Tabela 2-37. Pilot Program to Conserve the Brazilian Rain Forest PPG-7 (In US$ million or equivalent).

Projects	RFT*	Germany	European Commission	United Kingdom	USA	France	Counterpart Brazil	Total
Current projects								
Scientific institutions	9.00			0.70	3.00		2.98	15.68
Directed Research			10.91		9.00			19.91
Demonstrative Projects Type A	3.18	20.75	4.44			1.68	3.00	33.05
Extractivist Reserves	3.00		5.55				0.90	9.45
Natural Resources Policy	20.00	28.48	18.55	5.00			11.40	83.43
Indigenous lands	2.10	18.41					2.20	22.71
Subtotal – projects underway	37.28	67.64	39.45	5.70	12.00	1.68	20.48	184.23
Projects approved								
Management of Forest Resources-PROMANEJO	2.00	13.54		1.90			1.40	18.84
Environmental Education-CEDUC	2.25		5.55				0.80	8.60
Subtotal - projects approved	4.25	13.54	5.55	1.90	0.00	0.00	2.20	27.44
New projects for evaluation								
Analysis, Monitoring and Evaluation	2.00						0.20	2.20
Management of Natural Resources of Várzeas	2.00	4.54					0.70	7.24
Monitoring and Control of Deforestation and Fires- PRODESQUE	2.00						0.90	2.90
Parks and Reserves	5.00	21.15	13.00	3.00			7.00	49.15
Not allocated		11.34						11.34
Subtotal - new projects (estimate)	11.00	37.03	13.00	3.00	0.00	0.00	8.80	72.83
Total	**52.53**	**118.21**	**58.00**	**10.60**	**12.00**	**1.68**	**31.48**	**284.50**

RFT = Rain Forest Trust Fund, a multilateral fund from a number of donors, administered by The World Bank.
Source: Brasil, MMA. *Projeto Parques e Reservas*. Brasilia: Programa Piloto para a Proteção das Florestas Tropicais do Brasil - PPG-7 (1997). 3 v.

of computerised databases for collections. The National Zoological Programme (Programa Nacional de Zoologia) of CNPq recruits and trains personnel for the maintenance of research teams and of the collections themselves.

Of the zoology projects financed, 52% deal with vertebrates. Of these, 32% deal with fish, 25% mammals, 21% birds, 14% reptiles, and 7% amphibians. Research projects on invertebrates include insects (68%), crustaceans (32%), coelenterates (4.5%) and echinoderms (4.5%). A little over 10% of the research groups in zoology maintain scientific collections. The Tropical Database (BDT) has placed some information on these research groups and their collections on the Internet - ´Brazilian Zoological Collections´ (Table 2-43).

There are a number of initiatives involving the establishment of computerised databases for zoological collections. One of these is the Neodat Project, for fishes, involving 30 institutions world-wide, five of which are Brazilian. The Emílio Goeldi Museum (Museu Paraense Emílio Goeldi - MPEG) in Pará is also computerising the catalogues and registers for its collection. The National Museum (Museu Nacional) in Rio de Janeiro is using two systems: MUSE for the ichthyological collection and SGC, for the remainder.

2.4.3 Botanical Gardens and Arboreta

Botanical Gardens, which maintain, introduce, and breed native and non-native plant species, have a fundamental role to play in both in situ and ex situ conservation, especially of rare and threatened species. They act as germplasm banks, maintaining as they do valuable genetic material in their live collections.

In the Convention on Biological Diversity the view is given that it is fundamental that botanical gardens be involved in carrying out or supporting conservation *in situ* especially in such areas as species, habitat and ecosystem management, forest regeneration, habitat restoration, and the conservation of rare or threatened species of the Brazilian flora, besides playing an essential role in genome preservation.

Botanical gardens should also be involved in floristic and phytosociological inventories for the conservation and

management of ecosystems and habitats and the identification of processes and activities that currently or potentially represent adverse impacts on biodiversity.

There are 36 registered botanical gardens in the country, all involved in species' conservation and environmental education (Table 2-44).

There is a Brazilian Network of Botanical Gardens (Rede Brasileira de Jardins Botânicos) and some of their principal needs were summarised during a meeting held during the 46th National Botanical Congress, in Friburgo, Rio de Janeiro, July 1996;

- Establishment of a permanent base that would give priority to the study of the most important biomes;
- The exchange of information via the Network;
- The organization and integration of ex situ conservation strategies for rare or threatened native species;
- More environmental education programmes.

There is as yet no broad survey of the situation of Brazilian arboreta, forests or woods planted for the cultivation of tree species, native or otherwise, for the purposes of preservation, production of seedlings and seeds, or as germplasm banks. Available information refers to collections associated with botanical gardens and/or research centres, beside the development of human resources.

2.4.4 Zoological Gardens

Ninety-one zoological gardens in Brazil are responsible for maintaining some 40,000 wild animals in captivity, the large majority of them species naturally occurring in Brazil (Table 2-45, Figure 2-35). These zoos also carry out zoological research and environmental education projects, frequently in partnership with national and international institutions.

Table 2-39. Status of Indigenous lands in Brazil*

Situation	Number	Area (ha)	% in relation to total area
Registered	256	53,784,522	63.91
Legally sanctioned	32	6,185,806	7.35
Demarcated	14	1,399,622	1.66
Delimited	67	20,323,005	24.15
Identified	13	2,460,147	2.92
Subtotal	382	84,153,102	100.00
To be identified	177	-	-
Total	**559**	**168,306,204***	

* not including 177 areas to be identified.
Source: FUNAI (1997).

Table 2-38. Private Natural Heritage Reserves (RPPNs).

State	Number	Area (ha)
Amapá	1	46.75
Amazonas	5	104,222.96
Pará	1	2,000.00
Rondônia	1	623.24
Roraima	1	109.59
Tocantins	1	745.00
Total - North	**10**	**107,747.54**
Alagoas	3	180.50
Bahia	15	9,821.59
Ceará	3	3,124.33
Maranhão	5	1,054.04
Paraíba	4	5,580.65
Pernambuco	1	1,485.00
Piauí	1	27,458.00
Rio Grande do Norte	2	910.24
Total - North-east	**34**	**49,614.35**
Federal District	1	1.00
Goiás	15	13,306.60
Mato Grosso	6	82,040.79
Mato Grosso do Sul	9	49,533.35
Total Central-west	**31**	144,881.74
Minas Gerais	30	21,841.60
Rio de Janeiro	16	3,037.78
São Paulo	10	346.19
Total - South-east	**56**	**25,225.57**
Paraná	4	2,272.35
Rio Grande do Sul	9	3,175.68
Santa Catarina	6	8,140.11
Total - South	**19**	**13,588.14**
Total - Brazil	**150**	**341,057.34**

Source: IBAMA/DIREC (1998).

The Society of Brazilian Zoological Gardens (Sociedade dos Zoológicos do Brasil - SZB) is one of the two organizations representing zoos and animal collections in Brazil, the other being the Sao Paulo Society of Zoological Gardens (Sociedade Paulista de Zoológicos). The SBZ holds a Congress each year in which zoo staff and researchers present papers on veterinary medicine, ecology, and environmental education. It is also responsible for the committees that supervise and guide captive breeding efforts for some of the Brazilian threatened, such as the Maned

Table 2-40. Recognition of Indigenous Lands in Brazil.

Period	Declared		Legally sanctioned	
	Number	Area (ha)	Number	Area (ha)
01/90 to 09/92	58	25,794,711	112	26,405,219
10/92 to 12/94	39	7,241,711	16	5,432,437
01/95 to 11/97	34	12,613,036	68	15,631,897
TOTAL	**131**	**45,649,010**	**196**	**47,469,553**

Source: ISA. 1997. *Terras e Populações Indígenas* (1997) (Internal document).

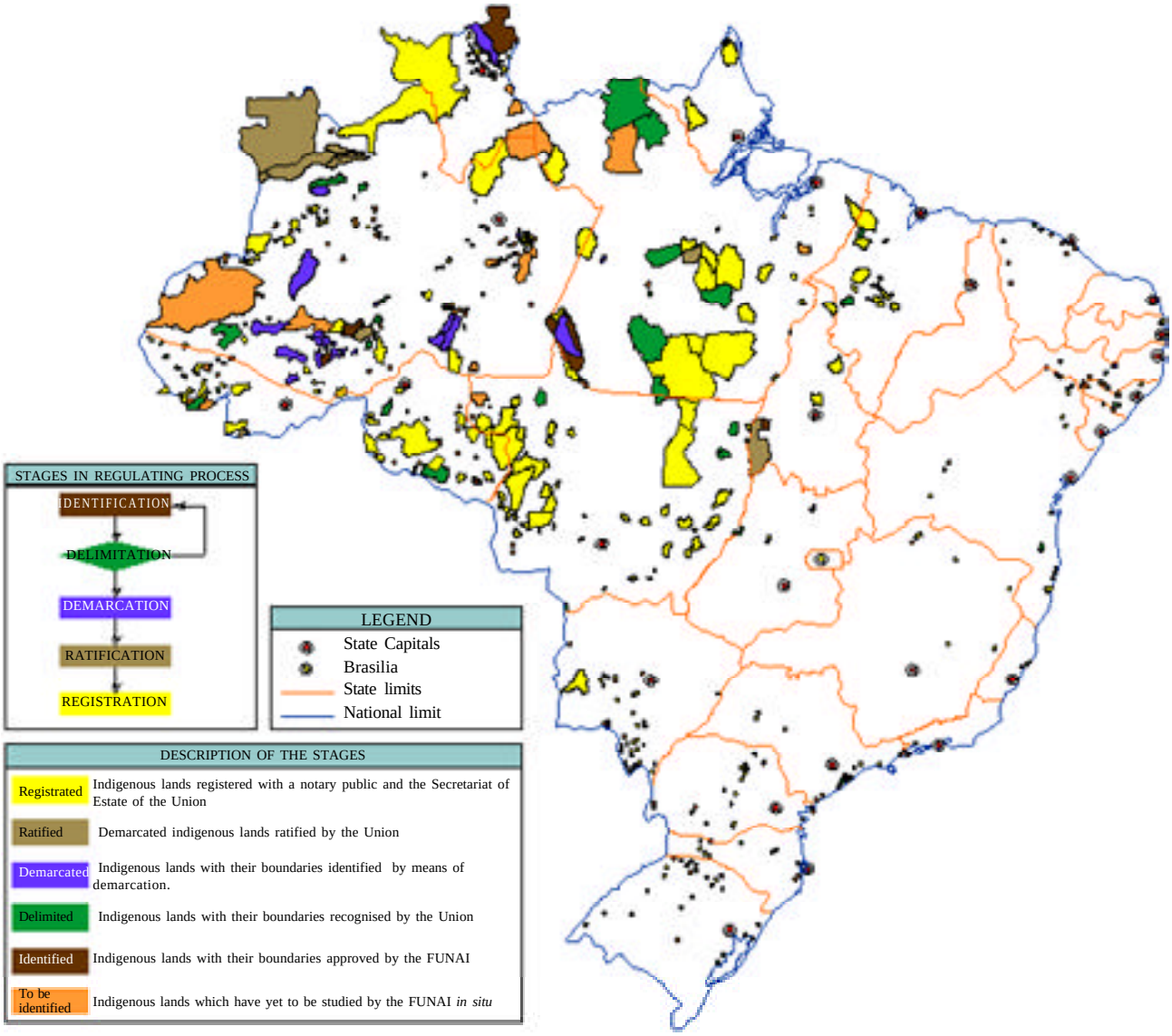

Figure 2.31 Status of Indigenous Lands in Brazil.
Source: Fundação Nacional do Índio (FUNAI). Brasil - Terras Indígenas. Map, scale 1:5,000,000. Brasília, 1997.

Wolf Management Committee. An annual census is carried out of all captive animals in order to formulate husbandry and breeding strategies and identify the species demanding specific efforts for their conservation in captivity. The information is compiled and made available on the Internet by the Tropical Database - BDT, Campinas, through the Web utility ´Census of Brazilian Zoological Gardens´. The census includes the scientific and common names, family, class and breeding stock, the latter expressed as the number of males, females, indeterminate and total (Table 2-46). There is also an indication of the status of the species: whether they are threatened in the wild, presumed threatened or insufficiently known, based on the ´Official List of Species of Brazilian Fauna Threatened with Extinction´ of IBAMA (Edict No. 1.522, 19th December 1989; Edict No. 221/90, No 45-N, 27th April 1992; and Edict No. 062,17th June 1997) (see Box 2-1).

The Tropical Database - BDT has also assisted the SZB in carrying out a survey of the Zoological Gardens to obtain information on their lines of research and environmental education projects. This is included in the ´Directory of Zoological Gardens in Brazil´ (Diretório dos Zoológicos do Brasil), also available on the Internet.

2.4.5 Germplasm Banks

The National Centre for Research on Genetic Resources and Biotechnology (Centro Nacional de Pesquisa de Recursos Genéticos e Biotecnologia - CENARGEN) of EMBRAPA, was set up in 1974. It resulted in the establishment of a National Network for the Conservation of Genetic Resources (Rede Nacional de Conservação de Recursos Genéticos) to organise the collection, exchange, quarantine,

characterisation, evaluation, documentation and, above all, the conservation and use of germplasm.

The Network is comprised of EMBRAPA and its research units, universities, state research institutes and private enterprises. Germplasm banks - BaG have been set up in 27 sites, all operating in strict collaboration with CENARGEN. The base collection of plant germplasm (deep-frozen at – 20ºC) is maintained at CENARGEN and the active collections, together with perennial plant collections, are kept in the other germplasm banks (Table 2-47).

A recent survey of the Network listed about 200,000 records of plant germplasm being conserved throughout the country. Of these, about 76% are non-native and 24% are native species.

Studies carried out by the Financing Agency for Research and Projects (Financiadora de Pesquisas e Projetos - FINEP) have indicated the need for a number of measures to improve the system of germplasm conservation in the country:

- Restoration of important collections which are deteriorating;
- More space and improved safety measures;
- Maintenance and upgrading of equipment;
- Expansion and computerisation of the stocks;
- Training, recycling and improved career stability of researchers and support staff;
- Increase in bibliographic material and the upgrading of specialised libraries;
- Incentives for, and facilitation of, the exchange of material;
- Mechanisms for exchange of specialists and opportunities for training technicians within the country and abroad.

Together, these components aim to guarantee the conservation of the existing genetic resources in the ex situ collections, as well as in situ conservation in their regions of origin, together with the agricultural and indigenous communities.

Twelve animal germplasm banks maintain in vivo and in vitro specimens of animal populations for research, conservation and breeding, especially of domestic races threatened with extinction.

Currently, research is concentrated on the following races:

- Cattle: ´Mocho Nacional´, ´Crioulo Lageano´, ´Pantaneiro´, ´Curraleiro´ or ´Pé-Duro´, ´Junqueira´ and ´Caracu´;
- Sheep: ´Crioulo Lanado´, ´Santa Inês´, ´Morada Nova´, ´Sornalis Brasileiro´;
- Goats: ´Moxotó´, ´Marota´, ´Canindé´, ´Gurguéia´, ´Repartida´, ´Azul´ and ´Graúna´;
- Pigs: ´Moura´, ´Caruncho´, ´Pirapetinga´, ´Piau´, ´Canastra´, ´Canastrinha´, ´Canastrão´, ´Tatu´, ´Nilo´ and ´Casco de Mula´;
- Mules: ´Jumento Nordestino´ and ´Jumento Brasileiro´;

Table 2-41. Indigenous populations and societies

State	Population	% of total	Nº of societies
Acre	6,610		13
Amapá	6,612		6
Amazonas	89,529		52
Pará	15,715		28
Rondônia	5,573		28
Roraima	37,025		8
Tocantins	6,360		8
North	**167,424**	**50.91**	**143**
Alagoas	6,611		5
Bahia	8,561		10
Ceará	4,650		2
Maranhão	14,271		9
Paraíba	6,902		1
Pernambuco	19,950		7
Sergipe	230		2
North-east	**61,175**	**18.60**	**36**
Espírito Santo	1,347		1
Minas Gerais	6,200		3
Rio de Janeiro	271		1
São Paulo	1,774		3
South-east	**9,592**	**2.92**	**8**
Goiás	142		3
Mato Grosso	17,329		38
Mato Grosso do Sul	45,259		5
Central-west	**62,730**	**19.07**	**46**
Rio Grande do Sul	13,354		2
Santa Catarina	6,667		3
Paraná	7,921		2
South	**27,942**	**8.50**	**7**
TOTAL	**328,863[1]**	**100.00**	**215[2]**

[1]The number of isolated Indians has not been computed; the numbers of those who live on the outskirts of cities are computed for the following towns/cities: 2,300 in Amambaú/MS, 3,000 in Campo Grande/MS, 1,000 in Boa Vista/RR, 10,000 in Manaus/AM, 20 in Governador Valadares/MG, and approximately 100 in Curitiba/PR, totalling approximately 26,420 Indians.

[2] The total for this column is higher than the real figure, due to the fact that some societies live in more than one State of the Federation.

Source: FUNAI. Brasília (1997).

Table 2-42. Brazilian herbaria - 1997.

	Acronym	Name	State	Phanerogams	Cryptogams	Total*
		South				**840,586**
1	FUEL	Fundação Universidade Estadual de Londrina	PR	25,000	100	25,100
2	HUCP	Herbário da Pontifícia Universidade Católica do Paraná	PR	7,410	3,171	10,581
3	HUM	Herbário da Universidade Estadual de Maringá	PR	—	—	—
4	HFC	Herbário Fernando Cardoso	PR	3,856	x	3,856
5	PKDC	Herbário Per Karl Dusen	PR	—	—	
6	MBM	Museu Botânico Municipal de Curitiba	PR	250,000	5,000	255,000
7	UPCB	Universidade Federal do Paraná	PR	—	—	—
8	CNPO	Centro de Pesquisas de Pecuária dos Campos do Sul Brasileiros	RS	—	—	—
9	HAS	Herbário Alarich Schultz	RS	90,000	18,300	108,300
10	HASU	Herbário Aloysio Sehnem – UNISINOS	RS	4,000	2,500	6,500
11	HERBARA	Herbário Balduíno Rambo	RS	7,067	500	7,567
12	HUCS	Herbário da Universidade de Caxias do Sul	RS	—	—	—
13	RSPF	Herbário da Universidade de Passo Fundo	RS	5,372	369	5,741
14	HURG	Herbário da Universidade do Rio Grande	RS	4,256	227	4,483
15	PEL	Herbário do Departamento de Botânica	RS	17,910	1,260	19,170
16	HDCF	Herbário do Departamento de Ciências Florestais	RS	5,950	20	5,970
17	MPUC	Herbário do Museu de Ciências	RS	5,121	2,341	7,462
18	SMDB	Herbário Santa Maria	RS	5,938	218	6,156
19	URG	Herbário Uruguaiana	RS	5,000	500	5,500
20	PACA	Herbarium Anchieta	RS	90,000	30,000	120,000
21	SFPA	Instituto de Pesquisas Agronômicas	RS	—	—	—
22	IPRN	Instituto de Pesquisas de Recursos Naturais Renováveis Ataliba Paz	RS	—	—	—
23	BLA	Laboratório Brasileiro de Agrostologia	RS	20,000	x	20,000
24	ICN	Universidade Federal do Rio Grande do Sul	RS	90,000	28,000	118,000
25	HBR	Herbário Barbosa Rodrigues	SC	70,000	5,000	75,000
26	FLOR	Herbário do Depto, de Botânica	SC	24,000	6,000	30,000
27	CRI	Herbário Pe. Dr, Raulino Reitz	SC	6,200	x	6,200
28	SRS	Herbarium Gilmar Pezzopane Plá	SC	—	—	—
		South-Eeast				**1,769,607**
29	MBML	Museu de Biologia Mello Leitão	ES	—	—	—
30	CVRD	Reserva Florestal de Linhares	ES	5,800	x	5,800
31	VIES	Universidade Federal do Espírito Santo	ES	8,000	2,000	10,000
32	PAMG	Empresa de Pesquisa Agropecuária de Minas Gerais – EPAMIG	MG	47,000	750	47,750
33	GFJP	Herbário "Guido Pabst"	MG	—	—	—
34	BHCB	Herbário da Universidade Federal de Minas Gerais	MG	38,662	4,000	42,662
35	VIC	Herbário de Viçosa	MG	15,486	829	16,315
36	CESJ	Herbário do Centro de Ensino Superior	MG	20,000	10,000	30,000
37	BHMH	Herbário do Museu de História Natural	MG	4,000	x	4,000
38	HXBH	Herbário e Xiloteca – CETEC/SAT	MG	11,500	1,500	13,000
39	OUPR	Herbário José Badini	MG	35,000	916	35,916
40	UCBH	Pontifícia Universidade Católica	MG	—	—	—
41	ESAL	Universidade Federal de Lavras	MG	14,700	300	15,000
42	HUFU	Universidade Federal de Uberlândia	MG	15,000	200	15,200
43	GUA	Herbário Alberto Castellanos	RJ	40,000	5,000	45,000
44	RUSU	Herbário da Universidade Santa Úrsula	RJ	7,136	843	7,979
45	R	Herbário do Museu Nacional do Rio de Janeiro	RJ	345,000	30,000	375,000
46	TER	Herbário do Parque Nacional da Serra dos Órgãos	RJ	—	—	—
47	HPNI	Herbário PARNA/ITA	RJ	—	—	—
48	HB	Herbarium Bradeanum	RJ	71,572	6,734	78,306
49	FCAB	Herbarium Friburguense Colégio Anchieta	RJ	—	—	
50	RBE	Jardim Botânico da Universidade Federal Rural do Rio de Janeiro	RJ	2,225	x	2,225
51	RB	Jardim Botânico do Rio de Janeiro	RJ	313,212	31,600	344,812
52	RFA	Universidade Federal do Rio de Janeiro	RJ	—	—	—
53	RBR	Universidade Federal Rural do Rio de Janeiro	RJ	—	—	—
54	ESA	Escola Superior de Agricultura Luiz de Queiroz	SP	—	—	—

Table 2-42 (contd). Brazilian Herbaria - 1997

	Acronym	Name	State	Phanerogams	Cryptogams	Total*
55	UNBA	Herbário da UNESP de Bauru	SP	1,500	200	1,700
56	BAUR	Herbário da Universidade Sagrado Coração	SP	3,103	x	3,103
57	HISA	Herbário de Ilha Solteira	SP	6,700	200	6,900
58	SPFR	Herbário do Departamento de Biologia – FFCL – USP	SP	6,600	250	6,850
59	SPSF	Herbário Don Bento Pickel	SP	21,100	480	21,580
60	SP	Herbário Maria Eneyda P, K, Fidalgo	SP	230,000	87,000	317,000
61	IACM	Herbário Micológico	SP	x	8,240	8,240
62	PMSP	Herbário Municipal de São Paulo	SP	4,117	41	4,158
63	HRCB	Herbarium Rioclarense	SP	26,200	350	26,550
64	IAC	Instituto Agronômico de Campinas	SP	34,600	134	34,734
65	IBI	Instituto Biológico	SP	—	—	—
66	SPF	Universidade de São Paulo	SP	124,327	18,500	142,827
67	UEC	Universidade Estadual de Campinas	SP	91,000	x	91,000
68	BOTU	Universidade Estadual Paulista Júlio de Mesquita Filho	SP	—	—	—
69	SJRP	Universidade Estadual Paulista Júlio de Mesquita Filho	SP	7,500	8,500	16,000
		North-East				**403,233**
70	ALCB	Herbário Alexandre Leal Costa	BA	—	—	—
71	BAH	Herbário Antônio Nonato Marques	BA	13,000	x	13,000
72	CEPEC	Herbário do Centro de Pesquisas do Cacau	BA	75,000	2,000	77,000
73	HRB	Herbário RADAM-BRASIL	BA	37,004	796	37,800
74	HUEFS	Universidade Estadual de Feira de Santana	BA	29,292	417	29,709
75	IAL	Centro Nacional de Pesquisa da Mandioca e Fruticultura – EMBRAPA	BA	—	—	—
76	MAC	Herbário do Instituto de Meio Ambiente	AL	13,000	674	13,674
77	MUFAL	Herbário Honório Monteiro	AL	2,494	64	2,558
78	URCA	Herbário Caririense Dárdano de Andrade Lima	CE	343	54	397
79	FORTM	Herbário Micológico e Fitológico	CE	—	—	—
80	EAC	Herbário Prisco Bezerra	CE	—	—	—
81	UVA	Herbário UVA/CNPq/EMBRAPA	CE	—	—	—
82	EAN	Herbário Jayme Coelho de Moraes	PB	—	—	
83	JPB	Herbário Lauro Pires Xavier	PB	18,000	5,000	23,000
84	HTSA	Centro de Pesquisa Agropecuária Trópico Semi-arido/EMBRAPA	PE	2,500	x	2,500
85	IPA	Herbário Dárdano de Andrade Lima	PE	57,100	x	57,100
86	HST	Herbário Sérgio Tavares	PE	6,800	x	6,800
87	PEUFR	Herbário Vasconcelos Sobrinho	PE	18,000	4,200	22,200
88	UFP	Universidade Federal de Pernambuco	PE	14,908	5,000	19,908
89	URM	Universidade Federal de Pernambuco	PE	x	75,830	75,830
90	TEPB	Herbário Gabriel Barroso	PI	9,500	430	9,930
91	EFC	Escola de Florestas	PR	—	—	—
92	MOSS	Herbário Dárdano de Andrade Lima	RN	4,454	52	4,506
93	UFMA	Herbário Atico Seabra	MA	—	—	—
94	NATAL	Herbário Parque das Dunas	RN	736	15	751
95	HUNP	Universidade Potiguar	RN	—	—	—
96	ASE	Herbário da Universidade Federal de Sergipe	SE	6,482	88	6,570
		North				**548,692**
97	FUNTAC	Fundação de Tecnologia do Estado do Acre	AC	—	—	—
98	HPZ	Herbário do Acre	AC	7,000	822	7,822
99	HAMAB	Herbário Amapaense	AP	8,000	x	8,000
100	HITAM	Instituto de Tecnologia da Amazônia	AM	—	—	—
101	HUAM	Herbário da Universidade do Amazonas	AM	6,006	86	6,092
102	INPA	Instituto Nacional de Pesquisas da Amazônia	AM	200,000	x	200,000
103	IAN	Herbário da EMBRAPA Amazônia Oriental	PA	144,000	20,000	164,000
104	MG	Museu Paraense Emílio Goeldi	PA	150,000	9,778	159,778
105	HF	Universidade Federal do Pará	PA	3,000	x	3,000
		Central-West				**317,489**
106	CEN	Centro Nacional de Pesquisa de Recursos Genéticos e Biotecnologia – CENARGEN	DF	27,868	93	27,961
107	IBGE	Herbário da Reserva Ecológica do IBGE	DF	32,200	x	32,200
108	UB	Herbário do Departamento de Botânica - UnB	DF	200,000	8,000	208,000

Table 2-42 (contd). Brazilian Herbaria - 1997

	Acronym	Name	State	Phanerogams	Cryptogams	Total*
109	HEPH	Herbário Ezechias Paulo Heringer	DF	13,100	213	13,313
110	UFG	Universidade Federal de Goiás	GO	18,278	3,723	22,001
111	CPAP	Centro de Pesquisas Agropecuárias do Pantanal – EMBRAPA	MS	—	—	—
112	CGMS	Fundação Universidade Federal do Mato Grosso do Sul	MS	—	—	—
113	CEUL	Herbário do Centro Universitário de Três Lagoas	MS	—	—	—
114	COR	Universidade Federal do Mato Grosso do Sul	MS	—	—	—
115	UFMT	Herbário Central	MT	12,818	1,196	14,014
		General Total				**3,879,607**

*Partial totals. State, see Figure 1-1. n.a. data not available.
Source: Peixoto & Barbosa (1998).

- Horses: ´Lavradeiro´, ´Pantaneiro´, ´Nordestino´, ´Marajoara´ and ´Campeiro´.

Besides the Animal Germplasm Bank maintained by CENARGEN in Brasília and the Rio Grande do Norte Agricultural and Cattle-Breeding Research Company (Empresa de Pesquisas Agropecuárias do Rio Grande do Norte - EMPARN), there are seven other germplasm banks maintained by EMBRAPA for domestic races of buffalo, cattle, mules, horses, goats, and sheep:

- Buffalo Germplasm Bank, Pará – *Bubalus bubalis*;
- ´Pé-Duro´ Cattle Germplasm Bank, Piauí – *Bos taurus*;
- ´Pantaneiro´ Cattle Germplasm Bank Mato Grosso do Sul – *Bos taurus*;
- ´Nordestino´ Mule Germplasm Bank, Rio Grande do Norte – *Equus asinus*;
- ´Lavradeiro´ Horse Germplasm Bank, Rorâima – *Equus cabalus*;
- ´Pantaneiro´ Horse Germplasm Bank, Mato Grosso do Sul – *Equus cabalus*;
- Goat Breeds of the Northeast Germplasm Bank, Ceará – *Capra hircus*;
- ´Marota´ Goat Germplasm Bank, Piauí – *Capra hircus*;
- ´Crioula Lanada´ Sheep Germplasm Bank, Rio Grande do Sul – *Ovis aries*;
- Parasitic Wasp Germplasm Bank, CENARGEN, Federal District - *Trichorama* spp..

Regarding wild animals, conservation work in situ and the appraisal of the effects of habitat fragmentation on genetic variability is concentrated on three species: capybara (*Hydrochaeris hydrochaeris*), paca (*Agouti paca*) and maned wolf (*Chrysocyon brachyurus*).

2.4.6 Micro-organism Culture Collections

Most of the collections of micro-organism cultures in Brazil come from the isolated efforts of researchers, without any institutional support. Use of these cultures is restricted to the interests of the researcher, access is limited, and they do not meet the demand for authenticated cultures available to the public.

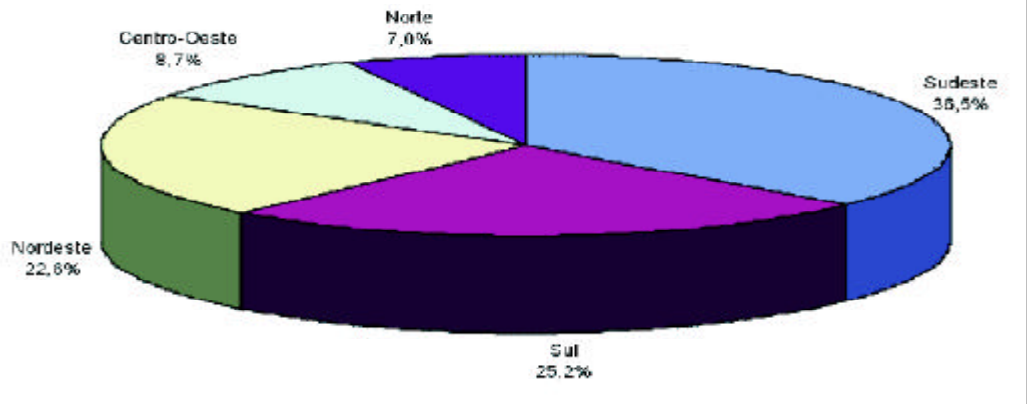

Figure 2-32. Distribution of herbaria in Brazil.
Source: Peixoto & Barbosa (1998).

