CEPF/DC28/7c

Critical Ecosystem Partnership Fund

28th Meeting of the CEPF Donor Council

Brussels, Belgium

20 January 2016

2:00 to 5:00 pm CET

Ecosystem profile for the Cerrado Hotspot

Background

The ecosystem profile for the Cerrado Hotspot was developed during FY14 and FY15 by a consortium involving Conservation International Brazil and the Institute for Society, Population and Nature.

An extended summary of the ecosystem profile for the Cerrado Hotspot is presented here. The full text of the profile can be downloaded from:

https://www.dropbox.com/sh/n45yjj651r9wgcu/AABVzgtPIn8O56nc-Ejbw9h2a?dl=0

Ecosystem Profile

Cerrado Biodiversity Hotspot

Extended Summary for CEPF Donor Council

7 December 2015

1. INTRODUCTION

1.1 The Critical Ecosystem Partnership Fund

The Critical Ecosystem Partnership Fund (CEPF) is a collaborative funding initiative of l'Agence Française de Développement (AFD), Conservation International (CI), the European Union (EU), the Global Environment Facility (GEF), the Government of Japan, the John D. and Catherine T. MacArthur Foundation, and the World Bank. Their shared interest and objective is the conservation of biodiversity hotspots – Earth's most biologically rich yet threatened areas.

In June 2013, the CEPF Donor Council selected the Cerrado Biodiversity Hotspot for profiling and future investment. This was intended to be the first investment by the fund in the Cerrado Hotspot. Following a competitive process, a consortium involving Conservation International Brazil (CI-Brazil) and the Institute for Society, Population and Nature (ISPN) was selected to prepare the ecosystem profile.

1.2 Cerrado Hotspot

The Cerrado is the largest hotspot in the Western Hemisphere, covering more than 2 million km^2 in Brazil and extending marginally (about 1%) into Bolivia and Paraguay. The hotspot includes the headwaters of three of South America's major river basins (the Amazon/Tocantins, São Francisco and Plata), and is thus of high importance for regional water security.

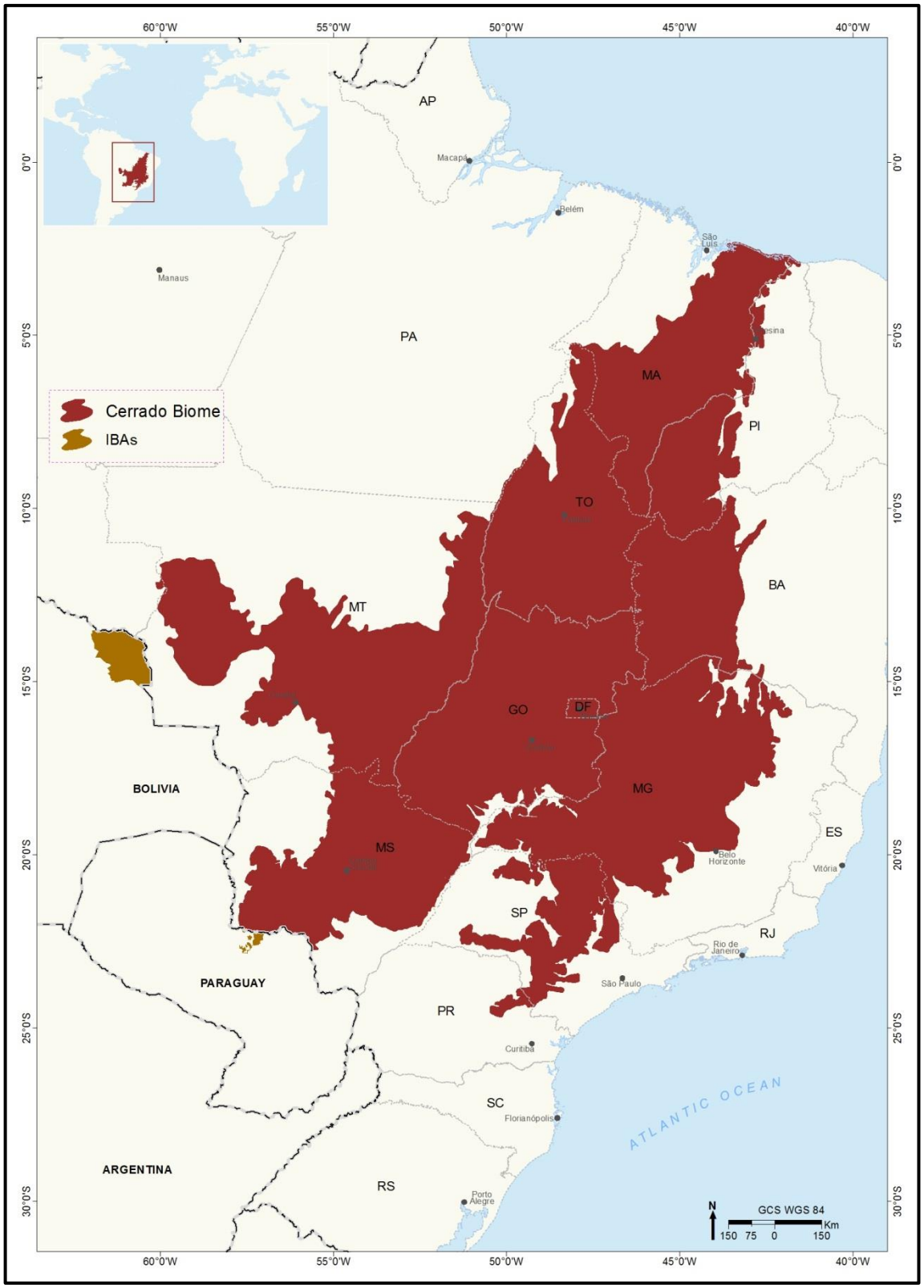
The Cerrado is extremely rich in plant species, being home to about 12,000 cataloged native species. The great diversity of habitats gives rise to remarkable transitions among different vegetation typologies. Almost 250 species of mammals live in the Cerrado, along with a rich avifauna comprising 856 species. Fish (800 species), reptile (262 species) and amphibian (204 species) diversity is also high. Many of these species and varieties are endemic, not only to the hotspot but also to single sites within it. For those reasons, the Cerrado is considered the biological richest tropical savanna region in the world.

Besides its biodiversity values, the Cerrado has great social importance. Many people depend on its natural resources to survive and thrive, including indigenous groups, *quilombolas* (descendants of escaped slaves), *geraizeiros* (traditional people living in savannas of northern Minas Gerais), *ribeirinhos* (traditional artisanal fishers) and babassu crackers (groups of women who extract the fruit of the babassu palm tree), which are all part of Brazil's historical and cultural heritage, and who share traditional knowledge of its biodiversity. More than 220 species have medicinal uses and a wide variety of native fruits are regularly consumed by local people and sold in urban centers. The biome is also the center of origin for pineapples and of dispersion for other established commercial crops like peanuts, beans and manioc.

For the purposes of the ecosystem profile, the Cerrado Hotspot was taken to comprise the Cerrado Biome recognized by the Brazilian government plus four Important Bird Areas (IBAs) in neighboring Bolivia and Paraguay, which contain examples of Cerrado ecosystems (Figure 1.1). This region of analysis was chosen because it makes the ecosystem profile more relevant to government conservation strategies in Brazil, while

still reflecting the fact that the biogeographic boundaries of the Cerrado extend marginally into neighboring countries.

Figure 1.1: Region of Analysis for the Ecosystem Profile



Currently, the Cerrado is one of the planet's leading areas for agricultural and livestock production. While this is a cause of pride for many, frontier expansion also takes its toll. The Brazilian Ministry of Environment estimates that, by 2010, 47% of the Cerrado had already been converted, and most the remaining areas of natural vegetation had been fragmented. Pressure on natural vegetation continues to be intense because of expansion of soy, beef, sugarcane, eucalyptus and cotton, which are essential for the national economy and world markets. As a consequence, annual deforestation rates and greenhouse gas emissions are higher in the Cerrado than in the Amazon. These trends are exacerbated by an under-developed protected area network: 8% of the Cerrado biome is legally protected, including less than 3% within fully protected conservation units. This is one of the lowest levels of protection of any hotspot. The Cerrado thus needs urgent action to ensure environmental sustainability and the well-being of its population.

2. BACKGROUND

The purpose of the ecosystem profile is to provide an overview of biodiversity conservation in the Cerrado Hotspot, to analyze priorities for action and to identify ways to strengthen the constituency for conservation. In doing so, it lays out a strategic framework for the implementation of CEPF's conservation grant-making program in the hotspot, over a five-year period from 2016. The profile also sets out a broader conservation agenda for the hotspot, which aims to encourage more stakeholders to engage with and support coordinated conservation efforts.

The ecosystem profile was prepared between October 2014 and October 2015, through a process coordinated by CI-Brazil and ISPN. This process featured contributions, critical analyses and recommendations from more than 170 people, including researchers, community and indigenous leaders, private sector representatives and members of non-governmental organizations, government authorities and universities or research centers.

Four workshops were held with different stakeholders: three in Brasilia and one in São Paulo. These workshops were used to present CEPF to a wide range of institutions in the government, business and civil society sectors, solicit input for the production of this document, and agree on a methodology for systematic identification and prioritization of geographic conservation priorities.

In addition to these consultation and strategic planning workshops, the preparation of the ecosystem profile involved a detailed survey of relevant literature and other documents, which informed the preparation of the situational analysis that forms the first part of the ecosystem profile. This situational analysis frames a niche for CEPF investment and a detailed investment strategy, comprising a series of investment priorities grouped under strategic directions, coupled with maps of priority sites and corridors, which provide a geographic lens for CEPF investment at scales below that of the hotspot. The investment strategy takes into account comments from stakeholders and a Senior Advisory Group drawn from civil society, private companies, government, academia and multilateral institutions, as well as the CEPF Secretariat and donors. A final workshop, held in Brasilia in October 2015, validated the investment niche and five-year investment strategy.

The ecosystem profile takes account of CEPF's previous experience with supporting civil society groups to engage in conservation in South America, especially in the Atlantic Forests of Brazil. It also draws on lessons learned by other conservation investment programs supported by international donors, such as the GEF Small Grants Program, which has supported more than 400 projects in the Cerrado since 1995.

3. BIOLOGICAL IMPORTANCE OF THE HOTSPOT

The Cerrado is the largest tropical savanna region in South America, including a large part of Central Brazil, and parts of northeastern Paraguay and eastern Bolivia. The Cerrado is at the center of a wide range of "open" formations, from the Caatinga to the Pantanal and the Chaco, separating the dense tropical rainforests of the Amazon from those of the Atlantic Forest.

The Cerrado has a rainy tropical climate, characterized by a long dry season, with little or no precipitation between May and October. Annual average temperatures range from 22 to 27^{o}C, while average yearly rainfall varies between 600 and 2,000 millimeters. In addition to climate, Cerrado biodiversity is influenced by altitude and topography. The core area of the Cerrado consists of vast plateaus with complex structures, between 300 and 1,600 meters in elevation, which mainly support savanna formations, separated by a network of peripheral or interplain depressions, which support a variety of vegetation types, including savannas, mesophytic forests and riparian woodlands.

The Cerrado is estimated to contain approximately 12,000 plant species, around one-third of which are endemic to the hotspot. The hotspot also contains at least 2,373 species of vertebrate, of which almost one-fifth are endemic (Table 3.1).

Table 3.1. Species Richness and Endemism and Among Plant and Vertebrate Groups in the Cerrado

Taxonomic Group	Species	Endemic Species	% Endemism
Plants	12,070	4,208	34.9
Vertebrates	2,373	433	18.2
Fish	*800*	*200*	*25.0*
Amphibians	*204*	*72*	*35.3*
Reptiles	*262*	*99*	*37.8*
Birds	*856*	*30*	*3.5*
Mammals	*251*	*32*	*12.7*
Total	**14,443**	**4,641**	**32.2**

4. ECOSYSTEM SERVICES IN THE HOTSPOT

4.1 Water

The water in the Cerrado is essential for the survival of its biodiversity, as well as for the well-being of its human inhabitants and the functioning of its economy. The water that flows from the Cerrado is also essential for the ecology of the Pantanal, the world's largest wetland. Other ecosystems along the São Francisco, Parnaíba, Paranaíba, Paraguay and Paraná rivers also depend on water coming from sources in the central plateau. Furthermore, all of the southern tributaries of the Amazon, except the Juruá and Purus, have their sources in the Cerrado, as do various rivers in Maranhão and Piauí states. The river basins that have their origin in the Cerrado are home to approximately

40% of Brazil's population and parts of the populations of Bolivia, Paraguay, Argentina and Uruguay.

Furthermore, the Guarani Aquifer, the second largest underground reservoir of water in the world, covering 1.2 million km^2 in densely populated areas of southwestern Brazil and extending into Paraguay, Argentina and Uruguay, is fed by water from the Cerrado. This water, which infiltrates down to levels between 150 and 1,800 meters and is tapped by artesian wells, is essential for water supply to large parts of southeastern Brazil.

In addition to providing surface and underground water, the Cerrado also supplies water to southern and southeastern Brazil and neighboring countries through atmospheric flows of water vapor from the Atlantic, via the Amazon. The names "flying rivers" or "rivers in the sky" may not be entirely appropriate but do provide vivid metaphors for a process of water transport via successive cycles of precipitation and evapotranspiration. The southeastern region of Brazil, with its large metropolitan areas (i.e. São Paulo, Rio de Janeiro and Belo Horizonte, with some 40 million people) and concentrations of industry, depends on rainfall coming from the Cerrado, which would be diminished or interrupted by loss of native vegetation. In 2015, the southeast was hard hit by water shortages, causing water rationing, blackouts due to low hydropower production, and relocation of industries to areas with more reliable supplies of water. The impact of the water and energy crises on GDP for 2015 is estimated at 1% or more.

The hydrological services provided by the Cerrado are essential for agricultural production in Brazil, as well as neighboring countries. Much of the Cerrado depends upon irrigation to ensure production during the dry season. Water from the São Francisco River sustains a rich cluster of irrigated fruit farming, much of which is for export, which generates tens of millions of US dollars per year in income. There are now fears of collapse because of the record low water level in 2015.

