



ECOSYSTEM PROFILE

MADAGASCAR ECOSYSTEM
OF THE
MADAGASCAR & INDIAN OCEAN ISLANDS
BIODIVERSITY HOTSPOT

FINAL VERSION
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INTRODUCTION

The Critical Ecosystem Partnership Fund (CEPF) is designed to better safeguard the world's threatened biological hotspots in developing countries. It is a joint initiative of Conservation International (CI), the Global Environment Facility (GEF), the Government of Japan, the MacArthur Foundation and the World Bank. CEPF provides financing to projects located in biodiversity hotspots highly threatened regions representing only 1.4 percent of the planet's land surface, where some 60 percent of all terrestrial species diversity is found.

CEPF has been designed to build on the World Bank's commitment to biodiversity conservation and sustainable management, primarily implemented through the GEF and channeled to governments. CEPF will complement the efforts of the World Bank and the GEF to conserve biodiversity by providing a streamlined funding mechanism to a broad range of civil society partners, including NGOs, community groups and private sector partners.

CEPF will further the overall goals of the Bank at the country level by offering an opportunity to engage local communities and other stakeholders in biodiversity conservation and ecosystem management. CEPF will also provide an important learning experience through an innovative online grant system at www.cepf.net and by focusing on on-the-ground results and experience. The site is designed to serve as a central node, disseminating lessons learned and facilitating cross-regional information exchange on conservation successes. It will also promote replication of successful projects by providing access to a wide range of resources designed to aid project implementers in the biodiversity hotspots.

CEPF will strive to use lessons from other programs, particularly the GEF's medium grants procedure, to ensure that funds are provided expeditiously and with appropriate, cost-effective levels of accountability. CEPF will also use the GEF national focal points to ensure client country endorsement of the strategic direction of CEPF. CEPF is intended to complement, rather than duplicate or overlap with, regular GEF activities.

CEPF will support strategic working alliances among community groups, NGOs, government, academia and the private sector, combining unique capacities and eliminating duplication of efforts for a more comprehensive approach to conservation challenges. CEPF is unique among funding mechanisms in that it focuses specifically on biological areas rather than political boundaries and will look at conservation threats on a corridor-wide basis for maximum return on investment. This will be a significant contribution in Madagascar where much of the investment has focused on safeguarding current levels of biological diversity within the existing protected areas, but not necessarily throughout the whole corridor. The strategic directions of the CEPF program are strongly linked to a thorough priority-setting process, and targets several gaps in this larger strategy. Building on the collaborative processes already underway in the region will allow not only for cooperation with the many nongovernmental, scientific and other private-sector participants, but also for the possibility of building the capacities of these various groups. In addition, CEPF aims to disburse funds to civil society in a more agile manner, complementing current funding available to government agencies.

Funds will be used to provide small grants to conservation projects managed by private, NGO and civil society groups working in the critical ecosystems. Funding from CEPF directed at the project level will leverage additional financial and in-kind contributions. By funding conservation efforts in production landscapes, such as agricultural areas, CEPF has the potential

to build broader-than-usual support for conservation measures from the agricultural community, specifically encouraging agro forestry initiatives that maintain connectivity in corridor landscapes.

In summary, CEPF offers an opportunity to promote the conservation of some of the most important ecosystems in the world--places of high biodiversity and great beauty. Conservation of these ecosystems is especially important given the values provided by healthy, diverse ecosystems to agriculture, forestry, water supply and fisheries. These are critical to the Bank's efforts to alleviate poverty. CEPF will deliver assistance in an agile manner; it will engage a wide range of local community groups, civil society organizations, NGOs and private companies in addressing conservation needs.

BACKGROUND: MADAGASCAR HOTSPOT

The current set of priority biodiversity conservation needs for the Madagascar portion of the Madagascar and Indian Ocean Islands Hotspot stem directly from the 1995 Conservation Priority-Setting Workshop (CPW), which more than 100 of the world's foremost experts in the biology of Madagascar attended. These experts were organized into thematic groups (taxonomy, paleontology, socio economics) in order to identify conservation and research priorities. This workshop proved to be a catalyst for new efforts to address the severe threats facing Madagascar's forests, such as the Second Environmental Action Plan (PE2) and the Global Environment Facility (GEF) programs. Several significant recommendations were put forward as a result of the priority-setting workshop, and these remain the initial priorities for new project funding: to extend the protected area system, to develop biological research systems that function beyond the existing protected areas, and to develop corridors of protected areas between remaining blocks of forest and existing protected areas.

Using the results of the CPW, and monitoring the implementation of the GEF programs and PE2, the CEPF ecosystem profile outlines the biological importance of the ecosystem, the current threats it faces, and the current level of investment toward conservation by different donors, NGOs, and government agencies. Based on this review, a proposed strategic focus for CEPF is presented that complements past recommendations and current conservation efforts. This focus is summarized in an investment strategy aimed at delivering six main outputs:

1. mechanisms to integrate local groups and individuals in the management of protected areas and reserves;
2. private-sector conservation initiatives such as plantation forestry and nature tourism;
3. support for biodiversity conservation and management training;
4. promotion of advocacy and awareness;
5. a Biodiversity Action Fund to respond to critical, unanticipated conservation needs; and
6. a participatory coordination network to ensure continuity of the overall program.

The purpose of the investment strategy is to facilitate effective participation by nongovernmental and other private-sector organizations in the conservation of biodiversity in Madagascar.

To be eligible for funding under this ecosystem profile, a project must not only contribute to one or more of the strategic funding outputs, but must also meet the following general criteria:

1. Project execution must be within World Bank client countries that have ratified or otherwise acceded to the Convention on Biological Diversity. (Madagascar meets this criterion.)

2. Project funding may by no means result in the physical relocation of people, be used for the purchase of land, be directed toward a government entity, or be used for the capitalization of trust funds or similar financial instruments.

BIOLOGICAL IMPORTANCE OF THE MADAGASCAR HOTSPOT

This hotspot is composed of the island nation of Madagascar and several neighboring island groups: the Mascarenes, Comoros, and Seychelles in the western Indian Ocean. Seychelles, Mauritius and the bulk of the Comoros are independent nations, whereas the island of Reunion is a French overseas department and the Comorian island of Mayotte is a French overseas territory. At 587,045 square kilometers (0.4% of the land surface of the planet), Madagascar is the largest oceanic island and the fourth largest island on Earth. The island nation is located approximately 400 kilometers from the eastern coast of Africa and, via the process of plate tectonics, is believed to have been isolated from other landmasses for more than 160 million years. This isolation has resulted in a number of distinct evolutionary lineages and high levels of endemism among groups of plants and animals that either were inhabitants of the original landmass before Madagascar's separation, or which colonized the "new" island later. This section in the ecosystem profile provides a brief overview of the biological importance of the entire Hotspot region. However, at this point CEPF will provide grant resources to projects within the boundaries of the nation of Madagascar. Other areas of the Madagascar and Indian Ocean Hotspot may become eligible for funding later.