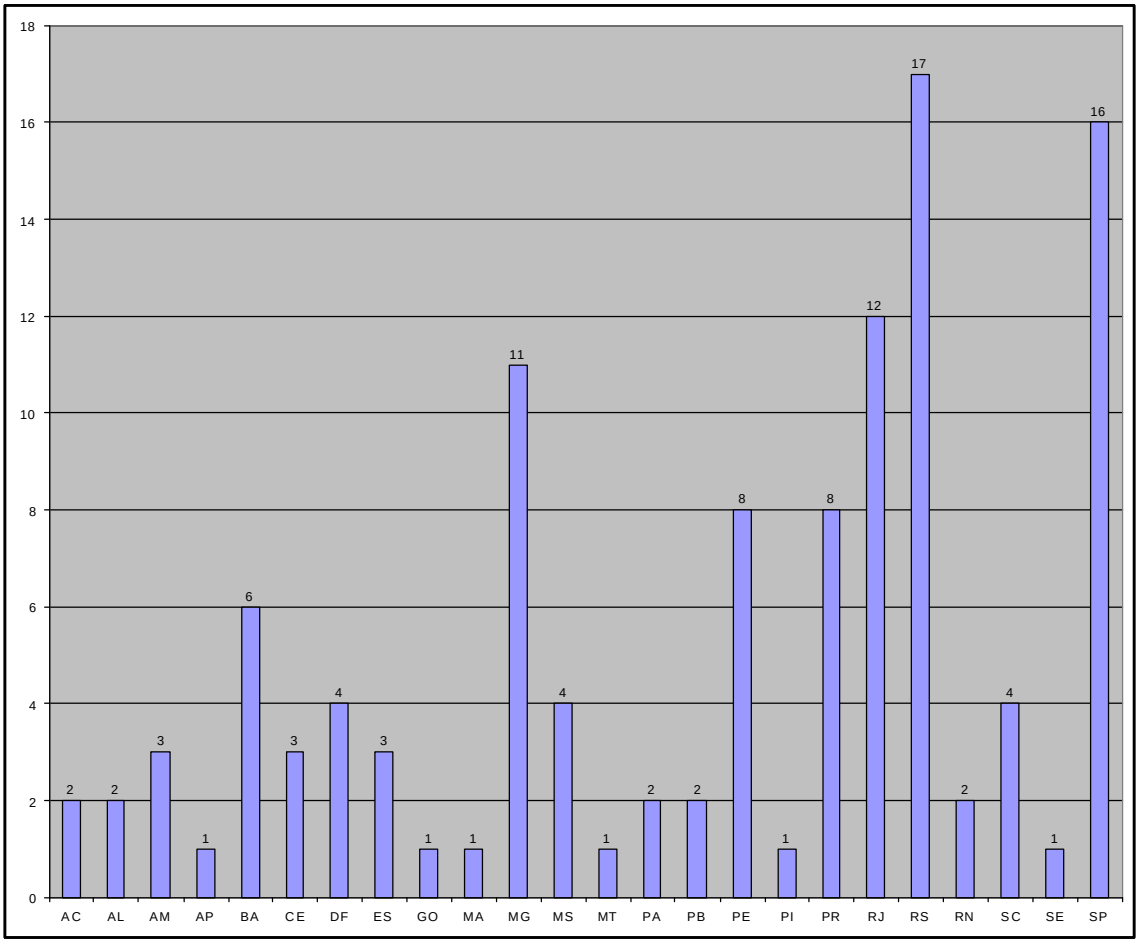

Figure 2-33. Number of herbaria in the different states of Brazil.
Source: Peixoto & Barbosa (1998).

With a view to creating a programme for this sector, in 1982, the ´André Tosello´ Tropical Research and Technology Foundation began a survey of the stocks of micro-organism collections of interest in terms of health, agriculture, industry and the environment, concentrated mainly in the state of Sao Paulo. The first Catalogue of Collections of Micro-organism Cultures was published in 1984. From 1985 onwards, the survey was extended to the other states, and resulted in the establishment of a Sectorial Programme of Culture Collections (Programa Setorial de Coleções de Culturas - PSCC), supported by FINEP. In 1986, the Second Catalogue of Lineages was published, and a further survey in the same year, sponsored by FINEP, identified 80 collections in 43 institutions.

A number of projects have been developed as a result of the PSCC. More than 40 courses and seminars, including participation of specialists from abroad, have been organised through the PSCCC in combination with the Personnel Training Program for Strategic Activities (Programa de Capacitação de Recursos Humanos para Atividades Estratégicas - RHAE) of the Ministry of Science and Technology - MCT. Also within the PSCC, in 1988 FINEP provided emergency support to 13 collections.

The first volume of the 3rd Edition of the National Catalogue of Lineages/Bacteria was published in 1989. The second (Yeasts and Filamentous Fungi), and third (Cells and Live Animals) volumes were published in 1990. The national survey of collections has not been updated since 1990. All the information is available via the Tropical Data Base - BDT on the Internet.

EMBRAPA co-ordinates and maintains 10 micro-organism germplasm banks of agricultural interest, including bacteria, fungi and protozoa, in six institutions.

The Collection of Tropical Cultures (Coleção de Culturas Tropical - CCT) and the Rio de Janeiro Cellbank (Banco de Células do Rio de Janeiro - BCRJ) have both received funding through the biotechnology subprogramme of the Programme for Support of Scientific and Technological Development (Programa de Apoio ao Desenvolvimento Científico e Tecnológico - PADCT II), for infrastructure, expanding stocks, and the improvement of services to the scientific and technological community. The CCT has a stock of almost 6,000 lineages of micro-organisms of industrial and environmental interest. Information on these cultures is available on the Internet through the Tropical Data Base -

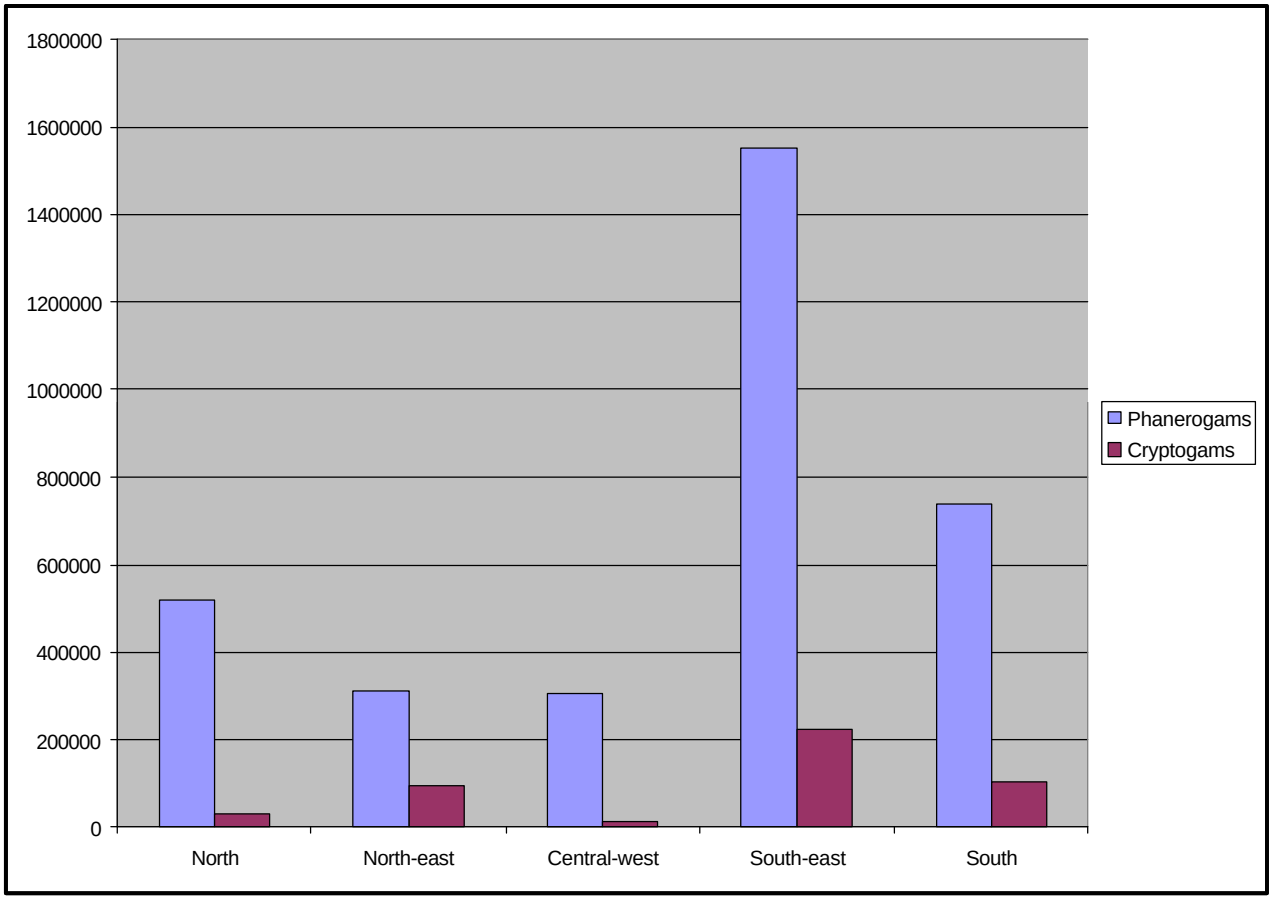

Figure 2-34. Number of specimens in herbaria in the different regions of Brazil.
Source: Peixoto & Barbosa (1998).

BDT. The BCRJ has a stock of around 130 lineages (animal cells) of interest to human health and tropical medicine. They are described in the Catálogo Nacional de Linhagens Humanas e Animais of 1994, and the addendum of 1996.

In view of the need for Depository Centres for Biological Material (Centros Depositários de Material Biológico), to comply with article 24, of the Law of Industrial Property (No 9.279/1996), the National Institute for Industrial Property (Instituto Nacional de Propriedade Industrial - INPI) has set up an advisory work group (GT-CREBIOT), to define legal and technical criteria for the selection of depository centres, to be accredited by INPI. This is to meet the demand for deposits associated with patent applications. Although there are 30 International Depository Centres recognised by the World Intellectual Property Organization - WIPO, none are in Latin America.

2.4.7 Breeding Wild Animals for Commercial Purposes

The Faunal Protection Law (Lei de Proteção à Fauna, No. 5.197/1967), which provides for the protection of wildlife, was significantly strengthened by the 1988 Constitution. The Constitution determines that it is the duty of the State "to protect fauna and flora, forbidding, by law, practices that put its ecological function at risk, cause the extinction of species or submit animals to cruelty". The Faunal Protection Law banned professional hunting and deliberate trade in species of Brazilian wildlife. It allowed, however, for amateur hunting, considered as a management strategy, and encouraged especially the establishment of breeding facilities for wild animals for economic or industrial purposes.

Breeding Brazilian wildlife in captivity for economic purposes

The breeding of native animals in captivity for commercial or economic purposes is provided for by Article 6 of Law No. 5197, 3rd January 1967 and regulated by edicts published by IBAMA. Edict No. 118/97 deals with the implantation of commercial breeding facilities for species that have no specific management plan. The species most often bred under the terms of this edict are: capybara, collared peccaries, white-lipped peccaries, quail, pacas, partridge, coypus, rheas, snakes, cayman, parrots, parakeets, and macaws. The recommendation given to IBAMA's state agencies is that the initial breeding and reproductive stock should preferably originate from other registered breeding facilities or be the product of confiscation by the inspecting agencies. The cap-

Table 2-43. Type and location, size of collection and origins of the specimens in Brazilian Zoological Collections.

Institution	Region	Taxon	Total specimens	Ecosystems covered
Zoology Reference Collection of the Universidade Federal do Mato Grosso do Sul (UFMS)	CW	Mollusca	3,404	Cerrado, Pantanal and continental waters
		Crustacea	835	
		Insecta	1,571	
		Pisces	9,655	
		Mammalia	292	
		Amphibia	667	
Instituto Nacional de Pesquisas da Amazonia (INPA)	N	Porifera	n.i.	Amazonia
		Platyhelminthes	n.i.	
		Rotifera	n.i.	
		Nematoda	n.i.	
		Acanthocephala	n.i.	
		Mollusca	5,281	
		Annelida	n.i.	
		Arachnida	n.i.	
		Crustacea	7,040	
		Insecta	over 200,000	
		Chilopoda	n.i.	
		Diplopoda	n.i.	
		Pauropoda	n.i.	
		Symphyla	n.i.	
		Pisces	over 100,000	
Coleção Mastozoológica Deoclécio Guerra, Universidade Federal de Pernambuco (UFPE)	NE	Mammalia	1,361	Amazonia, Atlantic forest, Cerrado, Caatinga and urban ecosystems
Universidade Federal do Rio Grande do Norte (UFRN)	NE	Pisces	1,000	Continental waters
Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS)	S	Amphibia	1,853	Amazonia, *Araucaria* pine forest, Cerrado, Caatinga, Pantanal, Atlantic Forest, Parkland Savannahs, and urban ecosystems.
		Reptilia	7,058	
		Arachnida	50,000	
		Pisces	160,000	

ture of wild animals may be authorised in situations where they are proved to be causing damage to agriculture, or where the species is abundant according to the demographic characteristics of each species, and only through a formal request containing a population survey of the species and information concerning capture methods.

Brazil currently has around 120 commercial breeding facilities registered with IBAMA. Of these, around 45% are capybara breeders, mainly in the state of Sao Paulo. Captive management plans and the norms for the breeding and maintenance of each species are published in specific edicts. The species which may be managed and the edict which regulates their breeding and management are as follows:

Pantanal Cayman

IBAMA Edict No. 126, 13th February 1990, deals the registration of breeding facilities for *Caiman crocodilus yacare* in the Rio Paraguay basin. Up to 1990, the Policy for breeding crocodilians in captivity had been based on a system of ´Farming´, while acquiring breeding stock from the wild. In the late 1980s, however, viability studies were carried out for the ´Ranching´ system, where only eggs are collected from the wild. The research was carried out by the Federal University of Mato Grosso do Sul, at the Fazenda Olhos D'água in the municipality of Aquidauna, Mato Grosso do Sul, and resulted in the edict for breeding Pantanal caymans in the Rio Paraguay basin. The edict determines that eggs from up to 80% of the nests identified following a survey of the property. Incubation is artificial and the stock is raised under cover, where temperature, humidity and food are controlled which results in skin without osteoblasts and osteoderms, referred to by crocodile ranchers as the ´classic skin´. There are about 50 commercial breeding facilities for Pantanal caymans in Brazil, and about 30 of these work as co-operatives in the state of Mato Grosso.

Butterflies

Table 2-43. (contd.) Type and location, size of collection and origins of the specimens in Brazilian Zoological Collections.

Institution	Region	Taxon	Total specimens	Ecosystems covered
Fundação Zoobotânica do Rio Grande do Sul (FZB)	S	Porifera	3.048	Amazonia, Cerrado, Pantanal, Parkland Savannahs, agricultural and urban ecosystems, Atlantic forest, *Araucaria* pine forest marine and continental waters, Caatinga
		Helmynthes	88	
		Annelida	280 (lots)	
		Arachnida	29,286 (lots)	
		Chilopoda	480 (lots)	
		Diplopoda	380 (lots)	
		Insecta	81,796	
		Echinodermata	100 (lots)	
		Amphibia	13,400	
		Aves	2,700	
		Mammalia	2,700	
		Mollusca	34,000 (lots)	
		Pisces	12,059	
Federal University of Paraná (UFPR)	S	Insecta	3,000,000	Amazonia, Atlantic forest, Cerrado, *Araucaria* pine forest, Pantanal, Caatinga, Parkland Savannahs, agricultural and urban ecosystems
Federal University of Londrina	S	Pisces	3,700	Tibagi river valley
Federal University of Maringá	S	Pisces	n.i.	Upper Rios Paraná and Iguaçu
Federal University of Rio Grande do Sul (UFRGS)	S	Pisces	4,694 (lots)	Marine zone of Rio Grande do Sul
Federal University of São Carlos (UFSCar)	SE	Insecta	n.i.	Amazonia, Atlantic forest, Cerrado, Pantanal, agricultural and urban ecosystems
Santa Úrsula University (USU)	SE	Pisces	15,000	Amazonia, marine and continental waters
Federal University of Viçosa (UFV)	SE	Pisces	1,700	Atlantic Forest, Cerrado, Caatinga, agricultural and urban ecosystems
		Amphibia	2,500	
		Reptilia	1,100	
		Aves	1,300	
		Mammalia	500	
		Insecta	100,000	
Federal University of Rio de Janeiro - National Museum	SE	Pisces	Around 500,000	n.i.
		Porifera	6,000	Continental and marine waters
São Paulo University (USP)	SE	Pisces	Around 200,000	Continental (mainly) and marine waters

Obs.: n.i. - not informed. Region names according to Figure 1-1.
Source: Base de Dados Tropical. Coleções Zoológicas Brasileiras http://www.bdt.org.br/bdt/museus/index?index - Neotropical Fish Collections, 1997.

Edict No. 2.314, 26th November 1990, regulates the commercial breeding of Lepidoptera. The management system for butterflies includes their attraction to specially planted flowers on rural estates, the collection of eggs laid on these plants, and their transfer to net-covered sheds to complete their metamorphosis. The caterpillars show a sex ratio strongly biased towards males, 40:1. Females ready to fly are released in the ratio of 40 females to two males. The wings of the surplus males are then used or sold for craft products. Only two farms have been authorised to date, one in the state of Santa Catarina, the other in Amazonas.

Giant Amazon river turtle and tracajá turtles

Edict No. 142/92, 30th December 1992, regulates the breeding of *Podocnemis expansa* (giant Amazon river turtle) and *Podocnemis unifilis* (tracajá) in captivity in the Amazon. For authorisation to breed these turtles in captivity, the edict demands that a detailed management project be presented to IBAMA. Once approved, IBAMA itself provides newborn turtles from the Amazon Chelonia Project bases administered by the National Centre for the Conservation and Management of Amazonian Turtles (Centro Nacional de Conservação e Manejo de Quelônios da Amazônia - CENAQUA). This centre monitors the activities of the breeding stations, and the growth of the young turtles up to their slaughter (from 2 kilos live weight upwards). The commercialisation of each animal is allowed only after they are tagged, tags being supplied by IBAMA/CENAQUA. There are 20 registered turtle farms in the Brazilian Amazon, the majority in the state of Amazonas.

The commercial breeding of animals on the Official List of Threatened Species of Brazilian Fauna, (Edict No. 1.522/89, 19th December 1989), has not yet not been regulated by IBAMA. The recommendation given to IBAMA's state agencies is refuse letters of consultation or complementary planning for commercial purposes which include these

Table 2-44. List of Botanical Gardens and similar institutions.

1.	Jardim Botânico de Belém - Bosque Rodrigues Alves, Belém, Pará
2.	Complexo Botânico Monjolinho, Instituto Agronômico de Campinas, Campinas, São Paulo
3.	Jardim Botânico "Irmão Teodoro Luiz", Pelotas, Rio Grande do Sul
4.	Jardim Botânico da ALBRAS, Barcarena, Pará
5.	Jardim Botânico do Instituto de Tecnologia da Amazônia, Manaus, Amazonas
6.	Jardim Florestal da Universidade Federal de Sergipe, Aracaju, Sergipe
7.	Jardim Zoobotânico de Dois Irmãos, Recife, Pernambuco
8.	Jardim Botânico da UNICRUZ, Cruz Alta, Rio Grande do Sul
9.	Jardim Botânico da Universidade Rural do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro
10.	Jardim Botânico de Curitiba, Curitiba, Paraná
11.	Jardim Botânico de Brasília, Distrito Federal
12.	Jardim Botânico de Goiânia, Goiânia, Goiás
13.	Fundação Zoobotânica de Belo Horizonte, Belo Horizonte, Minas Gerais
14.	Jardim Botânico da Cidade do Recife, Recife, Pernambuco
15.	Jardim Botânico de Caxias do Sul, Caxias do Sul, Rio Grande do Sul
16.	Jardim Botânico de Lajeado, Lajeado, Rio Grande do Sul
17.	Jardim Botânico de Santa Maria, Santa Maria, Rio Grande do Sul
18.	Jardim Botânico de Porto Alegre, Porto Alegre, Rio Grande do Sul
19.	Horto Botânico do Museu Nacional do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro
20.	Jardim Botânico Municipal de Bauru, Bauru, São Paulo
21.	Jardim Botânico de Botucatu, Botucatu, São Paulo
22.	Jardim Botânico Hermógenes de Freitas Leitão Filho, Universidade Estadual de Campinas, Campinas, São Paulo
23.	Jardim Botânico de Paulínia, Paulínia, São Paulo
24.	Jardim Botânico Municipal de Santos "Chico Mendes", Santos, São Paulo
25.	Jardim Botânico de São Paulo, São Paulo, São Paulo
26.	Jardim Botânico Particular Miraponga, São Paulo
27.	Jardim Botânico da Universidade Federal de Mato Grosso, Cuiabá, Mato Grosso
28.	Jardim Botânico de Niterói, Niterói, Rio de Janeiro
29.	Jardim Botânico do Centro de Pesquisa Agropecuária dos Trópicos Úmidos da EMBRAPA, Manaus, Amazonas
30.	Instituto Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro
31.	Museu de Biologia Mello Leitão, Santa Teresa, Espírito Santo
32.	Museu de História Natural e Jardim Botânico, Belo Horizonte, Minas Gerais
33.	Parque Zoobotânico do Museu Paraense Emílio Goeldi, Belém, Pará
34.	Parque Botânico do Instituto Nacional de Pesquisa da Amazônia, Manaus, Amazonas
35.	Parque Zoobotânico de Teresina, Teresina, Piauí
36.	Sítio Roberto Burle Marx/IPHAN, Rio de Janeiro

Source: Siqueira & Joly (1996).

species. If the interested party insists, the breeding of such species can be authorised on the basis of the edict that deals with ´breeding facilities for conservation purposes´, but the commercialisation of captive-bred threatened species can be authorised only for the F2 generation onwards. To do this, however, once it is proved that the breeding facility is self-sufficient, the interested party must then request a change in status from a ´conservationist´ to a ´commercial´ breeding facility, and must meet the norms of the respective edict as well those of Edict No. 132/88 concerning the International Convention on Trade in Endangered Species - CITES. Only then can the animals be sold. The founder stock of such facilities cannot be wildcaught.

Table 2-45. The number of zoological gardens in Brazil by state and the number registered with IBAMA.

State and Region	Zoological Gardens	
	Institutions	Registered with IBAMA
South-east	**46**	**20**
RJ	4	4
SP	42	16
South	**18**	**6**
PR	6	3
RS	7	3
SC	5	
North	**6**	**2**
A M	3	1
PA	2	1
RO	1	
North-east	**7**	**1**
BA	2	
CE	1	
PB	1	
PE	1	1
PI	1	
SE	1	
Central-west	**14**	**4**
DF	1	1
GO	1	1
MG	10	2
MT	2	
Total	**91**	**33**

States, see Figure 1-1.
Source: Censo Anual de Animais da Sociedade de Zoológicos do Brasil, 1996.

Table 2-46. Number of Animals in Captivity in Brazilian zoos.

Taxon	Males	Females	Sex unknown*	Total
Mammals	3,354	3,317	1,938	8,609
Birds	3,204	3,053	12,766	19,023
Reptiles	2,606	2,628	6,374	11,608
Amphibians	24	20	18	62
TOTAL	**9,188**	**9,018**	**21,096**	**39,302**

*Sex of the specimen was not informed.
Source: Censo Anual de Animais da Sociedade de Zoológicos do Brasil, 1996.

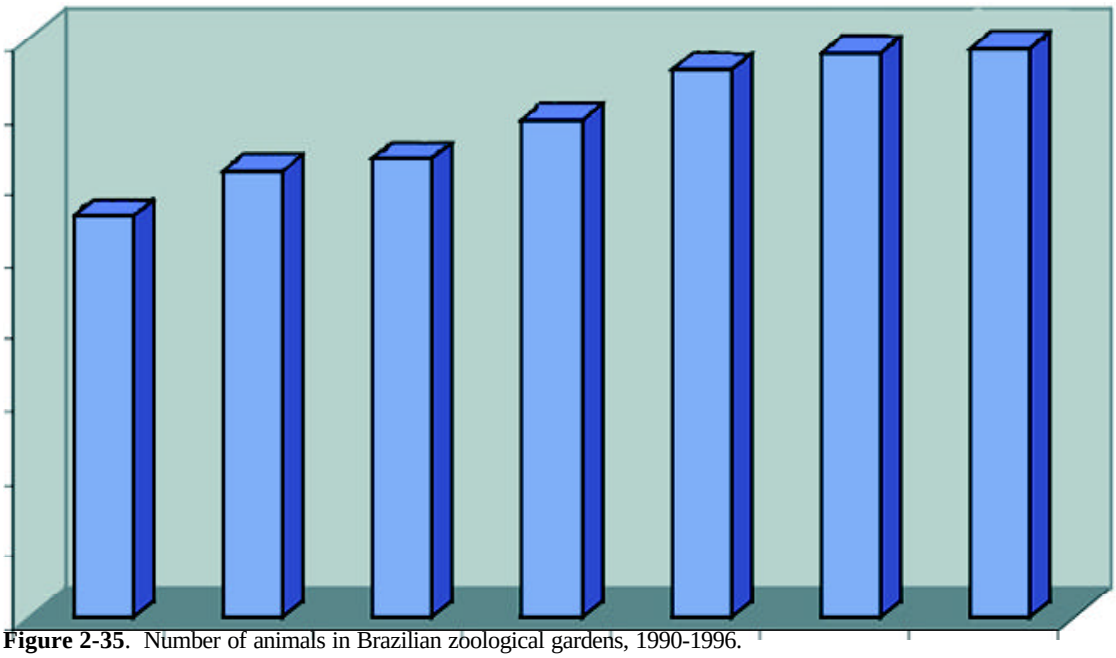

Figure 2-35. Number of animals in Brazilian zoological gardens, 1990-1996.
Source: Annual censuses carried out by the Sociedade de Zoológicos do Brasil (SZB) (1996).

Table 2-47. Germplasm Banks (BAG) comprising the Brazilian system of *ex situ* conservation of plant germplasm*.

Germplasm Bank Denomination	Instituição	City/State**	Taxon
1 BaG of Wheat	EMBRAPA-CNPT	Passo Fundo-RS	*Triticum aestivum*
2 BaG of Barley			*Hordeum vulgare*
3 BaG of *Triticum*			*T. aestivum* x *S. cereale*
4 BaG of Rye			*Secale cereale*
5 BaG of Oats			*Avena sativa*
6 BaG of *Cucurbita*	EMBRAPA-CPACT	Pelotas-RS	*Cucurbita* spp.
7 BaG of Onion			*Allium cepa*
8 BaG of Melon			*Cucumis melo*
9 BaG of Potato			*Solanum* spp.
10 BaG of Carrot			*Daucus carota*
11 BaG of Native fruits of the South			
Araçá			*Psidium cattleyanum*
Pitanga			*Eugenia uniflora*
12 BaG of *Prunus*			
Peach			*Prunus persica*
Nectarine			*P. persica var.nucipersica*
Cherry			*Prunus cerasus*
Apricot			*Prunus armeniaca*
Plum			*Prunus domestica*
Almond			*Prunus amygdalus*
13 BaG of Mountain Guava tree			*Feijoa sellowiana*
14 BaG of Grapes	EMBRAPA-CNPUv	Bento Gonçalves-RS	*Vitis vinifera*
15 BaG of Fodder – South Region	EMBRAPA-CPPSul	Bagé-RS	*Bromus*
			Paspalum
			Adesmia
			Trifolium
16 BaG of Paraná Pine	EMBRAPA-CNPF	Colombo-PR`	*Araucaria angustifolia*
17 BaG of *Eucalyptus*			*Eucalyptus benthamii*
			Eucalyptus cloeziana
			Eucalyptus deanei
			Eucalyptus maculata
			Eucalyptus pellita
			Eucalyptus pilularis
			Eucalyptus resinifera
			Eucalyptus saligna
			Eucalyptus urophyla
			Eucalyptus viminalis
			Eucalyptus dumii
			Eucalyptus spp.
18 BaG of Tropical Pines			*Pinus caribaea*
			Pinus maximinoi
			Pinus patula
			Pinus tecunumanii
			Pinus gregii
			Pinus kessica
			Pinus oocarpa
			Pinus spp.
19 BaG of Cypress			*Cupressus lusitanica*
20 BaG of Soybean	EMBRAPA-CNPSo	Londrina-PR	*Glycine max*
21 BaG of Sunflower			*Helianthus annuus*
22 BaG of Manioc	EPAGRI	Itajaí-SC	*Manihot esculenta*
23 BaG of Vegetables and Plants			
Amazon condiments	EMBRAPA-CPATU	Belém-PA	
Black Pepper			*Piper nigrum*
Jambu			*Spilanthes oleracea*
Pepper			*Capsicum* spp.

Table 2-47. (contd.) Germplasm Banks (BAG) comprising the Brazilian system of *ex situ* conservation of plant germplasm*.