The hydrological services of the Cerrado are also vital for generation of hydropower in Brazil. More than 200 million people in Brazil, depend, at least in part, on electricity generated by hydroelectric projects installed along the various rivers that flow off the central plateau. Availability of water in the dry season is vital, especially for hydroelectric plants that do not have large reservoirs but depend on run-of-river technology that has been adopted to reduce environmental impacts of large reservoirs.

4.2 Carbon

It is probable that deforestation in the Cerrado is now responsible for greater emissions of greenhouse gases than the Amazon. Per hectare stocks of carbon in the Cerrado are much greater than meets the eye, since the deep roots that trees, shrubs and herbaceous plants need to survive the long dry season hold most of the biomass. The proportion of biomass that is underground in the Cerrado is as high as 70%. Based on a conservative estimate of 137.3 tons of CO_2 per hectare, the 100 million hectares of natural vegetation remaining in the Cerrado hold the equivalent of approximately 13.7 billion tons of CO_2.

A new federal government program to promote expansion of the agricultural frontier into a total area of 73 million hectares in the states of Maranhão, Tocantins, Piaui and Bahia, a region now known as "MATOPIBA", would cause vast new emissions due to clearing and burning of native vegetation. If only 10% of the area was cleared, the

emissions would amount to more than a billion tons of CO_2. This increase would offset one-third of the emissions avoided by reduced deforestation in the Amazon since 2004.

There is potential for reducing emissions from clearing through intensification of production on land already cleared. Moreover, there is enormous potential for carbon sequestration through restoration of native vegetation on degraded pastures, which cover 32 million hectares in the hotspot. Both stocking (density of head per hectare) and take-off (tonnes of beef per year) rates for cattle are very low and many pastures are degraded. The area to be recovered to comply with the new Forest Law's provisions on Legal Reserves and Areas of Permanent Preservation is 2.1 million hectares. Restoration can also help enhance ecological connectivity among remnants.

4.3 Rural Livelihoods

Cerrado biodiversity is essential for the sustainable livelihoods of virtually all the family farmers, traditional communities and indigenous peoples in the Cerrado, who number some 5 million people. Among these communities, the Cerrado has traditionally been an important source of wood for fuel, construction materials, furniture and household utensils, as well as native species of fruits and nuts for consumption and sale. The most commercially important native species is the babassu palm tree, which involves 450,000 women collectors and breakers, organized into about 50 associations and five cooperatives producing oil, soap, flour and charcoal. For instance, the Cooperative of Agro-extractivist Producers of Lago de Junco, with 400 families, sold 160 tons of babassu oil in 2014, generating US$324,000.

5. CONSERVATION OUTCOMES

5.1 Introduction

Selection of conservation outcomes relies on the understanding that biodiversity is not measured in any single unit. Rather, it is distributed across a hierarchical continuum of ecological scales that can be categorized into three levels: i) species; ii) sites; and iii) broad landscapes (or ecosystem-level units) termed corridors. These levels interlock geographically through the occurrence of species at sites and of species and sites within corridors. Given the threats to biodiversity at each of these three levels, targets for conservation can be set in terms of 'extinctions avoided' (species outcomes), 'areas protected' (site outcomes) and 'corridors consolidated' (corridor outcomes). Species are selected as those classified as threatened according to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, or the National Red List for Brazil (recognizing that the IUCN Red List is incomplete with regard to coverage of certain taxonomic groups in Brazil, especially plants, freshwater fishes and invertebrates, and that national threat assessments can act as a proxy for global assessments). Sites are identified as Key Biodiversity Areas (KBAs): places that "contribute significantly to the global persistence of biodiversity", for example by supporting threatened species and species with severely restricted global distributions. Corridors are delineated to link KBAs (in particular to support landscape connectivity and maintain ecosystem function and services for long-term persistence of species). Following this approach, quantifiable measures of progress in the conservation of threatened biodiversity can be tracked across the Cerrado Hotspot, allowing the limited resources available for conservation to be targeted more effectively.

5.2 Species Outcomes

Significant anthropic pressure on natural habitats in the Cerrado is jeopardizing the long-term maintenance of its biodiversity. Analyses of the National Red Lists of Brazil show that at least 901 Cerrado species are threatened with extinction, including 266 species of fauna and 635 species of flora. These numbers are certainly an underestimate of the number of species threatened with extinction, since only 10% of the Cerrado flora species have been evaluated. Only 41 and 119, respectively, of the nationally threatened plant and animal species have been evaluated as globally threatened by IUCN. Overall, 980 species in the Cerrado have been assessed as threatened at either the national or global level: these represent the species outcomes for the hotspot (Table 5.1).

Table 5.1 Nationally and Globally Threatened Species in the Cerrado Hotspot, by Taxonomic Group

Taxonomic group	Brazilian National Red List	IUCN Global Red List	Total Threatened Species**
Plants	635	41	**635**
Birds	34	41*	**55**
Amphibians	4	4	**7**
Reptiles	17	7	**22**
Mammals	41	21	**47**
Fishes	103	5	**108**
Invertebrates	67	41	**106**
Total	**901**	**160**	**980**

Notes: *= including globally threatened birds from Bolivia and Paraguay; ** = species evaluated as threatened nationally and/or globally.

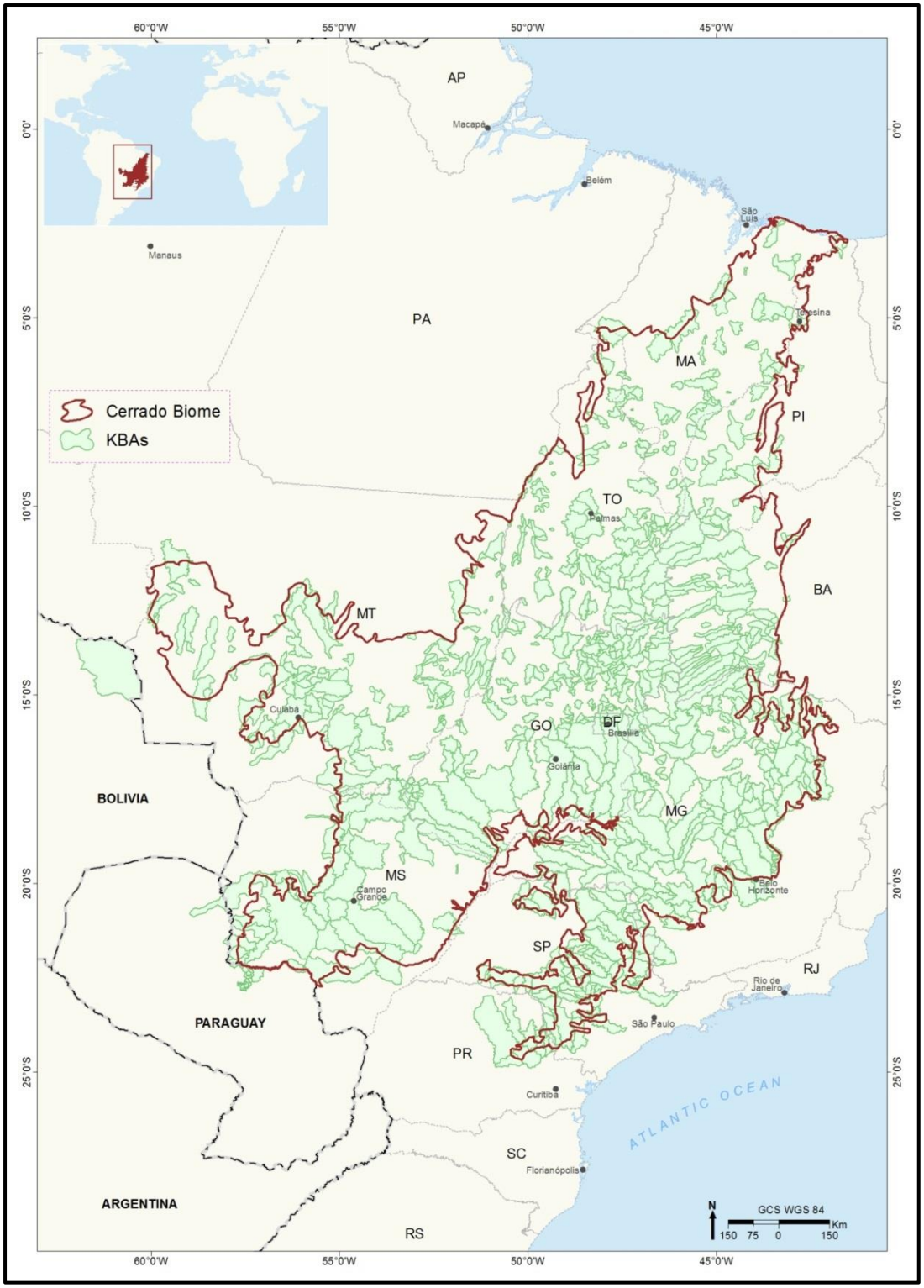
5.3 Site Outcomes

Efforts to identify strategic locations that contribute significantly to the global persistence of biodiversity in the Cerrado have been conducted since the mid-2000s. At the beginning of the ecosystem profiling exercise, the Brazilian portion of the Cerrado already had a list of KBAs, based on earlier assessments of the national and global threat status of plants and vertebrates. Bolivia and Paraguay had lists of Important Bird Areas (IBAs), identified by the national partners of BirdLife International. IBAs follow the same conceptual and methodological principle as KBAs but are based solely upon birds.

These analyses were built upon during the profiling process, incorporating data from the new national and global Red Lists, which were updated in 2014 and 2015, respectively, as well as new species occurrence records from the past 10 years, collated from the academic literature and specimen collections in herbaria and museums. The updated KBA analysis also applied the irreplaceability criteria (Table 5.2), taking advantages of studies on rare fish and plants (i.e. species with a range restricted to less than 10,000 km^2), conducted in 2010 and 2014, respectively. The analysis generated a database with more than 10,000 occurrence points for species that trigger one or more KBA criteria in the Brazilian side of the Cerrado Hotspot. In addition, the analysis of KBAs in Bolivia and Paraguay was based upon 12 globally threatened bird species.

KBAs were identified for each group of KBA trigger species, before a grouping analysis was undertaken to remove spatial overlaps. This resulted in a final list of 761 KBAs in Brazil plus one in Bolivia and three in Paraguay (Figure 5.1).

Figure 5.1 Key Biodiversity Areas in the Cerrado Hotspot



These 765 sites encompass a combined area of about 1.2 million km^2, of which 1.18 million km^2 is located in Brazil, representing approximately 60% of the Cerrado biome. The KBAs in Brazil contain only 474,000 km^2 of remaining original vegetation cover (40% of the total area). This apparent discrepancy is accounted for by the fact that most KBAs are mosaics of original vegetation, secondary habitats and anthropogenic habitats (mainly pasture and cultivation). KBA delineation did not attempt to exclude

modified and converted habitats, because this would have led to convoluted boundaries and ignored the need to natural vegetation restoration programs to reconnect fragments of native vegetation through corridors.

Table 5.2 Application of the KBA Criteria to Identify Key Biodiversity Areas in the Cerrado

KBA Criterion	Application in Cerrado Context	Number of KBA Trigger Species	No. of KBAs
Irreplaceability	Rare (i.e. restricted-range) plants	439	344
	Rare (i.e. restricted-range) fishes	210	149
Vulnerability	Globally/nationally threatened flora	635	392
	Globally/Nationally threatened fauna	345	385
Total for Cerrado Hotspot		**1,629**	**765***

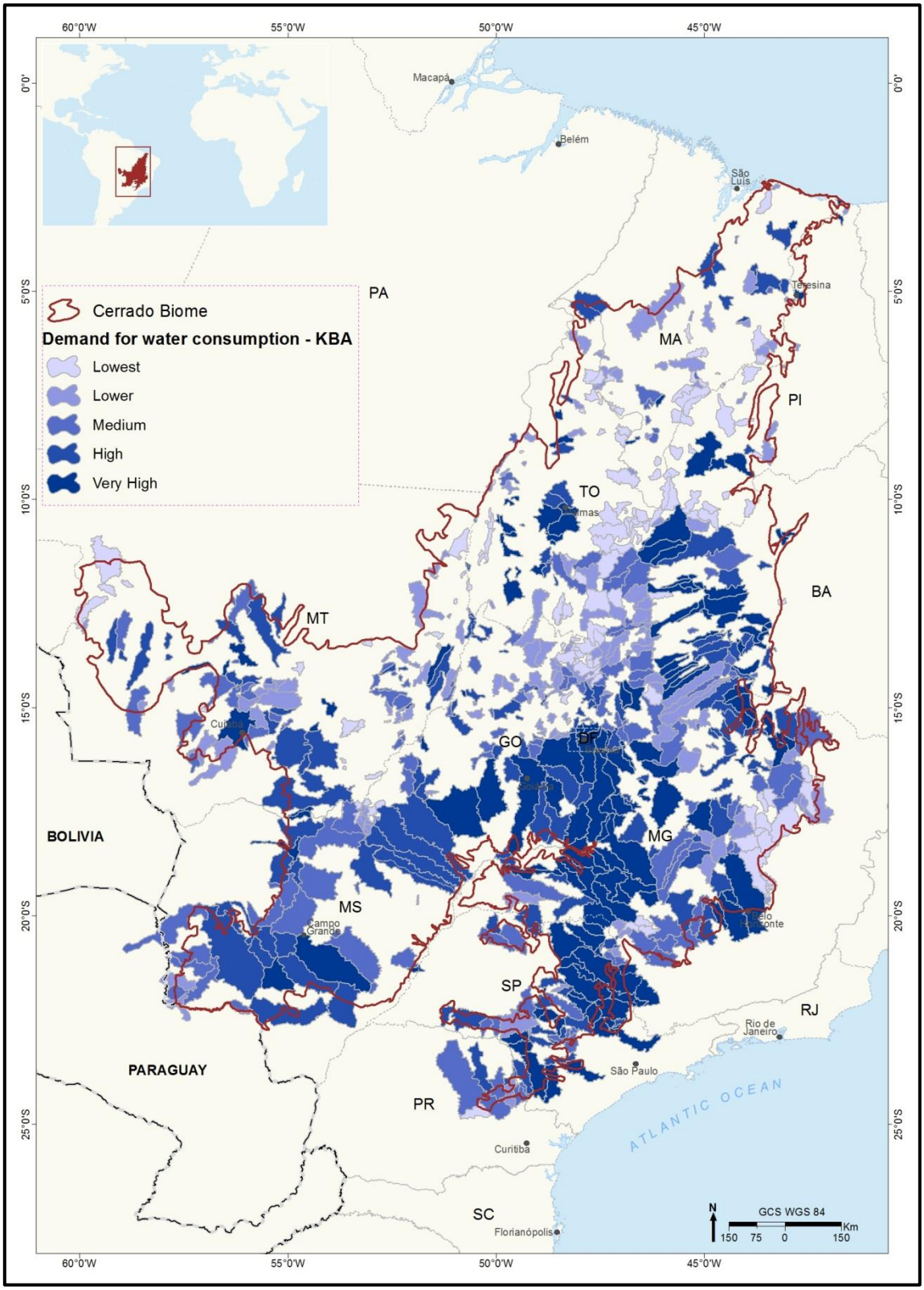
* Because many KBAs qualify under multiple criteria and thus overlaping, this figure is not equal to the sum of all criteria (1,270).

