the next decade. Yet they predominate as pilot projects. What will it take to transform these markets to impact ecosystem conservation on the global scale? The four most strategic and catalytic areas for policy and action are to

- structure emerging markets to support community-driven conservation;
- mobilize and organize buyers for ecosystem services;
- connect global and national action on climate change to biodiversity conservation; and
- invest in the policy frameworks and institutions required for functioning ecosystem service payment systems.

Supporting Community-Driven Conservation

The benefits of investments in ecosystem services will be maximized over the long term if markets reward local participation and utilize local knowledge. In community forests and agroforestry landscapes, communities have already established sophisticated conservation strategies. Studies of indigenous timber enterprises document conservation investments on the order of $2 per hectare per year apart from other management activities and investments of community time and labor; this is equal to the average available budget per hectare for protected areas worldwide. Conservation policies must recognize the role that local people are playing in the conservation of forest ecosystems worldwide and support them (either with cash or in-kind support) to continue to be good environmental stewards.

To enable conservation-oriented management to remain or become economically viable, it is important that ecosystem service payments and markets are designed so that they strategically channel financial payments to rural communities. Such payments can be used to develop and invest in new production systems that increase productivity and rural incomes, and enhance biodiversity at a landscape scale—an approach referred to as "ecoagriculture."[17] Ecosystem service payments to poor rural communities that are providing stewardship services of national or international value can help to meet multiple Millennium Development Goals. For any semblance of a sustainable future to be realized, it is crucial that our long-term vision includes biodiversity and natural ecosystems as part of the "natural infrastructure" of a healthy economy and society.

Mobilizing and Organizing Buyers for Ecosystem Services

Turning beneficiaries into buyers is the driving force of ecosystem service markets. Because beneficiaries are often hesitant to pay for goods previously considered free, "willingness to pay" for ecosystem services must be organized on a greater scale. The private sector must be called upon to engage in responsible corporate behavior in conserving biodiversity. For example, Insight Investment, a major financial firm, has developed a biodiversity policy that uses conservation as a screen for investment. Voluntary payments by consumers, retail firms, and other actors can be encouraged through social advertising. This approach is growing rapidly now for eco-labeling programs (labeling of some personal care products and foods) and voluntary carbon emission offset programs involving investment in reforestation. Stockholder pressure is beginning to influence some firms to avoid investments and activities that harm biodiversity, and this is evolving to positive action. Civil society campaigns can also mobilize willingness to pay for biodiversity offsets and payments to local partners for conservation.

Connecting Climate Action with Biodiversity Conservation

Far more aggressive action must and will be taken to mitigate and adapt to climate change. Land use and land-use change currently contribute more than 20 percent of carbon emissions and other greenhouse gases. Action to reduce these emissions must be a central part of our response, and it is critical that action to sequester carbon through improved land uses accompanies strategies to reduce industrial emissions. There is thus an unprecedented opportunity at this time to structure our responses to climate change so that actions related to land use are also designed to protect and restore biodiversity. Moreover, such actions can be designed in ways that enhance and protect livelihoods, especially for those most vulnerable to the impacts of climate change. Indeed, it is imperative that they do so (see the box on this page).

As a result of the deliberations at the Conference of the Parties of the United Nations Framework Convention on Climate Change last year, payments for forest carbon through the Clean Development Mechanism (CDM) of the Kyoto Protocol can be used to finance forest restoration and regeneration projects that conserve biodiversity while providing an alternative income source for local people.[18] But the scale of forest carbon under CDM is very small—too small to have a major impact on climate, biodiversity, or livelihoods. It is critical that we aim for a much larger program in the second commitment period, and it is crucial that nations affiliated with the Organisation for Economic Co-operation and Development (OECD) create initiatives to utilize carbon markets for biodiversity conservation in their own internal trading programs. It is imperative to develop a new principle of international agreements on climate response and carbon trading, one that builds a system that encourages overlap of the major international environmental agreements and the Millennium Development Goals. This could mobilize demand by creating an international framework for investing in good ecosystem service markets. It is also important that emerging private voluntary markets for carbon (that is, with actors who do not have a regulatory obligation) are encouraged to pursue such biodiversity goals as well. The Climate, Community and Biodiversity Alliance, for example, is seeking to develop guidelines and indicators for private investments in carbon projects that will achieve these multiple goals. The Forest Climate Alliance of The Katoomba Group is seeking to mobilize the international rural development community to advocate for such approaches.[19]