Germplasm Bank Denomination	Instituição	City/State**	Taxon
24 BaG of Native Amazon Forests	EMBRAPA-CPATU	Belém-PA	
Mahogany			*Swietenia macrophylla*
Ucuuba			*Virola surinamensis*
25 BaG of Manioc			*Manihot esculenta*
26 BaG of Palm Trees			
Açaí			*Euterpe oleracea*
Pupunha			*Bactris gassipaes*
Patauá			*Oenocarpus bataua*
Bacaba			*Oenocarpus* spp.
Tucuma			*Astrocaryum* spp.
27 BaG of Medicinal, Aromatic and Condiment plants			
Velame			*Croton cajucara*
Pedra hume-caa			*Myrcia sphaerocarpa*
Pau-Rosa			*Aniba duckei*
Crajiru			*Arrabidaea chica*
28 BaG of Medicinal and Insecticide plants			
Jaborandi			*Pilocarpus microphyllus*
Timbó			*Derris* sp.
Ipecacuanha			*Cephaelis ipecacuanha*
29 BaG of Amazon Industrial Cultivation			
Annatto			*Bixa orellana*
Guaraná			*Paullinia cupana*
Mallow			*Urena lobata*
Jute			*Corchorus* spp.
30 BaG of Dendê	EMBRAPA-CPAA	Manaus-AM	*Elaeis guineensis*
31 BaG of Caiaué			*Elaeis oleifera*
32 BaG of Guaraná			*Paullinia cupana*
33 BaG of Autocthonous Amazon Species			
Rubber			*Hevea brasiliensis*
Cacao			*Theobroma cacao*
Caiauê			*Elaeis oleifera*
Pupunha			*Bactris gasipaes*
Jacarandá			*Machaerium acutifolium*
Jequitibá			*Cariniana estrelensis*
Camu-camu			*Myrciaria dubia*
Sumaúma			*Ceiba pentandra*
Araticum			*Rollinia mucosa*
34 BaG of Brazil nut			*Bertholetia excelsa*
35 BaG of Cotton	IAC	Campinas-SP	*Gossypium* spp.
36 BaG of Rice			*Oryza sativa*
37 BaG of Amaryllis			*Amaryllis* spp.
38 BaG of Açucena			*Lilium candidum*
39 BaG of Ground nuts			*Arachis hipogea*
40 BaG of Avocado			*Persea americana*
41 BaG of Garlic			*Allium sativum*
42 BaG of Oats			*Avena sativa*
43 BaG of Potato			*Solanum tuberosum*
44 BaG of Banana			*Musa* spp.
45 BaG of Coffee			*Coffea arabica*
46 BaG of Sugar-cane			*Saccharum officinarum*
47 BaG of Barley			*Hordeum vulgare*
48 BaG of Citrus Fruits			*Citrus* spp.

Table 2-47. (contd.) Germplasm Banks (BAG) comprising the Brazilian system of *ex situ* conservation of plant germplasm*.

Germplasm Bank Denomination	Instituição	City/State**	Taxon
49 BaG of Cacao			*Theobroma cacao*
50 BaG of Guava			*Psidium guajava*
51 BaG of Sesame			*Sesamum indicum*
52 BaG of Papaya			*Carica papaya*
53 BaG of Mandioc			*Manihot esculenta*
54 BaG of Mango			*Mangifera indica*
55 BaG of Passion Fruit			*Passiflora* spp.
56 BaG of Herbaceous plants			*Diversas*
57 BaG of Pinhão			*Araucaria angustifolia*
58 BaG of Palm trees			*Diversas*
59 BaG of Ramie	IAC	Campinas-SP	*Boehmeria nivea*
60 BaG of Roses			*Rosa* spp.
61 BaG of Sisal			*Agave sisalana*
62 BaG of Tritical			*T. aestivum x S. cereale*
63 BaG of Wheat			*Triticum aestivum*
64 BaG of Fruit tree species			*Diversas*
65 BaG of Beans			*Phaseolus vulgaris*
66 BaG of Rubber	EMBRAPA-CPAC	Planaltina-DF	*Hevea brasiliensis*
67 BaG of Quinoa			*Chenopodium quinoa*
68 BaG of Species of Cerrado tree			
Gonçalo-Alves			*Astronium fraxinifolium*
Cherry tree			*Amburana cearensis*
Jequitibá			*Cariniana estrelensis*
Copaíba			*Copaifera langsdorfii*
Louro-Pardo			*Cordia trichotoma*
Baru			*Dipterix alata*
Braúna			*Schinopsis brasiliensis*
Ipê-Roxo			*Tabebuia impetignosa*
Ipê Amarelo do Cerrado			*Tabebuia caraiba*
Pau D'Arco Amarelo			*Tabebuia serratifolia*
Peroba			*Aspidosperma polyneuron*
69 BaG of Cerrado Forrage			*Arachis*
			Stylosanthes
			Sesbania
			Brachiaria
			Calopogonium
			Centrosema
			Panicum maximum
			Paspalum
70 BaG of Manioc			*Manihot esculenta*
71 BaG of Pumpkins and Squash	EMBRAPA-CNPH	Brasília-DF	*Cucurbita* spp.
72 BaG of Garlic			*Allium sativum*
73 BaG of Sweet Potato			*Ipomoea batatas*
74 BaG of Mandioquinha-salsa			*Arracacia xanthorriza*
75 BaG of Arachis	EMBRAPA-Cenargen	Brasília-DF	*Arachis* spp. ***
76 BaG of Sorghum	EMBRAPA-CNPMS	Sete Lagoas-MG	*Sorghum* spp.
77 BaG of Maize			*Zea mays*
78 BaG of Millet			*Pennisetum glaucum*
79 BaG of Elephant Grass			*Pennisetum purpureum*
80 BaG of Alfalfa			*Medicago sativa*
81 BaG of Rice	EMBRAPA-CNPAF	Goiânia-GO	*Oryza sativa*
82 BaG of Beans			*Phaseolus vulgaris*
83 BaG of Caupi			*Vigna unguiculata*
84 BaG of Baru	EMBRAPA-EMGOPA	Goiânia-GO	*Dipterix alata*
85 BaG of Cashew and similar species	EMBRAPA-CNPAT	Fortaleza-CE	*Anacardium* spp.
Cashew			*Anacardium occidentale*

Table 2-47. (contd.) Germplasm Banks (BAG) comprising the Brazilian system of *ex situ* conservation of plant germplasm*.

Germplasm Bank Denomination	Instituição	City/State**	Taxon
86 BaG of Custard apple			*Annona muricata*
87 BaG of Hog-plum (Cajá)			*Spondias lutea*
88 BaG of Papaya	EMBRAPA-CNPMF	Cruz das Almas-BA	*Carica papaya*
89 BaG of Pineapple			*Ananas* spp.
90 BaG of Banana			*Musa* spp.
91 BaG of Acerola			*Malpighia glabra*
92 BaG of Castor	EMBRAPA-CNPA	Campina Grande-PB	*Ricinus communis*
93 BaG of Manioc	EMBRAPA-CNPMF	Cruz das Almas-BA	*Manihot esculenta*
94 BaG of Passion Fruit			*Passiflora* spp.
95 BaG of Cacao	EMBRAPA-CEPLAC	Itabuna-BA	*Theobroma cacao*
96 BaG of Native and Exotic fruit trees	EMBRAPA-CNPMF	Cruz das Almas-BA	
Avocado			*Persea americana*
Abiu			*Pouteria caimito*
Abricó-do-Pará			*Mammea americana*
Ameixa do Peru			*Bunchosia armeniaca*
Akee			*Blighia sapida*
Custard apple (Araticum-do-Brejo)			*Annona glabra*
Guava (Araça)			*Psidium* spp.
Araça-boi			*Eugenia stipitata*
Cabeludinha			*Eugenia tomentosa*
Cainito			*Chrysophylum cainito*
Hog-plum (Cajá)			*Spondias lutea*
Cashew			*Anacardium occidentale*
Canistel			*Richardela nervosa*
Carambola			*Averrhoa carambola*
False Mangosteen			*Cariniana colchighinensis*
Guava			*Psidium guajava*
Custard apple			*Annona muricata*
Grumichama			*Eugenia brasiliensis*
Guabiroba			*Campomanesia* sp.
Jabuticaba			*Myrciaria cauliflora*
Lichee			*Lichi chinensis*
Macadamia			*Macadamia integrifolia*
Pinha			*Annona squamosa*
Sapodilla plum			*Achras sapota*
97 BaG of Guava and Acerola - Araripe Vale do Rio Moxotó Regions	EMBRAPA-CPATSA	Petrolina-PE	
Guava			*Psidium guajava*
Acerola			*Malpighia glabra*
98 BaG of Umbu			*Spondias tuberosa*
99 BaG of Mango of the Semi-Arid Region			*Mangifera indica*
100 BaG of North-east Region			*Cenchrus*
Cactaceous fodder			*Opuntia* spp.
			Nopalea spp.
101 BaG of *Cucurbitas* for the Nordeste			
Pumpkin (Jerimum)			*Cucurbita maxima*
Watermelon			*Citrulus vulgaris*
Melon			*Cucumis melo*
Maxixe			*Cucumis anguria*
102 BaG of Coconut	EMBRAPA-CPATC	Aracaju-SE	*Cocos nucifera*
103 BaG of Mangaba	EMBRAPA-CNPA	Campina Grande-PB	*Hancornia speciosa*
104 BaG of Ramie			*Boehmeria nivea*
105 BaG of Sisal			*Agave sisalana*
106 BaG of Herbaceous Cotton			*Gossypium* spp.
107 BaG of Cotton tree			*Gossypium* spp.

* In 1997 around 200,000 GERMPLASM entries were being conserved in these banks, approsimately 76% of them exotic species and 34% Brazilian native species. ** States, see figure 1.1. *** The Banks has some 1,000 entries, representing 75 of the 80 known Arachis species. Of these, 68 have been described and 12 are now being described. Sixty-one of them are native to Brazil.
Source: CENARGEN/Instituto Agronômico of Campinas (IAC), 1998.

Box 2-1

Threatened Species of the Brazilian Fauna

IBAMA Edict No. 1.522, 19th December 1989

MAMMALIA

Primates

Alouatta belzebul belzebul (Linnaeus, 1766). CEBIDAE. Red-handed howling monkey.
Alouatta fusca (E. Geoffroy, 1812). CEBIDAE. Brown howling monkey
Ateles belzebuth (E. Geoffroy, 1806). CEBIDAE. White-bellied spider monkey
Ateles paniscus (Linnaeus, 1758). CEBIDAE. Red-faced black spider monkey
Brachyteles arachnoides (E. Geoffroy, 1806). CEBIDAE. Muriqui
Cacajao calvus (I. Geoffroy, 1847). CEBIDAE. Bald uakari
Cacajao melanocephalus (Humboldt, 1811). CEBIDAE. Black uakari
Callicebus personatus (E. Geoffroy, 1812). CEBIDAE. Masked titi monkey
Callimico goeldii (Thomas, 1904). CALLIMICONIDAE. Goeldi's monkey
Callithrix argentata leucippe (Thomas, 1922). CALLITRICHIDAE. Golden-white bare-ear marmoset
Callithrix aurita (E. Geoffroy in Humboldt, 1812). CALLITRICHIDAE. Buffy tufted-ear marmoset
Callithrix flaviceps (Thomas, 1903). CALLITRICHIDAE. Buffy headed marmoset
Callithrix humeralifer (E. Geoffroy in Humboldt, 1812). CALLITRICHIDAE. Santarém marmoset
Cebus apella xanthosternos (Wied, 1820). CEBIDAE. Buffy headed capuchin monkey
Chiropotes albinasus (I. Geoffroy & Deville, 1848). CEBIDAE. White-nosed saki
Chiropotes satanas utahicki Hershkovitz, 1985. CEBIDAE. Uta Hick's bearded saki
Chiropotes satanas satanas (Hoffmannsegg, 1807). CEBIDAE. Guianan bearded saki
Lagothrix lagotricha (Humboldt, 1812). CEBIDAE. Woolly monkey
Leontopithecus chrysomelas (Kuhl, 1820). CALLITRICHIDAE. Golden-headed lion tamarin
Leontopithecus chrysopygus (Mikan, 1823). CALLITRICHIDAE. Black lion tamarin
Leontopithecus rosalia (Linnaeus, 1766). CALLITRICHIDAE. Golden lion tamarin
Pithecia albicans Gray, 1860. CEBIDAE. White saki, buffy saki
Saguinus bicolor bicolor (Spix, 1823). CALLITRICHIDAE. Pied tamarin
Saguinus imperator (Goeldi, 1907). CALLITRICHIDAE. Emperor tamarin
Saimiri vanzolinii Ayres, 1985. CEBIDAE. Black-crowned squirrel monkey

Carnivora

Atelocynus microtis (Sclater, 1883). CANIDAE. Short-eared dog
Chrysocyon brachyurus (Illiger, 1815). CANIDAE. Maned wolf
Leopardus pardalis (Linneaus, 1758). FELIDAE. Ocelot
Leopardus tigrinus (Schreber, 1775). FELIDAE. Oncilla
Leopardus wiedii (Schinz, 1821). FELIDAE. Margay
Lutra longicaudis (Olfers, 1818). MUSTELIDAE. Neotropical otter
Mustela africana (Demarest, 1818). MUSTELIDAE. Amazonian weasel
Oncifelis colocolo (Molina, 1810). FELIDAE.
Oncifelis geoffroyi (d'Orbigny & Gervais, 1844). FELIDAE. Geoffroy's cat
Panthera onca (Linneaus, 1758). FELIDAE. Jaguar
Pteronura brasiliensis (Gmelin, 1788). MUSTELIDAE. Giant otter
Puma concolor (Linnaeus, 1771). FELIDAE. Puma
Speothos venaticus (Lund, 1842). CANIDAE. Bush dog

Xenarthra

Bradypus torquatus Illiger, 1811. BRADYPODIDAE. Three-toed sloth
Myrmecophaga tridactyla Linnaeus, 1758. MYRMECOPHAGIDAE. Giant anteater
Priodontes maximus (Kerr, 1792). DASYPODIDAE. Giant armadillo

Tolypeutes tricinctus (Linnaeus, 1758). DASYPODIDAE. Three-banded armadillo

Sirenia

Trichechus inunguis (Natterer, 1883). TRICHECHIDAE. Amazon manatee
Trichechus manatus Linnaeus, 1758. TRICHECHIDAE. West Indian manatee

Cetacea

Eubalaena australis (Desmoulins, 1822). BALAENIDAE. Southern right whale
Megaptera novaeangliae (Borowski, 1781). BALAENOPTERIDAE. Humpback whale/
Pontoporia blainvillei (Gervais & d'Orbigny, 1844). PLATANISTIDAE. River Plate dolphin

Rodentia

Abrawayaomys ruschii Cunha & Cruz, 1979. MURIDAE. Abrawaya's spiny rat
Chaetomys subspinosus (Olfers, 1818). ECHIMYIDAE. Thin-spined porcupine
Juscelinomys candango Moojen, 1965. MURIDAE.
Kunsia tomentosus (Lichtenstein, 1830). CRICETIDAE.
Phaenomys ferrugineus (Thomas, 1894). MURIDAE.
Rhagomys rufescens (Thomas, 1886). MURIDAE. Brazilian arboreal mouse

Artiodactyla

Blastocerus dichotomus (Illiger, 1815). CERVIDAE. Marsh deer
Odocoileus virginianus (Zimmermann, 1780). CERVIDAE. White-tailed dear
Ozotoceros bezoarticus (Linnaeus, 1758). CERVIDAE. Pampas deer

AVES

Tinamiformes

Crypturellus noctivagus (Wied, 1820). TINAMIDAE. Yellow-legged tinamou
Nothura minor (Spix, 1825). TINAMIDAE. Lesser nothura
Taoniscus nanus (Temminck, 1815). TINAMIDAE. Dwarf tinamou
Tinamus solitarius (Vieillot, 1819). TINAMIDAE. Solitary tinamou

Ciconiiformes

Eudocimus ruber (Linnaeus, 1758). THRESKIORNITHIDAE. Scarlet ibis
Tigrisoma fasciatum fasciatum (Such, 1825). ARDEIDAE. Fasciated tiger heron

Phoenicopteriformes

Phoenicopterus ruber Linnaeus, 1758. PHOENICOPTERIDAE. American flamingo

Anseriformes

Mergus octosetaceus Vieillot, 1817. ANATIDAE. Brazilian merganser

Falconiformes

Accipiter poliogaster (Temminck, 1824). ACCIPITRIDAE. Gray-bellied hawk
Falco deiroleucus Temminck, 1825. FALCONIDAE. Orange-breasted falcon
Harpia harpyja (Linnaeus, 1758). ACCIPITRIDAE. Harpy eagle
Harpyhaliaetus coronatus (Vieillot, 1817). ACCIPITRIDAE. Crowned eagle
Leucopternis lacernulata (Temminck, 1827). ACCIPITRIDAE. White-necked hawk
Leucopternis polionota (Kaup, 1847). ACCIPITRIDAE. Mantled hawk
Morphnus guianensis (Daudin, 1800). ACCIPITRIDAE. Crested eagle
Spizastur melanoleucus (Vieillot, 1816). ACCIPITRIDAE. Black-and-white hawk eagle

Galliformes

Crax blumenbachii Spix, 1825. CRACIDAE. Red-bellied curassow
Crax fasciolata pinima Pelzeln, 1870. CRACIDAE. Natterer's curassow
Mitu mitu mitu (Linnaeus, 1766). CRACIDAE. Razor-billed curassow
Penelope jacucaca Spix, 1825. CRACIDAE. White-browed guan.

Penelope obscura bronzina Hellmayr, 1914. CRACIDAE. Dusky-legged guan
Penelope ochrogaster Pelzeln,1870. CRACIDAE. Chestnut-bellied guan
Pepile jacutinga (Spix, 1825). CRACIDAE. Black-fronted piping guan

Charadriiformes

Numenius borealis (Foster, 1772). SCOLOPACIDAE. Eskimo curlew

Columbiformes

Claravis godefrida (Temminck, 1811). COLUMBIDAE. Purple-winged ground dove
Columbina cyanopis (Pelzeln, 1870). COLUMBIDAE. Blue-eyed ground dove

Psittaciformes

Amazona brasiliensis (Linnaeus, 1766). PSITTACIDAE. Red-tailed amazon
Amazona pretrei (Temminck, 1830). PSITTACIDAE. Red-specatacled amazon
Amazona rhodocorytha (Salvadori, 1890). PSITTACIDAE. Red-browed amazon
Amazona vinacea (Kuhl, 1820). PSITTACIDAE. Vinaceous amazon
Anodorhynchus glaucus (*) (Vieillot, 1816). PSITTACIDAE. Glaucous macaw
Anodorhyncus hyacinthinus (Lalham, 1720). PSITTACIDAE. Hyacinth macaw
Anodorhyncus leari Bonaparte, 1856. PSITTACIDAE. Lear's macaw
Aratinga guarouba (Gmelin, 1778). PSITTACIDAE. Golden parakeet
Cyanopsitta spixii (Wagler, 1832). PSITTACIDAE. Spix's macaw
Pyrrhura cruentata (Wied, 1820). PSITTACIDAE. Ochre-marked parakeet
Pyrrhura leucotis (Kuhl, 1820). PSITTACIDAE. Maroon-faced parakeet
Touit melanonota (Wied, 1820). PSITTACIDAE. Black-eared parrotlet
Touit surda (Kuhl, 1820). PSITTACIDAE. Golden-tailed parrotlet
Triclaria malachitacea (Spix, 1824). PSITTACIDAE. Blue-bellied parrot

Cuculiformes

Neomorphus geoffroyi dulcis Snethlage, 1927. CUCULIDAE. Rufous-vented ground-cuckoo
Neomorphus geoffroyi geoffroyi (Temminck, 1820). CUCULIDAE. Rufous-vented ground-cuckoo

Caprimulgiformes

Caprimulgus candicans (Pelzeln, 1867). CAPRIMULGIDAE. White-winged nightjar
Eleothreptus anomalus (Gould, 1837). CAPRIMULGIDAE. Sickle-winged nightjar
Macropsalis creagra (Bonaparte, 1850). CAPRIMULGIDAE. Long-trained nightjar
Nyctibius leocopterus (Wied, 1821). NYCTIBIIDAE. White-winged potoo

Apodiformes

Phaethornis superciliosus margaretae (Ruschi, 1972). TROCHILIDAE. Long-tailed hermit
Ramphodon dohrnii (Boucier & Mulsant, 1852). TROCHILIDAE. Hook-billed hermit

Piciformes

Campephilus robustus (Lichtenstein, 1819). PICIDAE. Robust woodpecker
Celeus torquatus tinnunculus (Wagler, 1829). PICIDAE Ringed woodpecker
Dryocopus galeatus (Temminck, 1822). PICIDAE. Helmeted woodpecker
Jacamaralcyon tridactyla (Vieillot, 1817). GALBULIDAE. Three-toed jacamar

Passeriformes

Amaurospiza moesta (Hartlaub, 1853). EMBERIZIDAE. Blackish-blue seedeater
Alectrurus risora (Vieillot, 1816). TYRANNIDAE. Strange-tailed tyrant
Anthus nattereri (Sclater, 1878). MOTTACILLIDAE. Ochre-breasted pipit
Calyptura cristata (*) (Vieillot, 1818). COTINGIDAE. Kinglet calyptura
Carduelis yarrellii (Audubon, 1839). EMBERIZIDAE. Yarrell's cardinal
Carpornis melanocephalus (Wied, 1820). CONTINGIDAE. Black-headed berry-eater

Cercomacra carbonaria Sclater & Salvin, 1873. FORMICARIIDAE. Rio Branco antbird
Clibanornis dendrocolaptoides (Pelzeln, 1859). FURNARIIDAE. Canebreak groundcreepr
Conothraupis mesoleuca (Berlioz, 1939). EMBERIZIDAE. Cone-billed tanager
Cotinga maculata (Muller, 1776). COTINGIDAE. Banded cotinga
Culicivora caudacuta (Vieillot, 1818). TYRANNIDAE. Sharp-tailed tyrant
Curaeus forbesi (Sclater, 1886). ICTERIDAE. Forbes's blackbird
Dacnis nigripes Pelzeln, 1856. EMBERIZIDAE. Black-legged dacnis
Formicivora erythronotos Hartlaub, 1852. FORMICARIIDAE. Black-hooded antwren
Formicivora iheringi Hellmayr, 1909. FORMICARIIDAE. Narrow-billed antwren
Gubernatrix cristata (Vieillot, 1817). EMBERIZIDAE. Yellow cardinal
Hemitriccus aenigma (Zimmer, 1940). TYRANNIDAE. Pygmy tyrant
Hemitriccus furcatus (Lafresnaye, 1846). TYRANNIDAE. Fork-tailed pygmy tyrant
Hemitriccus kaempferi (Zimmer, 1953). TYRANNIDAE. Kaempfer's tody tyrant
Herpsilochmus pectoralis Sclater, 1857. FORMICARIIDAE. Pectoral antwren
Iodopleura pipra (Lesson, 1831). COTINGIDAE. Buff-throated purpletuft
Lipaugus lanioides (Lesson, 1844). COTINGIDAE. Cinnamon-vented piha
Megaxenops parnaguae Reiser, 1905. FURNARIIDAE. Great xenops
Merulaxis stresemanni Sick, 1960. RHINOCHRYPTIDAE. Stresemann's bristlefront
Myadestes leucogenys (Cabanis, 1851). TURDIDAE. Rufous-brown solitaire
Myrmeciza ruficauda (Wied, 1831). FORMICARIIDAE. Scalloped antbird
Myrmeciza stictothorax (Todd, 1927). FORMICARIIDAE. Spot-breasted antbird
Mymortherula minor Salvadori, 1867. FORMICARIIDAE. Salvadori's antwren
Nemosia rourei Cabanis, 1870. EMBERIZIDAE. Cherry-throated tanager
Oryzoborus maximiliani Cabanis, 1851. EMBERIZIDAE. Great-billed seedfinch
Phibalura flavirostris (Vieillot, 1816). COTINGIDAE. Swallow-tailed cotinga
Phylloscartes ceciliae Teixeira, 1987. TYRANNIDAE. Alagoas tyrannulet
Phylloscartes roquettei (Snethlage, 1928). TYRANNIDAE. Minas Gerais tyrannulet
Philydor novaesi Teixeira & Gonzaga, 1983. FURNARIIDAE. Alagoas foliage-gleaner
Piprites pileatus (Temminck, 1822). COTINGIDAE. Black-capped manakin
Platyrinchus leucoryphus (Wied, 1831). TYRANNIDAE. Russet-winged spadebill
Poecilurus kollari (Pelzeln, 1856). FURNARIIDAE. Hoary-throated spinetail
Poospiza cinerea Bonaparte, 1850. EMBERIZIDAE. Cinereous warbling finch
Procnias averano averano (Ilermann, 1783). COTINGIDAE. Bearded bellbird
Pyriglena atra (Swainson, 1825). FORMICARIIDAE. Fringe-back fire-eye
Pyroderus scutatus scutatus (Shaw, 1792). COTINGIDAE. Red-ruffed fruitcrow
Rhopornis ardesiaca (Wied, 1831). FORMICARIIDAE. Slender antbird
Scytalopus novacapitalis Sick, 1958. RHINOCRYPTIDAE. Brasília tapaculo
Sporophila falcirostris (Temminck, 1820). EMBERIZIDAE, Temminck's seedeater
Sporophila frontalis (Verreaux, 1869). EMBERIZIDAE. Buffy-fronted seedeater
Sporophila palustris (Barrows, 1883). EMBERIZIDAE. Marsh seedeater
Sturnella defilipii (Bonaparte, 1850). ICTERIDAE. Lesser red-breasted meadowlark
Synallaxis infuscata Pinto, 1950. FURNARIIDAE. Plain spinetail
Tangara fastuosa (Lesson 1831). EMBERIZIDAE. Seven-coloured tanager
Terenura sicki Teixeira & Gonzaga, 1983. FORMICARIIDAE. Orange-bellied antwren
Thamnomanes plumbeus (Wied, 1831). FORMICARIIDAE. Plumbeous antshrike
Thripophaga macroura (Wied, 1821). FURNARIIDAE. Striated softtail
Xanthopsar flavus (Gmelin, 1788). ICTERIDAE. Saffron-cowled blackbird
Xiphocolaptes falcirostris Spix, 1824. DENDROCOLAPTIDAE. Moustached woodcreeper
Xiphocolaptes franciscanus Snethlage, 1927. DENDROCOLAPTIDAE. Snethlage's woodcreeper
Xipholena atropurpurea (Wied, 1820). COTINGIDAE. White-winged cotinga.

REPTILIA

Chelonia

Caretta caretta (Linnaeus, 1758). CHELONIIDAE. Loggerhead turtle
Chelonia mydas (Linnaeus, 1758). CHELONIIDAE. Green turtle
Dermochelys coriacea (Linnaeus, 1766). DERMOCHELYDAE. Leatherback turtle
Eretmochelys imbricata (Linnaeus, 1766). CHELONIIDAE. Hawksbill turtle
Lepidochelys olivacea (Eschscholtz, 1829). CHELONIIDAE. Olive Ridley turtle
Phrynops hogei Mertens, 1957. CHELIDAE. Hoge's sideneck turtle

Squamata

Lachesis muta rhombeata Wied, 1825. VIPERIDAE

Crocodylia

Caiman latirostris (Daudin, 1802). ALLIGATORIDAE. Caiman
Melanosuchus niger (Spix, 1825). ALLIGATORIDAE. Black caiman

AMPHIBIA

Paratelmatobius gaigeae (Cochran, 1938). LEPTODACTYLIDAE.

INSECTA

Lepidoptera - Butterflies and moths

Dasyophthalma vertebralis (*) (Butler, 1969). NYMPHALIDAE.
Eresia orysice (*) (Geyer, 1832). NYMPHALIDAE.
Eurytides iphitas (*) (Hubner, 1821). PAPILIONIDAE.
Eurytides lysithous harrisianus (Swainson,1822). PAPILIONIDAE.
Eutresis hypereia imeriensis (Brown, 1977). NYMPHALIDAE.
Heliconius nattereri Felder&Felder,1865. Família NYMPHALIDAE.
Hyalyris fiammctta (*) (Hewitson, 1852). NYMPHALIDAE.
Hyalyris leptalina leptalina (*) (Felder & Felder, 1865). NYMPHALIDAE.
Hypoleria fallens (Haensch, 1905). NYMPHALIDAE.
Hypoleria mulviana (D'Almeida, 1958). NYMPHALIDAE.
Hypothiris mayi (D'Almeida, 1945). NYMPHALIDAE.
Joiceya praeclara (Talbot, 1928). LYCAENIDAE.
Mechanitis bipuncta (Forbes, 1948). NYMPHALIDAE.
Melinaea mnasias (Hewitson, 1855). NYMPHALIDAE.
Moschoneura methymna (Godart, 1819). PIERIDAE.
Napeogenes cyrianassa xanthone (Bates,1862). NYMPHALIDAE.
Orobrassolis ornamentalis (Stichel, 1906). NYMPHALIDAE.
Papilio himeros himeros (Hopffer, 1865). PAPILIONIDAE.
Papilio himeros baia (Rothschild & Jordan, 1906). PAPILIONIDAE.
Papilio zagreus zagreus (Doubleday, 1847). PAPILIONIDAE.
Papilio zagreus neyi (Niepelt, 1909). PAPILIONIDAE.
Papilio zagreus bedoci (LeCerf, 1925). PAPILIONIDAE.
Parides ascanius (Cramer, 1776). PAPILIONIDAE.
Parides lysander mattogrossensis (Talbot, 1928). PAPILIONIDAE.
Perrhybris flava (Oberthür, 1895). PIERIDAE.
Scada karschina delicata (Talbot, 1932). NYMPHALIDAE.

Odonata - Dragonflies

Leptagrion dardanoi Santos, 1968. COENAGRIONIDAE.
Leptagrion siqueirai Santos, 1968. COENAGRIONIDAE.
Mecistogaster asticta (Selys, 1860). PSEUDOSTIGMATIDAE.
Mecistogaster pronoti (*) Sjöestedt, 1918). PSEUDOSTIGMATIDAE.

ONYCHOPHORA

Peripatus acacioi Marcus & Marcus, 1953. PERIPATIDAE.

CNIDARIA

Millepora nitidae (Verreill, 1868). MILLEPORIDAE. Fire coral.

(*) Species probably extinct.
Species included under IBAMA Edict No. 45, April 27th 1992:

MAMMALIA - Primates

Leontopithecus caissara Lorini & Persson,1990. CALLITRICHIDAE. Black-faced lion tamarin

Species included under IBAMA Edict No. 62, June 17th 1997:

MAMMALIA - Chiroptera

Saccopteryx gymnura Thomas, 1901 EMBALLONURIDAE. White-lined sac-winged bat
Vampyrum spectrum (Linnaeus, 1758) PHYLLOSTOMIDAE. False vampire bat
Lonchophylla bokermanní Sazima *et al*., 1978 PHYLLOSTOMIDAE. Spear-nosed long-tongued bat
Lichonycteris obscura Thomas, 1895 PHYLLOSTOMIDAE. Dark long-tongued bat
Chiroderma doriae Thomas, 1901 PHYLLOSTOMIDAE. Big-eyed bat
Platyrrhinus recifinus (Thomas, 1901) PHYLLOSTOMIDAE. White-lined fruit bat
Lasiurus ebenus Fazzolari-Corrêa, 1994 VESPERTILIONIDAE. Hoary or hair-tailed bat
Lasiurus egregius (Peters, 1870) VESPERTILIONIDAE. Hoary or hair-tailed bat
Myotis ruber (E. Geoffroy, 1806) VESPERTILIONIDAE. Little brown bat

AVES - Passeriformes

Stynphalornis acutirostris (Bornschein, Reinet & Teixeira, 1995). FORMICARIDAE.