Each of the KBAs in Bolivia and Paraguay benefits from some form of protection. The KBA in Bolivia is centered on Noel Kempff National Park, which was declared a World Heritage Site by UNESCO in 2000. The KBAs in Paraguay are protected by San Luis and Paso Bravo National Parks and Cerrado del Tagatija Private Reserve, while another area within a KBA in Paraguay is currently awaiting recognition as a private scientific reserve. Consequently, the KBAs in these countries are considered to be under less immediate threat than those in Brazil, only around 117,000 km^2 (10%) have some form of protection within Indigenous lands, *quilombola* territories or federal or state conservation units.

In the past, KBAs were identified solely on the basis of their intrinsic biodiversity values. For the Cerrado, bearing in mind the need to make conservation outcomes as relevant as possible to policy makers, the KBA concept was broadened to include a consideration of ecosystem service values of individual sites, especially hydrological services. This approach, known as KBA+, was developed by Conservation International's Betty and Gordon Moore Center for Science and Oceans, and first applied to the Madagascar and Indian Ocean Islands Hotspot.

For the Cerrado, each KBA was evaluated for its contributions to the provision of hydrological services, especially provision of water for the five categories of use: animal; industrial; irrigation; rural; and urban. These contributions were not "valued" in economic terms but ranked as to their relative importance for provision of water for each type of use. Out of the 761 KBAs in Brazil (for which comparable data were available), 152 were considered to be of "very high" importance for hydrological services; all were located close to big cities and centers of agricultural activity, where demand for water consumption is highest (Figure 5.3).

Figure 5.3 Relative Importance of KBAs in Brazil for Provision of Hydrological Services



5.4 Corridor Outcomes

Corridors were defined as large-scale spatial units required for the maintenance of ecological and evolutionary processes. The corridors were defined based on clusters of KBAs of high relative biological importance based upon criteria of vulnerability and

irreplaceability, and taking into account connectivity among remnants of native vegetation and distribution of protected areas, including conservation units, indigenous lands and *quilombola* territories. Corridors already defined in the Cerrado under earlier analyses were also incorporated, because they already had ownership from stakeholders.

A first approach to the corridor definition was discussed and presented to stakeholders during the consultation workshops, to seek their inputs and improvements. Taking into account existing landscape conservation strategies, 10 corridors were initially identified: Cerrado Maranhense; Cerrado na Amazonia Legal; Jalapão; Araguaia; APA Pouso Alto-Veadeiros-Kalunga; RIDE Brasilia; Mosaico Grande Sertão Peruaçu; Serra do Espinhaço; Emas Taquari; and Miranda Bodoquena.

The Cerrado Maranhense and Cerrado na Amazonia Legal corridors were both considered too large to focus conservation investments well, and the recommendation was to split them into smaller parts, focusing on the core landscapes in need of conservation attention. The former corridor gave rise to the Lençóis Maranhenses and Mirador-Mesas corridors, while the latter was split into the Alto Juruena and Chapada dos Guimarães corridors, both of which are centered on important protected areas.

The Jalapão corridor was renamed as Central de MATOPIBA, since it encompasses an area bigger than the original corridor, which was based on a government conservation initiative. Mosaico Grande Sertão Peruaçu was expanded to incorporate the western portion of Bahia state, which contains unique ecosystems and presents opportunities to connect fragments through restoration, and was renamed as Sertão-Veredas-Peruaçu. The RIDE Brasilia corridor also incorporated an important cluster of high priority KBAs in the middle of Minas Gerais state, and was renamed as RIDE DF Parnaiba-Abaeté. The remaining corridors were retained with minor adjustments to their boundaries and/or names, according to recommendations from stakeholders.

Finally, after undertaking a KBA prioritization exercise, another important corridor was identified: Serra da Canastra. This corridor incorporates several important protected areas and fragments of native vegetation in a matrix of other land uses, like pastures and urban areas.

Following these modifications, a final list of 13 conservation corridors was prepared, each with different historical, socioeconomic, conservation and land-use characteristics (Figure 5.3, Table 5.3). The 13 corridors encompass a total area of 723,000 km^2, of which 689,700 km^2 (95%) are within the hotspot. This means that around one-third of the hotspot is located within conservation corridors considered highly important for biodiversity conservation and provision of ecosystem services. The corridors have an average natural vegetation cover of almost 70% and include that last large, pristine areas of the original Cerrado ecosystem. The 13 corridors all have unique characteristics, with different vegetation formations and areas of transition, different level of species endemism and specific socio-economic dynamics. Each corridor requires, therefore, a specific strategy and a differentiated conservation action to achieve the goal of sustainable landscapes. All these corridors are important for the conservation of the hotspot.

Figure 5.4 Conservation Corridors in the Cerrado Hotspot

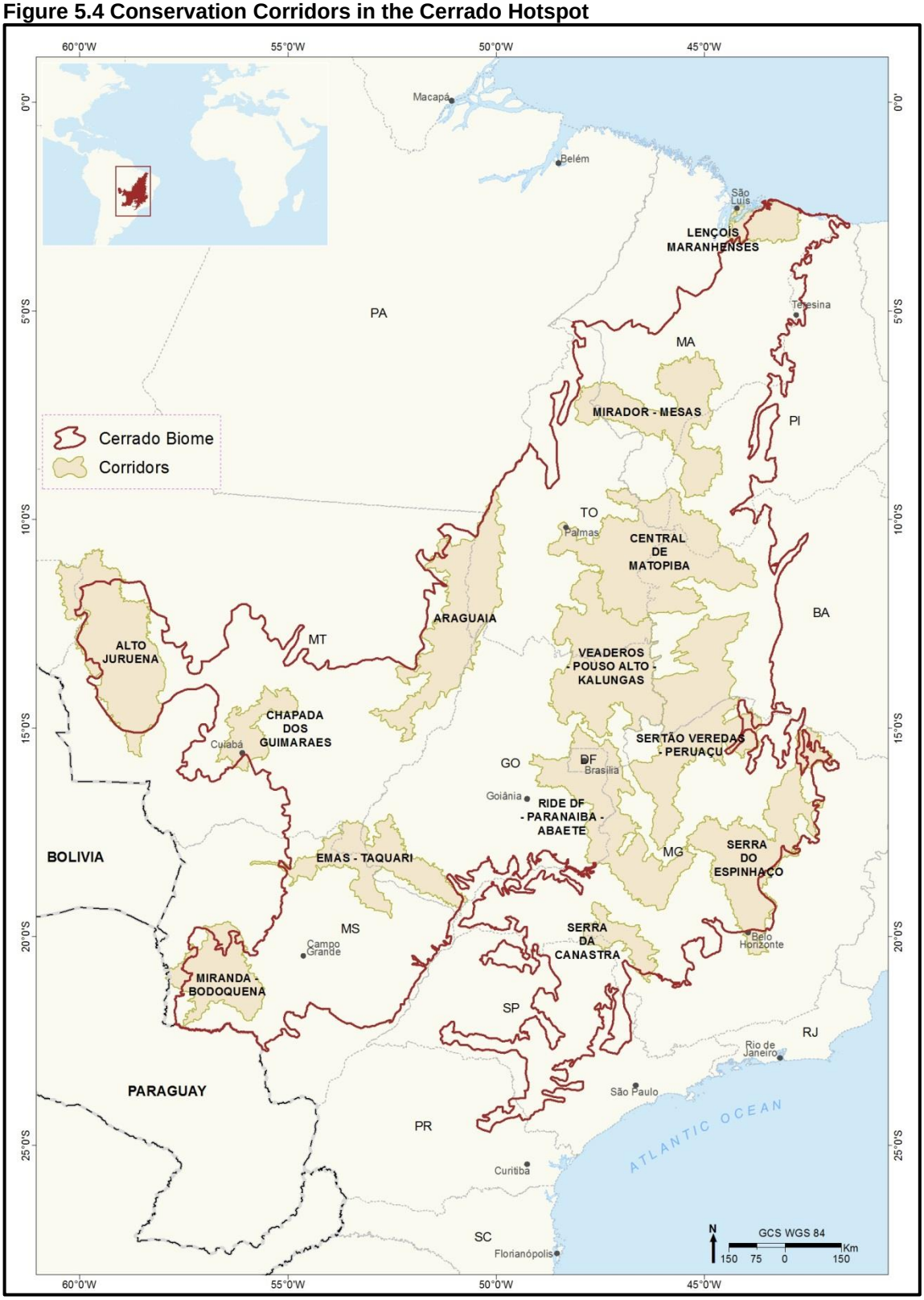


Table 5.3: Cerrado Corridors and Selected Environmental and Socioeconomic Indicators

Corridors	Population 2011	Average GDP (R$)	Average HDI	Average Threat Level (IPA index)*	Area (km^2)	% of Original Vegetation Cover
Alto Juruena	400,321	34,674	0.70	5.59	60,290	80.40
Araguaia	338,564	18,736	0.66	5.26	68,260	83.92
Chapada dos Guimaraes	1,020,611	28,275	0.68	5.59	17,732	61.43
Emas-Taquari	408,026	30,800	0.70	6.15	42,973	30.02
Central de MATOPIBA	844,577	11,809	0.62	4.95	99,096	81.18
Lencois Maranhenses	455,472	4,276	0.56	5.83	12,101	88.19
Mirador-Mesas	664,698	11,444	0.59	5.47	56,659	83.97
Miranda-Bodoquena	454,437	16,692	0.68	5.80	29,679	43.81
RIDE DF- Paranaiba-Abaete	4,771,838	20,478	0.70	7.09	64,671	41.36
Serra da Canastra	791,769	31,071	0.72	6.28	13,855	36.55
Serra do Espinhaco	5,433,500	13,724	0.66	5.25	57,689	59.84
Sertao Veredas-Peruacu	703,335	10,577	0.62	5.58	80,995	70.15
Veadeiros-Pouso Alto-Kalungas	335,345	12,599	0.65	5.49	78,124	75.25

Notes: HDI = Human Development Index, a summary measure of average achievement in key dimensions of human development: having a long and healthy life, being knowledgeable and having a decent standard of living. Scale of 0-1 with 1 being the highest. IPA index = *Indice de Pressão Antropica* [Anthropogenic Pressure Index], is a synthetic index of economic and demographic pressures on the environment, which combines agriculture and pasture pressures, population growth, stock and flow, at the municipal level. Scale of 2-10 with 10 being the highest.

6. SOCIOECONOMIC CONTEXT OF THE HOTSPOT

6.1 Social and Demographic Trends

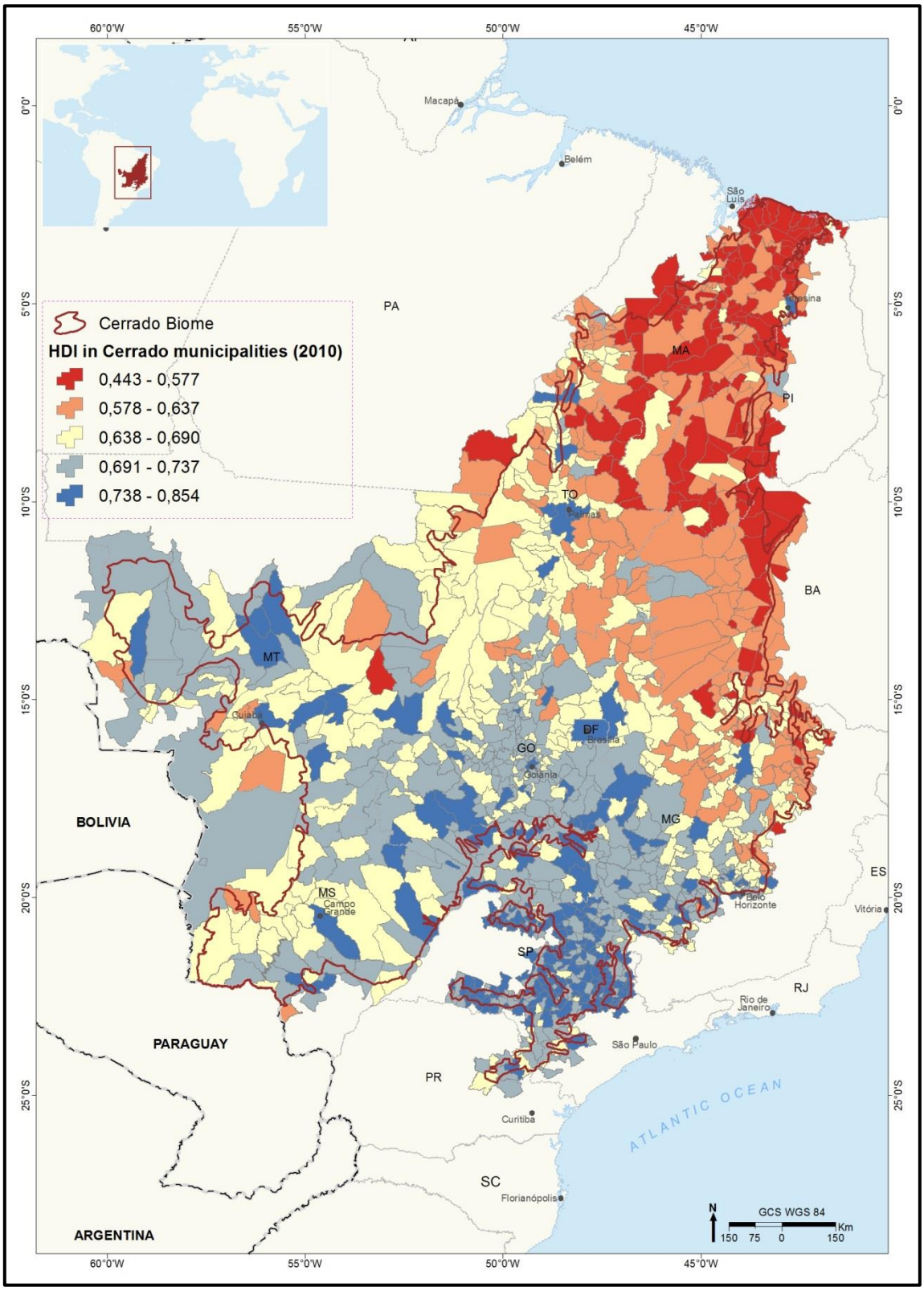
The Cerrado was first occupied by indigenous peoples about 12,000 years ago. They built some earthworks that suggest dense settlement, but the first Europeans to arrive found hunters and gatherers living in small villages with garden plots (shifting cultivation) who often moved to new sites.