Together, the other island groups add very little to the land area of the hotspot, yet they make a significant contribution to its biodiversity. Reunion and the Republic of Mauritius, which consists of the main island of Mauritius, Rodrigues, Round Island and a number of smaller islands, are located approximately 900 kilometers east of Madagascar and cover 2,040 square kilometers. The Comoros are located northwest of Madagascar in the Mozambique Channel and cover 2,171 square kilometers. Seychelles, with four main granitic islands, Mahé, Praslin, Silhouette and La Digue, and approximately 100 other granitic islands and coralline islets, covers an area of 455 square kilometers. Combined with Madagascar, these island groups bring the total area of the hotspot to 594,221 square kilometers.

In terms of the original extent of its native habitats, Madagascar and the Indian Ocean Islands represents the 10th largest of the 25 biodiversity hotspots that have been identified by Conservation International. It ranks 8th among the hotspots in terms of remaining intact habitat (approximately 18% of the original extent), according to the most recent estimates of tropical forest cover.

Levels of Biological Diversity and Endemism

High levels of biological diversity and endemism are found in Madagascar and the Indian Ocean Islands, not only at the species level, but at the genus and family levels as well. Current estimates put the number of plant species in Madagascar somewhere between 10,000-12,000, of which more than 80% (8,000-9,600 or 3.2% of the world total) are endemic. These species are represented by 160-181 families, of which 10 are endemic (*Asteropeiaceae*, *Bembiciaceae*, *Didiereaceae*, *Didymelaceae*, *Diegodendraceae*, *Kaliphoraceae*, *Melanophyllaceae*, *Physeenaceae*, *Sarcolaenaceae* and *Sphaerosepalaceae*). Only the continent of Australia, more than an order of magnitude larger than Madagascar, has more endemic plant families (13). Of the island's 1,289 genera, 260 (20%) are endemic. Regional levels of plant endemism in Madagascar are also quite high. For example, 95% the plants of the southern spiny deserts are

endemic at the species level and 48% are endemic at the genus level, not occurring anywhere else in Madagascar.

The Mascarenes (Mauritius and Réunion) have 108 families, 323 genera and 955 species of vascular plants, of which 38 genera and 697 species (73%) are endemic. Comoros has 136 families and 416 species, of which 137 species (33%) are endemic, and Seychelles has 93 families, 170 genera and 200-250 species, of which one family, 12 genera and at least 70 species (35% of the lower estimate) are endemic. Together, these smaller islands add one endemic plant family, 50 endemic genera and 904 endemic species to the figures for Madagascar, raising the totals for the hotspot to 11 endemic plant families, at least 310 endemic genera, and 8,904-10,504 endemic species. No other hotspot has this many endemic families, and only three -the Tropical Andes, Sundaland and the Mediterranean- exceed this number of endemic plant species.

Comparative figures for terrestrial vertebrate groups are mixed, but no less impressive. On Madagascar, while overall bird diversity is relatively low (only 250 species), 115 (46%) endemic. Furthermore, there is a high rate of family-level endemism, with five bird families (*Brachypteraciidae*, *Leptosomatidae*, *Mesithornidae*, *Phillepittidae* and *Vangidae*) restricted to the island. Comoros has 91 bird species, of which 23 (25%) are endemic; the Mascarenes have 17 endemic bird species (seven on Réunion, eight on Mauritius and two on Rodrigues); and Seychelles has 170 bird species, 11 endemic.

The recent global analysis of restricted-range bird species by BirdLife International highlights the importance of the Madagascar and Indian Ocean Islands Hotspot in its identification of 11 Endemic Bird Areas (EBAs), six of which are recognized at the critical level: West Malagasy Dry Forests, with eight restricted-range species (three endemic and four threatened); East Malagasy Wet Forests, with 23 restricted-range species (20 endemic and 14 threatened); East Malagasy Wetlands, with nine restricted-range species (six endemic and four threatened, including three critically endangered); West Malagasy Wetlands, with seven restricted-range species (four endemic and five threatened, including two critically endangered); South Malagasy Spiny Forests, with 10 restricted-range species (eight endemic and two threatened); Comoros, with 18 restricted-range species (15 endemic and six threatened, including five critically endangered); Aldabra, with three restricted-range species (one endemic); Granitic Seychelles, with 12 restricted-range species (11 endemic and eight threatened, including four critically endangered); Réunion, with seven restricted-range species (four endemic and one endangered); Mauritius, with 10 restricted-range species (seven endemic and seven threatened, including four critically endangered); and Rodrigues, with two restricted-range species (both endemic and both threatened, one critically endangered).

The list of critically endangered birds in the Madagascar and Indian Ocean Hotspot is among the highest for any of the 25 hotspots identified by Conservation International. From Madagascar it includes the Madagascar serpent eagle (*Eutriorchis astur*), Alaotra grebe (*Tachybaptus rufolavatus*), Madagascar pochard (*Aythya innotata*), Madagascar fish eagle (*Haliaeetus vociferoides*), and Sakalava rail (*Amaurornis olivieri*). Comoros adds the Anjouan Scops-owl (*Otus capnodes*), Grand Comoro Scops-owl (*Otus pauliani*), Mount Karthala white-

eye (*Zosterops mouroiensis*), Grand Comoro drongo (*Dicrurus eminentissima*), and Mayotte drongo (*Dicrurus fuscipennis*). From Seychelles, the list includes the Seychelles Scops-owl (*Otus insularis*), Seychelles magpie robin (*Copsychus sechellarum*), Seychelles paradise flycatcher (*Terpsiphone corvina*), and Seychelles white-eye (*Zosterops modestus*). And the Mascarenes add five more: the pink pigeon (*Columba mayeri*), Mauritius parakeet (*Psittacula eques*), Mauritius olive white-eye (*Zosterops chloronothos*), Mauritius fody (*Foudia rubra*), and Rodrigues warbler (*Acrocephalus rodericus*).

Of Madagascar's 300 reptile species, 274 (91%) are endemic, as are 36 out of 64 genera (56%). The Mascarenes add five endemic reptile species, Comoros 22 species, of which seven are endemic, and Seychelles 15 species, of which 14 are endemic. The island of Aldabra is also home to an endemic giant tortoise (*Geochelone gigantea*). Combined, the Madagascar and Indian Ocean Islands Hotspot is home to at least 327 reptile species, of which 301 (92%) are endemic. These figures rank an impressive seventh and fourth among the world's hotspots, respectively.

Frogs are the only amphibians found on Madagascar. Only one or two of the island's 178 species are introduced 99% are endemic. Neither the Mascarenes nor Comoros have indigenous amphibians, but Seychelles adds 12 species, of which 11 are endemic. Thus the entire hotspot is home to 190 amphibian species, of which 187 (98%) are endemic. These figures rank Madagascar and the Indian Ocean Islands Hotspot seventh among hotspots in terms of amphibian diversity and fifth in terms of endemism, with the highest percentage of amphibian endemism for any hotspot (except for Polynesia/Micronesia and New Zealand, which only have three and four amphibian species, respectively).