Box 2-2

Endangered or rare Brazilian plant species

IBAMA Edict No. 06/92

Species	Category	Family
Acanthococos emensis Toledo	R	Palmae
Aechmea apocalyptica Reitz	R	Bromeliaceae
Aechmea blumenavii Reitz	R	Bromeliaceae
Aechmea kleinii Reitz	E	Bromeliaceae
Aechmea pimenti-velosii Reitz	R	Bromeliaceae
Aniba rosaeodora Ducke	E	Lauraceae
Araucaria angustifolia (Bertol.) O Kuntze	V	Araucariaceae
Aspilia grazielae Santos	I	Compositae
Aspilia paraensis (Huber)Santos	R	Compositae
Aspilia pohlii Baker	I	Compositae
Aspilia procumbens Baker	R	Compositae
Astronium urundeuva Engl	V	Anacardiaceae
Bauhinia smilacina (Schott)Steudel	V	Leguminosae
Bertholletia excelsa HBK	V	Lecythidaceae
Billbergia alfonsi-joannis Reitz	E	Bromeliaceae
Bowdichia nitida Spruce ex Benth.	V	Leguminosae
Brosimum glaucum Taubert	R	Moraceae
Brosimum glazioui Taubert	R	Moraceae
Bumelia obtusifolia Roem. & Schult. var. excelsa (DC)Miq.	V	Sapotaceae
Caesalpinia echinata Lam	E	Leguminosae
Cariniana ianeirensis Knuth	R	Lecythidaceae
Cattleya schilleriana Reichbach	E	Orchidaceae
Costus cuspidatus (Nees et Martius)Maas	R	Zingiberaceae
Costus fragilis Maas	R	Zingiberaceae
Costus fusiformis Maas	R	Zingiberaceae
Couepia schottii Fritsch	V	Chrysobalanaceae
Dalbergia nigra (Vell.)Fr. All.	V	Leguminosae
Dicksonia sellowiana (Presl.) Hook.	E	Dicksoniaceae
Dicypellium caryophyllatum Nees	V	Lauraceae
Ditassa arianeae Font. & Schw.	E	Asclepiadaceae
Ditassa maricaensis Font. & Schw.	V	Asclepiadaceae
Dorstenia arifolia Lam.	V	Moraceae
Dorstenia cayapia Vell.	E	Moraceae
Dorstenia elata Hook.	R	Moraceae
Dorstenia ficus Vell.	R	Moraceae
Dorstenia fischeri Bureau	E	Moraceae
Dorstenia ramosa (Desv.) Car. et al.	V	Moraceae
Dorstenia tenuis Bonpl. ex Bur.	V	Moraceae
Dyckia cabrerae Smith & Reitz	E	Bromeliaceae
Dyckia distachya Hassler	E	Bromeliaceae
Dyckia hatschbachii L.B.Smith	E	Bromeliaceae
Dyckia ibiramensis Reitz	E	Bromeliaceae
Euxylophora paraensis Huber	V	Rutaceae
Fernseea itatiaiae (Wawra)Baker	R	Bromeliaceae
Gonolobus dorothyanus Font. & Schw.	E	Asclepiadaceae

Box 2-2 (continued)

Endangered or rare Brazilian plant species

IBAMA Edict No. 06/92

Species	Category	Family
Heliconia angusta Vell.	V	Musaceae
Heliconia citrina LEm. & Em.Santos	V	Musaceae
Heliconia farinosa Raddi	V	Musaceae
Heliconia fluminensis LEm. & Em.Santos	V	Musaceae
Heliconia lacletteana LEm. & Em.Santos	V	Musaceae
Heliconia sampaioana L Em.	V	Musaceae
Helosis cayennensis (Swartz) Sprengel var. cayennensis	V	Balanophoraceae
Hirtella insignis Briquet ex Prance	E	Chrysobalanaceae
Hirtella parviunguis Prance	E	Chrysobalanaceae
Hirtella santosii Prance	E	Chrysobalanaceae
Ipomoea carajaensis D.Austin	E	Convolvulaceae
Ipomoea cavaleantei D.Austin	E	Convolvulaceae
Jacquinia brasiliensis Mez	V	Theophrastaceae
Laelia fidelensis Pabst.	K	Orchidaceae
Laelia grandis Lindl. & Paxt.	E	Orchidaceae
Laelia jongheana Reichbach	V	Orchidaceae
Laelia lobata (Lindl.) Veitch	E	Orchidaceae
Laelia perrinii (Lindl.) Paxt.	E	Orchidaceae
Laelia tenebrosa Rolfe	E	Orchidaceae
Laelia virens Lindl.	R	Orchidaceae
Laelia xanthina Lindl.	E	Orchidaceae
Lavoisiera itambana DC.	R	Melastomataceae
Licania aracaensis Prance	R	Chrysobalanaceae
Licania bellingtonii Prance	E	Chrysobalanaceae
Licania indurata Pilger	E	Chrysobalanaceae
Lomatozona artemisaefolia Baker	R	Compositae
Lychnophora ericoides Mart.	V	Compositae
Melanoxylon brauna Schott.	V	Leguminosae
Mollinedia gilgiana Perkins	R	Monimiaceae
Mollinedia glabra (Sprengel) Perkins	V	Monimiaceae
Mollinedia lamprophylla Perkins	E	Monimiaceae
Mollinedia longicuspidata Perkins	R	Monimiaceae
Mollinedia stenophylla Perkins	E	Monimiaceae
Ocotea basicordatifolia Vattimo	R	Lauraceae
Ocotea catharinenais Mez	V	Lauraceae
Ocotea cymbanam H.B.K.	V	Lauraceae
Ocotea langsdorffii Mez	V	Lauraceae
Ocotea porosa (Nees) Angely	V	Lauraceae
Ocotea pretiosa (Nees) Mez	E	Lauraceae
Parinari brasiliensis (Schott) Hook	R	Chrysobalanaceae
Pavonia alnifolia St.Kl.	V	Malvaceae
Phyllantus gladiatus Muell.Arg.	E	Euphorbiaceae
Pilocarpus jaborandi Holmes	E	Rutaceae
Pilocarpus microphyllus Stapf.ex Wardl.	E	Rutaceae
Pilocarpus trachylophus Holmes	E	Rutaceae

Box 2-2 (continued)

Endangered or rare Brazilian plant species

IBAMA Edict No. 06/92

Species	Category	Family
Pithecellobium racemosum Ducke	V	Leguminosae
Pouteria psamophila var. xestophylla (Miq. et Eichl.) Baehni	V	Sapotaceae
Prepusa hookeriana Gardner	E	Gentianaceae
Schinopsis brasiliensis Engl.	V	Anacardiaceae
Simaba floribunda St.Hil.	*	Simaroubaceae
Simaba suaveolens St.Hil.	*	Simaroubaceae
Swartzia glazioviana (Taubert) Glaziou	E	Leguminosae
Swietenia macrophylla King	E	Meliaceae
Torresea aereana Ducke	V	Leguminosae
Virola surinamensis Warb	V	Myristicaceae
Vouacapoua americana Aubl.	E	Leguminosae
Vriesia biguassuensis Reitz	I	Bromeliaceae
Vriesia brusquensis Reitz	R	Bromeliaceae
Vriesia muelleri Mez	R	Bromeliaceae
Vriesia pinottii Reitz	E	Bromeliaceae
Vriesia triangularis Reitz	I	Bromeliaceae
Worsleya rayneri (Hook.) Traub.& Moldenke	E	Amaryllidaceae

CATEGORIES: * = Probably extinct, E = Endangered, V = Vulnerable, R = Rare, I = Indeterminate, K = Insufficiently known.

Box 2-3

Legal framework for the establishment of different categories of Protected Areas in Brazil.

Instrument	Date	Article	Categories envvolved	Category	Subject
Federal Constitution	1988	255, para. 1, clauses I, II & III	All	Direct and indirect use	Preservation of samples of ecosystems
Law Nº 4.771 Forest Code	15/9/65	5, line a	National, State & Municipal Parks, Biological Reserves	Indirect use	To safeguard exceptional natural attributes and for scientific purposes
Law Nº 4.771 Forest Code	15/9/65	5, line b	National, State & Municipal Forests	Direct use	For economic, social and technical purposes
Law Nº 5.197	30/1/67	5, line a	National, State & Municipal Biological Reserves	Indirect use	Prohibits hunting, use, and the introduction of species of flora and fauna, except for scientific activities.
Faunal Protection Law	21/09/79	1, para. 1,2 & 3	National parks	Indirect use	Regulates and establishes norms
Decree Nº 84.017	27/4/81	1, para. 1,2 & 3	Ecological Stations	Indirect Use	Establishes ESECs[1], promotes environmental protection, research and education
Law Nº 6.902	27/4/81	9, lines a, b & c	Environmental Protection Areas	Direct use	Establishes norms, limiting or prohibiting activities
Decree Nº 99.274	6/6/90	30	Ecological Stations	Indirect use	Regulates ESECs[1], subordinates activites that may harm the biota in the surrounding areas to CONAMA[2]
Decree Nº 89.336	31/1/84	1	Ecological Reserves	Indirect use	Areas of Permanent preservation cited in Art. 18 of Law Nº 6.939 of 31/1/81
Decree Nº 89.336	31/1/84	2	Areas of Relevant Ecological Interest	Direct use	For the protection of rare examples of the regional biota
Law Nº 7.804	18/7/89	9, clause VI	Extractivist Reserves	Direct use	Establishes extractivist reserves and the exploitation of natural resources on a sustainable basis
Decree Nº 98.897	30/1/90	1,2 & 3	Extractivist Reserves	Direct use	Regulates Extractivist Reserves
Decree Nº 1.298	27/10/94	1, clauses I, II & III; 2, lines a, b, c & d		National Forests	Direct use Regulates National Forests
Decree Nº 1.922	5/6/96		Private Natural Heritage Reserves		Indirect use Sets out provisions for the recognition of RPPNs[3]

Source: Soavinski, R.J. 1997. Sistema Nacional de Unidades de Conservação: Legislação e Política. IBAMA, Brasília.

[1] ESEC - Ecological Station; [2] CONAMA - National Council of the Environment; [3]RPPN - Private Natural Heritage Reserve

Box 2-4

The National System of Protected Areas

The first attempt to establish conservation areas in this country dates from 1861 with the establishment of the Tijuca and Paineiras Forest by a Decree of the Ministry of Agriculture, Trade and Public Works on 11th December 1861 and confirmed by Decree No. 577. The first legal protection for this forest, however, was in 1817, with a norm issued by the Prince Regent, Dom João, which declared it "covert," that is the woods around the sources of the Rios Carioca and Paineiras were given a status equivalent to a protected hunting area ("couto de caça") for the Royal Household, in order to safeguard the water sources which supplied the then capital of Brazil, Rio de Janeiro. The decree also determined indemnities for the landowners. The forest was later, in 1961, turned into a National Park, the Tijuca National Park.

Another precursor to current initiatives was the creation of the first Park as a protected area in 1896, the Parque Estadual da Cidade (State City Park) in a suburb of the city of São Paulo, now the Cantareira State Park.

The first Forest Code (Código Florestal) for the country was established in 1934. In the same year, the Brazilian Forestry Service (Serviço Florestal) was created. This was the predecessor of the Brazilian Forestry Development Institute (Instituto Brasileiro de Desenvolvimento Florestal - IBDF) set up in 1965 but which was subsequently absorbed by the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA) in 1989. As a result of the Forest Code, the first National Parks were created, in Itatiaia in 1937, and Iguaçu and Serra dos Orgãos in 1939.

Plans for a coherent national system of protected areas arose, however, only in the second half of the 1970s. This resulted in an important document prepared by IBDF, with technical support from the Food and Agriculture Organization (FAO), the "Analysis of Priorities for the Conservation of Nature in Amazonia," as part of the Project for Forestry Research and Development (Projeto de Desenvolvimento e Pesquisa Florestal - PRODEPEF). The proposals were based on biogeographical aspects, and resulted in 1979 in the "Plan of the National System of Protected Areas." In 1982, IBDF published the "Plan of the System of Protected Areas in Brazil - 2nd Stage," prepared in collaboration with the Brazilian Foundation for the Conservation of Nature (Fundação Brasileira para a Conservação da Natureza - FBCN); a detailed and well-grounded plan which laid the foundations for the major advances observed in Brazil in this respect in the 1980s. Also in the 70s and 80s, the Programme of Ecological Stations, co-ordinated by the Special Secretariat for the Environment (Secretaria Especial do Meio Ambiente - SEMA) (also absorbed by IBAMA in 1989) contributed greatly to the expansion and consolidation of a system of protected areas in the country.

In 1989, IBAMA requested the Fundacão Pró-Natureza (FUNATURA) to prepare the first version of a draft law for the "National System of Protected Areas" (Sistema Nacional de Unidades de Conservação - SNUC). After long and lengthy discussions with IBAMA and the National Environment Council (Conselho Nacional do Meio Ambiente - CONAMA), a revised version was sent to congress in 1992 in the form of Draft Law No. 2.892. A process of extensive consultation with society was subsequently co-ordinated by the Commission for the Defence of the Consumer, the Environment and Minorities (Comissão de Defesa do Consumidor, Meio Ambiente e Minorias) of the Chamber of Deputies, stimulating discussion on various aspects, in particular the relations between Protected Areas and traditional and indigenous local communities.

An amended Draft Law was drawn up in 1996 in the National Congress, and is under discussion to this day. It proposes a new paradigm for protected areas, based on four general principles:

- Protected areas should be an integral part of regional socio-economic development planning;
- The creation of protected areas should be preceded by studies and consultations with the communities affected;
- The management of protected areas should be participative, and include all parties involved in the conservation of the national patrimony and its sustainable use;
- The involvement of private enterprise, as well as the landowners surrounding protected areas, is indispensable for the financial and administrative aspects and to ensure the viability of the protected areas.

The amendment under discussion provides for a number of categories of protected areas:

- Of indirect use (strict protection): Ecological Stations, National Parks, Natural Monuments, Wildlife Sanctuaries, and Private Natural Heritage Reserves;

Box 2-4 (contd.)

The National System of Protected Areas

- Direct use: Environmental Protection Areas, National Forests, Extractivist Reserves, Wildlife Reserves, Water-Producing Reserves, Biosphere Reserves;
- Provisional management (until technical and scientific studies suggest a better destination).

The amendment also proposes the category of Areas of Relevant Ecological Interest (ARIE) (already regulated under Decree No. 89.336, 31st January 1984), Cultural Ecological Reserves and Integrated Ecological Reserves (mosaics), all of which maintain private ownership and provide for the sustainable use of resources. It proposes a mechanism for provisional administrative interdiction for two years, (renewable for two more years) of important natural areas under threat of degradation, in order to allow for the definition of the most appropriate measures for their protection.

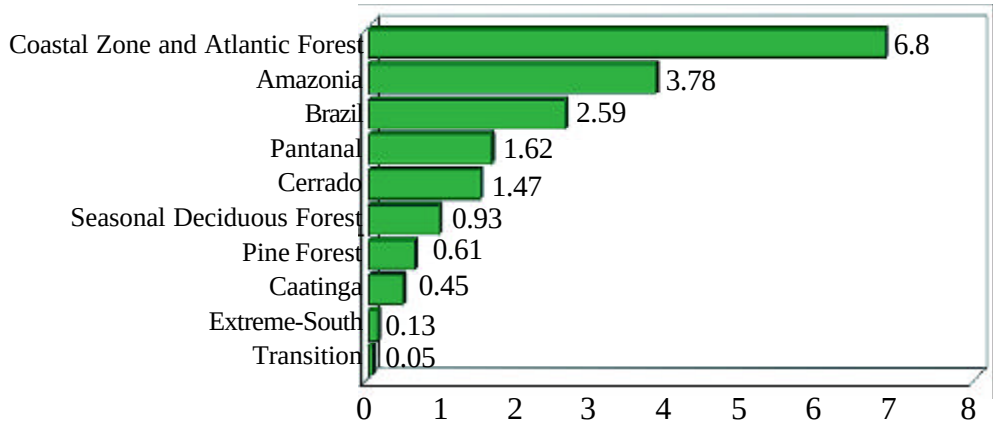

Figure 2-36. Percentages of the area of each of the Brazilian ecoysstems, and of Brazil, in protected areas of indirect use (strictly protected).

Sources: Marino (1997), PNMA (1997).

Ministry of Environment

Chapter III
Institutional Capacity

3.1 Institutional Progress

As early as the l970s, the Brazilian Government began taking steps towards a broader public policy for the environment and the conservation of natural resources. This was partly due to the impact of the United Nations Conference on the Human Environment (Stockholm in 1973) and partly owing to environmental problems in various parts of the country, caused by the rapid growth of cities and the expansion of the agricultural frontier.

The first major step was the establishment of the Special Secretariat for the Environment (Secretaria Especial do Meio Ambiente - SEMA) in 1973, followed by the creation of a number of protected areas (national parks, biological reserves and ecological stations), and of studies for the structuring of a national environment policy.

3.1.1 The National Environment System - SISNAMA

In the early l980s, the National Environment System (Sistema Nacional do Meio Ambiente - SISNAMA) was instituted and the main instruments of environmental policy were defined (Law No. 6938, 31st August 1981, regulated by Decree No. 99.274, 6th June 1990). Environmental control agencies were simultaneously set up in the majority of the Brazilian states (Órgãos Estaduais do Meio Ambiente - OEMAs). Later, municipalities also began creating their own agencies, at first in the state capital cities but today most Brazilian municipalities have established some sort of administrative structure to deal with their specific environmental problems.

The SISNAMA has six components of the Union, the states, the Federal District, municipalities and foundations

instituted by the State, which are responsible for the protection and improvement of the quality of the environment. The structure of SISNAMA is as follows:

I. Highest Organ: Government Council (Conselho do Governo), the functions of which include advising the President of the Republic on the formulation of national policy and government guidelines for the environment and environmental resources. The Chamber of Natural Resource Policies (Câmara de Políticas de Recursos Naturais), established by Decree No. 1.160, 21st June 1994, is part of the Government Council. It is comprised of nine State Ministers, with provision for invited members. This Chamber is responsible for formulating public policies and guidelines related to natural resources, as well as for co-ordinating their implementation. One of the important cases with which this Chamber was involved was the co-ordination of discussions leading to the final text of the law which established a new National Policy for Water Resources (Política Nacional de Recursos Hídricos, Law No. 9.433, 8th January 1997). The Chamber of Natural Resource Policies also has the duty to pronounce on national and regional plans for the regulation of land use and of economic development, as well as on the use of watercourses for the generation of energy. The Commission on Policies for Sustainable Development and for the National Agenda 21 (see next topic) is also connected to the Chamber of Natural Resource Policies.

II. Consultative/Deliberative Organ: the National Environment Council (Conselho Nacional do Meio Ambiente - CONAMA), gives advice, and studies and proposes guidelines on government policies for the environment and natural resources on behalf of the Government Council, and also deliberates, within its field of competence, on norms and standards compatible with an ecologically-balanced environment, essential to a healthy quality of life.

III. Central Organ: the Ministry of Environment - MMA, described below;

IV. Executive Organ: the Brazilian Institute for the Environment and Renewable Natural Resources - IBAMA described below among the organs linked to MMA;

V. Sectorial Organs: the organs or agencies of the direct or indirect Federal Public Administration, the foundations set up by the State, the activities of which are connected with the protection of environmental quality or regulating the use of environmental resources; as well as state organs and agencies responsible for carrying out programmes and projects, and for the control and inspection of activities which might cause environmental degradation and;

VI. Local organs: the state or municipal organs and agencies responsible for the control and inspection of activities referred to in the previous section, within their respective jurisdictions.

A number of Collegiate Organs have been set up in recent years with consultative or deliberative competence on different questions linked to the environment and to biological diversity (Box 3-1).

3.1.2 The Policy Commission for Sustainable Development and the National Agenda 21

In 1994, two years after UNCED, the Brazilian Government fulfilled commitments it had undertaken within the scope of the CBD by setting up the Inter-ministerial Commission for Sustainable Development (Comissão Interministerial para o Desenvolvimento Sustentável - CIDES, Decree No. 1.160, 21st June 1994). As CIDES was never installed, a Commission of Policy for Sustainable Development and the National Agenda 21 (Comissão de Políticas de Desenvolvimento Sustentável e da Agenda 21) was created by a Decree of 26th February, 1997, which replaced CIDES in the ambit of the Chamber of Policies for Natural Resources of the Presidency of the Republic. The aims of the commission are to propose sustainable development strategies and to co-ordinate, establish and monitor the implementation of Agenda 21.

The Commission is chaired by the Executive Secretary of the Ministry of Environment - MMA, and made up of representatives of the Ministries of Planning and Budget, External Relations, and Science and Technology, the Secretariat of Strategic Affairs (Secretaria de Assuntos Estratégicos - SAE) of the Presidency of the Republic, the Secretariat for the Co-ordination of Social Policies (Secretaria de Coordenação de Políticas Sociais) and five civilian representatives.

The Commission has been working on the definition of a methodology for the elaboration of the National Agenda 21, which includes consultations on six critical topics in Brazil. Among these is the management of natural resources, with strong emphasis on the question of biological diversity.

The conclusions and recommendations of this consultation process will give rise to the Brazilian Agenda 21, which will be the main input for the new Pluriannual Development Plan (Plano Pluriannual de Desenvolvimento - PPA) for the period 1999-2003.

3.1.3 The Ministry of Environment - MMA

The Ministry of Environment - MMA is the central organ of the National Environmental System - SISNAMA. A number of institutional experiments within the National Executive preceded its establishment.

The environment was first given priority by the Federal Government with the establishment of the Special Secretariat for the Environment (Secretaria Especial do Meio Ambiente - SEMA, Decree No. 73.030, 30th October 1973) within the (now disbanded) Ministry of the Interior. Decree No. 91.145, 15th March 1985, gave SEMA ministerial status, through the establishment of the Ministry of Urban Development and the Environment (Ministério do Desenvolvimento Urbano e Meio Ambiente - MDU). The Provisional Measure No. 150 and Decree No. 99.180, both of 15th March 1990, established the Special Secretariat for the Environment of the Presidency of the Republic (Secretaria do Meio Ambiente da Presidência da República - SEMAM). In successive transformations, the institution's mandate was widened to cover other administrative sectors, making its organisation more complex and diversified. On November 19th 1992, the Secretariat became the Ministry of Environment (Ministério do Meio Ambiente, Law No. 8.490, 19th November 1992), which later became the Ministry of Environment and Amazon Region (Ministério do Meio Ambiente e da Amazônia Legal, Law No. 8.746, 9th December l993); and the Ministry of Environment, Water Resources and the Amazon Region - MMA through Provisional Measure No. 813, 1st January 1995. MMA´s name was changed to Ministry of Environment by Provisional Measure No. 1795, in January 1st, 1999. The Decree No. 2923 defined MMA´s new structure in 1st January 1999 (Box 3-2).

According to Decree No. 1.205, 1st August 1994, the MMA is expected to plan, co-ordinate, supervise and control activities related to the National Environment Policy (Política Nacional do Meio Ambiente) and the preservation, conservation and rational use of renewable natural resources, and to articulate and co-ordinate the actions of the integrated policy for the Amazon Region, for the improvement in the quality of life of the Amazonian populations. The attributes of the MMA can be summarised as follows:

I. Formulate and carry out the national policy for the environment and articulate actions for the integrated policy for the Amazon Region;

II. Together with the Ministries, organs and agencies of the Federal Government, co-ordinate national and international action related to the national environmental policy and the integrated policy for the Amazon Region;

III. Participate in decision-making processes, both national and international, by means of agreements and negotiations addressing the management of the environment and the integrated policy for the Amazon Region;

IV. Implement technical, scientific and financial co-operation, in support of the national environmental policy;

V. Foster and promote research and scientific and technical studies, at all levels, related to its area of competence, and to publicise the results obtained;

VI. Foster environmental education and the formation of a collective consciousness of the importance of conservation and the natural environment, with a view to the improvement of the quality of life;

VII. Promote the integration of programmes and actions of the Public Federal Administration, and of the states, the Federal District and municipalities, in relation to the environment and renewable natural resources, as well as to the integrated policy for the Amazon Region;

VIII. Formulate, guide and regulate policy for forests, wildlife, fishing and the extraction of latex (rubber);

IX. Implement programmes for the management of watersheds and protection of springs; including the control of river pollution.

The MMA has the following Specific Organs:

(I) The National Environment Council (Conselho Nacional do Meio Ambiente - CONAMA), set up under Law No. 6.938/1981, which determined the National Environment Policy, regulated by Decree No. 99.274/1990, and modified by Decree No. 2.120/1997, is the consultative and deliberative organ of the National Environment System (Sistema Nacional do Meio Ambiente - SISNAMA). CONAMA is chaired by the Minister of Environment, and consists of Plenary and Technical Chambers and has an Executive Secretariat, headed by the Secretary for Integrated Development (Secretário de Desenvolvimento Integrado) of the MMA.

CONAMA is responsible for deciding, whenever it considers it necessary, that studies should be carried out of the alternatives and the possible environmental consequences of public and private projects. To this end, it has powers to require federal, state and municipal organs, as well as private companies, to provide the necessary information for the assessment of environmental impact and the respective reports in the case of major public works or other activities liable to result in significant environmental degradation, particularly in areas considered part of the national heritage. It is also CONAMA's responsibility to establish norms, criteria and standards relating to the control

and maintenance of the quality of the environment, with a view to the rational use of environmental resources, particularly water (Box 3-3). The Council is a collegiate body, representative of the highly varied sectors of Government and civil society which deal directly or indirectly with the environment. The Plenary is composed as follows: one representative of each Ministry, of each Presidential Secretariat and of IBAMA; one representative of each state government and one of the Federal District; representatives of the following bodies - National Confederations of Industry, Trade and Agriculture, the Brazilian Iron and Steel Institute (Instituto Brasileiro de Siderurgia), the Brazilian Association of Sanitary Engineering (Associação Brasileira de Engenharia Sanitária - ABES), the Brazilian Foundation for the Conservation of Nature (Fundação Brasileira para a Conservação da Natureza - FBCN), and the National Association of Municipalities and Environment (Associação Nacional dos Municípios e Meio Ambiente - ANAMMA); representatives of legally constituted associations dealing with the defence of natural resources and combating pollution, freely chosen by the President of the Republic; and legally recognised civilian organisations, representative of each of the country's five geographic regions, which are directly involved in the preservation of environmental quality, and registered in the National Register of Environmental Entities (Cadastro Nacional das Entidades Ambientalistas - CNEA).

CONAMA also includes 10 Permanent Technical Chambers and eight Temporary Technical Chambers. Each Technical Chamber is made up of seven Counsellors who elect a President and a Secretary. The Temporary Technical Chambers are set up as determined by the Plenary for a fixed period, to carry out a specific pre-determined task.

The Permanent Technical Chambers are as follows: Legal Affairs; Environmental Control; Ecosystems; Energy; Coastal management; Mining and Prospecting; Water Resources and Sanitation; Renewable Natural Resources; Transport; and Use of the Soil.

CONAMA meets every three months in the Federal District, but may hold Extraordinary Meetings in or outside the Federal District, as necessary.

The mandate of CONAMA is to:

I. Establish guidelines for government policies for the environment and natural resources;

II. Lay down norms necessary for the execution and implementation of the National Environment Policy;

III. Establish norms and criteria for the licensing of activities potentially or effectively involving pollution;

IV. Determine, whenever necessary, that studies be carried out of the alternatives and the possible environmental consequences of public or private projects. To this end, it has powers to require federal, state and municipal organs, as well as private companies, to provide the necessary information for the assessment of environmental impact and the respective reports in the case of major public or private works or other activities that may produce significant degradation of the environment;

V. As the last administrative court of appeal, decide, subsequent to a bank deposit, on the fines and other penalties imposed by IBAMA;

VI. Review and authorise accords which transform monetary penalties into the obligation to carry out measures of interest to environmental protection;

VII. Establish national norms and standards for the control of pollution caused by land motor vehicles, aircraft and boats/ships;

VIII. Establish norms, criteria and standards relating to the control and maintenance of the quality of the environment with a view to the rational use of environmental resources, especially water;

IX. Establish general norms in relation to Conservation Units (protected areas), and the activities that may be carried out in the surrounding areas; and

X. Establish the criteria for declaration of areas which are critical, saturated or in the process of saturation in terms of human activities.

CONAMA decides by means of Resolutions when the subject relates to deliberations linked to its legal competence and by Motions for other environmental topics.

(II) National Council for the Amazon Region. The principal mandate of the National Council for the Amazon Region (Conselho Nacional da Amazônia Legal - CONAMAZ), regulated by Decree No. 1541, 27th June 1995, is to advise the President of the Republic on the formulation and monitoring of the national integrated policy for the Amazon. It is composed of all the State Ministers, as well as the nine Amazonian State Governors (Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima and Tocantins). The sessions of the Council are convened and chaired by the President of the Republic in person, and its Executive Secretariat is the Secretariat for the Co-ordination of Amazonia (Secretaria de Coordenação da Amazônia) of the MMA.

Three Inter-sectorial Groups have been set up in order to permit CONAMAZ to monitor and implement the National Integrated Policy for the Amazon Region (Política Nacional Integrada da Amazônia Legal). Each deals with one of the Council's three main policies: the Reorientation of Economic Growth; Internal and External Integration, and Human and

Social Enhancement. The Groups are composed of representatives from the various ministries and the state governments of the region.

The Nucleus of Support for the Integrated Policies for Amazonia (Núcleo de Apoio às Políticas Integradas para a Amazônia) was established in order to advise and assist the Secretariat for the Co-ordination of Amazonia and the Inter-Sectorial Groups on matters related to the monitoring and evaluation of actions for the implementation of the National Integrated Policy for Amazonia.

The mandate of CONAMAZ is:

I. To propose and co-ordinate the national integrated policy for the Amazon Region, together with the state and municipal governments, taking into account all socio-economic dimensions and the demands of sustainable development, enhancement of the quality of life for the Amazon populations, and the protection and preservation of the Amazon environment;

II. To co-ordinate policies that harmonise the action of federal organs for the benefit of the Amazon populations;

III. To co-ordinate actions for the implementation of these policies and to respond to situations that demand special or emergency measures;

IV. To monitor the implementation of the integrated policy and initiatives co-ordinated at the federal level for the Amazon Region;

V. Give opinions on draft laws relating to the action of the Federal Government in the Amazon Region;

VI. Deliberate on and propose measures on events and situations connected with the Amazon Region which demand prompt and co-ordinated action from the Federal Government.