During the 16th and 17th centuries, European colonizers stayed near the Atlantic coast, without penetrating the interior. In the early 18th century, gold, diamonds and emeralds were discovered in the interior of Brazil by explorers from São Paulo. Since indigenous slavery did not function well, African slaves were brought to work in the mines. At the same time, extensive cattle-raising moved up the São Francisco River into the interior.

In the 19th and early 20th centuries, after the mining cycle ended, the main activity in the Cerrado was extensive cattle-raising, combined with some extractive activities. Settlement of family farmers, mainly from Minas Gerais state and the northeast of Brazil, began in the 1940s, including both government-sponsored colonization and spontaneous migration. It continued in the following decades, especially following the establishment of Brasília in the 1950s and the opening of roads to the north and

northwest. Although there were practically no foreigners among the landowners, many of the large landowners are absentee, especially the owners of large cattle ranches.

Figure 6.3: Human Development Index in the Cerrado



Today, the rural population is densest in the southern half of the Cerrado, although rural population growth is now negative, due to net migration to urban areas. There is now a vast and relatively dense urban network that links small towns and cities in the interior with large cities on the fringes of the Cerrado and beyond. The average maximum distance to a city is only 10.6 kilometers, meaning that the rural population has more access to urban services and markets. Out of a total rural population of 28 million in the Brazilian side of the Cerrado Hotspot, there are an estimated 25 million people engaged in smallholder farming of rice, beans, manioc and/or livestock and extraction of fruits, nuts and fish in agricultural settlements and traditional communities of various kinds.

Human Development Index (HDI) data for Brazil by municipality show that the highest indices are in São Paulo, Minas Gerais, Mato Grosso and Mato Grosso do Sul and lowest to the north and east. Since 1980, the HDI has improved dramatically in the interior, due to significant reductions in regional inequality.

6.2 Indigenous and Traditional Communities

The Cerrado is home to various indigenous groups and communities of *quilombolas* (descendants of escaped African slaves). Since 1988, both have constitutional rights to land. There are 95 indigenous lands in the Cerrado, covering 9.6 million hectares, and the largest intact areas of natural vegetation in the hotspot are found in these areas. Indigenous lands in Brazil tend to have lower levels of deforestation than conventional, government-managed protected areas, even those of integral protection. There are also 44 *quilombola* lands in the hotspot, covering 2.1 million hectares, and with wide variation in size.

In addition to indigenous peoples and *quilombola*, there are also five various kinds of traditional community who live off the land, without legal demarcation of their territories, over a large part of the remaining natural vegetation in the hotspot. Although their numbers are difficult to count, they constitute the majority of the rural population.

6.3 Gender

Women play a key role in family farming, especially with regard to home gardens, gathering of firewood and water and care for domestic livestock. Sustainable use of biodiversity, including food processing and handicrafts, contributes to the empowerment of rural women by providing them with income of their own. In the northern part of the Cerrado, 400,000 women make a living cracking palmnuts of babassu palm tree.

The experience of the GEF Small Grants Program has been that women play leadership roles in local community organizations in the Cerrado, the most emblematic of which is the Regional Association of Women Rural Workers in the Bico do Papagaio (ASMUPIB), in northern Tocantins. There is also an Interstate Movement of Women Babassu Crackers (MIQCB). Women tend to outnumber men on the staff of civil society organizations (CSOs). On the other hand, women are underrepresented in local, state and federal legislatures and other government structures.

6.4 Economic Trends

In the middle of the 20th century, central Brazil produced rice on recently cleared land. Starting in the 1980s, the main new economic trend in the Cerrado was growth of commodity production, as a result of adaptation of agricultural technology to allow continuous planting of monocultures. The Cerrado's soils tend to have high acidity and low fertility but to be relatively flat, deep and well drained, being well suited to mechanization of cultivation and harvesting. Productivity of cattle ranching and dairy production was improved by means of breeding of zebu and European cattle with artificial insemination and introduction of exotic species of pasture, mainly from Africa.

Because of agricultural advances in the Cerrado, Brazil is now a leading producer and exporter of soybeans and cotton as well as beef, chicken and pork, fed with grains. Agribusiness is responsible for 23% of Brazil's GDP. The Cerrado has 44% of the farm and ranch land in Brazil, with some 88 million hectares, and produces 40% of the beef, 84% of the cotton, 60% of the soybeans and 44% of the corn in the country.

Economic trends are responsible for the conversion and fragmentation of natural habitats across much of the Cerrado. However, there are some possibilities for changes in the pattern of horizontal expansion and even contributions to conservation by agribusiness. For example, a promising new development is the decision of Brookfield Assets Management Inc., Canada's largest alternative asset manager, to invest USD 300 million in a new agricultural fund to buy up pasture land and convert it into soy and sugar farming, thus intensifying production. Transnational companies like Bunge now intend to contribute to increase in production of food by 60% with increase of 90% in productivity and only 10% in increase of the land area. Other companies have similar intentions. There is much new technological innovation, which can reduce pressures for deforestation. There could be a rebound effect, with further frontier expansion, but increases in productivity require locations close to infrastructure and services.

On a more general level, the requirements of conformity with social, environmental and health standards in countries that import these products can favor sustainability of agribusiness. Exports also mean that the concerns of multinational companies about their reputations among their customers and their shareholders make them into interested parties in promoting sustainability in the Cerrado. This has led to pacts among private sector stakeholders, certification schemes, round tables, supply chains and global value chains. Modern agribusiness can be an ally of conservation, if monitored as to actual performance, and here civil society can play a role.

The analysis of the socioeconomic context of the Cerrado Hotspot indicates that population growth on the frontier and increased human wellbeing place strong pressures on the environment. There is no more wilderness in the sense of vast, unsettled virgin areas. For the short, medium and long terms, it will be necessary to go beyond a focus on conservation of individual species or sites to include landscapes at a larger scale. Except in a few cases, rather than placing barriers between people and nature, it will be necessary to find means for maintaining co-existence of nature with large- and small-scale agriculture, livestock, transportation, energy and communications infrastructure, small communities and large towns and cities.

7. POLICY CONTEXT OF THE HOTSPOT

7.1 Natural Resource Policies

The starting point for natural resource policies and laws in Brazil is the National Environment Policy of 1981, which created the National Environment System (SISNAMA), connecting the federal, state and municipal levels. The original policy was very generic but it established the National Environment Council (CONAMA), which includes representatives of government, civil society and the private sector.

A process of decentralization to states and municipalities is under way, which has implications for natural resource management. Many municipalities lack sufficient human and financial resources for environmental management, especially those with small populations and large areas. Since local economic interests are powerful, state and federal oversight is needed. Municipal authorities tend not to be concerned about environment or get involved in environmental projects.

Brazil's National System of Conservation Units (SNUC), established by law in 2000, is coordinated by the Ministry of Environment (MMA). Within the ministry, the Chico Mendes Institute for Biodiversity Conservation (ICMBio), created in 2008, is responsible for creating and managing federal protected areas. Analogous bodies are responsible at state and municipal levels.

There are two categories of conservation unit: strictly protected areas; and sustainable use protected areas. Conservation corridors and mosaics are also mentioned in the law that established the SNUC but do not have the same legal status as conservation units. Indigenous and *quilombola* lands are not conservation units under the SNUC but are considered to be part of the national protected area program.

The Aichi biodiversity target of extending formal protection to 17% of terrestrial areas is being applied to each biome in Brazil. Indigenous lands will be counted towards this target. Nevertheless, the gap in the Cerrado is enormous, in the order of 20 million hectares, and will be difficult to cover, because most land is privately owned and expensive. More realistic ways to reach the target for the Cerrado may include facilitating and providing incentives for private natural heritage reserves (RPPNs) and/or Environmental Protection Areas (APAs), a loose category of protected areas generally considered ineffective by conservationists. Neither RPPNs nor APAs require government purchase of land. It should be noted that CEPF investments in the Atlantic Forest included a very successful incentive program for voluntary designation of RPPNs, which was responsible for supporting the creation of more than half of the existing RPPNs in that hotspot. The growing environmental concern in society, including large rural landowners of both older and younger generations, creates a favorable climate for the creation of private reserves, although insufficient incentives and the bureaucracy, which is required to approve detailed management plans, remains a formidable barrier.

The use of environmental criteria to apportion state value-added tax (ICMS) revenues among municipal governments, through a mechanism called *ICMS Ecológico*, has been adopted voluntarily by some states. It is an important incentive for municipal governments to create and support protected areas and to adopt other conservation

measures. Of the states which have *ICMS Ecológico*, five (Mato Grosso, Mato Grosso do Sul, Minas Gerais, São Paulo and Tocantins) are in the Cerrado.

There are programs of support for so-called "producers of water" who plant and maintain trees on their properties, a practice which also generates benefits for biodiversity and climate. The National Water Agency (ANA) offers grant funds for projects of up to USD 175,000 each. Payments by water users are also possible in areas close to cities, as in the case of Extrema, in Minas Gerais, which provides water for São Paulo. This is difficult in most of the Cerrado, however, where per capita water availability is much higher. Nevertheless, it may be possible in specific areas.

The Forest Code of Brazil provides for Legal Reserves to maintain native plant cover on all rural properties. In most of the Cerrado and most of Brazil, the requirement is 20%, while in the Amazon it is 80%. The parts of the Cerrado that are in the Legal Amazon (i.e. all of Mato Grosso and Tocantins and the western part of Maranhão states) require Legal Reserves of 35%. Areas of Permanent Preservation (APPs) are required along water courses and on hilltops and steep slopes. Legal Reserves can be used sustainably, with approved management plans, while APPs cannot be used at all.

The deficit of Legal Reserves and APPs in the Cerrado is estimated to be 4.5 million hectares, which will need to be either recovered through restoration or compensated for financially. In 2015, the Ministry of Environment launched a National Plan to Recover Native Vegetation (PLANAVEG), which is based on effective enforcement of the new Forest Law. On the other hand, in areas where natural vegetation is still intact, millions of hectares can still be cleared without breaking the requirement to leave 20% in Legal Reserves.

Brazil is very proud of its success in reducing deforestation rates in the Amazon by 83% since 2004. In 2015, the government proposed reaching zero illegal deforestation by 2030. However, enforcement in the Amazon could end up increasing pressure on the Cerrado, i.e. reverse leakage. It is also necessary to take into account indirect land use changes, such as expansion of sugarcane plantations to produce ethanol biofuel.

In 2010, Brazil launched the "Low-Carbon Agriculture" (ABC) Plan and a special line of credit. Coordinated by the Ministries of Agriculture (MAPA) and Agrarian Development (MDA), the plan seeks to reduce carbon emissions by promoting practices in agriculture such as zero till and integrated crop-livestock systems. The initiative has been slow in uptake, given uncertainties about the Forest Law, lack of technical assistance and difficulty in access to credit.

7.2 Socio-Environmental Policies

In addition to specific natural resource policies for Brazil, there are also numerous "socio-environmental" initiatives that have positive impacts on biodiversity conservation in Brazil in general and in the Cerrado Hotspot in particular.

In 2008, the Secretariat of Extractivism and Sustainable Rural Development (SEDR) of the MMA began promoting value chains for non-timber products, including babassu. In 2009, these actions were included in the National Plan for Promotion of Socio-Biodiversity Value Chains (PNPSB). Socio-biodiversity products are defined as goods

and services (finished products, raw materials or benefits) generated from biodiversity resources, focused on the formation of production chains of interest to traditional people and communities and family farmers, promoting the maintenance and enhancement of their practices and knowledge, ensuring their rights, generating income, promoting their quality of life and improving the environment in which they live.

7.3 Policy towards Indigenous Peoples

The Brazilian Constitution of 1988 guarantees indigenous peoples the right to usufruct of the natural resources of the lands they have traditionally occupied, which remain federal property. Indigenous lands are the largest intact areas of the Cerrado and have less deforestation than official protected areas classified for either integral protection or sustainable use.

In 2012, the National Policy of Territorial and Environmental Management of Indigenous Lands was established. Although indigenous lands are not "conservation units" in the national system (SNUC), they can be considered as *de facto* protected areas, based on deforestation rates and other indicators of biodiversity conservation. There is now a small grants program called GATI, coordinated by ISPN, to support environmental management of indigenous territories. Three of the regional nuclei for this program are in the Cerrado.

7.4 Policy and Governance in the Cerrado Hotspot

Brazil started paying attention to the Cerrado as a result of Symposia on the Cerrado carried out by researchers in the 1960s. Only then was the name modified from the plural *cerrados* to refer to a unified, singular ecosystem. Government initiatives aimed at conservation and sustainable use of the Cerrado biome are recent, with the first dating back to the preparation of the Rio-92 UNCED Conference.