While mammalian species diversity in Madagascar is not exceptional, 78 (67%) of the 117 species are endemic; excluding bats and introduced species, the level approaches 100%. The Mascarenes add two endemic mammals to the hotspot total, Comoros another 12 species and two endemics, and Seychelles another two species, both endemic. Overall, the hotspot ranks only nineteenth out of 25 for mammalian diversity, but sixth in terms of mammalian endemism.

Madagascar's primates are unquestionably the most prominent group of mammals native to this hotspot. Although it is only one of 92 countries in the world with wild primate populations, Madagascar is responsible for 21% (14 out of 65) of all primate genera and 29% (5 out of 17) of all primate families (*Cheirogaleidae*, *Lemuridae*, *Megaladapidae*, *Indriidae* and *Daubentoniidae*), making it the single highest priority area on Earth for conserving primate diversity. All 36 primate species and 54 taxa currently described are endemic to the island, two species almost certainly having been introduced by man to neighboring Comoros. Eleven species of Madagascar's lemurs are considered critically endangered: the white-collared lemur (*Eulemur fulvus albocollaris*), Selater's lemur (*Eulemur macaco flavifrons*), golden bamboo lemur (*Hapalemur aureus*), Alaotran gentle lemur (*Hapalemur griseus alaotrensis*), broad-nosed gentle lemur (*Hapalemur simus*), red ruffed lemur (*Varecia variegata rubra*), silky sifaka (*Propithecus diadema candidus*), diademed sifaka (*Propithecus diadema diadema*), Perrier's sifaka (*Propithecus diadema perrieri*), Tattersall's sifaka (*Propithecus tattersalli*), and crowned sifaka (*Propithecus verreauxi coronatus*).

Levels of Protection for Biodiversity

According to Conservation International's hotspot analysis, the remaining natural habitat in the Madagascar and Indian Ocean Islands Hotspot consists of approximately 59,038 square

kilometers of tropical rainforest, tropical dry forest and xerophytic vegetation, only about 10% of the original extent of the vegetative cover. Of the remaining natural habitat, only 11,546 square kilometers, or just under 2%, is in officially protected areas. By far the largest amount of remaining habitat and most significant national system of protected areas within the hotspot are found in Madagascar; therefore it is the focus of this section and of the subsequent CEPF investment strategy.

The Ecoregions of Madagascar

Based on an action plan recently released by Madagascar's Association Nationale pour la Gestion des Aires Protégées (ANGAP), the national agency responsible for management of protected areas, the country can be divided into a series of Ecoregions and Transition zones which correspond roughly to earlier domains based on floristic composition.

The **Eastern Ecoregion** covers 115,617 square kilometers and is characterized by lowland rainforest occurring between sea level and 2,000 meters. It extends along Madagascar's east coast from just north of Sambava to Fort Dauphin. Only 35,229 square kilometers (30%) of this ecoregion's original forest cover remains; the largest remaining tracts are found in the northeastern and southeastern extent of its range. This is perhaps the richest region in Madagascar in terms of species diversity, as shown by studies of vascular plants and terrestrial vertebrates, and it is also characterized by local centers of endemism (e.g., the Masoala peninsula, the Andringitra massif and the regions of Andasibe and Zahamena).

The **Central Ecoregion** covers 170,887 square kilometers and is a heterogeneous ensemble of moist and dry formations that parallel the Eastern Ecoregion, extending westward across Madagascar's central plateau. This part of Madagascar has been largely deforested or modified by human activities; as a result, only 11,929 square kilometers (7%) of its original habitat remains intact.

The **Northern Mountains Ecoregion**, an area spanning 20,935 square kilometers, corresponds to the northern limits of the former Central Domain and is an area of high endemism for arthropods, amphibians, reptiles and rongeurs. It includes two geographically distinct high mountain regions, Tsaratanana and Marojejy. Approximately 8,664 square kilometers (41%) of this ecoregion's original forest cover remains intact.

The Northern Transition Zone is a relatively small area (5,524 square kilometers) of mixed forests growing above 800m and stretching coast to coast in a thin strip across northern Madagascar. This transition zone includes the Sambirano Domain, as well as the northeastern limits of the Central Domain. Approximately 1,028 square kilometers (19%) of these forests remain in their original condition.

The **Western Ecoregion** is the largest of Madagascar's ecoregions, extending over an area of 211,045 square kilometers. It is a vast zone of dry deciduous forests on Madagascar's western coastal plains and limestone plateau, ranging from sea level to 800 meters and covering the area from Antsiranana in the north to Morombe in the southwest, as well as a smaller block in the extreme northern part of the country which represents a major center of plant endemism. The bulk of this ecoregion is characterized by a dry season of almost seven months and, along with the eastern lowland forests, should be considered among the most endangered forest ecosystems in Madagascar. Unfortunately, only 31,372 square kilometers (15%) of the Western Ecoregion's original forest cover remains intact. Included within this larger region is the

Analavelona Transition Zone, a tiny fragment of moist forest with characteristics of the Central Ecoregion.

The dry forests of the **Southern Ecoregion** cover an area of 57,721 square kilometers and are characterized by deciduous thicket or thorn scrub. They extend southward from Morombe along the coast, covering much of Madagascar's southern tip from sea level to 400 meters. Rainfall in this region is sparse and irregular. As a result, these are the driest forests in Madagascar and this is the region popularly referred to as the *spiny desert*. An estimated 19,131 square kilometers (33%) of the Southern Ecoregions original forests remain intact.

The Status of Protected Areas in Madagascar

Madagascar's national system of nature reserves (Réseau National des Aires Protégées) is composed of 46 protected areas representing three categories: 15 national parks, 8 integral nature reserves, and 23 special reserves. The table below provides information on the status, size, management and location of protected areas within the major ecoregions of Madagascar.

A recent analysis conducted by Conservation International has identified the following 23 protected areas as most important to the conservation of threatened lemur diversity in Madagascar. These areas are indicated by an asterisk (*).