(III) Committee of the National Environment Fund. The National Environment Fund (Fundo Nacional do Meio Ambiente - FNMA) is more than a mere official organ to finance environmental projects. It is the only organ in the federal sphere which can deal directly with any municipality in the country. It also represents a special interface between the plans of the public administration, NGOs and civilians.

The FNMA is administered by a committee chaired by the Minister of Environment, and consists of 12 representatives of the Federal Government and civil society. Its present composition is: three representatives of the MMA; three representatives of IBAMA; one representative of the Ministry of Planning and the Budget; and five representatives of environmental non governmental organisations, one for each region of the country.

The FNMA was established by Law No. 7.797, 10th July 1989. Its resources come from the Inter-American Development Bank - IDB, budgetary contributions from the Union, donations, monetary contributions, goods and real-estate received from individuals and companies, income arising from its assets, and other contributions determined by law.

A fundamental element of the National Environmental Policy, and linked to the MMA, is decentralisation through the financing of small to medium-sized projects for the sustainable use of natural resources, or the preservation and recovery of environmental quality.

FNMA support can be given both to governmental and non governmental, non-profit, environmental organisations. A manual is available which details the pre-requisites for the submission of projects to FNMA.

Owing to the wide spectrum of environmental problems, guidelines have been established to cover projects with an innovative nature and a multiplying effect within the following areas: Forestry Extension; Sustainable Management and Conservation of Renewable Natural Resources; Protected Areas; Environmental Education and Information; Environmental Control; Technological Research and Development; and Institutional Development and Strengthening.

The FNMA has already given support to 515 projects distributed across these thematic areas, throughout the country, contributing to the enhancement of the quality of life of the Brazilian population.

(IV) The Executive Secretariat (Secretaria Executiva - SECEX) is the organ for direct and immediate assistance to the Minister of State for the MMA.

The mandate of the Secretariat is:

I. To supervise the planning, budgeting and programming activities of the Ministry;

II. To co-ordinate and forward draft Laws, Provisional Measures and Decrees of interest to the Ministry to the Presidency of the Republic;

III. To assist the Minister of Environment in the formulation and implementation of matters included in the fields of competence of the Ministry;

IV. To chair the Commission on Policies for Sustainable Development and the National Agenda 21.

(V) The Secretariat for the Co-ordination of Environmental Affairs (Secretaria de Coordenação dos Assuntos do Meio Ambiente - SMA) is directly linked to the Minister of Environment. It is responsible for planning, co-ordinating,

supervising, controlling and promoting the execution of national policy for the environment and the preservation, conservation and sustainable use of renewable natural resources. The Department of Environmental Management (Departamento de Gestão Ambiental - DEGAM) is responsible for planning, monitoring, supervising and evaluating the implementation of the policies and guidelines for the environment and renewable natural resources; promoting action in connection with commitments made in conventions, agreements and international acts, as well as mechanisms for environmental management. The Department of Formulation of Environmental Policies and Programmes (Departamento de Formulação de Políticas e Programas Ambientais - DEPAM) has two sectors: the Co-ordination of the Sustainable Use of Renewable Resources (Coordenação de Políticas de Uso Sustentável do Recursos Naturais - COREN) and the General Co-ordination of Biological Diversity (Coordenação Geral de Diversidade Biológica - COBIO). DEPAM is responsible for formulating, co-ordinating and evaluating environmental policies and programmes for the environment and renewable natural resources, as well as proposing guidelines for their execution, promoting measures in connection with commitments made in conventions, agreements and international acts, the formulation of environmental policies and programmes; and provision of the technical and administrative support to the National Environment Council (CONAMA).

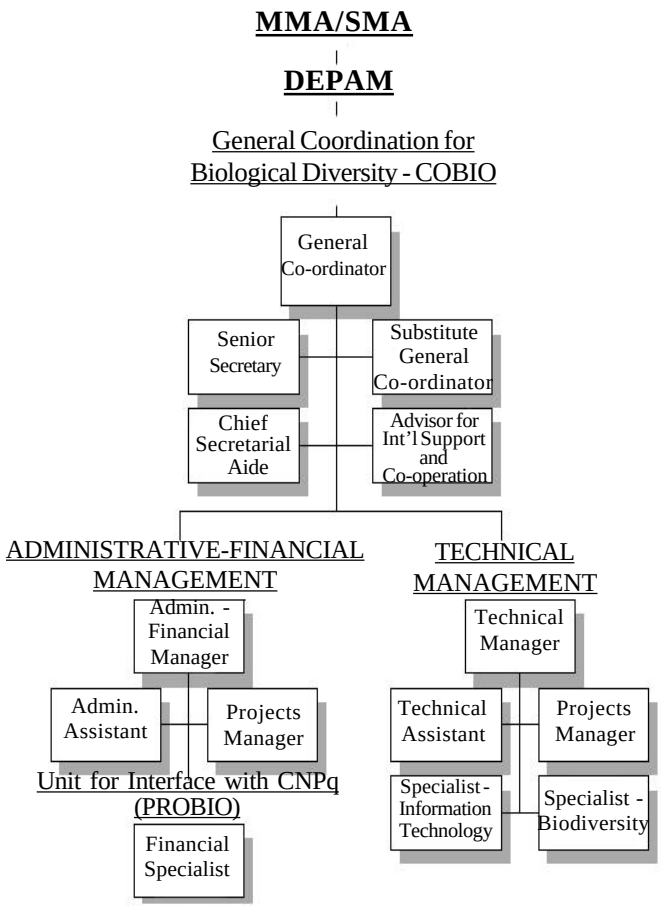

Figure 3-1. The hierarchical governmental strucutre for the implementation of the Convention on Biological Diversity.
Obs.: See Box 3-3 for changes in this structure.

The General Co-ordination of Biological Diversity (COBIO) formulates and proposes policies and guidelines, and develops and co-ordinates a national policy for the conservation and preservation of biological diversity. It also defines integrated models of in situ and ex situ genetic biodiversity conservation and manages the biological diversity programmes.

COBIO has a structure specially designed to carry out programmes in this area: a General Co-ordination (also responsible for planning), an Administrative-Financial Directorate and a Technical Directorate. The latter deals with the technical execution of projects related to biodiversity and information.

The National Environmental Programme (Programa Nacional do Meio Ambiente - PNMA) and the National Environment Fund - FNMA are both linked to the SMA.

(VI) The Secretariat for the Co-ordination of Affairs of the Amazon Region (Secretaria de Coordenação dos Assuntos da Amazônia Legal - SMA) responds directly to the State Minister of State, and co-ordinates, supervises and monitors action related to the national integrated policy for the Amazon Region, as well as co-operation between public organs and governmental and international agencies, and provides technical and administrative support for the National Council for the Amazon Region - CONAMAZ. The Secretariat is also responsible for the co-ordination of the Pilot Program for the Conservation of the Brazilian Rain Forest - PPG-7, the National Integrated Policy for the Amazon Region and the Amazonia Agenda 21.

(VII) The Secretariat for Water Resources (Secretaria de Recursos Hídricos - SRH) has the task of ensuring that the specific legislation related to water resources and water bodies is carried out, as well as the planning, supervision, control, execution of the National Policy for Water Resources and the Agricultural Use of Water (Política Nacional de Recursos Hídricos e do Aproveitamento Hidroagrícola), and for guiding, encouraging and co-operating with public and private entities to carry out research and studies concerning the sustainable use of water resources.

The National Council for Water Resources (Conselho Nacional de Recursos Hídricos) was created in 1997 (Law No. 9,443, 8th January 1997; a Law of Administrative Organisation), and the Secretariat for Water Resources acts as its Executive Secretariat.

(VIII) The Secretariat for the Co-ordination of Affairs of Integrated Development (Secretaria de Coordenação dos Assuntos de Desenvolvimento Integrado - SDI) is responsible for implementing and consolidating plans, programmes and special projects of the Ministry, accompanied and supervised by the Executive Secretariat. It also acts as the Secretariat of CONAMA and co-ordinates the Policies for the Sustainable Use of Renewable Natural Resources, in particular the Forest Policy.

3.1.4 The Brazilian Institute for the Environment and Renewable Natural Resources - IBAMA

The Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA) was created in 1989 by Law No. 7.735, 22nd February 1989. It is the central executive agency for Brazilian environmental policy. IBAMA took over the functions of a number of organs, including the Brazilian Institute for Forest Development (Instituto Brasileiro de Desenvolvimento Florestal - IBDF), the Superintendency for the Development of Fisheries (Superintendência do Desenvolvimento da Pesca - SUDEPE), the Superintendency for the Development of Rubber (Superintendência do Desenvolvimento da Borracha - SUDHEVEA), and the Special Secretariat for the Environment (Secretaria Especial do Meio Ambiente - SEMA).

IBAMA is an autarchy, with financial and administrative autonomy, connected to the MMA. Its mission is to carry out national environmental policies aiming to conserve and restore environmental quality for the present and future generations. In particular, IBAMA's mandate includes the following:

- Reduction of the prejudicial effects and prevent accidents arising from the use of agrotoxic chemicals and related substances and their residues;
- Promotion of the adoption of measures which control the production, use, commercialisation, transport and the destination of potentially dangerous chemical substances and their residues;
- Environmental monitoring at national and regional levels;
- Intervention in development projects involving significant environmental impacts, at national and regional levels;
- The monitoring of changes in the environment and natural resources;
- The administration, protection and quality control of water resources;
- The maintenance of the integrity of Areas of Permanent Preservation and legal reserves;
- The control and management of fisheries in Brazilian waters under the dominion of the State;
- The control and management of the use of forest resources;
- The monitoring of the conservation status of Brazilian ecosystems, species, and the genetic heritage of the country;
- The promotion measures for the protection and management of the Brazilian fauna and flora;
- The promotion of research, information, and scientific and technical development in environmental administration and management;
- The facilitation and promotion of access to, and the sustainable use of, natural resources;
- The development of analytical studies, of status and future prospects, scenarios, and possibilities, for environmental planning.

The basic structure of IBAMA is comprised of the Presidency of the Institute; eight advisory units (President's office [Gabinete], Planning Office [Coordenadoria Geral de Planejamento], Legal Department [Procuradoria Jurídica], Auditing Department [Auditoria], Ombudsman [Ouvidoria], International Advisory Department [Assessoria Internacional], Parliamentary Advisory Department [Assessoria Parlamentar] and Social Communication Advisory Department [Assessoria de Comunicação Social]); five higher advisory organs (Directorate of Control and Inspection [Diretoria de Controle e Fiscalização - DIRCOF], Directorate of Ecosystems [Diretoria de Ecossistemas - DIREC], Directorate of Renewable Natural Resources [Diretoria de Recursos Naturais Renováveis - DIREN], Directorate of Incentives to Research and Information [Diretoria de Pesquisa e Divulgação - DIRPED] and the Directorate of Finances and Administration [Diretoria de Administração e Financas - DIRAF]); four collegiate organs (the National Council for the Protection of Fauna [Conselho Nacional de Proteção à Fauna], the National Council for Protected Areas [Conselho Nacional de Unidades de Conservação - CNUC], Scientific and Technical Committee [Comitê Técnico-Científico] and the Regional Co-ordination Councils [Conselhos de Coordenação Regional]). The following organs also form part of the basic structure: the National Centre for the Development of Traditional Populations [Centro Nacional de Desenvolvimento das Populações Tradicionais - CNPT], the National Centre for Research on Tropical Fish [Centro Nacional de Pesquisas de Peixes Tropicais - CEPTA], superintendencies in each of the 27 states, a set of Specialised Units, protected

areas and several Multifunctional Units, all of them decentralised.

I - Support Units

The direct advisory units are responsible, together with DIRAF, for supervision, internal control, support, marketing, international relations, parliamentary relations and public relations, legal assistance and defence as well as for the provision of resources for Institute's functioning.

II –Directorates

The Directorates are responsible for the formulation and drafting of programmes and projects, which, once approved by the President, form part of the annual or pluriannual Institutional Action Plan of the autarchy. They are also responsible for defining, co-ordinating and supervising the activities of local organs.

The Directorate of Control and Inspection - DIRCOF is responsible for the planning and guidance of activities in inspection, control, monitoring, licensing and the management of environmental quality. DIRCOF has three departments: Inspection (Departamento de Fiscalização - DEFIS), Records and Licensing (Departamento de Registros e Licenciamento - DEREL) and Environmental Quality (Departamento de Qualidade Ambiental - DEAMB), the responsibilities of which are to co-ordinate national programmes within DIRCOF's mandate, namely:

1. National Programme for the Control of Pollution by Motor Vehicles [Programa Nacional de Controle da Poluição por Veículos Automotores - PROCONVE];
2. National Programme for Air Quality Control [Programa Nacional de Controle da Qualidade do Ar - PRONAR]
3. National Programme for the Control of Sound Pollution - Noise Abatement Programme [Programa Nacional de Controle da Poluição Sonora - Programa ´Silêncio´];
4. National Programme for the Control of Chemical Substances [Programa Nacional de Controle das Substâncias Químicas];
5. National Programme for the Control of Mining Activities [Programa Nacional de Controle das Atividades de Mineração];
6. National System for the Prevention and Control of Forest Fires [Sistema Nacional de Prevenção e Combate aos Incêndios Florestais - PREVFOGO];
7. Programme for the Environmental Management of Water Resources (Priority) [Programa de Gestão Ambiental dos Recursos Hídricos];
8. Programme for Environmental Monitoring (Priority) [Programa de Monitoramento Ambiental];
9. Programme for Environmental Control and Inspection (Priority) [Programa de Controle e Fiscalização Ambiental]

The Directorate of Ecosystems - DIREC is responsible for the planning and supervision of activities related to the conservation of ecosystems and species and wildlife management, aiming for the maintenance of biodiversity. It has two departments, one dealing with protected areas (Departamento de Unidades de Conservação - DEUC), and the other with wildlife (Departamento de Vida Silvestre - DEVIS), and both responsible for the national co-ordination of programmes and projects under DIREC's responsibility.

1. Programme for the Consolidation of the System of National Conservation Units - SNUC

   Programa de Consolidação do Sistema Nacional de Unidades de Conservação - SNUC;

2. Programme for the Conservation and Management of Ecosystems and Wildlife

   Programa de Conservação e Manejo de Ecossistemas e Vida Silvestre.

In addition to the above programmes, DIREC is the representative of IBAMA and responsible for developing a number of conservation projects supported by the Deutsche Gesellschaft für Technische Zusammenarbeit - GTZ, as well as implementing the regulations of the International Convention on Endangered Species of Flora and Fauna - CITES, of which Brazil is a signatory. For this, DIREC counts on several research centres and infrastructure specifically designed for developing special projects.

National Centre for the Conservation and Management of Marine Turtles - Tamar (Centro Nacional de Conservação a Manejo de Tartarugas Marinhas - TAMAR): begun in 1979, the Tamar Project has its own headquarters, along with numerous field bases on the Brazilian coast. Besides working for the protection of marine turtles, the project carries out studies of female behaviour in the breeding season, surveys to estimate population sizes, and research on migratory routes.

The National Centre for the Conservation and Management of Amazonian Turtles - CENAQUA (Centro Nacional de Conservação e Manejo de Quelônios da Amazônia -CENAQUA): set up in 1990, with its own headquarters and bases in all nine of the Amazonian states, CENAQUA protects turtle nesting beaches, carries out research on the species, and develops socio-economic, environmental programmes for local communities.

National Centre for the Conservation and Management of Carnivore Predators - CENAP (Centro Nacional de Conservação e Manejo de Carnívoros Predadores - CENAP): set up in 1994, CENAP protects Brazilian mammals of the Order Carnivora, most of which are on the endangered species list, by countering clandestine hunting and the destruction of habitats.

National Centre for Conservation and Management of Sirenia (Manatee Project) (Centro Nacional de Conservação e Manejo de Sirênios - Projeto Peixe-boi): begun in 1980, with field bases in several sites where the species is found on the north-east coast and in Amazonia, the project focuses primarily on protecting the West Indian and Amazon manatees, studying their biology, identifying their current distributions, working on proposals for conservation measures (especially for protected areas), and environmental education projects.

Research Centre for Wild Bird Conservation - CEMAVE (Centro de Pesquisas para a Conservação de Aves Silvestres - CEMAVE); set up in 1977, CEMAVE co-ordinates the country-wide bird-ringing programme, important especially for the study of migration patterns, as well as developing and carrying out conservation and research projects.

National Centre for the Study, Protection and Management of Caves - CECAVE) (Centro Nacional de Estudos, Proteção e Manejo de Cavernas - CECAVE): was set up for the protection of caves and the development of programmes to organise their exploration and mapping, tourism, scientific expeditions and environmental education.

Other relevant projects for biodiversity conservation under the responsibility of DIREC are:

- The Otter Project (Projeto Lontra). The Neotropical otter, Lutra longicaudis, occurs throughout Brazil, but is considered a threatened species. Where it occurs it is a bioindicator of environmental health, disappearing as it does rapidly when its habitat, especially water quality, is degraded. It is still common along the coast and inland in southern Brazil, and this project is being carried out in collaboration with the Federal University of Santa Catarina.
- The Spinner Dolphin Project (Projeto Golfinho Rotador). This project is studying the biology and reproductive behaviour of spinner dolphins, Stenella longirostris, in the archipelago of Fernando de Noronha, one of the main breeding grounds in the southern Atlantic.
- The Marine Mammals of the South Coast Project (Projeto Mamíferos Marinhos do Litoral Sul). This project monitors and studies the two known summer breeding grounds of South American sea lions, Otaria flavescens, and the South American fur seal, Arctocephalus australis, on the coast of Rio Grande City, in the state Rio Grande do Sul.
- The Brazilian Orchids Project (Projeto Orquídeas Brasileiras). This project involves the study of orchids which are threatened, and in some cases even believed extinct in the wild. It is based at the National Orchid Centre (Orquidário Nacional) of IBAMA.

The Directorate of Natural Renewable Natural Resources - DIREN is responsible for the planning and supervision of activities involving the sustainable use of natural resources. It is made up of three departments: Forest Resources (Departamento de Recursos Florestais), Fishery and Aquaculture (Departamento de Pesca e Aquicultura), and commercialisation and manufacture (Departamento de Comercialização e Transformação). DIREN is also responsible for management of National Forests (FLONAs), for regulating fisheries and forestry and for co-ordinating the following priority programmes:

1. Forestry Programme
2. Programme for control and commercialisation of plant resources.
3. Programme for regulating fisheries.

The National Centre for Developing Traditional Populations - CNPT, the National Centre for Research on Tropical Fish - CEPTA and the Laboratory for Forestry Products - LPF provide significant support for DIREN's activities.

CNPT is responsible for the development of socio-environmental activities with traditional populations and for the administration of the Extractivist Reserves (RESEXs). CEPTA, set up 18 years ago, has as its main objective the production, adaptation and dissemination of scientific research and technology for fish culture. It has a modern and specialised infra-structure for developing its programmes, as well as for carrying out research and training. LPF was set up in 1973, and carries out research in wood technology and forest products. The main emphasis is on divulging technology by means of basic and advanced training of professionals, as well as teaching and research institutions and companies.

The Directorate for Stimulating Research and Information - DIRPED plans and supervises research, technological development, environmental information and education and documentation. It is composed of two departments: Study and Research Advancement (Departamento de Incentivo a Estudos e Pesquisa), and Technical-Scientific Diffusion (Departamento de Divulgação Técnico-Científico). DIRPED is responsible for co-ordinating the National System of Information on the Environment (Sistema Nacional de Infor-

mações sobre o Meio Ambiente - SINIMA) and for the following priority programmes:

1. Programme for Environmental Education and Technical-Scientific Information;
2. Associated Programme for Environmental Research;
3. Programme of Analysis and Environmental Licensing.

DIRPED is also responsible for national co-ordination of the activities of Centre for Fishery Research and Extension in the North-East (Centro de Pesquisa e Extensão Pesqueira do Nordeste - CEPENE), the Centre for Fishery Research and Extension in the North (Centro de Pesquisa e Extensão Pesqueira do Norte - CEPNOR), Centre for Fishery Research and Extension in the South (Centro de Pesquisa e Extensão Pesqueira do Sul - CEPSUL) and the Centre for Remote Sensing (Centro de Sensoriamento Remoto -CSR) which are currently being reorganised to align their activities with the priority objectives of IBAMA regarding monitoring environmental change, using the most modern techniques and technology over the entire country, and the management of coastal waters.

III - Collegiate Organs

In order to carry out its functions satisfactorily, IBAMA has adopted a collegiate system, on the one hand using internal committees to advise the President in formulating and implementing institutional directives and on the other through committees with external participation to advise the President in the formulation and elaboration of proposals for directives and measures necessary for the Federal Government's role in environmental policy.

1 - Collegiate Advisory Committees

Besides the Directorates which run the organ in a collegiate manner, IBAMA maintains three Regional Co-ordination Councils (Conselhos de Coordenação Regional). These are composed of the state superintendents, and their main function is to define environmental management agenda for institutional action within each region. The actions and directives of the Regional Co-ordination Councils are proactive and complementary to those of the Collegiate Directorate. They focus on the regional context as a point of reference for organising and establishing mechanisms for regulation, control and intervention, as well as establishing priority measures for the environment and the institution.

2 - Consultative Collegiate Bodies

The main objective of the National Council for Protected Areas (Conselho Nacional de Unidades de Conservação - CNUC) is to draw up general policy guidelines for the creation, enhancement and use of protected areas. The National Council for Fauna Protection (Conselho Nacional de Proteção à Fauna -CNPA) studies and proposes general directives for the protection and management of fauna. The Technical-Scientific Committee (Comitê Técnico-Científico) sets out directives for promoting and disseminating research and technological development, and evaluates the scientific and technological output of the IBAMA programmes and projects. This committee reports directly to the President of IBAMA.

IV - Protected Areas

These are territorial spaces and their components, including waters under the country's jurisdiction, which have relevant natural characteristics, and which are legally designated by the Government as conservation/protected areas with defined limits and a special administrative regime designed to guarantees their protection. At present, IBAMA is responsible for the administration and management of 184 protected areas.

V - Specialised Units

These are centres for regional management, research, species conservation and management, development of technology, monitoring, and environmental information. There are 14 of these centres linked to IBAMA, at strategic locations throughout the country.

VI - Multifunction Units

These are regional agencies in strategic locations to facilitate the ongoing programs of IBAMA. At present their activities are restricted, but they are currently being prepared to respond in loco to a wider range of requirements concerning environmental policy under the responsibility of IBAMA. There are 390 posts over the country, all being reviewed, reorganised and substantially streamlined.

3.1.5 The Rio de Janeiro Botanical Garden Research Institute

The Rio de Janeiro Botanical Garden (Jardim Botânico do Rio de Janeiro) was created by D. João VI in 1808 in order to acclimatise non-native plants. Over nearly two centuries, its name and status were changed from the Royal Garden (Real Horto), to The Royal Botanical Garden (Real Jardim Botânico), subsequently the Rio de Janeiro Botanical Garden (Jardim Botânico do Rio de Janeiro) and finally, by Provisional Measure No. 813, 1st January 1996, to the Rio de Janeiro Botanical Garden Research Institute (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro).

It has been subordinated to the Imperial Fluminense Institute for Agriculture (Imperial Instituto Fluminense de Agricultura), the Institute for Plant Biology (Instituto de Bi-

ologia Vegetal), the Forest Service (Serviço Florestal), the Brazilian Institute for Forestry Development (Instituto Brasileiro de Desenvolvimento Florestal - IBDF) and IBAMA. It is now linked directly to the Ministry of Environment (MMA).

Covering about 137 ha, 67 ha of which are cultivated (the Arboretum), the Rio de Janeiro Botanical Garden Research Institute maintains a collection of considerable scientific, historical and artistic interest. Scientific research there concentrates on the propagation, preservation and conservation of tropical flora, besides their programmes in environmental education and the development and conservation of its live and preserved scientific collections.

The mission of the Research Institute is to... "promote, carry out and divulge technical and scientific research on the flora of Brazil to know and conserve biological diversity, and maintain the reference collections under its responsibility."

The Botanical Garden carries out research on community ecology and phytosociology in various parts of the country, and on the biology and seed technology of native species and commercially important fruit trees, as well as ornamental and medicinal plants. It also develops specific projects for environmental conservation and management, and promotes the exchange of species and of information, nationally and internationally.

It has scientific collections totalling some 330,000 specimens of dried plants in the herbarium, besides the live collections in the Arboretum and greenhouses, along with a photographic library of some 9,000 dried plants; 6,100 dried fruits; 8,000 samples of wood, and a collection of 20,000 microscope slides. The Library is one of the most important in Latin America, with 66,000 volumes and 3,000 rare works.

Following the recommendations of the Convention on Biological Diversity, the Rio de Janeiro Botanical Garden Research Institute is setting up a Policy for Collection and Access to Genetic Resources (Política de Coleção e Acesso a Recursos Genéticos) to regulate the representation, acquisition and transfer of plant specimens in its scientific collection. Together with botanical gardens in other countries, it participates in the ´Botanic Garden Policy on Access and Benefit-Sharing Pilot Project´, the main purpose of which is to facilitate exchanges between countries for bioprospection, including the equitable sharing of the benefits, and considering their importance in the science, conservation and education.

The Atlantic Forest Programme (Programa Mata Atlântica), begun in 1988 in collaboration with the Government, private enterprise and national and international NGOs, involves research in forest fragments, particularly protected areas. The programme has three components: Floristic and Environmental Inventories (Projeto Levantamentos Florísticos e Ambientais), Revegetation (Projeto Revegetação), and Information and Services (Projeto Centro de Informações e Serviços). Amongst its main objectives are: quantitative and qualitative studies of the forested areas of Rio de Janeiro; improvement of methodologies for biodiversity inventories, the elaboration of models for revegetation with native species, and conservation of the biological communities. The project phase include: phenological studies of selected species and seed collection for research on germination and propagation; anatomical studies, especially of wood with respect to its potential as timber, monitoring Atlantic Forest fragments; and producing vegetation maps through surveys and inventories to monitoring forest cover. Other important activities include maintaining and up-dating a computer data bank, publications, and training.

The broad aim of the Coastal Zone Programme (Programa Zona Costeira), begun in 1996, is to increase our knowledge of THE continental and marine ecosystems, and promote their conservation and management. It has two components. The Restinga Project (Projeto Restinga) involves studies of the flora of the sandy coastal plains, the structure, dynamics and regeneration of the plant communities, the preservation of the ethno-botanical traditions of local communities, computer data banks, and the use of geographic information systems. The Marine Ecosystems Project (Projeto Ecossistemas Marinhos) involves research on the diversity of Brazil's marine flora, on the structure and dynamics of the populations and communities of marine plants important for their conservation, on natural banks of economically important species and systems important for their cultivation and management, and the selection and use of plant species to monitor the recovery of areas subject to adverse environmental impacts. The Programme is also involved in training and qualification.

The Taxonomic Diversity Programme (Programa Diversidade Taxonômica), set up in 1996, combines all the research on plant taxonomy traditionally carried out at the Institute. Its aim is the advancement of knowledge on the composition and diversity of the Brazilian flora by taxonomic and anatomical research in representative groups, and the documentation of the present composition of native floras through its representation in the national institutional collections. This programme also involves training and qualification, the publication of monographs and taxonomic and geographic revisions of relevant groups, and the organisation, maintenance and expansion of national collections including herbaria, carpothecas (fruits), xylothecas (wood samples), and arboreta, and the computerisation of data banks. It includes three components:

1. The Taxonomic Advances and Botanic Collections Project (Projeto Avanços Taxonômicos e Coleções

Botânicas) introduces and encourage specific lines of taxonomic research, in complex groups and/or those representative of Brazilian flora, as well as projects for inventorying regional flora. It includes postgraduate courses, expansion of the Herbarium, concentrating particularly on poorly represented species and groups, and training in taxonomic research;

2. The Flora of the State of Rio de Janeiro Project (Projeto Flora do Estado do Rio de Janeiro) is documenting the composition and diversity of the flora of Rio de Janeiro, with special attention given to the remaining forest fragments and areas which have been under explored to date. It involves the establishment of a nucleus for the taxonomic study of the flora of the state, co-ordinated by the Institute, in collaboration with similar institutions, and will define the most significant areas in terms of taxonomic diversity and species, and contribute data for a phytogeographic map of the state, and conservation strategies for the state's flora.
3. The Project for Anatomic and Ultra-structural Progress (Projeto Avanços Anatômicos e Ultraestruturais) involves anatomic and ultra-structural research on the native plant species of Brazil, with special attention being given to species in isolated and under explored forest fragments.

The Conservation Programme (Programa Conservação) was begun in 1996 specifically to carry out research on the conservation of rare and endangered species, besides establishing strategies for the conservation of species in botanical gardens. It has two components.

1. The *In situ* Conservation Project (Projeto Conservação *In situ*) promotes research on the conservation of species, genetic viability, and evolutionary processes in natural habitats. In the first phase, studies are being carried out on the genetic structure and population dynamics of pau brasil trees in Rio de Janeiro for the management of the forest fragments where they occur.
2. The *Ex situ* Conservation Project (Projeto Conservação *Ex situ*) promotes research on the conservation of species in germplasm banks. In the short term, priority is being given to assays of the ecophysiology of germination of pau brasil seeds from the Região dos Lagos (RJ), and also research on desiccation tolerance levels of seeds for their storage in seed banks.

The Special Collections Programme (Programa Especial Acervo), begun in 1996, combines the scientific collections of the Institute (the herbarium, carpotheca, xylotheca, and that of the Barbosa Rodrigues Library). The Herbarium, founded in 1890, has scientific documentation of international significance, especially for the Brazilian flora. Represented in this collection is the extraordinary diversity of species to be found in such as the Amazon rain forest, the Atlantic forest, the Cerrado, restinga formations, and the Pantanal, as well as rare specimens from other South American countries and Europe. There is a data bank which is widely consulted by professionals with a broad range of interests. Scientific exchange involves some 200 institutions in Brazil and abroad.

The Herbarium, Carpotheca and Xylotheca Project (Projeto Herbário, Carpoteca e Xiloteca) provides the infrastructure for the organisation, maintenance, preservation and expansion of the collections, as well as instant access to the data and information it contains, and the basis for taxonomic, floral, phytosociological, phytogeographic, ethnobotanical and anatomical research. Specifically, it supports laboratory research, field studies and institutional projects, and the demands of visiting researchers, schools, universities, postgraduate courses and the community in general. The collections act as a repository of information on the composition of the flora in areas where the vegetation is degraded or subject to imminent or future human impacts. The project makes provision for scientific interchange (loans, donations for identification and exchange of services) with similar institutions and includes the maintenance of a data base with information on each species. The project also involves inventories of the botanical collections, the photographic library and historical collections, as well as training in herbarium curation, in scientific exchange, cataloguing techniques, inventories and scientific nomenclature.