In 2005, the National Sustainable Cerrado Program Commission (CONACER) and the Sustainable Cerrado Program (PCS) were established. The commission has equal participation between representatives of government and civil society and is responsible for monitoring implementation of the program. The aim of the program is to promote conservation, restoration, recovery and sustainable management of natural and agricultural ecosystems as well as appreciation and recognition of their traditional populations, seeking to reverse negative social and environmental impacts through: i) biodiversity conservation; ii) sustainable use of biodiversity; iii) traditional communities and family farmers; and iv) sustainable agriculture, livestock and forestry. Funding and effectiveness have not met expectations of civil society, however.

In order to carry out program guidelines, the Brazilian government approached the World Bank to submit a proposal to the GEF, which received preliminary approval in November 2005 with an initial USD 13 million grant. Officially called "GEF Sustainable Cerrado Initiative," the project aimed to promote increased biodiversity conservation and enhance the sustainable use of natural resources from the Cerrado biome, through appropriate policies and practices. Negotiations over this project, however, turned out to be more complex than originally anticipated and funding only began in 2009. Two states were involved: Goiás and Tocantins.

In 2009, MMA released its proposal for the Action Plan for the Prevention and Control of Cerrado Deforestation (PPCerrado). During COP-15 in Copenhagen, the Brazilian government announced voluntary national commitments to reduce emissions of greenhouse gases through the reduction of at least 40% in emissions from deforestation of the Cerrado. The new version of PPCerrado launched in 2010 stressed the integration of state and local governments to reduce deforestation and fires. It also made clear that without the involvement of the private sector, especially agribusiness, it would not be possible to reduce the loss of the biome. While the Sustainable Cerrado Program (PCS) can be characterized as guiding and directive, the PPCerrado is more operative, containing actions, detailed goals and deadlines. The PPCerrado proposes an investment of USD 100 million in four thematic areas: i) sustainable production activities; ii) monitoring and control; iii) protected areas and land use planning; and iv) environmental education. Since mid-2013, an inter-ministerial team has been working on drafting the document of the PPCerrado Second Phase for 2014 and 2015 and carrying out public consultations. Two internationally funded projects are now underway support the PPCerrado in Brazil: the Program to Reduce Deforestation and Burning in the Cerrado (supported by the UK government) and the Project on Prevention, Monitoring and the Control of Illegal Burning and Forest Fires in the Cerrado (Cerrado-Jalapão Project; supported by the German government). PPCerrado focuses on the 52 priority municipalities where there has been the most deforestation. The results of PPCerrado have not yet met with expectations, however.

8. CIVIL SOCIETY CONTEXT OF THE HOTSPOT

8.1 Civil Society Organizations

Until the 1980s, when democracy was re-established in Brazil, there were relatively few CSO mediating between citizens and governments. Since then, there has been large-scale multiplication of a wide range of organizations and a trend for them to spread the scope of their activities from the southeast and south to other areas. There are more than 2,200 organizations specifically working on environmental issues and animal protection in Brazil. This represents a small percentage (less than 1%) of the hundreds of thousands of CSOs in the country but is still a significant number.

Only a few environmental CSOs are currently active in the Cerrado, although well-established national-level organizations working in other parts of Brazil, Bolivia and Paraguay could be attracted to the hotspot and incorporate specific concerns into their own agendas. In addition, there are also at least 100 local CSOs in the Cerrado that are not primarily environmental but are already involved in environmental issues. Beyond them, there are thousands of formal and informal labor, church, civic, business, academic and indigenous organizations that are increasingly concerned about environment but need stimulus and support to really get involved. This is especially true in the northern part of the hotspot.

8.2 Operating Environment for CSOs

There are serious difficulties with the legal framework for associations in Brazil, especially for local organizations outside the capital cities and close to nature. There is no legal status for non-governmental organizations (NGOs) as such. In order to have

legal personality, non-profit associations must have bylaws, annual assemblies, elected officers, fiscal councils and accountants, among other requirements. Formal organization is not always compatible with the necessary informality of family and community organization, especially in rural areas. Productive activities based on nature are diverse, with multiple locations in space and seasonality over time. They are not continuous and routine, as in urban industry or commerce. This makes it much more difficult to maintain administrative structures year round for small financial turnovers and to comply with labor laws, which presume long-term, formal employment.

In addition, it is difficult for non-profit associations to comply with official rules and regulations regarding expenditures of government funds, which require bidding and complex accounting and reporting. Moreover, non-profit organizations are not eligible for bank credit. Cooperatives for family farmers can get bank credit, but have difficulty in complying with complex bureaucratic requirements and finding reliable leaders. These challenges are exacerbated by the funding environment for civil society. Because of recent economic growth, on the one hand, and recent global and domestic economic crises, on the other, funds from the Brazilian government and from international donors are drying up. Some CSOs have now become inactive, closed down or face extinction.

8.3 Civil Society Programs and Activities in the Cerrado

The Cerrado Network, a legacy of the "Cerrados Treaty" signed by NGOs at the Rio Conference in 1992, involves hundreds of local civil society organizations. It organizes bi-annual national meetings and fairs of Cerrado peoples. Because of lack of funding, its office is now closed and it has no more staff of its own. However, it still operates through its member organizations.

The Cerrado Center (*Central do Cerrado*), based in Brasília, is a second-order cooperative joining 30 cooperatives from all over the Cerrado to market a wide range of sustainable-use biodiversity products. It ensures high visibility for these products in the national capital.

The Mobilization of Indigenous Peoples of the Cerrado (MOPIC), created in 2008, is a network that seeks to unite indigenous groups in approximately 100 Indigenous Lands throughout the hotspot. Previously, Cerrado indigenous groups were a minor part of larger organizations in Brazil or the Amazon basin. MOPIC is part of the Cerrado Network. Vyty-Cate, in Maranhão and Tocantins, the Kanindê Ethno-Environmental Defense Fund, in Rondônia, and Wara, in Mato Grosso, are examples of local indigenous associations. One key issue for indigenous peoples and their associations is, once land is secured, how to generate income from sustainable use of natural resources.

The international environmental NGOs most active in the Cerrado are World Wide Fund for Nature (WWF) and The Nature Conservancy (TNC), both of which have their main offices in Brasília, as well as Conservation International (CI), which has its main office in Rio de Janeiro and a small office in Brasília.

Because of Brazilian financial regulations, it is impractical for Brazilian organizations to carry out activities in neighboring countries. Although some international conservation organizations are active in Bolivia and Paraguay, the only organization that works with transboundary conservation issues among Brazilian, Bolivian and

Paraguayan parts of the hotspot is WWF. The GEF Small Grants Program is active in both Bolivia and Paraguay, providing small grants to NGOs and community-based organizations working on conservation and sustainable use of biodiversity, land degradation and climate change.

8.4 Civil Society Capacity in the Cerrado

With a few exceptions, civil society capacity in the Cerrado is at an intermediate level of development. On the one hand, it is very difficult for CSOs to comply with government regulations, which forbid administrative expenses and require complex bidding and financial reporting for use of government funds, among many other bureaucratic provisions intended to avoid corruption. There is also limited knowledge among civil society about the complex legal frameworks and government policies and programs relevant to the environment. There are, of course, regional variations, with the strongest organizations in the national and state capitals and limitations in the interior. Nevertheless, even the organizations with the highest capacity are in need of institutional strengthening, as was made clear during the stakeholder consultations.

The private sector in the Cerrado is well organized in associations. It has participated in the Roundtable on Responsible Soy, while the Cerrado No-Till Farming Association has brought about a remarkable shift in crop management and defends conservation. There is increasing concern about environment because of market pressures and because of prospects of scarcity of water, which is already being felt by coffee growers in Minas Gerais, who may also be pushed south by climate change.

To address gaps in civil society capacity in the Cerrado, a number of priorities were identified during the stakeholder consultations. First, civil society identified a need for small grants, accessible to local organizations, which implies simplified bureaucratic requirements. Second, "consolidation" grants, for larger amounts and longer periods, are required for organizations that have demonstrated capacity and impacts, in order to sustain activities and retain qualified staff. Third, continuous institutional support is essential for networks of CSOs, not only support for project activities. Fourth, capacity development is needed for CSO representatives, especially representatives of indigenous people, to empower them to participate effectively in official councils, commissions, conferences and consultations regarding the environment and related issues. Fifth, in order to represent civil society at the ecosystem level and promote a common agenda, it is necessary for community leaders to become familiar with other groups from other parts of the Cerrado, and thereby build a conservation community at the hotspot scale. Finally, there is a need to sensitize journalists in various media about the values of the Cerrado and the best ways to achieve conservation outcomes.

9. THREATS TO BIODIVERSITY IN THE HOTSPOT

9.1 Introduction

The main threat to biodiversity in the Cerrado is clearing of land for pastures and monoculture cultivation. Production of commodities for consumption within Brazil and for export is essential for Brazil's balance of trade and for generating tax revenues for government budgets, as well as meeting the needs of a growing global population and rising consumption of protein in low-income countries.

In the last five decades, the Cerrado has been the main area for agricultural expansion and consolidation of Brazilian agribusiness, leading to loss of half of the original vegetation cover. It has been projected that continuing uncontrolled occupation of the Cerrado may lead to loss of 72% of its original area by 2020 and 82% by 2050. The process now extends from Brazil into Paraguay as well.

Exact figures on deforestation are difficult to obtain for various reasons. Monitoring of clearing in the Cerrado is much more difficult than in homogenous dense forests, due to the high diversity and fine texture of plant cover. Cerrado vegetation varies from narrow riparian forests that do not appear in satellite images to woody savannas and fields that can easily be confused with degraded pastures where trees and shrubs sprout from deep roots. Compared with the Amazon, little effort has been put into Cerrado deforestation monitoring. PPCerrado concluded that, up to 2010, 986,711 km² (i.e. 47%) of the Cerrado had already been converted. Most of the remaining areas are fragmented.

9.2 Direct Threats

While half of the Cerrado has been totally cleared, most of the rest has been subject to various kinds of interference. In the period 1990-2010, the hotspot suffered a net loss of approximately 12 million hectares of natural vegetation. However, the rate of loss decreased from the first decade (0.79% per year) to the second (0.44% per year). Projections for coming decades show the largest increases in agricultural production in Brazil will be in the Cerrado. At the same time, the Forest Code allows for vast further legal deforestation in the Cerrado, and, while the code provides for the designation of APPs and Legal Reserves, these will be fragments, subject to edge effects and fragmentation effects, which imply a loss of species richness and ecological function.

Many pastures considered by farmers as degraded are, in fact, natural vegetation under natural regeneration, since Cerrado plants, because of their deep roots, have a remarkable capacity to resprout. Such regeneration, especially in areas of hilly topography, in addition to enforcement of the Forest Code, could eventually contribute to zero net deforestation. In this context, actions that favor or assist natural regeneration of the Cerrado are important elements in conservation strategies. Although imperfect, they at least provide habitat for larger, more viable populations of species, as well as connectivity to enable gene flows among them.

Rapid land-use changes in the Cerrado not only impact natural vegetation but also have negative effects in water availability. Irrigation needed for agricultural activities in the Cerrado and elsewhere to the east and south exerts strong pressure on water resources. In addition to the impacts associated with reduced water supply, chemical pollution from pesticides is also a major concern. These inputs are widely used for soy, corn and cotton, the most important crops in the Cerrado. Some persistent organic pollutants are used illegally and pesticides forbidden elsewhere are still legal in Brazil. Chemical fertilizers, which are essential in the poor soils of the Cerrado, can also pollute local streams, a major complaint of communities, while the Pantanal wetlands and the Paraguay-Paraná basin are threatened with eutrophication.

Cerrado species and ecosystems are adapted to fire. The vegetation has features that minimize the effect of burning, such as thick bark, rhizomes and bulbs, as well as high regrowth capacity after fire and a high proportion of underground biomass. However,

fire frequency has intensified drastically due to human actions. Nowadays, fires may occur every one or two years, rather than following cycles of 16 years on average, as they did before European settlement. A frequent and intense fire regime causes changes in the dynamics of plant communities, affecting the populations of rare species. When fire frequency increases, it enables expansion of exotic grasses. The presence of exotic grasses causes hotter fires, which kill off juvenile trees, preventing recovery of woodlands and creating a vicious circle.

9.3 Indirect Causes of Threats

A major indirect cause of threats to the Cerrado is increased global demand for soy and for meat from livestock fed with soy, due to changing consumer preferences and purchasing power. In addition to increased cattle raising and crop cultivation, other indirect causes of threats to Cerrado ecosystems include steel manufacture, pulp and paper manufacture, transportation, electric power generation, oil and gas production, mining and urbanization. These all derive from the root causes of population growth, increasing consumption of food, especially protein, among people around the world, economic globalization, North-South outsourcing of economic activities with high energy demands and environmental impacts, spread of "green revolution" agricultural technology and limited concern about the environment and inter-generational equity. In sum, these threats arise from continuity of unsustainable perceptions, practices and policies.

Based on the literature review and the various consultations undertaken during the ecosystem profiling process, a ranking of the relative severity of indirect threats to biodiversity was carried out, taking into account the scale of impacts at the ecosystem level and recognizing the effects of some threats, while severe locally, may be restricted in extent (e.g. mining). This analysis recognized six threats as having the highest relative severity now and in the near future: cattle raising; annual crops; biofuel; charcoal; fire; and tree plantations.

The investments that cause negative impacts on conservation are both private and public. Public investments in infrastructure, technology, rural credit and extension and export promotion, for example, enable private investment by farmers, ranchers and other private economic agents. Except for mining, most of the investment in the Cerrado is made by Brazilian individuals, companies or banks. Some of the private companies are traded on stock markets. The banks include public banks such as the National Economic and Social Development Bank and the Bank of Brazil. These public funding sources are more inclined to include environmental criteria, and efforts are under way to hold banks in Brazil liable for the negative impacts of their investments, such as the Green Protocol of the Ministry of Environment. Multinational companies provide credit and inputs and buy and sell the products, especially soybeans. They include Archer-Daniel Midlands, Bunge, Cargill and Dreyfuss (the "ABCD" giants). Other companies sell the fertilizers and machinery that are essential for growing crops in the Cerrado. Abroad, companies that use raw material from the Cerrado include buyers like Unilever and Walmart, which can be considered as indirect investors. All are part of supply chains under increasing environmental scrutiny.