Protected Area	Created	Area	Govt Region	Ecoregion	Authority
National Parks					
Andohahela *	8/7/97 ¹	760	Toliara	Eastern and Southern	ANGAP
Andringitra *	10/19/9 ¹	312	Fianarantsoa	Eastern and Central	WWF
Ankarafantsika ³ *	12/31/97	605	Mahajanga	Western	ANGAP
Baie de Baly	12/18/97	574	Mahajanga	Western	
Isalo	7/19/62	815	Fianarantsoa	Central	ANGAP
Kirindy-Mitea	12/18/97	722	Toliara	Western	
Mananara-Nord	7/25/89	230	Toamasina	Eastern	UNDP/ UNESCO
Mantadia *	1/11/89	100	Toamasina	Eastern	ANGAP
Marojejy *	5/19/98 ¹	601	Antsiranana	Northern Mountains	WWF
Masoala *	3/2/97	2,300	Toamasina	Eastern	ANGAP/ WCS
Midongy-Sud	12/18/97 ²	1,922	Fianarantsoa	Eastern and Central	
Montagne d'Ambre *	10/28/58	182	Antsiranana	Central	ANGAP
Ranomafana *	5/27/91	416	Fianarantsoa	Eastern	ANGAP
Tsingy de Bemaraha ⁴	8/7/97 ¹	666	Mahajanga	Western	ANGAP
Zahamena ⁴	8/7/97	414	Toamasina	Eastern	CI
Integral Nature Reserves					
Betampona *	12/31/27	22	Toamasina	Eastern	ANGAP
Lokobe	12/31/27	7	Antsiranana	Northern Transition Zone	ANGAP
Tsaratana	12/31/27	486	Antsiranana	Northern Mountains	ANGAP
Tsimanampetsotsa	12/31/27	432	Toliara	Southern	
Tsingy de Bemaraha *	12/31/27	854	Mahajanga	Western	ANGAP
Tsingy de Namoroka *	12/31/27	217	Mahajanga	Western	
Zahamena *	12/31/27	225	Toamasina	Eastern	CI
Zombitse-Vohibasia ²	12/18/97	172	Toliara	Central and Western	WWF
Special Reserves					
Ambatovaky *	10/28/58	601	Toamasina	Eastern	
Ambohitately	2/12/82	56	Antananarivo	Central	ANGAP
Ambohijanahary	10/28/58	248	Mahajanga	Central	

Analamazaotra	*	7/21/70	8	Toamasina	Eastern	ANGAP
Analamera	*	2/20/56	347	Antsiranana	Western	ANGAP
Andranomena	*	10/28/58	64	Toliara	Western	ANGAP
Anjanaharibe-Sud	*	10/28/58	321	Antsiranana	Northern Mountains	WWF
Ankarana	*	2/20/56	182	Antsiranana	Western	ANGAP
Bemarivo		9/10/56	116	Mahajanga	Western	
Beza-Mahafaly		6/4/86	6	Toliara	Southern	ESSA
Bora		2/20/56	48	Mahajanga	Western	
Cap Sainte Marie		10/24/62	18	Toliara	Southern	ANGAP
Forêt d'Ambre	*	10/28/58	48	Antsiranana	Central	ANGAP
Kalambatritra		4/24/59	283	Fianarantsoa	Central	
Kasijy		9/10/56	198	Mahajanga	Western	
Mangerivola		10/28/58	119	Toamasina	Eastern	
Maningoza		2/20/56	79	Mahajanga	Western	
Manombo	*	12/5/62	53	Fianarantsoa	Eastern	ANGAP
Manongarivo		2/20/56	327	Antsiranana	Northern Mountains and Northern Transition Zone	ANGAP
Marotandrano		2/20/56	422	Mahajanga	Eastern and Central	
Nosy Mangabe	*	12/14/65	5	Toamasina	Eastern	ANGAP/ WCS
Pic d'Ivohibe		9/16/94	35	Fianarantsoa	Eastern and Central	WWF
Tampoketsa-Analamaitso		10/28/58	172	Mahajanga	Central	

Table 1. Status, size, management, and location of protected areas within major ecoregions of Madagascar

- 1: established originally as an Integral Nature Reserve
 - 2: established originally as a Classified Forest
 - 3: currently an Integral Nature Reserve; proposed National park, but not yet decreed
 - 4: portion of former Integral Nature Reserve that has been upgraded to National Park status
- (*) Protected areas of major importance for threatened lemur conservation

ANGAP: Association Nationale pour la Gestion des Aires Protégées
 CI: Conservation International
 ESSA: University of Antananarivo, Department of Water and Forests
 UNDP: United Nations Development Program
 WCS: Wildlife Conservation Society
 WWF: Worldwide Fund for Nature

THREAT ASSESSMENT

There are several direct threats to ecosystem function and species diversity in Madagascar, including:

- agricultural expansion;
- timber exploitation;
- uncontrolled livestock grazing;
- fuel wood collection/charcoal production;
- hunting;
- corporate and small-scale mining;
- ornamental plant and wildlife collection; and
- introduction of exotic species.

Estimates of forest destruction indicate that as much as 80% of Madagascar's original forest cover has disappeared in the 1,500-2,000 years since the arrival of humans. The human population is now about 15 million and growing at about 3% each year (doubling every 20-25 years), and Madagascar is one of the most economically disadvantaged countries in the world.

Agricultural Expansion

In Madagascar, the production of rice, coffee, vanilla and spices accounts for about 80% of the national economy, and this exerts continual pressure on remaining forested areas. For the most part, the country's lateritic soils, with their low fertility, are not well suited to such agricultural uses and experience high levels of erosion annually. According to World Bank estimates, some US\$100-300 million of future agricultural potential is lost each year in Madagascar due to soil erosion.

Rice cultivation is the primary source of livelihood for 70% of the country's population; indeed, the Malagasy have the greatest per capita rice consumption of any country on Earth. Paddy rice is grown in the valleys and low plains in a few major agricultural centers and represents nearly three-fourths of the national rice production. Dry rice, while representing less than a third of the annual production, is grown throughout the country and often on deforested slopes in more mountainous areas. In the normal tavy process used in dry rice cultivation, natural vegetation is cleared and burned. The resultant ash provides sufficient nutrients to otherwise poor soil to allow for a season or two of crop production, after which the soil becomes exhausted and the farmer moves on, leaving the original plot to lay fallow and regenerate. Unfortunately, the average fallow time in much of Madagascar is far less than that required to regenerate nutrients, and this results in a net loss of both original vegetation and arable land. Current national estimates of forest loss due to shifting cultivation in Madagascar are on the order of 2,000 square kilometers per year.

Timber Exploitation

At present, logging is actually a relatively minor threat to Madagascar's remaining forest ecosystems, as it is traditionally practiced with low levels of mechanization. Chainsaws are seldom used, and transport within the forest is most often by human or animal traction. However, if foreign companies are allowed to acquire concessions or if international donors increase support for sustainable forest management in Madagascar, logging could quickly escalate to a major threat.

Uncontrolled Livestock Grazing

This is a problem in Madagascar, where a cattle-raising tradition was imported centuries ago from East Africa, and today there are at least as many cattle in Madagascar as there are people. Cattle grazing affects natural forest ecosystems through the clearance of vegetation, the annual burning to encourage new grass growth, and overgrazing in general. These problems are concentrated in the west and south, where cattle are the principal source of wealth.

Fuelwood Collection/Charcoal Production

Every year, large areas of natural forest in Madagascar are destroyed to provide fuelwood and charcoal for cooking. This problem is especially severe in the spiny desert forests of the south, where roadside charcoal stands are a common sight and help supply the needs of people living in distant towns.