Over the years, the Library Project (Projeto Biblioteca) has brought together works of priceless scientific, cultural and historical value. The stock is composed of collections of books, periodicals, leaflets, iconography, theses and specialised material on botany and related areas. Included are around 3,000 rare and classic scientific publications, dating back to the 16th century.

The Special Scientific Computation Programme (Programa Especial de Computação Científica) covers all areas of the applications of computer technology to research and the cataloguing of the collections. Components include: assistance for researchers and components of other programmes (Projeto de Atendimento/Suporte Computacional); and the establishment and maintenance of a data bank and appropriate support for users in the inclusion, editing and retrieval of data (Projeto Criação e Manutenção de Banco de Dados). The data bank includes complete cross-referenced information on the living collections, the Arboretum, Bromelarium, Insectivorous Plants, Orchidarium, and Medicinal Plants, as well as on the reference collections, including the Library, Herbarium, Xylotheca and Carpotheca.

The Co-ordination of Studies and Research (Coordenadoria de Estudos e Pesquisas) has four laboratories to support the research programmes:

The Nursery (Horto Florestal) produces seedlings of ornamental plants, palm trees and fruit trees, with special emphasis on threatened species. It also serves as a support laboratory for programmes and research projects on ex situ conservation and the cultivation of exemplars sent in by the programmes. In addition, it offers technical guidance for the recovery of degraded areas and urban tree-planting, maintains interchange with similar institutions, and sells seedlings to the public.

The Seed Laboratory (Laboratório de Sementes) supports institutional programmes carrying out research on seed ecophysiology. It includes a Seed Bank for, on average, 150 tree species stocked in the short term, collected from the Rio de Janeiro Botanical Gardens Arboretum (JBRJ) and protected areas. Seed stocks are exchanged with a number of similar institutions, both in Brazil and abroad through the Index Seminum.

The Laboratory of Plant Anatomy (Laboratório de Anatomia Vegetal) supports research programmes and projects, preparing permanent slides of plant and wood anatomy, using both optical and scanning electron microscopes. It is the only laboratory in the state of Rio de Janeiro which has a (xylotheca) of wood samples from Brazil and abroad.

The Geoprocessing Laboratory (Laboratório de Geoprocessamento) plans, executes, evaluates, and maps vegetation surveys using remote sensing and geoprocessing techniques in collaboration with floristic survey projects.

The Arboretum occupies an area of 67 ha (67,000 m²), and houses native and non-native species of inestimable scientific value including plants from a number of Brazilian ecosystems (Amazonia, tropical forest, Cerrado and Caatinga) and non-Brazilian species (Asian and Mexican flora). In all, the arboretum contains some 8,200 species and 40,000 specimens (July 1993) and six hothouses (Cactus, Insectivorous Plants, Orchidarium, Medicinal Plants and Bromeliarium). The area cultivated extends into a forest reserve of 147.06 ha, adjacent to the Tijuca National Park.

The Co-ordination of Cultural Activities (Coordenadoria de Extensão Cultural) plans, co-ordinates and executes educational activities and environmental interpretation, and publicises the Institute's activities and research. There are eight components as follows.

The Environmental Education Programme, the objective of which is to change behaviour and attitudes towards environmental questions. This programme has two Projects:

The ´Knowing Our Botanic Garden´ Project (Projeto ´Conhecendo Nosso Jardim´): this gives specific guidance to teachers of the full educational potential available for school visits the Arboretum. The ´Basic Route´, the first phase of which has already been set-up, trains teachers of kindergartens, primary and secondary schools. As they are taken round the huge hothouses of the Arboretum they receive information on plant species, the history of the institution, and the regulations for public use, along with hints as to how to maintain the children's attention. A video tape is available (´Stories of the Botanical Gardens´) and a booklet ´Notebook l- Basic Route´ produced by the Nucleus for Environmental Education. The training programme also stimulates the teacher to develop environmental educational activities, suited to the level of the classes they work with. The teachers receive a certificate which allows them to program school outings.

The "Teaching Laboratory" Project (Projeto ´Laboratório Didático´) offers schoolchildren space to develop educational and creative games in natural history for the discussion of ideas and experimentation. Educational activities are developed, based on a particular theme and presented in the appropriate environment with a children's book on the subject. They include: making up stories, looking at botanical material, painting and artistic activities, educational games, and the use of videotapes and books from the library. Open-air activities are also encouraged, such as the observation of plants and specimens, workshops for recycling and re-using materials, and other activities which increase the awareness of the children.

The Environmental Interpretation Programme provides for a dynamic communication between the natural and cultural resources of the Arboretum and its public; its educational content enriches public visitation and stresses the importance of the conservation of the Botanical Gardens, and consequently, conservation of the environment as a whole. It includes the following components: Interpretative Signs Project (Projeto ´Placas Interpretativas Itinerantes´) help the visitor to identify and know the important natural and cultural resources available in the Arboretum, which differ in the four seasons of the year. The Visitors' Centre Project (Projeto ´Centro de Visitantes´) offers the visitor an immediate broad view of the natural and cultural resources available in the Arboretum. The ´Data Bank´ Project (Projeto ´Banco de Dados´) identifies and describes elements of significant natural and cultural interest in the Arboretum, in language appropriate to the various target audiences. The ´Guided Visit´ Project (Projeto ´Visitação Guiada´) trains university students and also poor children as guides on the natural and cultural resources of the Arboretum.

3.1.6. Other Agencies Linked to the MMA*

(I) The National Department for Combat against Drought (Departamento Nacional de Obras Contra as Secas- DNOCS) is a federal autarchy with administrative and financial autonomy. It promotes protective measures against drought and floods, irrigation projects, and, through special support programmes, the settlement of agricultural communities in newly irrigated areas and those designated for agrarian reform, especially in the semi-arid Northeast.

(II) The São Francisco Valley Development Company (Companhia de Desenvolvimento do Vale do Rio São Francisco - CODEVASF) is a legal public company under private law with administrative and financial autonomy. It promotes the rational exploitation of the water resources and the soil of the São Francisco Valley for agriculture, agro-industry and cattle-ranching, either directly or through other public or private institutions, and as such the integrated development of priority areas in the region. It co-ordinates or executes, directly or indirectly, works of infrastructure such as water-catchment for irrigation, primary and secondary irrigation canals, basic sanitation, power supplies and public transport, in accordance with a Master Plan and in conjunction with the appropriate federal organs.

* Obs.: Since January 1999, DNOCS and CODESVASF do not belong to the Ministry of Environment structure (Box 3-2).

3.1.7. Brazilian Company for Research in Agriculture and Cattle-breeding - EMBRAPA

The Brazilian Company for Research in Agriculture and Cattle-raising (Empresa Brasileira de Pesquisa Agropecuária - EMBRAPA) is a public company linked to the Ministry of Agriculture and Supply (Ministério da Agricultura e do Abastecmento - MAA). Its mission is to carry out, promote and divulge, research and technology for the sustainable development of agriculture, cattle raising, agro-industry and forestry. EMBRAPA co-ordinates the National System for Agriculture and Cattle Raising Research (Sistema Nacional de Pesquisa Agropecuária - SNPA) comprised of state research companies and co-operative institutions linked to them. EMBRAPA's headquarters are in Brasília and there are 39 units round the country including 13 Eco-regional Centres for Agroforestry, Agriculture and Cattle-raising (Centros Ecorregionais de Pesquisa Agroflorestal ou Agropecuária), 15 National Centres for Thematic Research (Centros Nacionais de Pesquisa Temáticos) and two of Special Services (Serviços Especiais).

EMBRAPA is also involved in the conservation and sustainable use of biodiversity, especially of edible plants and animals. In researching new alleles, it develops the technology for the selection and improvement of new varieties, exploiting and promoting the sustainable use of the biological diversity of the country.

Linked to EMBRAPA is the National Research Centre for Genetic Resources and Biotechnology (Centro Nacional de Pesquisa da Recursos Genéticos e Biotecnologia - CENARGEN) which has the mission "to maintain the diversity of genetic resources and develop biotechnological methodologies and processes to this end". CENARGEN is a reference for the training of people throughout Latin America and the Caribbean, in genetic resources, biotechnology, and the biological control of pests, weeds and diseases. CENARGEN co-ordinates 165 germplasm banks of genetic resources (see 2.4.5). It is also responsible for the exchange, collection, conservation, characterisation, evaluation and use of germplasm, as well as the inspection and quarantine of research material entering the country. Basic research is carried out on biotechnology and biological control with other institutions of the National Agricultural Research System (Sistema Nacional de Pesquisa Agrícola). Projects include aspects of molecular biology (cell, organ and tissue culture), and the biological control of pests, weeds and diseases.

Research carried out at EMPRAPA has led to important advances in agriculture, including, for example, the biological control of the soybean worm, using *Baculovirus*, developed by the National Soybean Research Centre (Centro Nacional de Pesquisa da Soja). This breakthrough has resulted in an enormous saving in costs, and a reduction in use of chemical products.

In the field of biosafety, the National Research Centre for Monitoring and Environmental Impact (Centro Nacional de Pesquisa de Monitoramento e de Impacto Ambiental - CNPMA) is responsible for the quarantine of insects and micro-organisms, as well as establishing procedures for the importation of biological-control agents. CENARGEN is responsible for the examination and quarantine of imported plant material.

Another important institution in relation to biodiversity is the National Centre for Forest Research (Centro Nacional de Pesquisa de Florestas - CNPF). This centre develops production systems for the management of planted and natural forests, agroforestry systems, and environmental and education programmes for, and the dissemination and transfer of, forest technology. Some of the technologies produced at this Centre have direct and indirect benefits for the conservation of biodiversity. They include: the economic production of seedlings of native and non-native forest species; development and perfection of techniques for the collection, treatment, storage and germination of forest species; adaptation of seeds of eucalyptus species to the

soils and climate conditions in the country; selection of *Rhizobium* strains to increase productivity of *Mimosa* and *Acacia*; mass production of nematodes for biological control; ecological zoning for forest plantations; methodologies for the use of urban and industrial waste for fertilising eucalyptus (with an increase in up to 92% in timber yield above non-fertilised trees); methods for the use of residues from paper and pulp factories, such as ash; use of sewage; software to help the producer in genetic improvement; software for management decisions in the timing and methods of thinning for maximum productivity.

The Centre for Agroforestry Research of the Eastern Amazon (Centro Nacional de Pesquisa Agroflorestal da Amazônia Oriental - CPATU) is developing systems for forest and agroforest production specifically for the eastern Amazon, alternatives for the production of food, and wood and non-wood products, taking into account the conservation and maintenance of the tropical ecosystems. Some of the key activities of this centre are:

- Development of production systems for planted forests;
- Development of sustainable management for natural forests;
- Development of agroforestry systems.

Forming the basis of its research programme, EMBRAPA has 15 national programmes in the different areas of agriculture, cattle-breeding and agroforestry. The following are particularly important for biodiversity:

The Programme for Natural Resources: Assessment, Management and Recovery (Programa de Recursos Naturais - Avaliação, Manejo e Recuperação) organises systematic information on natural resources pertinent to agriculture and cattle-breeding, besides promoting research on their conservation, use and management. The Programme for the Conservation and Use of Genetic Resources (Programa de Conservação e Uso de Recursos Genéticos) promotes the use, diversity and conservation of native and non-native genetic resources, specifically for sustainable agriculture. The Programme for the Development of Basic Research in Biotechnology provides support for basic research on biological pest control and the application of biotechnology in agriculture. It also supports the development of molecular markers in forestry, allowing for biodiversity assessment in protected areas. The Environmental Quality Programme (Programa de Qualidade Ambiental) develops methods for the evaluation and management of environmental impacts and the sustainability of agriculture systems. Finally, the Forest and Agroforestry Production Systems Programme (Programa Sistemas de Produção Florestal e Agroflorestal) combines a number of projects related to the rational management of natural forests and management systems for planted forests, seeking, above all, to conserve forest resources.

3.1.8. Profile and the Role of Environmental Agencies in Brazil

Governmental and non governmental institutions concerned with the environment have played an important part in the progress obtained in the field of conservation and sustainable use of biodiversity.

A clear picture of the role of these institutions was provided in a survey carried out in 1995 and 1996 by researchers from the Institute of Higher Religious Studies (Instituto Superior de Estudos Religiosas - ISER), the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq) and the State University of Rio de Janeiro (Universidade Estadual do Rio de Janeiro - UERJ).

In 1992, another institution, Mater Natura, produced a register of 1,891 environmental institutions. In the 1995/1996 survey, 985 institutions of the Mater Natura register responded to a questionnaire, along with some institutions established after 1992. Of these 725 (73.6%) were non governmental and the remainder (26.4%) governmental (Figure 3-2).

Of the institutions that answered the questionnaire, only 39.2% were more than ten years-old. Most of them had been founded from 1991 onwards. In the years leading to the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, as well as in 1992, there was an upsurge in the number of institutions being created, followed, however, by a progressive decline. Only 1.6% of the institutions had been founded less than two years previously (Figure 3-3). Of the governmental institutions, however, 35% had been established before 1980 (as opposed to 9% of non governmental organisations).

Most of the institutions are concentrated in the south-east, economically the most developed region, (Table 3-1). In terms of biomes, many governmental and nongovernmental institutions are concentrated in the Atlantic Forest and associated areas (Table 3-2). There are probably two reasons for this: the high human population density of the region and the fact that, together with the Cerrado, this is Brazil's most threatened biome. One of the most common themes for these institutions is biodiversity conservation (70.1% of the institutions, Table 3-3). When biodiversity conservation is combined with protected areas (51.7% of institutions) and the protection of forests (73.6%), it is evident that the majority of these institutions work with species and natural ecosystem conservation. There is, however, also a large number of institutions concerned with urban environmental problems:

34.5% develop activities related to refuse, 39.1% are involved with the urban environment, 16.1% with sanitation, 42.5% with water resources and 3.4% are concerned with energy. One third of the institutions reported that they acted only on a municipal scale, 17.9% defined their field of action as national, and 15.3% act at an international level.

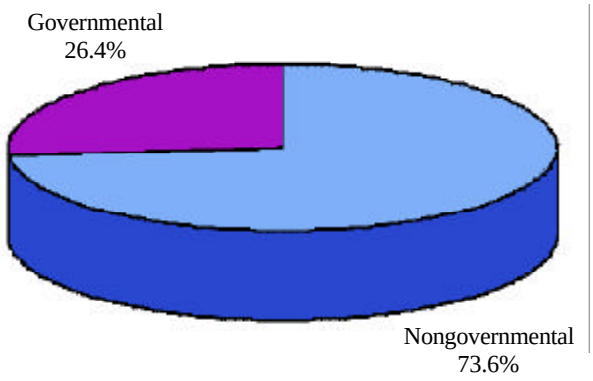

Figure 3-2. Environmental Institutions in Brazil.
Source: Crespo & Carneiro (1996).

In general, the governmental institutions have higher revenues than the nongovernmental institutions. More than 30% of the governmental institutions have annual revenues of over R$ 500,000 (a little more than US$ 500,000), as opposed to only 3.9% of the non governmental organisations (Table 3-4). Among the latter, almost 70% have revenues of up to R$ 50,000 (a little more than US$ 50,000).

While the smaller organisations live on the contributions of a limited membership, the bigger ones receive funds from the National Government as well as international sources, generally from NGOs in the USA, Canada and the European Union.

It was also found that 34% of the NGOs were based in private residences. Only 37.6% of the NGOs had paid staff, and 15% declared that they are not yet legalised. From this it was possible to conclude that the non governmental sector suffers from a lack of institutionalisation (availability of paid scientific and technological staff members, legal registration, access to electronic communication networks, computers, and the like).

Environmental education is the main activity on both governmental and non governmental sectors (Table 3-5), with 81.5% of the institutions doing some work in this area. More than 50% have educational activities related to the conservation of biodiversity. The priority target audience in both sectors is local communities (Table 3-6). The secondary target audience of governmental organisations is the scientific community, and that of the non governmental organisations is young people and adolescents.

Some conclusions:

- The non governmental sector is active and co-ordinated internally and with other sectors;
- The non governmental sector suffers from a lack of public and private policies and proper institutionalisation;

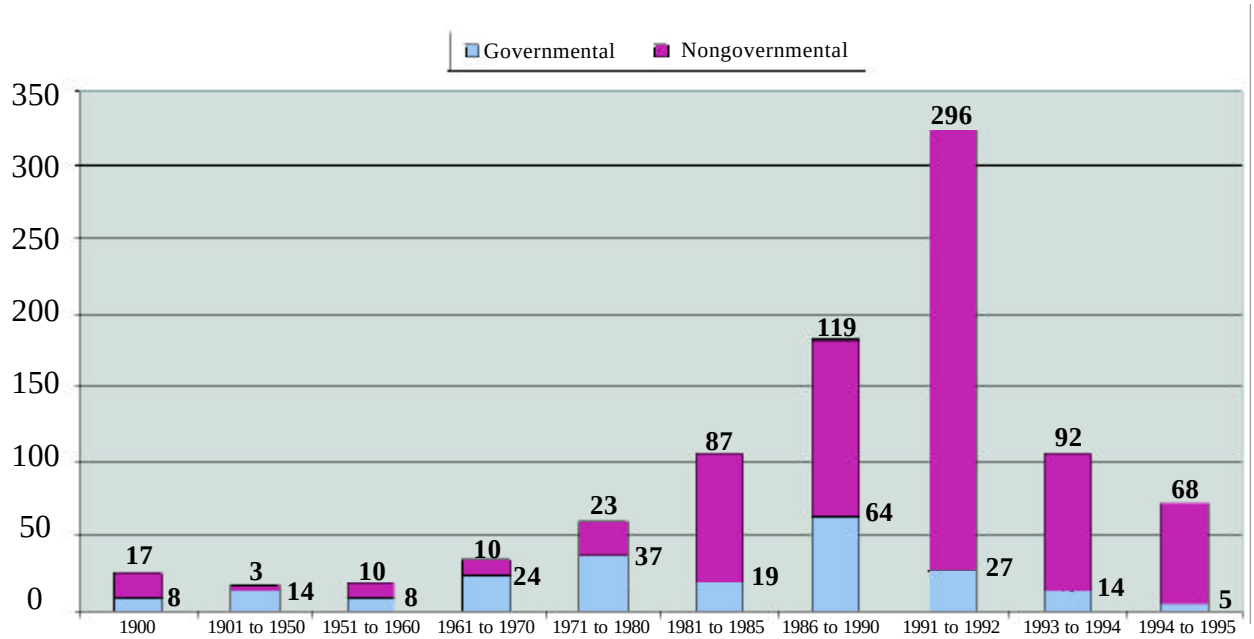

Figure 3-3. Number of environmental institutions created each year from 1900-1995.
Source: Crespo & Carneiro (1996).

Table 3-1. Number of government and nongovernmental environmental organisations by state and region.

Region/State	Governmental	Non-governmental	Total
North	**32**	**55**	**87**
Acre	6	2	8
Amapá	4	2	6
Amazonas	4	4	8
Pará	5	25	30
Rondônia	5	17	22
Roraima	4	3	7
Tocantins	4	2	6
North-east	**54**	**90**	**144**
Alagoas	3	4	7
Bahia	7	46	53
Ceará	11	6	17
Maranhão	6	6	12
Paraíba	6	4	10
Pernambuco	9	12	21
Piauí	6	5	11
Rio Grande do Norte	2	7	9
Sergipe	4	0	4
Central-West	**35**	**69**	**104**
Distrito Federal	22	25	47
Goiás	4	13	17
Mato Grosso	5	18	23
Mato Grosso do Sul	4	13	17
South-east	**78**	**346**	**424**
Espírito Santo	10	23	33
Minas Gerais	16	65	81
Rio de Janeiro	13	94	107
São Paulo	39	164	203
South	**61**	**165**	**226**
Paraná	36	58	94
Rio Grande do Sul	14	69	83
Santa Catarina	11	38	49
Total	**260**	**725**	**985**

Source: Crespo & Carneiro (1996).

Table 3-2. Number of government and nongovernmental environmental institutions by Brazilian biome (1995-1996).

Biome	Governmental		Non-governmental		Total	% Total
Atlantic forest	118	45.4%	386	53.2%	504	51.2%
Cerrado	81	31.2%	150	20.7%	231	23.5%
Amazon	69	26.5%	119	16.4%	188	19.1%
Caatinga	46	17.7%	65	9.0%	111	11.3%
Araucaria pine forest	39	15.0%	67	9.2%	106	10.8%
Coastal ecosystems	30	11.5%	56	7.7%	86	8.7%
Pantanal of Mato Grosso	28	10.8%	53	7.3%	81	8.2%
Others	34	13.1%	70	9.7%	104	10.6%
Total institutions registered	**260**		**725**		**985**	

Source: Crespo & Carneiro (1996).

- The number of non governmental institutions is small or non-existent in some states where there are serious environmental problems;
- The private sector contributes little to environmental recovery and conservation;
- Governmental and non governmental organisations are developing similar and complementary projects and activities;
- There has been a tendency, in recent years for partnerships between governmental and non governmental organisations.

3.2 Progress in Training Personnel

3.2.1 Postgraduation

According to the Brazilian Higher Education Authority (Fundação Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES) of the Ministry of Education (MEC), in 1993 there were 1,639 postgraduate courses in the country, 1,073 at the Master's level and 566 at the Doctorate level in federal, state and private higher education institutions (Table 3-7). Almost 70% of these (1,156) were concentrated in the south-east, followed by the south with 218. In the north there are only 22 master's courses and six doctoral programmes in the local universities and the National Institute for Amazon Research (INPA) (Table 3-8).

In the biological and agricultural sciences, the most pertinent to the conservation and sustainable use of biodiversity, there are 182 Master's courses and 184 Doctoral programmes, or 11% of the total courses in both cases. There are 262 Master's courses and 173 Doctoral programmes in the Health Sciences (Table 3-9).

Considering only the top-level postgraduate courses (credited with grades A and B in the evaluation of CAPES), important areas in the conservation and sustainable use of biodiversity are deficient. Areas such as Botany, Ecology,

Table 3-3. Number of environmental institutions, by region according to their fields of interest (1995-1996).

Interest	North-west*	North-east*	Central-west*	South-east*	South*	% Total	Total
Fauna and flora (biodiversity)	70.1%	69.4%	74.0%	65.6%	66.4%	67.6%	666
Forests	73.6%	49.3%	47.1%	55.2%	50.0%	53.9%	531
Water resources	42.5%	60.4%	56.7%	53.8%	53.1%	53.9%	531
Waste (solid and liquid residues)	34.5%	50.0%	41.3%	51.4%	58.8%	50.4%	496
Urban environments	39.1%	54.2%	44.2%	50.9%	50.0%	49.4%	487
Protected areas	51.7%	46.5%	49.0%	47.4%	48.7%	48.1%	474
Environmental legislation & public policies	37.9%	48.6%	50.0%	50.0%	45.6%	47.7%	470
Sanitation	16.1%	34.7%	21.2%	37.7%	35.4%	33.1%	326
Agriculture and rural development	32.2%	31.3%	33.7%	29.2%	34.5%	31.5%	310
Pesticides	11.5%	29.2%	29.8%	20.0%	38.5%	25.9%	255
Alternative technologies	26.4%	27.1%	26.0%	28.3%	17.7%	25.3%	249
Traditional & extractivist populations	36.8%	16.0%	23.1%	17.2%	9.3%	17.6%	173
Marine resources	4.6%	29.9%	8.7%	15.3%	10.6%	14.7%	145
Indigenous peoples	35.6%	11.1%	18.3%	12.7%	8.4%	14.1%	139
Energy	3.4%	6.3%	13.5%	14.2%	12.8%	11.7%	115
Climate change	14.9%	8.3%	11.5%	10.6%	8.0%	10.2%	100
Speleology (caves)	5.7%	9.0%	16.3%	10.8%	7.1%	9.8%	97
Others	14.9%	11.8%	15.4%	11.1%	6.2%	10.9%	107
Total no. of institutions analysed	**87**	**144**	**104**	**424**	**226**		**985**

Brazilian Regions are shown in Figure 1.1.

Source: Crespo & Carneiro (1996).

Microbiology, Physiology, Pharmacology and Parasitology lack the necessary specific support scientific and technological development required to meet the country's demands.

The role of CAPES in the training of human resources for biodiversity conservation, nationally and abroad, has, however, been exceptional: 304 courses in the 23 academic areas sustaining Master's and Doctoral courses in the country, have an interface with biodiversity (Table 3-9). In 1993, there were 27,535 new, registered, and qualified students in areas related to biodiversity (Table 3-10).

Despite this, training of personnel was below the desirable level in some areas. In 1993, there were 2,979 people with doctor's degrees on the permanent staff of teaching institutions in the Exact and Earth Sciences, but only 57 in Oceanography, 33 in Geosciences/Environmental Analysis, and 26 in the Chemistry of Natural Products (while Chemistry in general had 629). In the same year, there were 2,101 permanent staff with Doctorates in the Biological Sciences (Zoology and Ecology predominated with 257 and 260, respectively).

Of the 1,928 staff with doctorates in Engineering, only 52 were in Sanitary Engineering and 194 in Chemical Engineering. In Agronomy, with 1,028 PhDs in 55 postgraduate courses, less than 50% were for the Agrarian Sciences.

These figures suggest the need for further incentives for the training of personnel in the Biological Sciences. The number of new students in 1993 was 936 in Master's programmes and 461 in Doctoral programmes. The Master's courses most in demand were those in Biochemistry, Genetics, Zoology and Botany, in that order. For Doctorates, the highest demand was in Biochemistry, Botany and Genetics.

The evolution of the numbers of students and qualified staff at the doctor's level between 1990 and 1993 was not impressive (Table 3-11) considering the growth in the population of the country and the ever-increasing regional and national demands (Figures 3-3 and 3-4). The number of Master's and Doctoral scholarships awarded by CAPES and CNPq for areas related to biodiversity grew somewhat, however, between 1991 and 1994 (Tables 3-12 and 3-13).

Another government initiative for the formation, training and qualification of personnel has been the Programme of Human Resources Training for Strategic Areas (Programa de Capacitação de Recursos Humanos para Atividades Estratégicas - RHAE), of the Ministry of Science and Technology, with the National Council for Scientific and Technological Development (CNPq) as its executing agency. The environment has been one of the priority areas since 1990, under the denomination ´Social Impact Technology: the Environment´ (Tecnologia de Impacto Social: Meio Ambiente).

Table 3-4. Number of environmental institutions in Brazil, according to their revenue (1995-1996).

Revenue/Institution	Annual revenue: Governmental		Nongovernmental (NGOs)		Governmental and nongovernmental	
	No.	%	No.	%	No.	%
Up to R$ 10,000	8	3.1	147	20.3	155	15.7
From R$ 11,000 to R$ 50,000	10	3.8	147	20.3	157	15.9
From R$ 51,000 to R$ 100,000	7	2.7	83	11.4	90	9.1
From R$ 101,000 to R$ 500,000	28	10.8	111	15.3	139	14.1
More than R$ 501,000	82	31.5	28	3.9	110	11.2
No reply	125	48.1	209	28.8	334	33.9
Total institutions analysed	**260**		**725**		**985**	

Composition of the revenue of the 260 Brazilian government institutions

Source of revenue /% of total	0-10%		10-25%		25-50%		50-75%		75-100%		Institutions receiving the resource	
	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
Financing by national governments	5	4	5	4	15	11	11	8	100	74	136	52
Sale of services/ products	25	47	13	25	3	6	6	11	6	11	53	20
International financing	18	39	12	26	8	17	6	13	2	4	46	18
Financing by companies	14	70	2	10	2	10	1	5	1	5	20	8
Financing by national NGOs	4	36	3	27	-	-	1	9	3	27	11	4
Individual donations	2	50	-	-	-	-	2	50	-	-	4	2
Members' contributions	-	-	-	-	1	50	-	-	1	50	2	1
Other sources	4	44	3	33	-	-	-	-	2	22	9	4
Composition of the revenue of 725 nongovernmental institutions												
Members' contributions	80	21	48	13	48	13	34	9	173	45	383	53
Individual donations	89	41	41	19	43	20	10	5	35	16	218	30
Sale of services/ products	89	44	36	18	30	15	20	10	28	14	203	28
International financing	14	12	7	6	21	18	19	17	53	47	114	16
Financing by national governments	40	36	22	20	31	28	7	6	12	11	112	15
Financing by companies	37	35	18	17	16	15	19	18	17	16	107	15
Financing by national NGOs	22	39	8	14	11	20	4	7	11	20	56	8
Other sources	16	27	9	15	6	10	4	7	25	42	60	8

Source: Crespo & Carneiro (1996).

Between 1992 and 1994, 1,565 scholarships were awarded in Biotechnology and the Environment, for projects run by public and private institutions. The scholarships were assigned to three broad themes related to biodiversity:

- Taxonomy, identification and systematics;
- Scientific collections, germplasm banks, data banks of natural products geared towards preservation;
- The sustainable use of biodiversity.

Geographically, the Biotechnology and Environment projects over this period were concentrated in the south-east (30 projects), the south (21) and the central-west (14). The projects approved by RHAE demonstrated a lack of research institutions working with ex situ conservation (through collections or germplasm banks) particularly in the north of the country, where the diversity of plant and animal species and micro-organisms is highest. The reverse is true for projects for the use of biodiversity, with 700 of the 1,565 scholarships awarded by the programme involving this line of research.

In general, the participation of the business sector in biodiversity research has been modest, despite the potential and the benefits of its use for the population. The demand for the training of personnel in Biotechnology and the Environment, on the other hand, is shifting from more academic themes to innovative projects related to the development and improvement of products, and the techniques and processes involved.