The main investments with negative impacts on conservation in the Cerrado either promote or lead to expansion of the agricultural frontier, including both crops

(monocultures) and cattle (extensive pastures), which lead to deforestation and landscape fragmentation, with little or no connectivity through corridors or even "stepping stones." Such investments also pollute air, soil and water. Investments in the various sectors are interrelated and tend to reinforce each other.

It should be noted that investments in the region do not always generate negative impacts on biodiversity, water or carbon. Investments that favor the consolidation and intensification of settlements in areas of the Cerrado that are already densely occupied may reduce pressures for deforestation elsewhere. Horizontal frontier expansion without increases in productivity was the dominant pattern in the past, but verticalization of agriculture through higher productivity on existing farms and ranches, and greater integration with agroindustry, is now under way through Crop-Livestock Integration, which seeks to increase soil quality and organic matter content.

At the same time, investments in conservation elsewhere may have unintended negative impacts on the Cerrado, because of displacement ("leakage") of deforestation from other biomes. This biome has been chosen as the main productive region by Brazilian government, with little objection from civil society, which considers forests (the Amazon and the Atlantic Forest) more important to conserve. The Cerrado does not have dense forest but it is equally or more important in terms of its biodiversity values and water and carbon services.

10. CLIMATE CHANGE ASSESSMENT

10.1 Current and Projected Patterns in the Cerrado

Even though deforestation rates are expected to further decline, climate change impacts are likely to negatively affect carbon stocks in Cerrado ecosystems, due to increased dryness and more frequent burning. The findings of the first Brazilian Panel on Climate Change indicate a complex scenario by the year 2100. The main trends identified for the Cerrado were: (i) a 1°C increase in air temperature combined with a 10 to 20% decrease in precipitation over the next three decades (by 2040); (ii) an increase of between 3 and 3.5ºC in air temperature and a reduction of between 20% and 35% in rainfall by mid-century (2041-2070); and (iii) an increase in temperature between 5 and 5.5ºC and a more critical downturn in rainfall, with a reduction of between 35% and 45% by the latter part of the century (2071-2100).

The temperature rises projected under any of the scenarios will probably result in a reduction of the photosynthetic process in Cerrado plants, resulting in a decrease in biomass and a reduction in primary productivity. At the same time, the increase in the length of the dry period could potentially result in increased vulnerability to fire in the Cerrado, as has already been noted in recent years. Given that local trends in desertification are already alarming, there is the risk that these processes could be amplified by the potential negative effects of rising temperature, more frequent burning and decreasing precipitation on Cerrado vegetation, especially considering the historically high rates of deforestation and land degradation. If the dry season becomes longer, less cloud cover would make temperatures rise even higher in the summer, which is now the rainy season.

10.2 Impacts on Biodiversity

A pioneer study on climate change effects on the Cerrado flora projected substantial declines for most tree species over the next 40 years. The researchers applied techniques of ecological niche modeling to project that between 10 and 32% of the 162 analyzed species could end up without habitable areas in the Cerrado Hotspot or become extinct by 2055. Furthermore, between 91 and 123 species were predicted to decline by more than 90% of their potential distributional area in the Cerrado, with major range shifts to the south and to the east.

The expected impacts of global climate change on environmental suitability of wild edible plants, specifically, have also been projected. Considering the 16 most popular edible species in the Cerrado and a "business as usual" climate scenario, this research projects large negative effects of climate change on range sizes, with 12 species undergoing retractions in range by 2080. This would lead to edible species becoming increasingly restricted to the southeast of the hotspot, which has the highest predicted environmental suitability.

Geographical displacement of species niches has also been predicted for Cerrado endemic bird species. This study projects an average range shift of 200 km towards the southeast, and a retraction of the geographic distribution of seven forest-dependent bird species by between 41 and 80% by the end of the century, under the A1B and the B1 Emission Scenarios of the Inter-governmental Panel on Climate Change (IPCC). For nine savanna species, the estimated distribution retraction was 9 to 37%, while for 10 grassland species it was between 2 and 71%.

10.3 Social and Economic Impacts

EMBRAPA Cerrados, in partnership with the State University of Campinas, modelled changes on spatial patterns of crops in the Cerrado due to climate change. Considering the most optimistic IPCC scenario evaluated (B2, which projects a 1.4 to 3.8°C rise in mean global surface temperature), areas with low probability of hazardous thermic events would be reduced by 11.0% for cotton, 8.4% for rice, 4.4% for beans, 12.2% for corn and 21.6% for soy, the main crop in the Cerrado. This could cause combined economic losses of USD 1.7 billion for the main crops in the hotspot, as well as crops migration southwards, where climate conditions might be more favorable but land and labor are more expensive. It should be noted, that the southern parts of the hotspot are also projected to be the refugia for species displaced by climate change.

Reduced precipitation could lead to more severe dry seasons and even desertification, as already evidenced locally in the northeastern portion of the Cerrado. Given that the Cerrado is the main source of water for three of the largest river basins in South America, understanding the socioeconomic and ecological impacts of hydrological changes is critical. Modelling South America future precipitation trends that derive from IPCC scenarios, extensive salinization and degradation of croplands are expected, as well as dropping livestock productivity, reflecting the fact that water availability and food security are closely related.

10.4 Potential Mitigation and Adaptation

Natural ecosystems play a substantial role in balancing anthropogenic greenhouse gas emissions, as shown by the growing convergence between the approaches of the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change. Thus, reaching the Aichi target of 17% of the Cerrado within protected areas would help mitigate emissions through avoided deforestation and fire management. However, this target is below what would be necessary in terms of woody plant cover. It would be fundamental to maintain about half of the hotspot with native tree cover, both original and recovered through regeneration and reforestation. To achieve results on this scale would require conservation strategies that extend well beyond conventional protected areas and involve conservation and restoration of natural vegetation on privately owned land, including as part of production landscapes.

Regardless of the strategies pursued, it will be essential to link biodiversity conservation and climate change agendas. Resilience to climate change in the Cerrado and neighboring areas depends on maintaining the original ecosystem and the services they provide at a scale of a million square kilometers or more. This challenging scenario requires integrated efforts from civil society, governments, farmers and the global community to elaborate strong governance and incisive environmental-biased policies. Another fundamental goal is to provide means for the rural population to transition towards more sustainable forms of production. Social and agroecological technology transfers will certainly play a role in this enterprise, because they provide solutions to environmental tensions – including but not restricted to the impacts of a changing climate – that may provoke emigration from rural regions.

11. ASSESSMENT OF CURRENT CONSERVATION INVESTMENT

11.1 Introduction

The ecosystem profile assesses recent and current conservation investment, covering both direct investment in such elements as protected areas and environmental science, as well as investment in economic development and local governance with positive impacts on conservation outcomes. Loans are not included, nor are investments intended to generate profit. Thus, the analysis includes traditional development funders and actors, whose programs influence CEPF's niche for investment. Although a precise baseline is not possible, some patterns, trends, limitations and opportunities are clear.

To understand what can be done in the Cerrado, one must look to broader contexts both in Brazil, including government, society and the private sector, and abroad, taking into account the environmental policies and priorities of governments, international agencies, foundations and companies. Some investments in social programs or economic development must also be taken into account, to the extent that they can generate large-scale environmental co-benefits, much needed in the Cerrado Hotspot. The purpose of using this broad scope is to identify limitations and opportunities for the Cerrado, as well as lessons learned.

11.2 Investment by Source and Location

Since 1992, when the United Nations Conference on Environment and Development in Rio de Janeiro catalyzed Brazil's first large-scale investments in conservation, the biome to receive the most attention and investment has been the Amazon. Analysis of trends in conservation investment over time, however, reveal less funding for the Amazon and more for the Cerrado, although dramatic differences remain. The Cerrado is often eligible for funding from national or international donors but has generally failed to present competitive proposals, compared to the Amazon or the Atlantic Forest. Because funding tends to be cumulative, with successful grant recipients requesting and receiving further support, there is a degree of inertia: a cycle that is not necessarily virtuous, at least when change is needed.

Detailed data on conservation investments are rarely available and are not always broken down in a helpful way. In most of the existing sources of data, such as the catalog of projects approved by the Brazilian Cooperation Agency of the Ministry of External Relations or the lists of projects funded by certain donors provided on their websites, investments are typically not categorized by biome or by state. Even when they are, interpretation of data is made difficult by the fact that the Federal district is the only state-level administrative unit entirely within the hotspot. Furthermore, figures often include considerable co-financing, sometimes accounting for most of the total, much of which is in the form of in-kind contributions rather than cash. Nonetheless, general patterns and trends can be identified.

The main investments indirectly related to environment in the Cerrado were made by the Brazilian Agricultural Research Company (EMBRAPA), which has a specific unit for the Cerrado, originally known as the Center for Cerrados Agricultural Research (CPAC), located in the Federal district. Most of the investment was for technology for crops and livestock, although some researchers at CPAC worked on environmental issues such as useful plants and vegetation types, especially gallery forests, among others. EMBRAPA's Genetic Resources and Biotechnology center (CENARGEN) also did pioneering work with saving agrobiodiversity genetic resources among the Krahô indigenous people in Tocantins, as well as supporting family farmers in northern Minas Gerais.

In 1991, FUNATURA, through The Nature Conservancy (TNC), received support from Brazil's first debt-for-nature swap, to implement the Grand Sertão-Veredas National Park and resettle the area's original inhabitants. The interest of 6% on USD 2,192,000 provides continuous income of USD 131,520 every year.

Between 1996 and 2000, the United Kingdom Department for International Development (DfID; formerly the Overseas Development Agency) funded the project on Conservation and Management of the Plant Biodiversity of the Cerrado Biome, with grants to government, academia and civil society partners totaling some USD 2 million. A second phase, starting in 2001, focused on the Paranã-Pirineus corridor in northeastern Goiás. The project made significant contributions to scientific knowledge about the botany of the Cerrado.

The GEF Sustainable Cerrado Initiative, through the World Bank, provided USD 13 million in support of the MMA and the states of Goiás and Tocantins from

2010-2015, promoting environmental protection and sustainable agriculture. This project was based upon the Sustainable Cerrado Plan, which resulted from broad-based consultation with stakeholders in 2003-2004. However, the project did not deal with the parts of the plan regarding sustainable use of biodiversity or communities.

Since 1995, the GEF Small Grants Program, through the *Programa de Pequenos Projetos Ecossociais* (PPP-ECOS) has invested USD 10 million to support more than 300 projects having to do primarily with sustainable use of biodiversity by local communities in the states that are part of the Cerrado. The future of the program under GEF6 is not certain, because of the need for GEF full-sized projects to compete with federal agencies in great need of funding for their own activities.

The United States Tropical Forest Conservation Act provides funding through the Brazilian Biodiversity Foundation (FUNBIO) for activities in the Cerrado, including some projects associated with PPP-ECOS that have to do with capacity-building and institutional strengthening, such as resource mobilization and dissemination.

WWF has invested in the ongoing tri-national Cerrado-Pantanal project in Mato Grosso do Sul and Mato Grosso states, as well as Chiquitano and Chaco areas of Bolivia and Paraguay. It also invests in the Grande Sertão-Peruaçu mosaic of protected areas in northern Minas Gerais state.

The German government began investing in the Cerrado in 2012 by funding the Cerrado-Jalapão project, providing the equivalent of USD 12 million. The project primarily addresses control of wildfire for climate change mitigation but this also benefits biodiversity. The German government plans larger investments in forests, biodiversity and climate in Brazil, part of which may go to projects in the Cerrado.

Regarding the private sector, Monsanto and Conservation International invested USD 1.1 million in the Produce and Conserve Program in western Bahia state between 2009 and 2013. The Cerrado No-Till Farming Association and the Round Table on Sustainable Soy both involve the private sector in conservation-friendly agriculture, such as zero tillage and integrated crop-livestock systems. In general, the main concern of the private sector, as expressed in the consultation workshops, is with covering the costs of sustainable production rather than investing in conservation.

Together with the Inter-American Development Bank (IDB), the World Bank Group (IBRD, IFC), other development partners and key Brazilian stakeholders, the Forest Investment Program (FIP) will lend between USD 50 million and USD 70 million for projects in the Cerrado starting in early 2016. The investment plan aims to promote sustainable management and use of previously anthropized savanna woods areas, maintain carbon stocks and reduce GHG emissions and improve the collection and management of information across the 11 states of the Cerrado through implementation of the Forest Law and monitoring of deforestation. Brazil's FIP investments also focus on indigenous peoples and local communities, providing access to fire alerts and early warning systems, information and support for environmental compliance and assistance with the adoption low-carbon farming practices in and around their lands. The Dedicated Grant Mechanism (DGM) provides a grant of USD 6.5 million channeled through the Center for Alternative Agriculture of Northern Minas Gerais (CAA-NM),

with the aim of empowering indigenous people to engage in climate change mitigation and adaptation.

Also through the World Bank, the United Kingdom Department of Environment, Food and Rural Affairs (DEFRA) is investing USD 4.3 million in three municipalities in Bahia and six in Piaui and three protected areas, including areas prioritized for CEPF investment in the ecosystem profile. The funding aims to reduce rates of deforestation by supporting the environmental registration of rural holdings and helping farmers restore vegetation on illegally cleared land. It also funds measures to prevent and manage forest fires. This includes improving Brazil's Early Warning Fire system and supporting emergency aid services to enhance local capacities to handle forest fires.

Regarding government investments, federal programs like PPCerrado have invested tens of millions of dollars in the hotspot but these investments have mainly been for social policies with co-benefits for environment, both in the sense of promoting sustainable use of biodiversity and in reducing the need to clear more land to produce food and income. The state governments in the Cerrado, which now have their own environmental secretariats, have also begun to invest more in environment than in the past, although the priority for local government in the less developed parts of Brazil continues to be economic growth, mainly through agribusiness and mining, and social programs.