Hunting and Trade

Bush meat hunting is a major threat in Madagascar, especially for a number of the larger species. Certain lemurs e.g. the ruffed lemurs (*Varecia* spp.), the true lemurs (*Eulemur* spp.) and the sifakas (*Propithecus* spp.) are heavily affected, and even smaller species such as tenrecs, small carnivores, and a variety of birds are hunted as well. The radiated tortoise, which is protected by

taboo in local culture, is sent in large quantities to Tulear and illegally to Réunion, where it is a prized delicacy. The large Madagascar side-necked turtle, found only in the rivers and lakes of the west coast, has been hunted to extinction in many areas. Overall, hunting should probably be considered a greater threat than the wildlife trade, since it affects many of the larger, more endangered species.

Corporate and Small-Scale Mining

Madagascar is rich in valuable minerals and gemstones. As a result, it has attracted foreign attention for such valuable resources as titanium, which is mined on a commercial scale. It has also attracted itinerant miners in search of gold, sapphire and other precious stones. These events have had serious impact in areas such as Daraina (site of a proposed protected area) and existing parks and reserves such as the Ankarana Special Reserve.

Ornamental Plant and Wildlife Collection

The unique biota of Madagascar attracts an illicit and illegal trade in native plants and animals. Among vertebrates, reptiles and amphibians are the most heavily poached, and the scale of this trade is estimated at millions of dollars annually.

Introduction of Exotic Species

The introduction of invasive plants and animals is by far the most serious threat to native wildlife in the smaller islands of this hotspot. Introduced feral animals and game species have been particularly detrimental to island flora that had evolved no defenses against browsing and trampling by pigs (*Sus scrofa*), goats, cattle, deer (*Cervus timorensis*), rabbits and hares (*Oryctolagus cuniculus* and *Lepus nigricollis*), rats (*Rattus rattus*), monkeys (*Macaca fascicularis*) and giant African land snails (*Achatina fulica* and *A. panthera*). Wet forests seem to be more susceptible than dry forests to invasion and degradation by exotic species.

In addition to the proximate threats described here, there are a number of indirect, but equally serious, threats to ecosystem functions and species diversity, especially in Madagascar, the principal focus of this profile. These include:

- policy-making practices;
- governance and rule of law;
- training and capacity;
- limited biodiversity information;
- disruptive effects of forest fragmentation; and
- lack of conservation benefits to local communities.

Policy-Making Practices

In the parks and forestry sectors, the Malagasy governments practices of policy-making pose a threat to effective conservation. The National Association for the Management of Protected Areas (ANGAP) has no legal mandate to police the country's 46 parks and reserves, which cover approximately 17,187 square kilometers, or about 3% of the country. This authority rests with the Ministry of Water and Forests (MEF), which is principally concerned with managing logging practices in Madagascar's extensive national system of more than 250 classified forests and forest reserves, which cover an area of approximately 40,000 square kilometers, (about 7% of the land area) and no doubt harbor at least as much of Madagascar's biodiversity as the ANGAP-managed network, including a number of species of threatened plants and animals that are currently unprotected.

Certain bilateral donors have encouraged the MEF to generate resources by entering into more commercial logging, a disastrous scenario in a region where so little habitat remains and so many other threats are present. An alternate strategy would be for the MEF to redesignate its highest-priority forest reserves as biodiversity conservation reserves (ZODECOs), in return for which international NGOs would find the resources to carry out this conversion and to manage these protected areas in the long term. Pending legislation, focused on changing the MEF from a logging ministry to a more potent force for biodiversity conservation, should help advance this process.

Governance and Rule of Law

Government services are inadequate throughout large areas of Madagascar. Where government is present, it is often severely underfunded, such that legislation regarding resource management, e.g. banning *tavy* and the use of brush fires is largely moot. The uneven application of existing laws can cause community resentment and actually result in the opposite of the intended effect of legislation.

In the realm of protected areas and forestry, ambiguous policy-making can threaten effective conservation. Because ANGAP has no formal legal mandate to police parks and reserves, attempts by NGOs to improve protected-area management have resulted in a confusion of roles and responsibilities. This situation illustrates the need for more targeted support of NGO efforts to strengthen protected areas.

Training and Capacity

Few formally trained protected-area personnel and biologists can be found in Madagascar; therefore much of the conservation work is done by expatriates. This problem, however, can also be viewed as an opportunity to foster partnerships between Malagasy scientists and expatriates who continue to work on conservation projects in Madagascar.

Limited Biodiversity Information

A small national scientific community and limited facilities for field research constrain the gathering and processing of important biodiversity data in Madagascar. Most of the country's remaining natural forest formations are found in remote areas, to which access is limited, time-consuming and expensive, and this has caused even basic inventory processes to lag behind conservation planning. Information from long-term ecological studies is even more limited.

Disruptive Effects of Forest Fragmentation

The overall process and extent of forest fragmentation is itself a major and growing threat to Madagascar's biodiversity. Many of the country's forests are already so fragmented that their long-term contribution to ecosystem function and species diversity is questionable.

Lack of Conservation Benefits to Local Communities

The lack of tangible benefits to local communities from ongoing conservation activities ultimately undermines the long-term success of these activities. Some of the most profitable enterprises, for example- including nature tourism and the medicinal plant trade- largely or solely benefit foreign entrepreneurs. Without appropriate models for community integration and benefit sharing, local support for conservation projects is unlikely.

ASSESSMENT OF CURRENT INVESTMENT

National Environmental Action Plan

In 1991, the government of Madagascar approved a 15-year National Environmental Action Plan (NEAP), to be implemented in three five-year multi-donor coordinated programs. Under the first phase, PE1, several new institutions were created, such as the National Office of the Environment, ANGAP, and the National Small Action Fund for the Environment. In addition, the capacities of the existing Forestry Department were augmented. PE1 assigned a high priority to the conservation of biological diversity based on the existing national system of protected areas, and to development assistance from NGOs for surrounding communities. Key products of PE1 were the Scientific Priority-Setting Workshop for Madagascar, a biodiversity data-driven exercise conducted under the direction of Conservation International in 1995, and the subsequent Participatory Options and Priorities Process, a series of workshops intended to build consensus for conservation action among local stakeholders. Both products set the stage for PE2.

PE2 was launched in 1997 as a US \$150 million effort, and is still in progress. Major foci of this second phase include the protection of watersheds and existing protected areas, improved management of classified forests and forest reserves, the development of a “corridors” approach to ecosystem conservation, the transfer of resource stewardship to communities, and environmental policy reform at the national level. However, a recent midterm review of PE2 noted continued environmental destruction and only moderately successful results at developing field programs.

It is important to note that there has also been a heavy emphasis on sustainable development activities at the community level as part of PE2, as opposed to mainstream biodiversity conservation. A change in strategy is required to effectively address biodiversity conservation.