Investing in Policy Frameworks and Institutions for Biodiversity Markets

Ecosystem service markets are genuinely new—and biodiversity markets are the newest and most challenging. Every market requires basic rules and institutions in order to function, and this is equally true of biodiversity markets. The biodiversity conservation community needs to act quickly and strategically to ensure that as these markets develop, they are effective, equitable, and operational and are used sensibly to complement other conservation approaches.

Policymakers and public agencies play a vital role in creating the legal and legislative frameworks necessary for market tools to operate effectively. This includes establishing regulatory rules, systems of rights over ecosystem services, and mechanisms to enforce contracts and settle ownership disputes. Ecosystem service markets pose pro-

PROTECTING BRAZIL'S ATLANTIC FOREST: THE GUARAQUEÇABA CLIMATE ACTION PROJECT

Due to excessive deforestation, the Atlantic Forest of Brazil has been reduced to less than 10 percent of its original size. The Guaraqueçaba Climate Action Project has sought to regenerate and restore natural forest and pastureland.[1] Companies such as American Electric Power Corporation, General Motors, and Chevron-Texaco have invested US$18.4 million to buy carbon emission offset credits from the approximately 8.4 million metric tons of carbon dioxide that the project is expected to sequester during its lifespan. The project has initiated sustainable development activities both within and outside the project boundary, including ecotourism, organic agriculture, medicinal plant production, and a community craft network. The project has made significant contributions toward enhancing biodiversity in the area, creating economic opportunities for local people (such as jobs), restoring the local watershed, and substantially mitigating climate change.

1. The Nature Conservancy (TNC), *Climate Action: The Atlantic Forest in Brazil* (Arlington, VA: TNC, 1999).

found equity implications, as new rules may fundamentally change the distribution of rights and responsibilities for essential ecosystem services. Forest producers and civil society will need to take a proactive role to ensure that rules support the public interest and create development opportunities.

New institutions will also be needed to provide the business services required in ecosystem service markets. For example, in order for beneficiaries of biodiversity services to become willing to pay for them, better methods of measuring and assessing biodiversity in working landscapes must be developed, as well as the institutional capacity to do so. New institutions must be created to encourage transactions and reduce transaction costs. Such institutions could include "bundling" biodiversity services provided by large numbers of local producers, as well as investment vehicles that have a diverse portfolio of projects to manage risks. Registers must be established and maintained, to record payments and trades. For example, The Katoomba Group is developing a Web-based "Marketplace" to slash the information and transaction costs for buyers, sellers, and intermediaries in ecosystem service markets.[20]

Conclusion

Conservation of biodiversity and of the services biodiversity provides to humans and to the ecological health of the planet requires financing on a scale many times larger than is feasible from public and philanthropic sources. It is essential to find new mechanisms by which resource owners and managers can realize the economic values created by good stewardship of biodiversity. Moreover, private consumers, producers, and investors can financially reward that stewardship. New markets and payment systems, strategically shaped to deliver critical public benefits, are showing tremendous potential to move biodiversity conservation objectives to greater scale and significance.

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NOTES

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19. For more information on this project, see http://www.katoombagroup.org/Katoomba/forestcarbon.

20. The Katoomba Group is a unique network of experts in forestry and finance companies, environmental policy and research organizations, governmental agencies and influential private, community, and nonprofit groups. It is dedicated to advancing markets for some of the ecosystem services provided by forests, such as watershed protection, biodiversity habitat, and carbon storage. For more information on the Katoomba Group, see http://www.katoombagroup.org. Forest Trends serves as the secretariat for the group. More information on Forest Trends can be found at http://www.forest-trends.org.