The sum of conservation investments in the Cerrado since 1992 is in the order of USD 10 million per year, with a tendency to increase in recent years but it is still far from sufficient to avoid serious damage to biodiversity, hydrology and climate.

11.3 Gap Analysis

The general pattern revealed by the analysis of large-scale (over a million dollars) conservation investments in Brazil conducted during the preparation of the ecosystem profile is one of hundreds of millions of dollars per year for the Amazon, tens of millions of dollars per year for the Atlantic Forest, Caatinga and Cerrado and only one or two million dollars per year for the Pantanal and Pampa biomes. The Cerrado biome is attracting more attention from donors than in the past but the totals are still far from what is needed. It is essential not only to mobilize more funds but also to increase the Cerrado's share in existing sources of investment for the environment and to influence investments in economic and social development that have positive or negative environmental impacts so as to shift the balance.

Investment in new protected areas in Brazil has dropped significantly in recent years, due in part to the creation of vast areas since 1992. In the case of conservation in the Cerrado, it needs to be borne in mind that the most of the land is private and that it is and will remain relatively expensive for many years to come. If one assumes an average cost of USD 1,000 per hectare of private land, 5 million hectares of protected areas would have a total cost of nearly USD 5 billion for regularization. The fact that many payments to landowners are still outstanding is one of the reasons for political resistance to designating new protected areas.

Scientific knowledge about the Cerrado is another gap. The coverage of data on species distribution is biased toward proximity to large universities, because it is expensive to

do field research in remote areas. Information on deforestation, carbon stocks and water cycles is incomplete and outdated. There is practically no solid information on local and inter-regional atmospheric flows in hydrological cycles or on the importance of biodiversity for surface runoff and evapotranspiration. The economic and ecological costs and benefits of traditional and innovative land uses and practices have not been analyzed, much less used to inform policy.

The Cerrado's CSOs urgently need funding, including capacity building and institutional support for networks, to carry out activities, meet their legal obligations and participate effectively in conservation efforts. It became clear in the final consultation workshop that dependence on one project after another threatens organizational survival and can be counterproductive. Continuity is essential. For this, it would be important to make the regulatory framework more workable. Although this is beyond CEPF's mandate, there is now a congressional bloc working towards this end.

Indigenous groups, even where they have legal rights to their land, still need options for livelihoods and income generation, without depending entirely on the government. They also need special training, including in English, in order to participate effectively at international meetings and negotiations, for which Portuguese is far from sufficient.

In terms of new sources of investment, the private sector can certainly play a key role. The challenges are to reconcile the interests of producers with those of suppliers of inputs and services, as well as local buyers and international commodity traders. Large corporations are often easier for civil society to engage with than are small and medium companies or individual landowners, although there is enormous heterogeneity with the private sector and change is now under way.

Mobilizations of funding from the private sector and other sources, to enable continuity of conservation programs, depend on inter-sectorial dialog and negotiations among governments, companies, communities and socio-environmental movements. This in turn requires financial support for civil society capacity building and to enable participation in consultation processes in a vast region where people's physical presence at meetings is costly. Above all, it is fundamental for the various donors supporting biodiversity conservation in the Cerrado, as well as investors in other sectors (e.g. infrastructure, energy, commodities, etc.), to collaborate, seeking synergies and avoiding unnecessary duplication so as to achieve the greatest impact.

12. CEPF NICHE FOR INVESTMENT

12.1 Conservation Investment Needs

Among the many barriers identified by stakeholders and captured in this document are the following: a regulatory framework that hinders the sustained, effective engagement of civil society (including local communities and private sector companies); a lack of enforcement of existing favorable policies; a weak civil society, especially in terms of capacities for participation in the decision-making sphere; and a lack of appreciation of the biological and socio-economical values of the Cerrado among decision makers at all levels. In addition, funding opportunities for civil society organizations wishing to

engage in the conservation of the Cerrado is currently very limited, especially in light of the size of the hotspot and the scale of the threats facing it.

The main needs for action in the next five years to conserve the Cerrado Hotspot include:

- to avoid or at least minimize new clearing by making better use of the land already cleared and/or creating alternative economic incentives for land users/owners;
- to restore degraded lands so as to recreate ecological connectivity among fragments of remant vegetation by tailoring low-cost, ecologically and economically appropriate technologies;
- to expand the network of protected areas by creating incentives for private reserves and promoting sustainable land management by indigenous and traditional communities.

Addressing these needs across the Cerrado as a whole will require the combined efforts of many actors. CEPF will need to collaborate closely with (and encourage the involvement of) other funders, both international donors and, most important of all, domestic development, social and environmental programs. CEPF's focus is on engaging civil society but, even here, the fund will need to make targeted investments, to avoid duplicating efforts of other donors or spreading its resources too thinly. Considering its limited funds, CEPF investment will not attempt to deliver conservation action throughout the hotspot but, rather, to piloting demonstration models, promote their wider replication by other donors and invest in the capacity development of civil society organizations as strong partners in multi-sector initiatives for conservation and sustainable development.

12.2 CEPF Niche

Investment in conservation in the Cerrado must be strategic, in order to achieve the necessary scale in the world's third largest hotspot. In line with the new directions for CEPF's third phase, which emphasize biodiversity conservation mainstreaming into public policies and private practices and dealing with the drivers of environmental degradation, the investment niche for the Cerrado is not limited to conservation of biodiversity at specific sites but also takes into account the essential links among biodiversity, ecosystem services, cultural and social issues and public policy.

The CEPF investment will be used to leverage, enhance and amplify opportunities for financial support as well as technical cooperation, within Brazil and abroad. In some cases, a tri-national focus, including Bolivia and Paraguay, is strategic. The impact of the CEPF investment niche is much larger than it might seem at first sight due to shrinking funding from international donors and government budget restrictions, especially in the context of the current national economic crisis in Brazil.

In terms of target groups, in addition to the civil society groups most directly involved in conservation, it will be strategic for CEPF investment to target local communities of family farmers, indigenous peoples, traditional communities and civil society networks. The main needs identified by the stakeholders through the consultation process are institutional strengthening, capacity building, infrastructure and technology tools.

The Cerrado has a diversity of CSOs, with varying levels of capacity to achieve conservation outcomes. Some kinds of institutional strengthening and capacity development, such as learning how to access and manage grants and other kinds of funds, can be achieved through short-term projects. At the same time, support for networks of civil society organizations should be substantial and continuous over the five years, as opposed to short-term small grants for specific purposes. Such investments are strategic, by enhancing the sustainability of civil society organizations, making them more efficient and better able to establish partnerships and raise the necessary funds to fulfill their missions in the years following the period of CEPF investments.

Capacity development should include qualification for participation in policy dialogues through the various councils, commissions and conferences. Few representatives from the Cerrado have both local legitimacy and understanding of complex technical and administrative issues, and there are specific needs of indigenous groups.

Private sector engagement is essential for successful conservation of the Cerrado. To be able to have an impact on large-scale and to induce transformative processes, it is necessary to implement actions in partnership with associations and cooperatives of producers, farmers and extractive communities. Strengthening associations and promoting the integration of sustainable production chains will be prioritized. There should also be incentives for sustainable business initiatives and a strategy to work with supply chains that link many producers as well as their suppliers, buyers, customers and creditors.

Working with government at all levels is also essential to the success of conservation efforts. Therefore, CEPF will support initiatives that promote dialogue and cooperation among civil society organizations and government agencies responsible for managing issues such as environment, agriculture, infrastructure and other strategic sectors, since these are responsible for decisions and actions with high impact on the Cerrado's conservation. The direct participation of civil society organizations or their dialogue with the governance bodies should be promoted and strengthened, through actions that increase their skills to intervene and propose innovations and solutions. CEPF investments could support the development of these skills and create better conditions to promote participatory and inclusive governance of territories and natural resources.

There are some gaps in scientific knowledge about the Cerrado, even about the occurrence of threatened species, as well as the ecosystem services. The traditional and indigenous knowledge on biodiversity and natural resources management remains poorly or not at all considered in the planning and in the implementation of conservation actions. On the other hand, information and knowledge available are vast, both scientific as well as from local communities, but dispersed and without appropriate tools or platforms to allow integrated analysis that supports decision-making processes. CEPF investment will not fill data gaps directly but will be used strategically to develop and implement tools and protocols for data integration and generation of strategic analysis that supports decision-making processes. Those tools are key to raising social, political and financial support for conservation of the hotspot.

The identification of conservation outcomes provides a long-term, overarching agenda for conservation of the Cerrado's unique and valuable biodiversity. Realistically, only a fraction of these priorities can be tackled by civil society organizations over the next

five years. Therefore, the ecosystem profile identifies geographic and taxonomic priorities for support.

Regarding taxonomic priorities, of the 160 globally threatened species in the hotspot, CEPF will support actions to address the conservation of nine terrestrial and freshwater priority species. These investments will be focused on the implementation of existing National Action Plans, which present the official guidelines for the protection of these species, developed by experts and validated by the responsible government agency.

Regarding geographic priorities, CEPF investments will focus on four priority corridors: Veadeiros-Pouso Alto-Kalungas; Central de MATOPIBA; Sertão Veredas-Peruaçu; and Mirador-Mesas. Within these corridors, CEPF investments at the site scale will focus on 62 KBAs classified as "Very High" relative importance for conservation, according to the prioritization method validated by stakeholders. It is important to note that, as this ecosystem profile will be adopted by other institutions as a reference for action planning and fundraising for the hotspot, all 13 conservation corridors should be considered as priorities for conservation investment and action, even though the investment of CEPF will only target four of them. Similarly, it should be noted that an additional 47 KBAs of "Very High" relative conservation importance are located outside of the four priority corridors: 40 in other corridors; and seven outside of any conservation corridor.

CEPF investments in Cerrado are designed to have an enduring impact on the ability of civil society to influence positively public policies and private initiatives, aimed at conservation and sustainable development of the hotspot. By investing in one of the most important regions for agricultural commodities in the world, CEPF will help to increase the effectiveness and the scale of agribusinesses' sustainable practices. The harvesting of non-timber forest products and the traditional practices carried out by rural communities, indigenous people and *quilombolas* will also be supported, enabling the exchange of experiences and a better insertion in the market of so-called 'socio-biodiversity products'. Support to establish new public and private protected areas is also included in the investment strategy, to enhance the status of legal protection for critically endangered species in the hotspot. By this strategy, CEPF will help to leverage coordinated contributions to the conservation of the Cerrado from diverse actors, in the same way as has been seen for other hotspots around the world.

12.3 Collaboration with Other Initiatives

CEPF will only be one of several international donors supporting conservation efforts in the Cerrado over the next five years, albeit one of only a few with a principal focus on working through civil society. It will be essential to coordinate closely with other initiatives, to avoid duplication of effort and realize synergies. Collaboration is, therefore, an important element of the CEPF niche, and is reflected in the investment strategy. Specific mechanisms for ensuring effective collaboration with other initiatives will include, but not necessarily be limited to:

- targeting CEPF investments at strategies that align closely with national priorities and that present opportunities for financial leverage;
- proactively engaging with other funders supporting civil society to align support to organizations and share lessons learned;

- establishing a national advisory group with representatives of government, donors and civil society, to provide strategic guidance to the development of the CEPF grant portfolio in the hotspot;
- seeking the development of complementarity in terms of geographical and/or thematical focus based on the investment gaps indentified in the profile or of cooperation on grant making.

Several of the conservation initiatives in the hotspot that are identified in this profile will end in 2016, when CEPF investment will have just started. These include the Cerrado-Jalapão project supported by Germany and the Program to Reduce Deforestation and Burning in the Brazilian Cerrado supported by the United Kingdom. Final assessments of these initiatives should provide lessons learned and recommendations that the Regional Implementation Team (RIT) will be able to use to better coordinate and implement the CEPF investment strategy and strategically guide the network of partner institutions.

Regarding other known initiatives that will be implemented during part of the next five years or beyond, such as the CAR-FIP Cerrado Project or the National Plan for the Recovery of Native Vegetation (PLANAVEG), which aims at recovering at least 12.5 million hectares of native vegetation over the next 20 years, the CEPF investment strategy will implement supportive actions. These actions, ranging from local capacity building to piloting approaches and creating socio-environmental benefits as incentives for instance, have been identified as investment gaps in the Cerrado Hotspot.

At the same time, other significant initiatives may begin only during the investment phase, such as the Dedicated Grant Mechanism for Indigenous People and Traditional Communities. The CEPF investment strategy will need to practice adaptive management with regard to new initiatives that arise. The RIT will be instrumental in monitoring this changing investment landscape, and exploring new opportunities for collaboration. This role will be explicitly reflected in the team's scope of work, and it will be resourced accordingly.

13. CEPF INVESTMENT STRATEGY AND PROGRAMMATIC FOCUS

13.1 Priority Species for CEPF Investment

Species outcomes in the Cerrado were prioritized according to three criteria. The first was level of threat, with priority being given to species classified as Critically Endangered by the Brazilian National Red List and/or the IUCN Red List, because these face an extremely high risk of extinction in the wild and thus demand urgent conservation action. The second criterion was existence of National Action Plans (PANs) for the conservation of the species or sites containing the species. PANs are public policies that identify and guide priority actions against threats to populations of species and natural environments, developed through consultation with researchers and experts in the field. Focusing CEPF investments on species with PANs will amplify and enhance the results of conservation, and promote an important alignment with federal government priorities. The third criterion was relative importance of the hotspot for

conservation of the species, with priority being given to species endemic to the hotspot or specific sub-region within it.

Of the 218 species of flora and fauna classified as Critically Endangered according to either the national or global Red List, only 12 currently have PANs or are part of a regional PAN. Only nine of these species are currently recognized as globally threatened and thus eligible for CEPF investment (Table 13.1). The remaining three species (*Actinocephalus cipoensis*, *Paepalanthus ater* and *Parides burchellanus*) are considered candidate priority species, which would become eligible for CEPF support were they to be (re-)evaluated as globally threatened during the period of CEPF investment. Additional candidate priority species are including in three draft PANs, currently under preparation by CNC Flora. These PANs cover the regions of Grão Mogol and Serra do Espinhaço Meridional, and the Alto Tocantins basin, which all have high concentrations of Critically Endangered plant species, together with high species richness and levels of endemism.