Multilateral and Bilateral Donors

Donors to NEAP include the **World Bank**, the **United States Agency for International Development (USAID)**, **German Technical Assistance (GTZ)**, **German Infrastructure Development (KfW)**, **United Nations Development Program (UNDP)**, and the **Global Environmental Facility (GEF)**. This group has formed a Multi-Donor Secretariat to coordinate the deployment of international financial resources.

The World Bank: The World Bank has referred to itself as the lender of last resort for PE2. Its environmental portfolio includes watershed protection, park protection and forestry. The Bank administers one part of the GEF’s input to PE2 concerning national parks and forest management.

UNDP: UNDP support of PE2 is targeted to the identification of regional conservation problems and to marine conservation efforts.

UNEP: UNEP/GEF has finalized a PDF B that will shortly result in a project to be implemented in Madagascar called “In-situ Conservation of Crop Wild Relatives Through Enhanced Information Management and Field Application.” This project will result in increased production of crop wild relatives to be used to improve native crop productions. Information gleaned from this project will aid countries to identify priority conservation actions and areas.

GEF: Global Environmental Facility support is administered partly through UNDP and partly through the World Bank, and has been channeled to national parks planning and implementation, improved forest management, the development of non-timber forest products, and marine conservation efforts.

USAID: The U.S. government has made a multiyear US\$40 million commitment to biodiversity conservation in Madagascar. Its program is focused on rural development initiatives and the identification of regional problems and threats to biodiversity. USAID was instrumental in launching the process that led to the creation of the National Environmental Action Plan in 1984 and has helped keep this process on track since then. It also continues to provide funding for research, monitoring and management activities in the new Masoala National Park.

Dutch Agency for International Development (Dutch AID): Dutch AID was instrumental in supporting the creation of the Masoala National Park in 1998, and maintains its support of activities conducted in that protected area.

GTZ: GTZ is providing assistance to revise national forest policy and to strengthen the field of forestry management.

KfW: KfW is providing support for watershed protection and improved management practices at three national parks.

French cooperation: Foci for French support have been the identification of regional conservation problems and assistance in forest management and forestry research.

Swiss cooperation: The Swiss were previously active in PE2 in the areas of forestry training and the development of community forestry techniques, but they have withdrawn from the international support group.

JICA: The Japanese have provided limited support for forest management under PE2.

Foreign NGO Donors

Individual and foundation donors to biodiversity conservation efforts in Madagascar are numerous. Noteworthy among them are the **John D. & Catherine T. MacArthur Foundation**, the **National Geographic Society**, the **Carbon Storage Trust**, the **UNDP Foundation**, **CARE International**, the **Madagascar Fauna Group**, **Wildlife Preservation Trust International** (United States), the **Margot Marsh Biodiversity Foundation**, **Missouri Botanical Garden**, **BirdLife International**, **National Science Foundation**, **Friends of the Earth** (Asa Fady) and **Primate Conservation, Inc.**

Local Implementers

Association FANAMBY: This relatively new Malagasy NGO has already developed a national presence with key projects to establish new protected areas in Anjozorobe and Daraina, as well as efforts to support the activities of community-based ecotourism projects such as the Association des Guides d'Andasibe, a locally organized association of guides at work in one of the country's most prominent international ecotourist projects in eastern Madagascar.

Université d'Antananarivo: A growing number of field research and conservation projects in Madagascar include professors and students representing the Université d'Antananarivo's Faculty of Science and Department of Biological Anthropology.

Foreign Implementers

World Wildlife Fund (WWF): WWF has been the single most important international NGO in the history of conservation in Madagascar. WWF administers protected area management programs in two national parks (Andringitra and Marojejy), one integral nature reserve (Zombitse-Vohibasia), and two special reserves (Anjanaharibe-Sud and Pic d'Ivohibe) with funding provided by USAID, KfW and GEF. Conservation education and outreach programs under its auspices are funded by other sources.

Conservation International (CI): CI was instrumental in developing and conducting Madagascar's Scientific Priority-Setting Workshop in 1995, which helps to guide ongoing and future biodiversity conservation efforts. CI maintains a full-time national program staff in Madagascar, where it supports PE2 protected area and forestry objectives with funding from USAID and GEF, focusing on the new Zahamena National Park and the Zahamena Integral Nature Reserve. CI also administers a series of species conservation, biological assessment and NGO support projects with funding from foundations and private sources.

Wildlife Conservation Society (WCS): WCS was instrumental in the creation of the Masoala National Park in 1998, part of a 10-year multiorganizational effort in collaboration with **Université d'Antananarivo, Stanford University, the Peregrine Fund, Natural History Museum (London), Parc Botanique et Zoologique de Tsimbazaza, AMNH Center for Conservation Biology, Kew Gardens and Missouri Botanical Gardens**, and supported by the Dutch government and USAID. WCS maintains its role in surveying, monitoring and assisting in the management of Masoala, Madagascar's largest national park.

Center for Biodiversity Conservation/The American Museum of Natural History: In Madagascar, the museum's new Center for Biodiversity Conservation has established a biological survey and monitoring project at the Nosy Mangabe Special Reserve, and has also conducted searches and surveys of the endangered aye-aye (*Daubentonia madagascariensis*) in other parts of Madagascar.

Deutsches Primatenzentrum: The German National Primate Center has established a key ecological research presence in the dry forests of western Madagascar and supports the publication of *Lemur News*, the newsletter of the Madagascar Section of the IUCN/SSC Primate Specialist Group.

The Durrell Wildlife Conservation Trust: Formerly known as the Jersey Wildlife Preservation Trust, this small organization has implemented a number of important species conservation projects in Madagascar since the 1980s. In the northern part of the country, the Trust pioneered a breeding program for the angonoka tortoise (*Geochelone yniphora*) and flat-tailed tortoise (*Pyxis planicauda*), which has resulted in the creation of Baly Bay National Park to protect the angonoka in its natural habitat and the trial reintroduction of captive-bred tortoises. In western Madagascar, the Trust has initiated field studies of the critically endangered Madagascar teal (*Anas bernieri*), for which it has established a captive breeding program in the United Kingdom, as it also has for the aye-aye (*Daubentonia madagascariensis*) and the Lac Alaotra gentle lemur (*Haplemur griseus alaotrensis*). Trust staff, working with a local

Malagasy NGO, maintain a research presence at Lac Alaotra as part of the effort to establish a protected area for the “bandro” or gentle lemur.

British Airways Assisting Nature Conservation Programme: Through this unique program, British Airways has provided significant logistic support (at no cost) to a number of collaborating institutions for the purpose of transporting project personnel and threatened wildlife to and from Madagascar.

Institute for the Conservation of Tropical Environments (ICTE)/State University of New York at Stony Brook: These affiliated organizations are largely responsible for the creation of Ranomafana National Park, for protected area management efforts and ongoing field research at the Ranomafana Biological Research Station, and for support of biological inventories and species surveys in a number of key protected areas throughout Madagascar, as well as the training of Malagasy biologists abroad. ICTE maintains offices in the United States and in Madagascar and links its field-based efforts in Madagascar to more than 50 U.S.-based and 13 non-U.S. universities and institutions.