Collaborative projects between companies, research centres and universities have had priority for support through the RHAE Programme. Despite this, however, there is still a lack of effective transfer of the results of research programmes

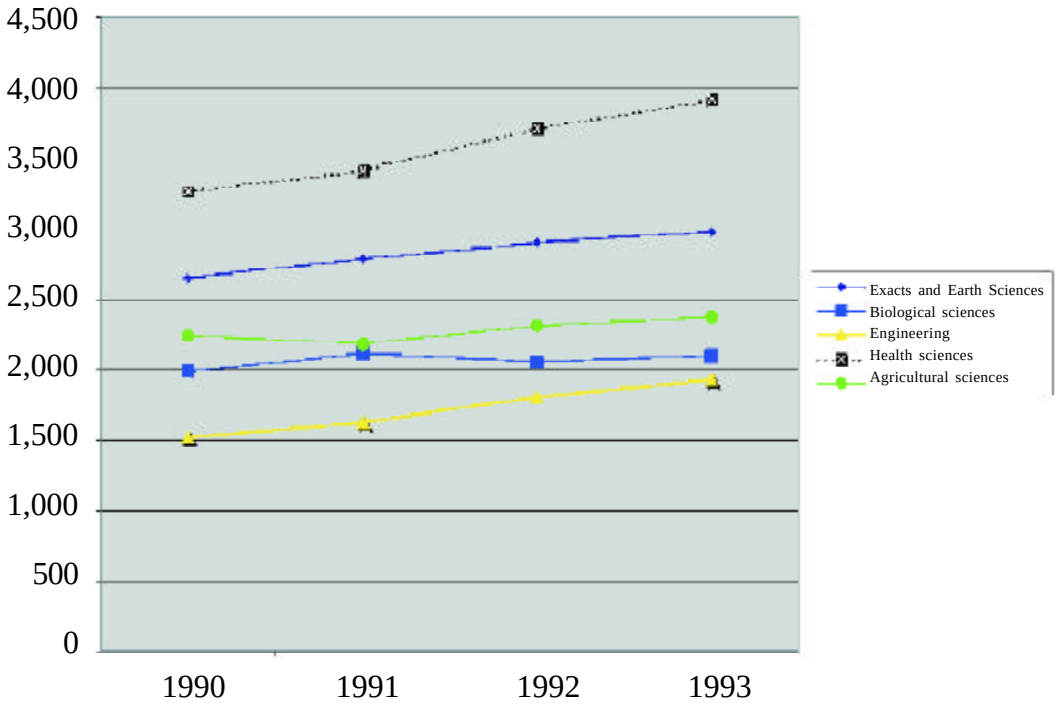

Figure 3-4. Number of university staff with doctorates in different academic fields in Brazil, 1990-1993.
Source: Rios *et al*. (1996).

and the incorporation of new technologies by the production sector.

Despite the effective action of the Federal Government through CNPq and CAPES, as well as such programmes devoted to the training and qualification of human resources as that of RHAE, Brazil's privileged position in relation to the richness and economic potential of its biodiversity makes the training and qualification of specialised personnel in a wide range of areas a national priority.

3.2.2 The National Council for Scientific and Technological Development - CNPq

The National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Ci-

Table 3-5. Number of environmental institutions in Brazil involved in different categories of activities (1995-1996).

Activities	Governmental		Nongovernmental		Governmental and nongovernmental	
	Nº	%	Nº	%	Nº	%
Environmental education	176	67.7	627	86.5	803	81.5
Projects with local communities	131	50.4	424	58.5	555	56.3
Campaigns to mobilise public opinion	82	31.5	450	62.1	532	54.0
Conservation projects	160	61.9	367	50.6	528	53.6
Environmental inspection	143	55.0	300	41.4	443	45.0
Research and development	138	53.1	250	34.5	388	39.4
Advice and technical consultancies	117	45.0	229	31.6	346	35.1
Environmental monitoring	133	51.2	176	24.3	309	31.4
Ecotourism	27	10.4	168	23.2	195	19.8
Administration of natural resources	109	41.9	85	11.7	194	19.7
Total institutions analysed	**260**		**725**		**985**	

Source: Crespo & Carneiro (1996).

entífico e Tecnológico - CNPq) was created in 1951. Institutions linked directly to CNPq include the Emílio Goeldi Museum (Museu Paraense Emílio Goeldi - MPEG), the National Observatory (Observatório Nacional), the National Astrophysics Laboratory (Laboratório Nacional de Astrofísica - LNA), and the National Light Synchrotron Laboratory (Laboratório Nacional de Luz Síncrotron - LNLS), amongst others. CNPq plays an important role in promoting research on biodiversity and its conservation. Its objectives include:

- The promotion and execution of scientific and technological research and the training of personnel in all fields of knowledge;
- The promotion, implementation and maintenance of mechanisms for the support, analysis storage, diffusion and exchange of data and information on scientific and technological development in the country.

A number of strategies are used to achieve these ends:

- In country scholarships include: quotas for Master's and Doctoral students, for scientific initiation, for research productivity, technical support, visiting researchers, regional scientific development and recently graduated Doctors and for post-doctoral research;
- Abroad, awards are given for senior training courses, post-doctoral studies, sandwich doctorate courses, full doctorate courses, specialisation courses.

Table 3-6. Number of environmental organizations in Brazil, according to their target Public (1995-1996).

Target public	Governmental		Nongovernmental		Governmental and nongovernmental	
	N	%	%	%	N	%
Local communities	172	66.2	571	78.8	743	75.4
Schools	99	38.1	435	60.0	534	54.2
Children and adolescents	66	25.4	443	61.1	509	51.7
Local authorities	102	39.2	325	44.8	427	43.4
Community leaders	84	32.3	305	42.1	389	39.5
Scientific community	108	41.5	242	33.4	350	35.5
State and Federal Government	100	38.5	219	30.2	319	32.4
Business people	75	28.8	155	21.4	230	23.4
Women	229	8.8	143	19.7	166	16.9
Company staff	30	11.5	79	10.9	109	11.1
Others	44	16.9	101	13.9	145	14.7
Total institutions analysed	**260**		**725**		**985**	

Source: Crespo & Carneiro (1996).

Trends in the resources available to CNPq between 1985 and 1994 are shown in Figure 3-5. A decline in 1991 and 1992 was followed by a strong recovery. The Directorate of Scientific and Technological Development (Diretoria de Desenvolvimento Científico e Tecnológico - DCT) controls 80% of the resources available and has the majority of the responsibility for awarding scholarships and grants. Around 90% of the resources allocated to this agency are for training programmes (R$ 541,835,000 in 1996, approximately US$ 541,835,000, some 8% of which went to overseas scholarships). A Doctoral programme abroad costs on average R$ 100,000.00 over a period of four years. In 1998, around 1,645 scholars were studying abroad, of whom 1,000 are studying for full doctorates.

Table 3-7. Number of postgraduate courses in different academic fields (1993).

Academic field	Master's	Doctorate	Total
Exact and Earth Sciences	137	85	222
Biological Sciences	109	73	182
Engineering	106	54	160
Health Sciences	262	173	435
Agrarian Sciences	135	49	184
Applied Social Sciences	98	31	129
Human Sciences	156	65	221
Linguistics, Languages & Arts	67	35	102
Multidisciplinary	03	01	04
Total	**1,073**	**566**	**1,639**

Source:. CAPES/MEC (1995). *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília, 1995*

Between 1990 and 1996, the number of scholarships went up from 26,542 to 50,967. The 1996 data show that CNPq supported 8,421 scholars in Brazil and 304 abroad in different programmes related to some aspect of biodiversity, totalling around R$ 100 million per year. The grants awarded for research projects and scientific events totalled some R$ 10 million in the same year.

3.2.3 The Brazilian Higher Education Authority - CAPES

The Brazilian Higher Education Authority (Fundação Coordenação de Aperfeiçoamento de

Table 3-8. Number of postgraduate courses in different regions of Brazil (1993).

Region	Master's	Doctorate	Total
North	22	6	28
North-east	147	28	175
South-east	697	459	1,156
South	158	60	218
Central-West	49	13	62
Brazil	**1,073**	**566**	**1,639**

Source:. CAPES/MEC (1995). *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília.*

Pessoal de Nível Superior - CAPES) was also created in 1951. It forms part of the Ministry of Education and Sports (Ministério de Educação e Desporto - MEC) and participates in the formulation of policies for post-graduation and training in a number of areas, including scientific and technological development. It monitors and systematically evaluates (every three years) all postgraduate courses (1,798 Master's and Doctoral programmes), supported by 300 scientific consultants.

Its programmes include: advanced qualification of teaching and technical training; academic development; special training programmes; postgraduate programmes sensu strictu; postgraduation overseas; academic exchange programmes; support for sensu latu graduation; and teacher training for basic education (Primary and Secondary).

In addition to these programmes, CAPES supports the participation of researchers and teaching staff in, and the organisation of, scientific events. It also supports postgraduate courses, and provides scholarships for Master's degrees and Doctoral students. In 1992, 11,013 scholarships were awarded to 895 Master's and 347 Doctoral courses, besides 1,174 scholarships for specialisation courses. This support went to 162 institutions throughout the country (59 federal, 29 state and 71 private institutions).

In 1992, the Institutional Programme for Teacher Training (Programa Institucional de Capacitação de Docentes), supported the participation of 3,873 teachers from 123 institutions in training programmes, with 100 grants for visiting professors and 400 for academic studies. In the CAPES Special Training Programme (Programa Especial de Treinamento - PET), 1,650 grants were awarded to students and 240 to teacher/tutors.

Two thousand scholarships were awarded for training abroad, approximately 30% of the budget. The demand in Biological and Agrarian Sciences was not compatible with their strategic importance to the country.

Resources were invested in scholarships in a range of academic areas, including a number related to biodiversity (Table 3-10). There are 1,639 postgraduate courses in the country with 7,613 registered and qualified students and teachers in field areas related to biodiversity alone. Table 3-9 indicates the geographic distribution of the courses. The number of academic staff with Ph.Ds increased from 1990 to 1993. The number of postgraduate students awarded higher

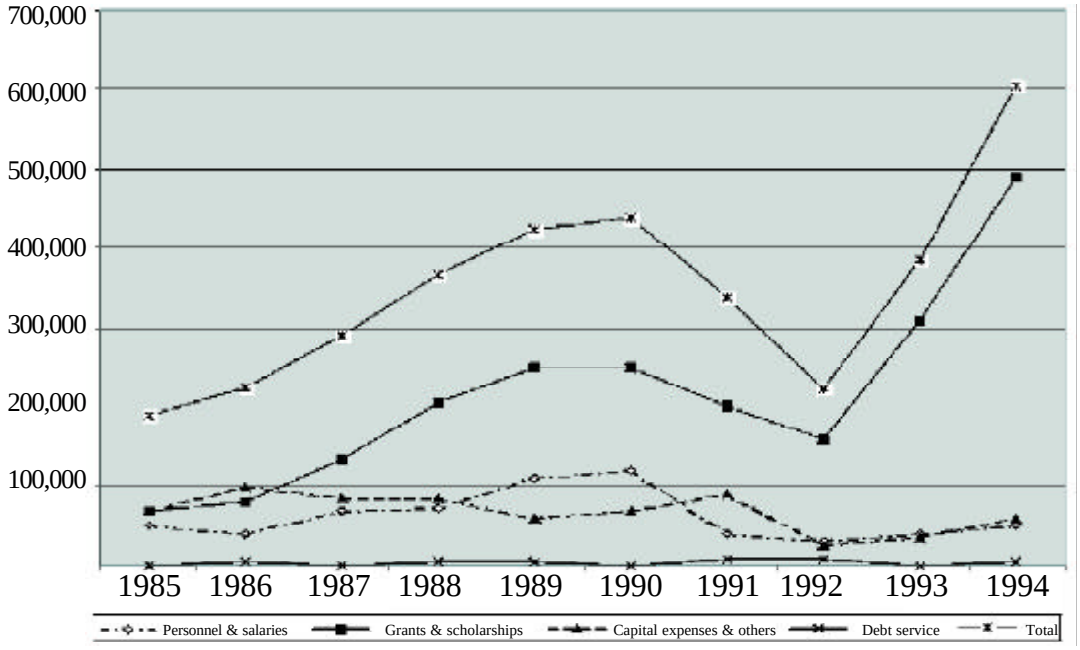

Figure 3-5. Disbursements of the Brazilian National Science Council (CNPq), 1985-1994.
Source: Rios *et al.* (1996)

degrees also went up in all areas from 1990 to 1993, with the exception of Agrarian Sciences (Figure 3-6).

3.2.4 State Foundations for the Support of Research

The State Foundations for the Support of Research (Fundações Estaduais de Apoio à Pesquisa) have played a subsidiary role in training, although their main objective is in the financing of research projects and scientific and technological development.

The oldest of these institutions is the Foundation for the Support of Research in the State of São Paulo (Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP), which was set up in 1947 and began functioning in 1962. It served as a model for other similar state foundations. By law it has an allocation of 0.5% of the ordinary revenue of the state of São Paulo. FAPESP has financed important initiatives in biodiversity, such as the BIOTA/SP and the project "Phanerogamic Flora of the state of São Paulo (Projeto Flora Fanerogâmica do Estado de São Paulo) described in chapter III. These institutions have financed individual and institutional research projects, and covered the cost of the installation of new laboratories and research units, promoting academic exchange and awarding research scholarships, besides grants for higher education. More detailed information on the contributions of state research support foundations is given below in the section covering ´Progress in Financial Mechanisms´.

3.2.5 The National Environment Programme - PNMA

The establishment of IBAMA through the amalgamation of four other governmental agencies, brought with it the responsibility of structuring the administrative organisation for more than 7,000 staff members, only about 300 of whom had any previous experience of dealing with environmental problems, and all from wide range of institutional cultures.

The incorporation of IBAMA's human resources project into the National Environment Programme (Programa Nacional do Meio Ambiente - PNMA) produced the following results:

- The structuring and equipping of the Co-ordination for the Development of Human Resources (Coordenadoria de Desenvolvimento de Recursos Humanos - DIDER), through the creation and improvement of norms and the means for training and qualification;

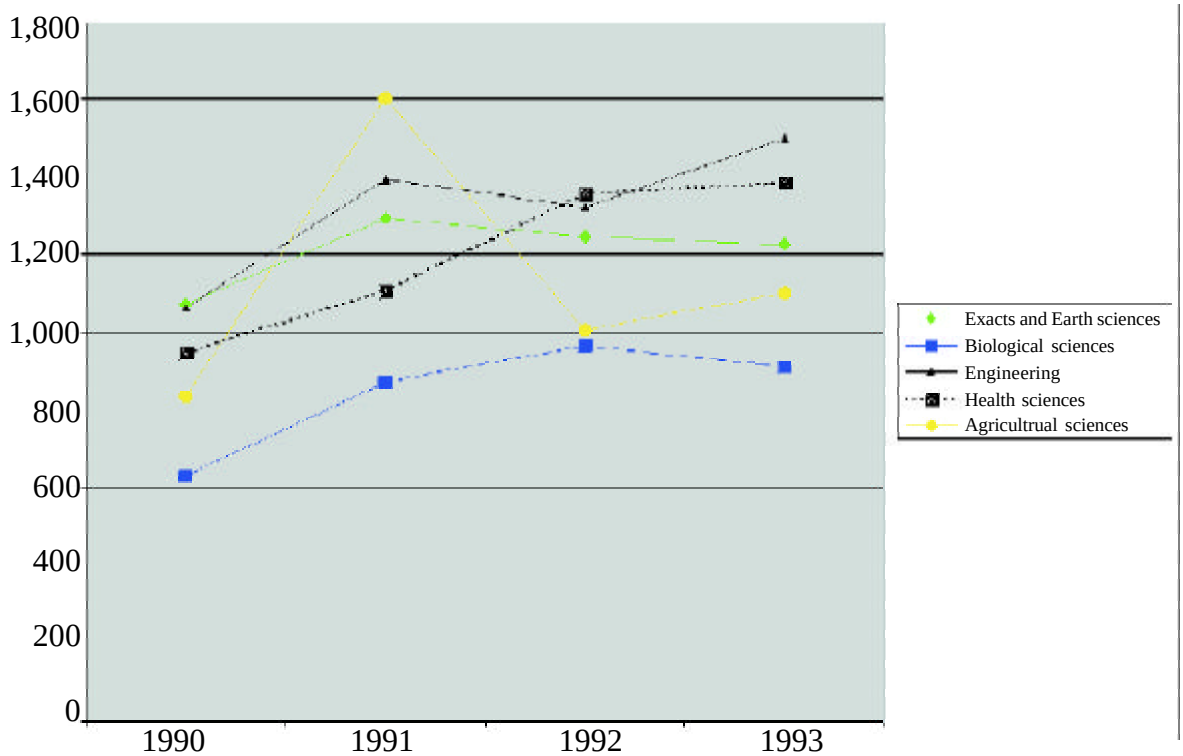

Figure 3-6. Number of postgraduate students receiving their degrees in different academic fields in Brazil (1990-1993).

Source: Rios *et al., 1996.*

Table 3-9. Number of postgraduate courses related to biodiversity in different academic fields.

Academic fields	Total Number of Courses		Related to Biodiversity	
	Master's	Doctorate	Master's	Doctorate
Agronomy	55	24	43	18
Biophysics	02	01	01	01
General biology	06	01	05	00
Biochemistry	12	10	12	08
Botany	14	06	09	03
Ecology	11	05	09	04
Chemical engineering	12	05	06	04
Sanitary engineering	03	01	03	01
Pharmacy	09	04	06	02
Pharmacology	11	05	08	04
Physiology	08	05	06	03
Genetics	12	08	09	07
Immunology	06	04	03	01
Medicine (infectious and parasitic diseases)	10	06	07	05
Veterinary medicine	24	09	16	07
Microbiology	05	04	04	03
Biological oceanography	03	02	03	01
Parasitology	04	03	03	02
Chemistry	34	23	24	14
Forestry engineering & forest resources	08	02	05	02
Fisheries & engineering	03	00	02	00
Zoology	11	07	09	06
Zootechnology	15	04	12	03
Total	**278**	**139**	**205**	**99**

Source: CAPES/MEC (1995). *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília, 1995.*

- The drafting and implementation of IBAMA's Managerial Development Programme (Programa de Desenvolvimento Gerencial);
- The drafting and execution of the Career Plan and System of Performance Appraisal (Plano de Carreiras e Sistema de Avaliação de Desempenho);
- The production of teaching material, instructions and guidelines to support the training programmes;
- The establishment, implantation and extension of the IBAMA Training Centre (Centro do Treinamento do IBAMA - CENTRE);
- The training of 1,739 technical specialists and managers from IBAMA and personnel involved in the National Environment System (Sistema Nacional do Meio Ambiente - SISNAMA). Fifty-two courses were attended in the priority areas of the programme: Environmental Management; Environmental Impact Studies; Licensing, Control and Inspection, Administration of Protected Areas; Public Participation in Environmental Management, Levelling and Managerial Functions.

To carry out its responsibilities in control and supervision, IBAMA was forced to organise, standardise and speed up its procedures, and adopt the appropriate strategies to make data, information and systems accessible to the entire Institute as well as a number of other organisations. To do this, a computer network was installed which linked institutions on a nation-wide basis, with the advantage of access to national and international public networks. A total of 177 IBAMA technicians were trained and qualified (including the Central Administration, the state superintendencies and research centres) in the use of the standard software programs, the administration of data banks, and the management and operation of networks. In addition, 700 members of the technical staff of the Institute were trained in informatics.

3.3 Progress in the Financing Mechanisms

3.3.1. The National Environment Fund - FNMA

An important mechanism for the conservation and the definition of the means for the sustainable use of Brazilian biodiversity is the National Environment Fund (Fundo Nacional do Meio Ambiente - FNMA). It is linked to the Ministry of Environment (MMA), and invested over US$ 26 million in 498 projects during the period from 1991 to September 1997.

Established by Law No. 7.797, 10th July 1989, FNMA receives funds from Inter-American Development Bank - IDB loans, from the Union budget, besides donations and contributions from international sources and national private enterprise, and returns on financial investments.

As an instrument of the National Environment Policy, the FNMA finances small and medium-sized projects (up to $ 200,000) in the sustainable use of renewable resources and the conservation or recovery of environmental quality throughout the country.

FNMA support can go to governmental or non governmental organisations (so long as they are non-profit making and of an environmental character) for projects in the following areas:

- Forestry extension, sustainable management and the conservation of renewable natural resources;
- Protected Areas;
- environmental education and diffusion;
- environmental control;
- technological research and development;
- institutional development and strengthening.

Of the resources invested to date, 32% have been given over to environmental education and publications and 19% to technological research and development. This distribution reflects the demand. The other areas have received the following percentages of the resources: forestry extension, sustainable management and the conservation of renewable natural resources 16%; environmental control 14%; Protected Areas 13%; and institutional development and strengthening 6% (Figure 3-7). The distribution is similar in terms of the numbers of projects financed: environmental education and publications 30%; research and technological development 25%; environment control 17%; sustainable management and

Table 3-10. Numbers of students and teachers with doctorates by academic field related to biodiversity (1993).

Area Sub-area	New students	New students	Students enrolled	Students enrolled	Degrees awarded	Degrees awarded	University teachers
	Master's	**Doctorate**	**Master's**	**Doctorate**	**Master's**	Doctorate	Ph.D.s
Exact and Earth Sciences	**659**	**338**	**2,088**	**1,479**	**483**	**130**	**1,204**
Chemistry	327	211	988	899	253	86	629
Chemistry of natural products	12	13	55	68	16	0	26
Geosciences	280	97	910	427	176	38	459
Geosciences (environmental analysis)	17	9	45	35	5	3	33
Oceanography	23	8	90	50	23	3	57
Biological Sciences	**883**	**461**	**2,780**	**1,891**	**673**	**241**	**2,101**
General Biology	63	9	123	28	34	1	116
Genetics	116	65	256	253	80	36	228
Botany	105	65	280	272	87	27	223
Zoology	113	46	356	186	96	25	257
Ecology	88	61	421	189	75	15	260
Physiology	64	29	164	109	36	15	119
Biochemistry	118	67	254	294	77	35	202
Biophysics	44	31	142	111	35	18	72
Pharmacology	63	23	218	97	42	10	157
Immunology	31	10	97	60	13	14	96
Microbiology		32	186	184	44	20	166
Parasitology	27	6	124	31	25	6	91
Morphology	51	17	159	77	29	19	114
Engineering	**331**	**108**	**725**	**294**	**184**	**27**	**273**
Biomedical Engineering	28	8	78	17	16	0	27
Sanitary Engineering	80	19	214	68	45	9	52
Chemical Engineering	223	81	433	209	123	18	194
Health Sciences	**88**	**29**	**268**	**73**	**52**	**20**	**221**
Pharmacy	88	29	268	73	52	20	221
Agrarian Sciences	**1,281**	**360**	**3,393**	**1,207**	**881**	**156**	**2,241**
Agronomy	592	180	1,587	641	449	87	1,028
Forest Resources/ Forestry Engineering	94	30	180	61	53	14	139
Zootechnology	146	33	420	97	113	15	335
Veterinary Medicine	230	62	513	171	140	17	421
Fishery resources / Fishery Engineering	30	0	64	7	9	0	49
Food Technology	189	55	629	230	117	23	269
Total	**3,242**	**1,296**	**9,254**	**4,944**	**2,273**	574	6,040

Source: CAPES/MEC (1995). *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília, 1995. (Modified from).*

conservation of renewable natural resources 12%; Protected Areas 9%; institutional development and strengthening 7% (Figure 3-8).

From 1991 to 1997, NGOs received more than half the resources (51%). Federal institutions received 15%, and 9% went to state agencies. Municipalities with less than 120,000 inhabitants received 22%, and those with a population of more than 120,000 inhabitants received 3% (Figure 3-9). In terms of the number of projects supported; NGOs contributed 54%; federal organs 17%; state agencies 14%; municipal districts with less than 120,000 inhabitants received 13% and those with over 120,000 inhabitants 2% (Figure 3-10).

Considering geographical regions, 31% of the projects were in the south-east; 30% in the south; 14% in the central-west; 13% in the north-east and 12% in the north (Figure 3-10). In terms of the distribution of the financial resources, the south received 32%; the south-east 31%; the north-east 14%; the central-west 14%; and the north 9% (Figure 3-12).

In terms of both the number of projects and the amount of financing, more than 60% of the support was concentrated in the south and south-east. The smaller participation of the north and north-east is attributed to difficulties in formulating technically adequate proposals, and less availability of information is available in these areas. Besides, there are other sources of funding available for the Amazon (northern region). Of all the projects supported by FNMA (up to March 1997), 141 were directly related to biodiversity, almost 30% and with a combined total of R$ 6,536,640.70.

New resources in the order of US$ 75 million are being negotiated for the FNMA: US$ 45 million from a new IDB loan and US$ 30 million as the Brazilian Government contribution. The FNMA Co-ordination has already received 275 project proposals for these resources, 39% of which involve biodiversity (107 proposals totalling R$ 9,940,489.63). Thirty-four per cent of these proposals are from the south, 28% from the south-east, 16% from the north-east, 12% from the central-west and 10% from the north. Thirty-five per cent are from NGOs, 29% from small municipalities, 21% from federal organs, 10% from municipal agencies, and 5% from the larger municipal districts.

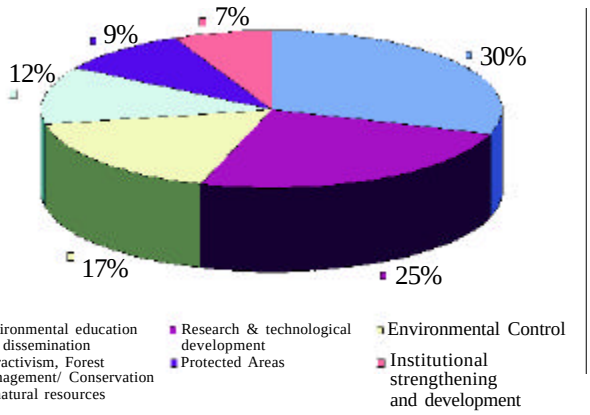

Figure 3-8. The percentage of projects (totalling 498) in different areas supported by the National Environment Fund (FNMA) between November 1990 and September 1997.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do Meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

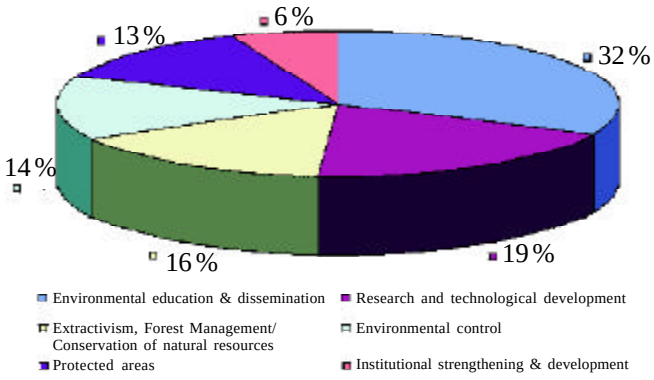

Figure 3-7. Distribution of disbursements (totalling US$26,021,003.86) for different thematic areas by the National Environment Fund (FNMA) between November 1990 and September 1997.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

According to topic, the largest demand is in the field of forestry extension, sustainable management and conservation of renewable natural resources (37%). Next comes technological research and development (32%), protected areas (25%, environmental control (3%), environmental education and diffusion (2%) and technological development and strengthening (1%).

FNMA's contribution to the conservation and sustainable use of biodiversity has involved support in a number of areas:

- The implantation of protected areas and management plans;
- Restoration of degraded areas with the establishment of agroforestry systems, the reconstitution of gallery forest, and agro-ecological programmes;
- Research on biodiversity in protected areas;
- Training in the administration and management of protected areas;

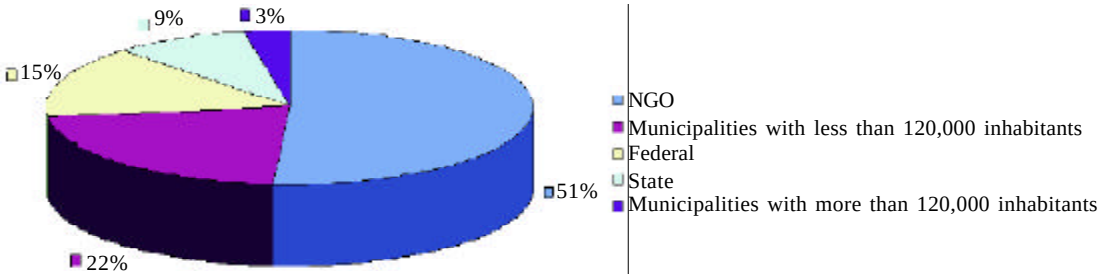

Figure 3-9. Distribution of disbursements (totalling US$26,021,003.86) for different categories of organisations by the National Environment Fund (FNMA) between November 1990 and September 1997.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do Meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

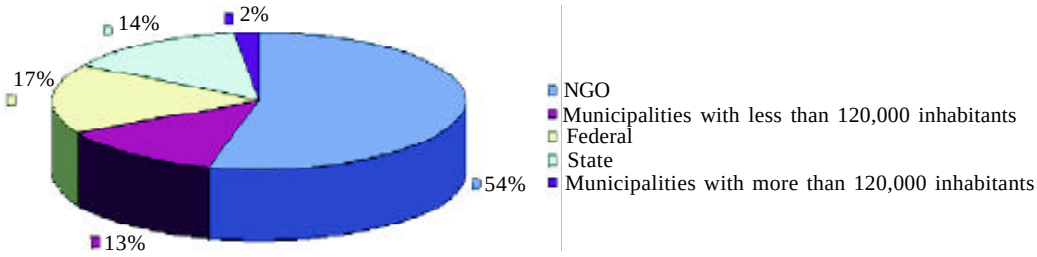

Figure 3-10. Distribution of projects (totalling 498) for different categories of organisations by the National Environment Fund (FNMA) between November 1990 and September 1997.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do Meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

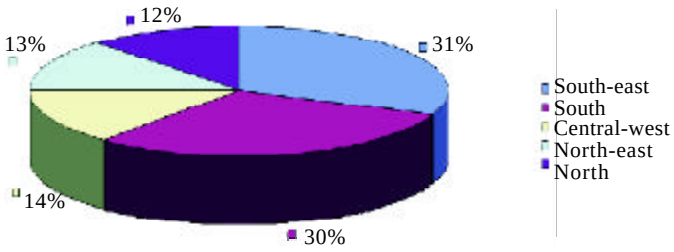

Figure 3-11. Distribution of projects (totalling 498) for different regions of the country by the National Environment Fund (FNMA) between November 1990 and September 1997.

Brazilian Regions are shown in Figure 1.1.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do Meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

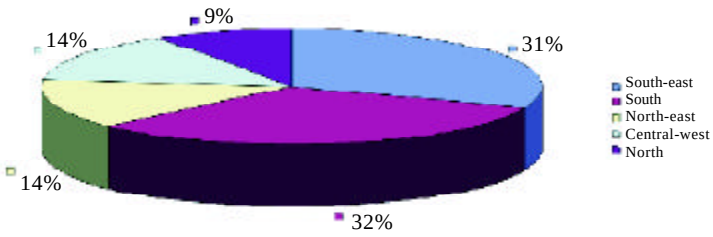

Figure 3-12. Distribution of disbursements (totalling US$26,021,003.86) for different regions of the country by the National Environment Fund (FNMA) between November 1990 and September 1997.

Brazilian Regions are shown in Figure 1.1.

Source: Brazil, MMA, Secretaria de Coordenação dos Assuntos do Meio Ambiente. 1997. O FNMA. Brasília. (Internal document).