Table 13.1 Priority Species for CEPF Investment in the Cerrado Hotspot

Taxonomic Group	Species	National Threat Status	Global Threat Status	Priority Conservation Strategies
Plant	*Discocactus horstii*	CR	VU	- Increase knowledge about the species, focused on protected areas, and its population dynamics - Enhance and strengthen public policies related to the Cactaceae, specially for international scientific collaboration
Plant	*Dimorphandra wilsonii*	CR	CR	- Create incentives and/or reformulate public policies to mitigate threats and protect the populations - Integrate government institutions, non-governmental, the private sector and local communities in conservation actions and promote educational activities on its protection and conservation - Expand and protect populations and combat and/or mitigate threats to its range
Bird	*Columbina cyanopis*	CR(PEX)	CR	- Reduce losses and improve habitat quality for species conservation - Reduce negative impacts of agribusiness activities on species - Reduce the negative impacts of human settlements, infrastructure projects and exploitation of natural resources. - Increase scientific knowledge on the species
Bird	*Conothraupis mesoleuca*	EN	CR	
Bird	*Sporophila melanops*		CR	
Bird	*Mergus octosetaceus*	CR	CR	- Support conservation actions for the species and its habitat - Increase research and monitoring - Promote awareness and training actions - Support collaboration and international communication

Taxonomic Group	Species	National Threat Status	Global Threat Status	Priority Conservation Strategies
Insect	*Heliconius nattereri*	EN	CR	- Increase information about species with insufficient data and monitor the conservation status of endangered species or species occurring in habitats with high conversion rates - Promote actions focused on reducing habitat loss - Strengthen institutions involved in Lepidoptera conservation - Ensure public awareness of the conservation of Lepidoptera
Insect	*Nirodia belphegor*	CR	EN	
Amphibian	*Phyllomedusa ayeaye*	-	CR	- Increase research to gain taxonomic, genetic and biological knowledge - Support actions to decrease the loss of habitat from fires - Strengthen public policies related to the use and occupation of land and water resources that affect the species - Establish and implement strategies to improve quality and habitat connectivity in priority areas for the species - Develop education practices for sustainability aligned with local development, benefiting species conservation

13.2 Priority Corridors for CEPF Investment

Landscape-scale corridors provide a geographic lens for conservation investment that is very relevant to the Cerrado, allowing for a mosaic of different actions and activities across a single landscape, ranging from support for sustainable production to the strictest protection. To select corridors as priorities for CEPF investment, the following selection criteria were used: (i) weighted average of relative priority rankings for KBAs in the corridor; (ii) conservation investment gaps; (iii) opportunities to work with civil society; (iv) potential for leverage to sustain or amplify CEPF investments; (v) urgency of conservation actions; and (vi) natural vegetation cover.

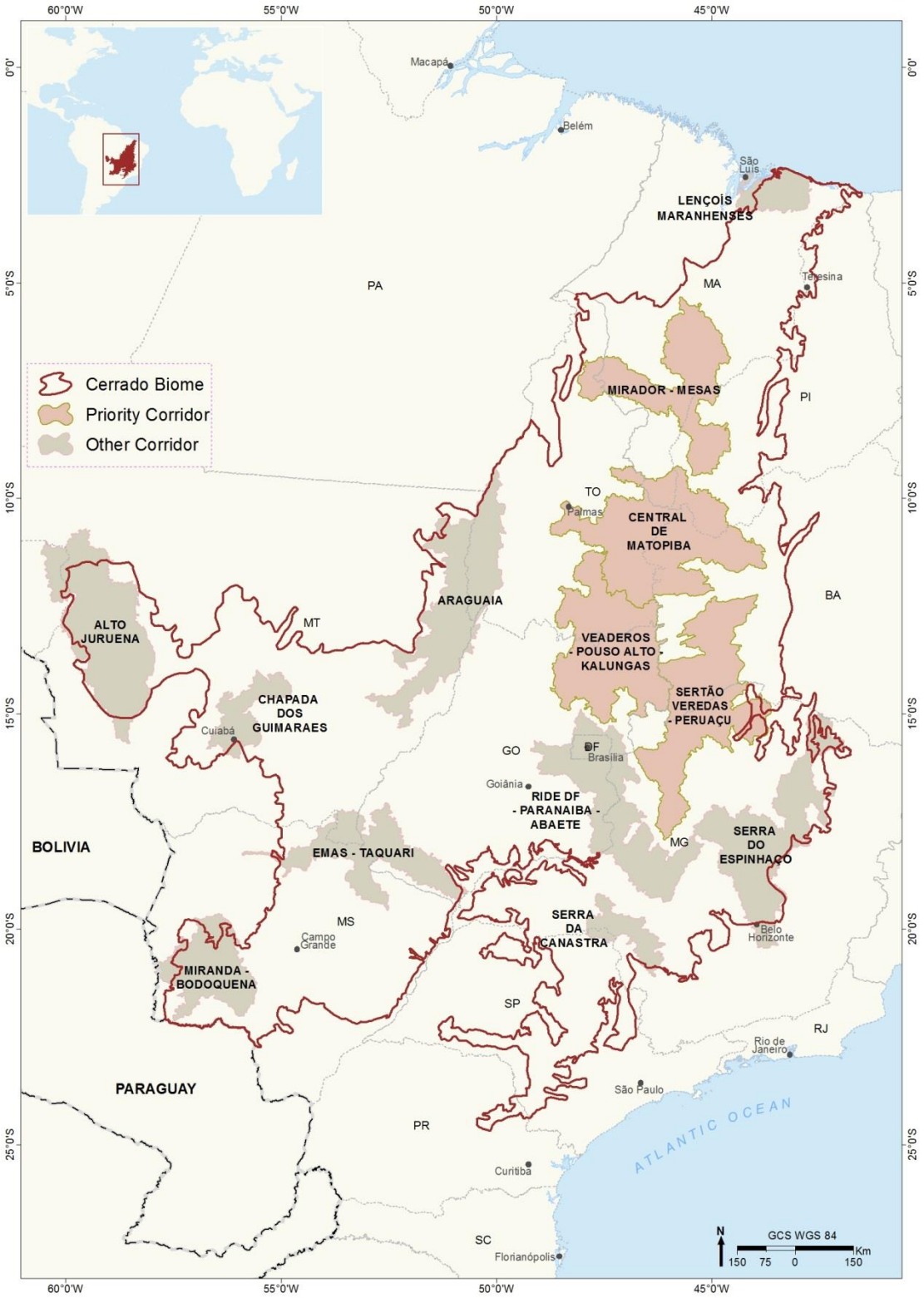
Based on these criteria, four priority corridors were selected: Central de MATOPIBA; Mirador-Mesas; Sertão Veredas Peruaçu; and Veadeiros Pouso Alto Kalungas (Figure 13.1). These are all located in strategic regions of the Cerrado that were anthropized with pasture and agriculture activities in the last five years, resulting in a high level of threat to their ecosystems.

All four priority corridors have a high proportion of natural vegetation cover but little protected area coverage and low capacity to manage those protected areas that do exist. Significantly, all four corridors have a high need for additional investment and present excellent opportunities to catalyze and amplify the results of conservation actions. The total area encompassed by the four priority corridors is about 32.2 million hectares, representing approximately 16% of the whole Cerrado Hotspot.

In addition to the four priority corridors, the Serra do Espinhaço corridor supports high numbers of threatened and endemic species, highlighted in scientific literature and

PANs. The forthcoming Serra do Espinhaço Meridional PAN (for plants and herpetofauna) and Grão Mogol PAN (for plants) indicate priority strategies and also conservation actions for the region and for threatened and endemic species that inhabit the area. It is strongly recommended that CEPF's investment niche in this region keep its focus on species, aligned with these PANs.

Figure 13.1: Priority Corridors for CEPF Investment in the Cerrado Hotspot



13.3 Priority Sites for CEPF Investment

KBAs were prioritized following the methodology set out in the IUCN Protected Area Guidelines Series, validated in a workshop with researchers and actors from government and civil society, and applying the Analytical Hierarchical Process to account for huge variation in the ranges of different criteria. The six criteria used to prioritize KBAs were as follows: (i) biological priority; (ii) level of threat; (iii) alignment with national priorities; (iv) civil society capacity; (v) percentage cover of original vegetation; and (vi) provision of ecosystem services, especially water.

Application of these criteria led to the identification of 109 KBAs of "Very High" relative conservation importance: the highest ranking (Figure 13.1). These sites cover a combined area of about 21 million hectares, equivalent to roughly 10% of the hotspot. Of these, 62 KBAs, covering 9 million hectares, were located within the four priority corridors, and were considered a priority sites for CEPF investments at the site scale. KBAs from Bolivia and Paraguay were not part of the KBA prioritization process, due to the lack of comparative data on these sites. In any case, as previously mentioned, all of these sites benefit from some degree of protection, and the investment priority concerning site-level conservation developed with KBAs in Brazil in mind would not necessarily be relevant to them.

13.4 Strategic Directions and Investment Priorities

The broad and detailed compilation of information presented in the first 11 chapters of the ecosystem profile was used to refine a first set of 120 actions for the integrated conservation of the Cerrado Hotspot. These 120 actions were organized into the following 12 categories: (i) ecosocial monitoring; (ii) integrated ecosystem management; (iii) environmental protection; (iv) sustainable use; (v) water resources; (vi) indigenous peoples and traditional communities; (vii) family agriculture; (viii) agriculture; (ix) public policies; (x) institutional strengthening; (xi) knowledge and information; and (xii) sustainable financing.

About 170 experts were consulted during the profiling process, in particular during the four consultation workshops that brought together CSOs, private sector companies, academia and government institutions. These experts were tasked with ranking the identified actions to guide medium-term investments in the Cerrado. Based on this work, a preliminary investment strategy was then compiled, with 15 investment priorities grouped into four strategic directions at three geographic scales: site; corridor; and hotspot. The preliminary strategy was presented at the final consultation workshop, during which stakeholders further streamlined it.

The geographic scale created most of the discussions. Many stakeholders objected strongly to being asked prioritize among the conservation corridors. They were concerned that the corridors not being prioritized might no longer be considered for investments by other donors. Once it was made clear that this additional prioritization of the corridors was for the CEPF investment niche only and that all 13 corridors should be considered by other donors as being priorities for conservation investment, agreement was quickly reached on the four priority corridors. In addition, stakeholder felt that it was important to define site-scale priorities, based on KBAs, in order to guide site selection for the creation of private protected areas (RPPNs), as this was seen as a site-

specific need rather than a landscape-wide one, due to the high fragmentation of the hotspot.

The final investment strategy, presented in Table 13.2, is in accordance with the stakeholders present at the final consultation workshop and with members of the Senior Advisory Group, and also incorporates feedback from the CEPF Working Group. The investment strategy is for five years, and comprises 17 investment prioritiesgrouped into seven strategic directions.

Table 13.2 Strategic Directions and Investment Priorities for CEPF in the Cerrado Hotspot

CEPF Strategic Directions	CEPF Investment Priorities
1. Promote the adoption of best practices in agriculture in the priority corridors	1.1 Identify and disseminate sustainable technologies and production practices in the agriculture sector to ensure protection of biodiversity, maintenance of ecosystem services and food security
	1.2 Promote the development and adoption of public policies and economic incentives for improved agricultural and livestock production practices, promoting sustainable agricultural landscapes
2. Support the creation/ expansion and effective management of protected areas in the priority corridors	2.1 Support studies and analyses necessary to justify the creation and expansion of public protected areas, while promoting conservation and sustainable use of biodiversity and valuing local and traditional culture
	2.2 Promote the inclusion of existing indigenous, quilombola and traditional populations, respecting and integrating their traditional knowledge, into conservation/restoration planning by government and civil society
	2.3 Encourage the creation and implementation of private protected areas (RPPNs) to extend legal protection in priority KBAs
3. Promote and strengthen supply chains associated with the sustainable use of natural resources and ecological restoration in the hotspot	3.1 Support the development of markets and supply chains for sustainably harvested non-timber products, in particular for women and youth
	3.2 Promote capacity-building initiatives in particular among seed collectors, seedlings producers and those who carry out restoration activities, to enhance technical and management skills and low-cost, ecologically appropriate technologies in the supply chain of ecological restoration
	3.3 Promote the adoption of public policies and economic incentives to expand the scale and effectiveness of conservation and restoration of Permanent Preservation Areas (APPs) and Legal Reserves (LRs), through improved productive systems that enhance ecosystem services
4. Support the protection of threatened species in the hotspot	4.1 Support the implementation of National Action Plans (PANs) for priority species, with a focus on habitat management and protection
5. Support the implementation of tools to integrate and to share data on monitoring to better inform decision-making processes in the hotspot	5.1 Support the dissemination of data on native vegetation cover and dynamics of land uses, seeking reliability and shorter time intervals between analyses and informed evidence-based decision-making
	5.2 Support the collection and dissemination of monitoring data on quantity and quality of water resources, to integrate and to share data on the main river basins in the hotspot

CEPF Strategic Directions	CEPF Investment Priorities
6. Strengthen the capacity of civil society organizations to promote better management of territories and of natural resources and to support other investment priorities in the hotspot	6.1 Strengthen capacities of civil society organizations to participate in collective bodies and processes related to the management of territories and natural resources
	6.2 Develop and strengthen technical and management skills of civil society organizations, on environment, conservation strategy and planning, policy advocacy, fund raising, compliance with regulations and other topics relevant to investment priorities
	6.3 Facilitate processes of dialogue and cooperation among public, private and civil society actors to identify synergies and to catalyze integrated actions and policies for the conservation and sustainable development of the Cerrado
	6.4 Disseminate information about the biological, ecological, social and cultural functions of the Cerrado to different stakeholders, including civil society leaders, decision makers, and national and international audiences
7. Coordinate the implementation of the investment strategy of the CEPF in the hotspot through a Regional Implementation Team	7.1 Coordinate and implement the strategy of investments of CEPF in the Cerrado, through procedures to ensure the effective use of resources and achievement of expected results
	7.2 Support and strategically guide the network of institutions responsible for the implementation of actions and projects funded by CEPF, promoting their coordination, integration, cooperation and exchange of experiences and lessons learned