Duke University: The Duke University Primate Center has a long-term commitment to lemur conservation, which includes captive breeding efforts for a number of species at its facilities in the United States, support for Madagascar’s Ivoloina Zoological Park in Tamatave, the reintroduction of black-and-white ruffed lemurs (*Varecia v. variegata*) in the Betampona Integral Nature Reserve, ongoing genetic research, and the training of Malagasy biologists abroad.

Major long-term international university and natural history museum programs established in Madagascar include those of the **University of Hannover** (Germany), **Yale University**, the **Field Museum of Natural History**, **Cornell University**, and **Clark University** from the United States.

CEPF NICHE FOR INVESTMENT IN THE REGION

In developing this profile, root causes considered included poverty, inadequate access to education, and conflicting national policies. More proximate threats include local community activities that are incompatible with biodiversity conservation; small-scale mining; and lack of local constituency for conservation issues. Given the relatively small amount of money available through CEPF for this region, project designers had to make some choices regarding resource allocation. This project is fundamentally regional in its approach and proposes to provide incremental value in addressing some national-level root causes directly, such as policies regarding natural resource extraction. In other cases, it is taking on more proximate cause issues, such as problems at the level of communities and municipalities. The communications component seeks to build a constituency for conservation at the national and local levels. Recognizing that its resources are limited, CEPF has always proposed to play a strategic coordination role and in so doing leverage considerably more resources in support of conservation than it could possibly bring to the table itself. In this spirit, CEPF proposes to invest significantly in activities that will focus the many disparate efforts at work in this vast corridor while ensuring that the best and most objective information is available to shape decision-making by a broad range of actors. In this way, CEPF expects to influence the root causes of biodiversity loss, albeit indirectly in some cases.

It has been determined that the most strategically compelling niche for CEPF is to focus on filling the gaps between existing efforts and investments. For this reason, defining the mechanisms to ensure the proper coordination among existing efforts is a major component of each of the profiles.

It must also be understood that the set of CEPF objectives is not meant to resolve all of the threats described in the profile. CEPF is one small element of much larger strategies in each ecosystem. Given the current levels of investment, the programs and strategies already in place and those anticipated, CEPF strives to fill a particular niche that has yet to be addressed at the level required for positive impact. This niche, and the main objective of CEPF, is to provide civil society, organizations, and individuals with the capacity to manage biodiversity conservation more effectively. CEPF focuses on this group based on the hypothesis that sustainable biodiversity conservation will only be realized if civil society groups existing within the critical ecosystems drive the process. To extend the logic, if these groups become the actors and voices for biodiversity conservation, then decision-makers will begin to incorporate these issues into national and transboundary policies, legislation and action. Only if this impact is achieved will resources from CEPF be able to realize sustainable biodiversity conservation.

CEPF INVESTMENT STRATEGY AND PROGRAM FOCUS

The investment strategy for CEPF funding for Madagascar is based on conservation planning and implementation efforts undertaken in the last decade. The strategic investment opportunities build on initiatives such as those put forth under the auspices of the NEAP, and recommendations that emerged from Madagascar's Conservation Priority-Setting Workshop (CPW). The NEAP focuses on an already widespread system of protected areas with a view toward the coordinated management of ecosystems within Madagascar's distinct ecoregions. Recommendations from the CPW go beyond the current protected-area network to include the development of corridors between existing parks and reserves and the creation of new ones.

To date, there has been limited focus by the international donor community on broadly defined natural resource management programs and community development. Current efforts focus on the "nuts and bolts" of safeguarding current levels of biological diversity within the framework of existing and proposed protected areas. As a result, many parks and reserves remain severely underfunded, lacking designated management authorities or management plans. Current initiatives also lack coordination among Malagasy scientists, national and international NGOs, and expatriate conservation experts. CEPF support should create and strengthen such partnerships.

Throughout the hotspot, the scientific and NGO communities remain relatively weak, and there is still a lack of skilled leadership at the national and regional levels. These island nations do not have effective national scientific institutions. CEPF support will help bolster institutional commitments to the study of biodiversity throughout the region.

Despite much discussion, sound models of private sector engagement in biodiversity conservation have yet to be demonstrated in Madagascar. Nature tourism, for example, has strong potential, yet projects that link the benefits of such tourism to communities in ways that encourage conservation at the grassroots level have not yet been developed. Another example, plantation forestry, has the potential to relieve pressure on natural forests, but has largely remained a government initiative that has generated little local employment or support. Carbon

sequestration also has generated much interest as a concept, but no serious feasibility studies or demonstration efforts currently exist.

The emphasis of CEPF funding in the region will focus on these strategic themes:

1. Integrating local groups and individuals in the management of protected areas and reserves

Throughout the hotspot, and especially in Madagascar, increased financial and technical support for NGOs is needed to enhance the management of existing parks and reserves. Approximately one-third (15) of these protected areas currently have no management authority assigned to them, which limits their contribution to biodiversity conservation. In addition, another 20 parks and reserves now assigned to ANGAP are not linked to any international partners from which technical and financial support would be more readily available. CEPF support for protected-area management in Madagascar will focus on increasing the number of partnerships between ANGAP and those international NGOs that have demonstrated their ability to manage protected areas. Notable among these organizations are the World Wide Fund for Nature, the Wildlife Conservation Society, and Conservation International.

The creation of new protected areas and corridors will be a likely result of expanding biological inventory programs in Madagascar, and the planning processes necessary for this should also be supported by CEPF. This includes biological inventories and better management of the country's extensive systems of classified forests and forest reserves. Within the world's 25 hotspots, approximately 40% of the remaining natural habitat is in officially protected areas; in Madagascar, however, only 17,187 of the remaining 107,353 square kilometers of natural habitat only- 16% -are protected. At least 90,000 square kilometers of natural habitat remain unprotected throughout the country.

In Madagascar, the extent of protected areas varies from one ecoregion to the next: 18% in the Eastern Ecoregion, 22% in the Central Ecoregion, 17% in the Western Ecoregion, 20% in the Northern Mountains Ecoregion, 5% in the Southern Ecoregion, and less than 1% in the Northern Transition Zone. In addition, studies in several ecoregions show that not all of the land area lying within parks and reserves represents intact natural habitat: in the Central Ecoregion, 61% of protected area is natural habitat; in the Southern Ecoregion 57%, and in the Western Ecoregion only 39%. ANGAP has published a plan to augment Madagascar's protected-area network by creating new parks and reserves, including three in the Southern Ecoregion (succulent bush west of the Manambavo River, the Plateau Mahafaly Karimbola, and Forêt Mikea), six in the Eastern Ecoregion (the Forêt Littorale south of the Manombo Special Reserve, Zafimaniry, Marolambo, Torotorofotsy, Anjozorobe and the Plateau Makira); and 10 in the Western Ecoregion/Northern Transition Zone (Betandraka, Analavelona, Forêt Mikea, Menabe, Manambolamaty, Mahavavy Kinkony, Forêt de IÃAndrona, Sahamalaza, and Daraina).