Table 3-11. Number of teachers with doctorates and students in each academic field (1990-93).

Year	Academic field	New students		Students enrolled		Degrees awarded		University teachers with doctorates
		Master's	Doctorate	Master's	Doctorate	Master's	Doctorate	
1990	Exact and Earth Sciences	1,697	563	4,053	1,871	858	214	2,655
	Biological Sciences	825	307	2,534	1,409	463	169	1,985
	Engineering	2,259	426	5,691	1,425	934	128	1,520
	Health Sciences	1,480	417	4,559	1,710	702	248	3,272
	Agrarian Sciences	1,204	206	3,325	837	712	123	2,245
Total		**7,465**	**1,919**	**20,162**	**7,252**	**3,669**	**882**	**11,677**
1991	Exact and Earth Sciences	1,670	674	4,211	2,074	1,027	266	2,793
	Biological Sciences	1,016	463	2,740	1,636	644	229	2,122
	Engineering	2,509	565	5,999	1,780	1,209	185	1,628
	Health Sciences	1,423	542	4,905	1,877	804	305	3,422
	Agrarian Sciences	1,133	258	3,416	809	936	127	2,181
Total		**7,751**	**2,502**	**21,271**	**8,176**	**4,620**	**1,112**	**12,146**
1992	Exact and Earth Sciences	1,587	666	3,874	2,249	955	292	2,908
	Biological Sciences	900	397	2,805	1,803	640	328	2,059
	Engineering	2,469	560	6,666	2,436	1,151	171	1,811
	Health Sciences	1,476	576	5,080	2,132	1,011	349	3,715
	Agrarian Sciences	1,220	388	3,485	1,158	869	137	2,319
Total		**7,652**	**2,587**	**20,910**	**9,778**	**4,626**	**1,277**	**12,812**
1993	Exact and Earth Sciences	1,533	682	3,981	2,632	962	267	2,979
	Biological Sciences	936	461	2,780	1,891	673	240	2,101
	Engineering	2,320	688	6,407	2,581	1,264	236	1,928
	Health Sciences	1,679	750	5,290	2,458	1,007	381	3,927
	Agrarian Sciences	1,466	411	3,644	1,270	941	161	2,381
Total		**7,934**	**2,992**	**22,102**	**10,832**	**4,847**	**1,285**	**13,316**

Source: CAPES/MEC (1995). *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília, 1995.*

- Consciousness-raising and involvement in conservation and management projects for communities around (or within) protected areas, riverside populations, fishing communities, etc.;
- Indirectly, through the control of contamination of water sources through programmes of selective waste collection and alternative treatment of waste.

3.3.2 Support Programme for Scientific and Technological Development - PADCT

The Support Programme for Scientific and Technological Development (Programa de Apoio ao Desenvolvimento Científico e Tecnológico - PADCT) was set up in 1984 to support pure and applied research for technological innovation in products and processes in the Brazilian industrial sector. It has already invested US$ 470 million, benefiting 3,000 research projects, including the production of new varieties of soybean, of biodegradable plastics and biomaterials. In 1999, the third phase of the PADCT will involve six-year programme of US$ 700 million; US$ 305 million from the Brazilian Government, and an equal amount from the World Bank, along with US$ 90 million from the private sector.

PADCT III will begin with an investment of US$ 360 million to finance projects in six areas of science and technology, including Biotechnology and Environmental Sciences. In the first call of projects (August-September 1997), 96 were selected and announced publicly. A second call (December 1997-January 1998) resulted in 335 research project applications, involving 599 institutions and more than 3,000 researchers from all over the country.

3.3.3 Support for Biodiversity Projects from 1985 to 1996

Parallel to the efforts of the Brazilian Government to meet the commitments to conserve biological resources or permit their sustainable use, undertaken in accord with the

Table 3-12. Number of postgraduate scholarships awarded by the Brazilian National Research Council (CNPq) in fields related to biodiversity.

Field	Master's					Doctorate				
	1991	**1992**	**1993**	**1994**	**1995**	**1991**	**1992**	**1993**	**1994**	**1995**
Chemistry	543	430	526	435	424	264	318	407	370	375
Oceanography	30	34	37	32	39	3	0	1	5	10
General Biology	13	16	30	34	44	0	0	0	2	4
Genetics	96	107	106	111	124	69	82	52	83	89
Botany	123	125	108	217	129	44	44	52	52	51
Zoology	133	104	134	140	157	44	52	64	54	66
Ecology	101	96	92	109	115	25	26	29	33	44
Biochemistry	148	135	166	174	178	110	149	185	170	169
Pharmacology	46	530	64	64	52	31	36	36	35	34
Microbiology	53	57	63	64	70	38	44	44	46	40
Parasitology	39	35	44	39	39	7	4	5	9	11
Chemical Engineering	222	266	320	332	303	35	90	100	115	139
Pharmacy	56	67	64	55	56	0	7	7	12	7
Agronomy	472	508	540	601	603	0	176	194	212	259
Forest Resources and Forestry Engineering	53	57	48	60	61	0	14	12	18	15
Multidisciplinary	11	9	6	14	17	0	0	0	4	4
Total	**2,139**	**2,099**	**2,348**	**2,481**	**2,411**	**670**	**1,047**	**1,188**	**1,220**	**1,317**

Source: CAPES/MEC. *Avaliação da Pós-Graduação. Síntese dos Resultados. Brasília, 1995.*

Convention on Biological Diversity, many other and varied mechanisms with similar objectives arose shortly before and after Rio 92.

A survey of these mechanisms and experiments was carried out in l996 by the Ministry of Environment, in collaboration with the NGO Institute Society, Population and Nature (Instituto Sociedade, População e Natureza - ISPN). The survey facilitated the consolidation of a proposal for a system of storing information on biodiversity projects in the form of a data bank.

The first phase consisted of a survey and analysis of the information from the principal financing or supporting agencies. Information was also collected from official government institutions and bilateral and multilateral financing agencies. The projects included in the survey were those concerned with research, management, conservation, sustainable use and the recovery of biological diversity.

The areas covered included Conservation Biology, in situ and ex situ conservation, Biotechnology, Botany, Zoology, Animal and Plant Genetics, Animal and Plant Morphology, Animal and Plant Systematics, Zootechnology, inventories and surveys of living organisms, Physiology, Biochemistry, Microbiology, Ecology, Ethnobotany, Ethnopharmacology, Phytopathology and the sustainable use of plants and wildlife.

It proved possible to systematise information relating to the financing of biodiversity projects for 27 of the 40 funding sources for environmental projects in Brazil (Table 3-14). These were divided into five categories:

- State foundations for the support of research (5);
- Federal Government institutions: foundations, financing foundations, state banks (6);
- Nongovernmental organisations and foundations (4);
- Governments of other countries (8);
- International financing organisations (4).

The state research support foundations invest principally in scientific and technological research projects of interests to the development of the state where they are located, with resources from the state budget. The beneficiaries are generally researchers in higher education and research institutions. Assistance normally takes the form of scholarships, assistance for participation in scientific events, and support for basic and applied research.

From 1985 to 96, the five state foundations surveyed financed 1,615 projects which involved some aspect of biodiversity research, totalling US$ 14,270,973 (Table 3-15). The average grant per project was US$ 9,000, varying

Table 3-13. Number of postgraduate scholarships awarded by CAPES in fields related to biodiversity.

Field	Master's					Doctorate				
	1991	1992	1993	1994	1995	1991	1992	1993	1994	1995
Chemistry	229	224	237	291	265	83	109	151	195	202
Oceanography	32	34	34	39	34	5	6	10	18	16
General Biology	48	50	62	57	52	0	0	0	0	1
Genetics	78	87	96	111	88	51	38	59	76	79
Botany	90	94	120	129	125	20	36	45	58	63
Zoology	104	120	121	146	132	17	21	33	41	44
Ecology	95	109	124	134	113	23	31	52	69	68
Biochemistry	116	108	12	143	130	46	50	55	92	101
Pharmacology	49	46	56	66	63	22	28	32	34	38
Microbiology	65	76	79	90	73	18	20	24	25	28
Parasitology	30	25	17	13	17	4	7	4	5	7
Chemical Engineering	231	228	261	285	279	41	41	71	90	92
Pharmacy	57	59	57	55	57	1	3	11	11	15
Agronomy	517	577	593	659	581	69	103	161	181	203
Forest Resources and Forestry Engineering	34	41	50	85	88	3	6	8	10	13
Multidisciplinary	4	3	3	20	31	0	0	0	8	13
Total	**1,779**	**1,881**	**1,922**	**2,313**	**2,128**	**403**	**499**	**706**	**913**	**983**

Source: CAPES/MEC. *Avaliação da Pós-Graduação. Síntese dos Resutlados. Brasília*, 1995.

somewhat the different foundations. The São Paulo State Science Research Foundation (Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP) accounted for 64% of the resources in this category, and 87% of the projects. Of the projects supported by this foundation, 16% were carried out in other states.

The category of Federal Government institutions and organisations grouped together funds, foundations, financing agencies, superintendencies and state banks which financed projects connected with biodiversity. Collectively, they financed 430 projects, to the amount of US$ 19,034,701, with grants averaging US$ 44,267 (Table 3-16). These figures do not include three of the biggest federal funding agencies: CNPq, CAPES and EMBRAPA.

Table 3-14. Values of biodiversity projects financed during 1985-1996.

Financing institution	No. of projects	Average amount /project (US$)	Total value (US$)
Government organisations - foreign	37	1,997,899	73,922,269
Government organisations - national*	430	44,267	19,034,701
International organisations	29	653,475	18,950,764
State foundations	1,579	9,038	14,270,973
Nongovernmental organisations	418	21,347	8,922,948
Total	**2,493**	**54,192**	**135,101,655**

* Data from CNPq, CAPES & EMBRAPA are not included.

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de biodiversidade no Brasil: Relatório Final de Pesquisa - Fase I e Fase II, Brasília*, 1996.

Two international NGOs, The World Wide Fund for Nature (WWF) and Conservation International (CI) and two non governmental foundations, The Ford Foundation and the Boticário Foundation (Fundação o Boticário de Proteção à Natureza), which finance biodiversity projects, supported 418 projects, totalling US$ 8,922,948, with an average grant of US$ 21,347 (Table 3-17).

Eight countries (Germany, United Kingdom, the USA, Japan, France, Italy, Spain and Canada) financed 37 projects, totalling US$ 73,922,269 (Table 3-18). The average grant was US$ 2,000,000. Forty-four per cent of these resources came from Germany, and 27% from the United Kingdom. The other six countries together accounted for 29% (Figure 3-12).

Overseas government policies give priority to a relatively small number of projects, but on a large scale with a long duration. Resources are invested mainly in the Amazon region, and particularly in the protection and conservation of natural resources. There is poor or no co-ordination between the different projects, except in the case of those forming part of the Pilot Program to Conserve the Brazilian Rain Forest (Programa Piloto para a Proteção das Florestas Tropicais do Brasil - PPG-7).

Most of the projects financed by overseas governments are carried out by state and federal research institutes and

Table 3-15. Projects financed by state research support foundations, 1985-1996.

Financing institution	Period	No. of projects	Average no. of projects/year	Average amount/ project (US$)	Average amount/ year (US$)	Total(US$)
Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP)	85-96	1,395	113.25	6,704	759,237	9,110,844
Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS)	92-96	81	16.2	5,217	84,515	422,576
Fundação de Apoio à Pesquisa do Distrito Federal (FAP-DF)	92-95	55	13.75	41,371	568,851	2,275,405
Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG)	89-95	48	6.85	45,711	313,447	2,194,128
Fundação de Amparo à Pesquisa do Estado de Pernambuco (FACEPE)	86-96	36	3.27	7,445	24,365	268,020

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brasil: Relatório Final de Pesquisa - Fase I e Fase II, Brasília (1996).*

government agencies. The US Agency for International Development (USAID), however, carries out projects in partnership with NGOs, universities and US government agencies.

International organisations invested in 29 biodiversity projects totalling US$ 18,950,764 (Table 3-19). With the exception of the Small Projects Programme (PPP-GEF), which, as its name suggests, generally finances small projects carried out by NGOs and communities, they give priority to large-scale projects, generally costing over US$ 1.2 million.

A total of 2,493 projects were supported by the five types of funding agencies (Table 3-14), with resources totalling US$135,101,655.

In general, while national government organisations, state research support foundations and local NGOs give priority to a large number of projects with relatively low-level funding, overseas government agencies and international organisations give priority to a relatively small number of projects with relatively higher costs (Table 3-14). While only 2% of the projects were funded with external resources, this corresponded to 70% of the total funding among the 27 sources surveyed.

From 1985 to 1996, the 27 funding sources surveyed supported varying numbers of projects, from one to 1,359, with amounts ranging US$ 32,540 to US$ 268,020 (Table 3-20). The number of projects financed annually varied from 150 to slightly over 200 between 1985 and 1990. It increased considerably from 1991/1992 onwards to reach 400 in 1995 and a little less than 350 in 1996.

Table 3-16. Number of biodiversity projects financed by Federal Government institutions.*

Financing institution	Period	No. of projects	Average no. of projects/year	Average amount/ project (US$)	Average amount/ year (US$)	Total (US$)
FNMA[1]	92-96	139	27.8	26,610	739,770	3,698,849
FINEP[2]	85-95	137	12.5	59,041	735,329	8,088,617
BASA[3]	89-95	70	10	33,300	333,000	2,330,998
BNB[4]	92-95	40	10	43,580	435,800	1,743,198
SUDAM[5]	89-96	26	3.3	68,298	221,969	1,775,753
FBB[6]	89-95	18	3	77,627	199,612	1,397,286

* Data from CNPq, CAPES, EMBRAPA and IBAMA are not included.
[1] *Fundo Nacional do Meio Ambiente* / National Environment Fund
[2] *Financiadora de Estudos e Projetos* / Financing Agency for Studies and Projects
[3] *Banco da Amazônia* / Bank of Amazonia
[4] *Banco do Nordeste do Brasil* / Bank of the North-east of Brazil
[5] *Superintendência de Desenvolvimento da Amazônia* / Amazon Development Superintendency
[6] *Fundação Banco do Brasil* / Bank of Brazil Foundation
Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no brasil: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

Table 3-17. Number of biodiversity projects financed by nongovernmental organisations.

Financing institution	Period	No. of projects	Average no. of projects/year	Average amount/ project (US$)	Average amount/ year (US$)	Total (US$)
World Wide Fund For Nature / World Wildlife Fund (WWF)	86-96	127	11.5	25,355	292,739	3,220,125
Ford Foundation	86-96	25	2.3	104,103	236,599	2,602,585
Conservation International	89-96	78	11.1	24,979	278,337	1,948,362
Fundação O Boticário para a Conservação da Natureza	91-96	188	31.3	6,127	191,979	1,151,876

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brasil: relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

Although the information provided by the funding institutions did not always allow a precise identification of the geographical areas or biomes to which the resources were destined, it was evident that the south-east of Brazil received the largest number of projects (45% of the total), while the north-east and the central-west received the lowest percentage (11% each). Seventeen per cent were in the north.

This unequal distribution of the number of projects per region in part reflects the contributions of the state research funding foundations which vary according the resources available to each. It also reflects the availability of research scientists in each region. The state of São Paulo contributed one-third of the projects financed, having as it does the richest state research support foundation and the most scientists. The five states with the most projects contributed 62% of the total (Table 3-21).

Table 3-18. Number of projects financed by foreign governments.

Country	Period	No. of projects	Average amount/ project (US$)	Total amount (US$)
Germany	92-95	5	6,508,000	32,540,000
United Kingdom	89-95	9	2,202,000	19,818,000
USA	89-95	7	1,490,467	10,433,269
Japan	92-95	4	1,349,000	5,396,000
France	92-95	9	514,000	4,626,000
Italy	92-95	1	377,000	377,000
Spain	92-95	1	374,000	374,000
Canada	92-95	1	358,000	358,000

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

Table 3-19. Number of projects financed by international organisations and multilateral agencies.

Organisation	Period	No. of projects	Average amount/ project (US$)	Total amount (US$)
IDB[1]	92-95	7	1,098,000	7,686,000
ITTO[2]	89-95	7	884,000	6,188,000
UNDP[3]	92-95	3	1,601,967	4,805,901
GEF[4]	92-96	12	22,572	270,863

[1] Interamerican Development Bank (IDB)
[2] International Tropical Timber Organisation (ITTO)
[3] United Nations Development Programme (UNDP)
[4] Small Projects Programme/Global Environment Facility (GEF)
Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

The distribution is unequal between the states comprising each region. For example, in the south, 49% of the projects were in Paraná. In the south-east, 72% were in São Paulo. In the central-west, 68% were in the Federal District. Projects are concentrated in the wealthiest areas and with no relation to their importance in terms of biodiversity. States such as Mato Grosso and Roraima, with highly diversified ecosystems of great significance in terms of the country's biodiversity, contributed with less than 1% of projects.

However, when considering the amount of funding, the larger-scale projects are mainly concentrated in the north, on account of projects related to the Amazon rain forest. In relation to the number of projects funded, the Amazon rain forest, the Cerrado and the Atlantic forest together accounted for 49% of projects dealing with terrestrial biomes. The biodiversity of aquatic and fluvial, coastal and marine systems accounted for about one-third of the projects financed. The Caatinga (4%) and the Pantanal

Table 3-20. Total value of biodiversity projects financed, according to funding source (1985-1996).*

	Source	Amount(US$)
1)	Germany	32,540,000
2)	United Kingdom	19,818,000
3)	United States of America	10,433,269
4)	FAPESP[1]	9,110,844
5)	FINEP[2]	8,088,617
6)	IDB[3]	7,686,000
7)	ITTO[4]	6,188,000
8)	Japan	5,396,000
9)	UNDP[5]	4,805,901
10)	France	4,626,000
11)	FNMA[6]	3,698,849
12)	WWF[7]	3,220,125
13)	Ford Foundation	2,602,585
14)	BASA[8]	2,330,998
15)	FAP-DF[9]	2,275,405
16)	FAPEMIG[10]	2,194,128
17)	CI[11]	1,948,362
18)	SUDAM[12]	1,775,753
19)	BNB[13]	1,743,198
20)	FBB[14]	1,397,286
21)	Boticário Foundation	1,151,876
22)	FAPERGS[15]	422,576
23)	Italy	377,000
24)	Spain	374,000
25)	Canada	358,000
26)	PPP-GEF[16]	270,863
27)	FACEPE[17]	268,020

	Source	Nº of projects
1)	FAPESP[1]	1,359
2)	O Boticário Foundation	188
3)	FNMA[6]	139
4)	FINEP[2]	137
5)	WWF[7]	127
6)	FAPERGS[15]	81
7)	CI[11]	78
8)	BASA[8]	70
9)	FAP-DF[9]	55
10)	FAPEMIG[10]	48
11)	BNB[13]	40
12)	FACEPE[17]	36
13)	SUDAM[12]	26
14)	Ford Foundation	25
15)	FBB[14]	18
16)	PPP-GEF[16]	12
17)	United Kingdom	9
18)	France	9
19)	United States of America	7
20)	IDB[3]	7
21)	ITTO[4]	7
22)	Germany	5
23)	Japan	4
24)	UNDP[5]	3
25)	Italy	1
26)	Spain	1
27)	Canada	1

***** Data on CNPq, CAPES and EMBRAPA not included.

1 Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) - São Paulo State Science Research Foundation

2 Financiadora de Pesquisas e Projetos (FINEP) - Financing Agency for Research and Projects

3 Interamerican Development Bank (IDB)

4 International Tropical Timber Organisation (ITTO)

5 United Nations Development Programme (UNDP)

6 Fundo Nacional do Meio Ambiente (FNMA) National Environment Fund

7 World Wildlife Fund / World Wide Fund for Nature (WWF)

8 Banco da Amazônia (BASA) Bank of Amazonia

9 Fundação de Apoio à Pesquisa do Distrito Federal (FAP-DF) - Federal District Research Support Foundation

10 Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) - Minas Gerais State Research Support Foundation

11 Conservation International (CI)

12 Superintendência de Desenvolvimento da Amazônia (SUDAM) - Superintendency for Amazon Development

13 Banco do Nordeste do Brasil (BNB) - Bank of the North-East of Brazil

14 Fundação Banco do Brasil (FBB) - Bank of Brazil Foundation

15 Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS) - Rio Grande do Sul State Research Support Foundation

16 Small Projects Programme/Global Environment Facility (GEF)

17 Fundação de Apoio à Pesquisa do Estado de Pernambuco (FACEPE) - Pernambuco State Research Support Foundation

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

Table 3-21. Number of biodiversity projects financed by state (1985-1996).*

State	No. of projects	%	Region
1) São Paulo	522	33.5	South-east
2) Minas Gerais	113	7.3	South-east
3) Distrito Federal	111	7.1	Central-west
4) Amazonas	106	6.9	North
5) Paraná	92	5.9	South
6) Pará	73	4.7	North
7) Rio de Janeiro	67	4.3	South-east
8) Acre	61	3.9	North
9) Rio Grande do Sul	59	3.8	South
10)Pernambuco	51	3.3	North-east
11)Bahia	47	3.0	North-east
12)Santa Catarina	37	2.4	South
13)Espírito Santo	20	1.3	South-east
14)Goiás	20	1.3	Central-west
15)Rondônia	19	1.2	North
16)Mato Grosso do Sul	18	1.1	Central-west
17)Piauí	16	1.0	North-east
18)Ceará	15	0.9	North-east
19)Mato Grosso	15	0.9	Central-west
20)Paraíba	13	0.8	North-east
21)Rio Grande do Norte	13	0.8	North-east
22)Amapá	11	0.7	North
23)Sergipe	7	0.4	North-east
24)Maranhão	6	0.4	North-east
25)Alagoas	5	0.3	North-east
26)Roraima	4	0.3	North
27)Tocantins	3	0.2	North

*Data from CNPq, CAPES and EMBRAPA not included.

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

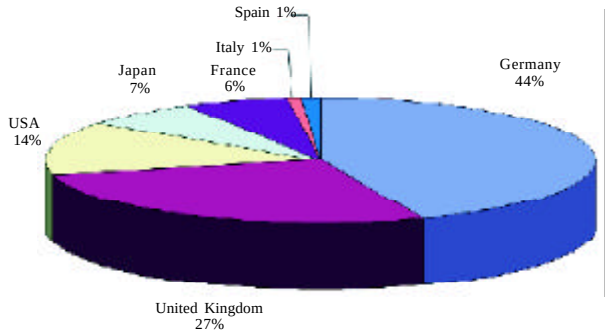

Figure 3-13. Financial resources provided on biodiversity projects by foreign governments, 1989-1995.

Source: Instituto Sociedade, População e Natureza - ISPN. 1996. Levantamento e Caracterização de Projetos de Biodiversidade no Brasil: Relatório Final de Pesquisa - Fase I e Fase II. Brasília.

Table 3-22. Number of biodiversity projects financed by biome (1985-1996).*

Biome/ Ecosystem	Nº of Projects	%
Amazon rain forest	260	22
Aquatic and fluvial systems	251	21
Cerrado	159	14
Coastal and marine systems	154	13
Atlantic forest	148	13
Other Woods and Forests	82	7
Caatinga	42	4
Mangroves	24	2
Pantanal of Mato Grosso	22	2
Others (caves, *restingas*, urban systems)	22	2

* Data from CNPq, CAPES and EMBRAPA not included.
Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

Table 3-23. Number of biodiversity projects financed by topic (1985-1996).*

Topic	%
Ecology	28
Zoology	17
Botany	10
Sustainable management of biodiversity resources	10
Conservation biology *in situ* and *ex situ*	6
Systematics and Taxonomy	4
Inventory and surveys of biodiversity	4
Environmental education	3
Genetics	2
Oceanography	2
Others	14

*Data from CNPq, CAPES and EMBRAPA not included.

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

(wetlands) (2%), both biologically rich biomes, were not given their due (Table 3-22 and Figure 3-13).

Analysis of the biodiversity projects by theme during this period demonstrated considerable concentration on just a few areas. Three of these, Ecology, Zoology and Botany,

represented 55% of the projects financed (Table 3-23), and ten of the principal areas accounted for 86% of the projects.

Besides these ten main topics, projects in Agronomy, Biotechnology, Museology, and Animal and Plant Physiology came to between one and 2% of the total. Another 5% went to congresses, seminars and workshops, as well as publications. The remaining 4% went to: Anthropology; Health Sciences; Soil Conservation; Biological Control; Demography; Law, Political Science and Sociology; Sanitary Engineering; Ethnobiology; Pharmacology; Plant Genetics; Phytopathology; Geography; Geology; Informatics; Limnology; Microbiology; Palynology; Fish-farming; Chemistry/Biochemistry; Remote Sensing; and Veterinary Science/Zootechnology.

Public agencies carried out most of the projects. Taken together, public universities, public agencies (state and municipal environmental secretariats) and public research institutions represented 84% of the total (Table 3-24). Universities represented 70%, owing principally to the projects funded by FAPESP, 1,233 of which were carried out by universities. Even so, universities received only 5% of the total financing, since each grant was small. NGOs were responsible for 11% of the projects.

The distribution of these projects over time (Figure 3-15) shows that from 1991 on there was an increase in the number of projects financed, probably as a consequence of the Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, when the Convention on Biological Diversity was ratified. The highest total in terms of disbursement, however, was in 1995.

Although only five agencies gave information on unmet demand, the data indicate that little more than 13% of the

Table 3-24. Number of biodiversity projects by different agencies.*

Agency	Nº of Projects
Universities	1,490
NGOs	228
Public agencies	209
Research Institutes	92
Individuals	71
Private companies	12
Others	27
Total	2,129

* Data from CNPq, CAPES and EMBRAPA not included

Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília,* 1996.

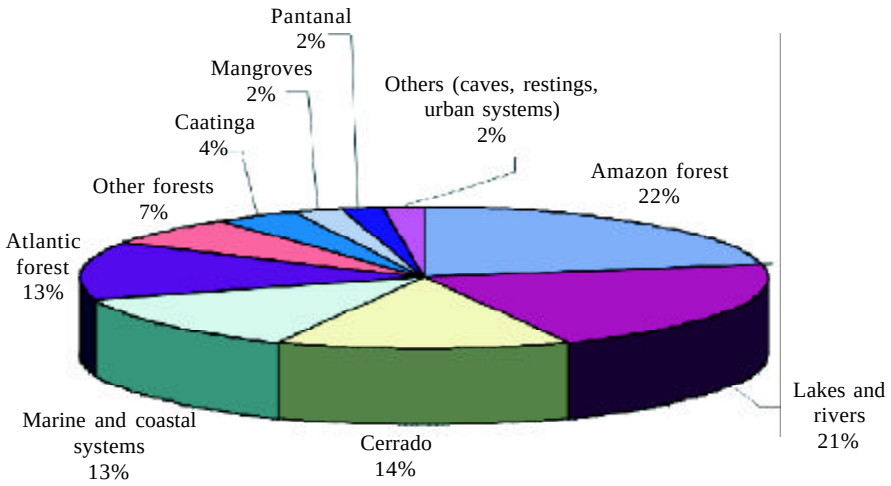

Figure 3-14. Distribution of projects on biodiversity by biome from 27 funding sources during 1985-1996.

Source: Instituto Sociedade, População e Natureza - ISPN. 1996. Levantamento e Caracterização de Projetos de Biodiversidade no Brasil: Relatório Final de Pesquisa - Fase I e Fase II. Brasília.

projects submitted actually received funding (Table 3-25). In financial terms, only 3.5% was met (US$ 8.355 million), while 96.5% failed obtain the resources requested (US$ 233.67 million). The average budgets of the proposals not accepted was some 60% higher than that of the projects that were accepted.

One of the problems in this first phase of the research survey was that some funding sources, both public and private, preferred not to disclose the information requested. Importantly, this survey led to a system of storing and organising information on the funding, distribution and types of biodiversity projects.

3.3.4 Other Financial Mechanisms

Besides these sources of funding, there are other programmes and institutions which have been mentioned in the course of this chapter on the implementation of Article 6 of the CBD. They include, such as PROBIO, FUNBIO, PNMA, PADCT, PPG-7 and FNMA. The Kreditanstalt für Wiederaufbau - KfW of the Federal Republic of Germany, provides financial support for two important projects in the states of São Paulo and Paraná.

The first is the Atlantic Forest Preservation Project (Projeto de Preservação da Mata Atlântica), which covers an area of 17,300 km², from the Vale do Ribeira to the north of the state of São Paulo, passing through the Serra do Mar State Park, and including 39 municipalities. The project involves: 1) Inspection and monitoring; 2) Consolidation of protected areas; 3) Zoning and community participation and 4) Management co-ordination.

The total expected cost of the project is equivalent to US$ 35,485,526. US$ 19,736,842 comes from KfW and US$ 15,748,684 from the São Paulo State Government. R$ 1,296,524 has already been invested in the project.

The second project seeks to create the necessary organisational conditions for the conservation, preservation and recovery of remaining areas of Atlantic forest and associated ecosystems, including promoting socio-economic activities of local communities which are sustainable and compatible with conservation and the rational use of natural resources. It covers areas of dense rain forest and associated ecosystems in 15 municipalities of the state of Paraná, and a total area of 11,390 km². The total funding provided for the programme is R$ 19,596,838. US$ 7,746,978 of this is from the state of Paraná, and US$ 11,849,860 from KfW.

Table 3-25. Demand for biodiversity projects, met and unmet (1992 -1996)* by funding source.

Source	Met		Unmet		Total
	No.	%	No.	%	
FACEPE[1]	36	84	7	16	43
FAPERGS[2]	81	19	354	81	435
PPP-GEF[3]	12	7	151	93	163
FUNBIO[4]	10	1	1,073	99	1,083
SUDAM[5]	26	50	26	50	52
WWF[6]	127	12	277	78	404
Total	**292**	**13.4**	**1,888**	**86.6**	**2,180**

*Data from CNPq, CAPES and EMBRAPA not included.
1 Fundação de Apoio à Pesquisa do Estado de Pernambuco - FACEPE
Pernambuco State Research Support Foundation
2 Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS)
Rio Grande do Sul State Research Support Foundation
3 Small Projects Programme/Global Environment Facility (GEF)
4 Fundo Brasileiro para a Biodiversidade (FUNBIO)
Brazilian Fund for Biodiversity
5 Superintendência de Desenvolvimento da Amazônia (SUDAM)
Superintendency for Amazon Development
6 World Wildlife Fund / World Wide Fund for Nature (WWF)
Source: Instituto Sociedade, População e Natureza (ISPN). *Levantamento e Caracterização de Projetos de Biodiversidade no Brail: Relatório Final de Pesquisa - Fase I e Fase II, Brasília*, 1996.