CEPF will also support plans to link existing protected areas in Madagascar through biodiversity corridors. In the Northern Mountains Ecoregion a corridor has been proposed to connect the Tsaratanana Integral Nature Reserve with Marojejy National Park and the Anjanaharibe Special Reserve. In the Eastern Ecoregion, proposals have been made to develop three major corridors:

- one linking Andohalela National Park, the Midongy du Sud Special Reserve, the Pic d'Ivohibe Special Reserve, Andringitra National Park and Ranomafana National Park;

- another linking the Analamazaotra Special Reserve, Mantadia National Park, the Mangerivola Special Reserve, and the Zahamena National Park and Zahamena Integral Nature Reserve; and
- a third linking the Ambatovaky Special Reserve and the Marotandrano Special Reserve.

In order to improve management of protected areas and to support the creation of these corridors, CEPF funds will be targeted to support priority-setting activities and similar participatory processes to ensure that a sufficient range of views and ideas is considered and incorporated.

2. Private-sector conservation initiatives

Private-sector conservation initiatives can have a catalytic effect in a number of key areas including nature tourism, plantation farming and carbon sequestration. Small nature tourism programs have been established in a number of local communities adjacent to parks, reserves and proposed protected areas. Generally, these projects focus on Madagascar's unique vertebrate fauna and provide guides and essential services to foreign tourists. CEPF support will focus on guide training and on enhancing the local infrastructure to attract more tourists. Plantation forestry production of wood and paper goods for the local market is a private-sector opportunity with major dividends in the conservation of natural forests. Carbon sequestration has significant potential in Madagascar, and requires private-sector involvement and demonstrated models to succeed.

3. Biodiversity conservation and management training

Training in the techniques of biodiversity conservation is required in order to strengthen the scientific and NGO communities in Madagascar. This should include support for programs based at national universities, such as the cooperative agreements undertaken by Université d'Antananarivo, as well as a collaborative program in western Madagascar recently proposed by Hannover University of Zurich and Madagascar's University of Mahajanga. Support could also be provided to existing programs that offer Malagasy students an opportunity to study abroad. Two successful programs that may be interested in this opportunity are Duke University and the State University of New York at Stony Brook.

Likewise, CEPF resources will be directed toward in-country training and capacity-building for conservation professionals to increase their ability to advocate and manage conservation programs.

4. Awareness and advocacy mechanism

Awareness and advocacy efforts are needed to improve public involvement in conservation, encourage sound legislative frameworks, and to promote reconciliation of Madagascar's international biological importance with its pressing needs for economic growth. NGO leaders can play an important role in this process by involving themselves in promotions that highlight the importance of biodiversity. CEPF will support targeted awareness and advocacy programs promoting biodiversity as a valuable national asset. These awareness campaigns or programs will coordinate with, and build upon, initiatives currently being implemented by government entities. In most instances, projects funded by CEPF will be required to demonstrate linkages with existing programs.

5. Biodiversity Action Fund

In order to respond to unforeseen circumstances that affect biodiversity conservation, and to facilitate inter-institutional coordination and small-scale capacity building, it is recommended that CEPF provide resources to establish a Biodiversity Action Fund. Small grants from the Biodiversity Action Fund will vary in size, but no single grant will exceed US\$10,000.

6. Creating a participatory monitoring and coordination network

In order for the strategy, as laid out in this profile, to be implemented successfully, an overall monitoring and coordination mechanism is required. CEPF will provide support for such a mechanism to ensure that projects in the region are fulfilling the objectives established in the CEPF ecosystem profile. It is envisioned that the mechanism, or network, will consist of a core alliance of organizations having significant technical capacity and strong program history in the region. It should also include some form of advisory panel of top scientists to ensure that efforts focus on identified priorities for the region. In order to maintain communication within this mechanism, CEPF will support the creation of an electronic information system or other new communications vehicles.

The monitoring and coordination network will work with the CEPF core management team to identify and review potential CEPF projects. In addition, it will play an active role in monitoring specific projects during implementation in order to maintain high performance levels.

This coordination network is important for the CEPF implementation period; however, the intention is that this network will operate well beyond the CEPF financing period. Therefore, as the network is established, it must also focus on how it will sustain itself in the longer term.

SUSTAINABILITY

The CEPF Investment Strategy will be funded over a period of three years and represents the beginning of a larger process to bring about sustainable biodiversity conservation within the region. It is therefore important to highlight the sustainability of the CEPF strategy beyond the initial three-year funding period. There are three key elements to the sustainability of these objectives; the first, already noted, is a tremendous current level of investment within the region by several multilateral and bilateral organizations, government agencies, and international and local NGOs. In order to build on this, CEPF plans to encourage sustainability by building local capacities, the second key element of sustainability. Much of the implementation of biodiversity conservation efforts is currently done by outside organizations and the focus of CEPF is to build local capacities to take over much of this role and for these civil society groups to take the lead on conservation efforts. Capacity alone, however, may not be sufficient. Financial resources for biodiversity conservation will remain a critical issue for sustainability. For this, through cultivation of partnerships and alliances, CEPF hopes to leverage new funding for biodiversity conservation. This is the third element of sustainability. It is expected that quality results from CEPF projects will generate increased interest and confidence in the donor community leading to increased investment. The combination of local capacity and increased overall funding, together with current levels of investment in the region, should lead to greater biodiversity conservation impacts that can be sustained for a long time to come.

While the overall sustainability hypothesis is logical and sound, there will be much to learn from each individual CEPF grant project. Accordingly, all project proposals will include a section in which external risk factors and long-term sustainability issues will be addressed. Projects will be required to highlight key external factors that might reduce the benefits of their

activities and discuss plans to mitigate these. Applicants will also explain how they see the objectives of their specific projects carrying forward after the initial CEPF funding period. All of this will be shared on the CEPF web site, allowing other project teams to learn from successful risk mitigation strategies and sustainability measures put in place by various projects. To continue this process after the initial project design phase, grantees will revisit these issues in each of their quarterly project performance reports. The purpose is not only to highlight risk and sustainability at the outset, but also to track these critical issues throughout the life of each project.

CONCLUSION

The major ecosystems of Madagascar have levels of endemism that make them biologically outstanding, and threats that compel global conservation action. Lack of government resources for protected areas and a limited NGO sector has hampered conservation progress in the region. A multifaceted approach is needed in order to establish effective models of protected-area management and grassroots conservation. From small grants for fledgling NGO efforts to larger grants for park conservation and responses to top scientific priorities, the CEPF strategy will make a critical difference. The strategy will be implemented first in Madagascar, the largest and most diverse island in the hotspot, and may expand later to include activities on other islands.