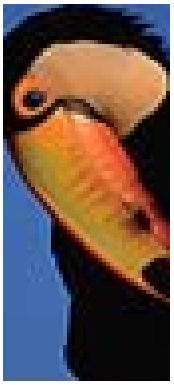
1.4 Conservation Areas



There are already several Conservation Areas in the region. The following tables and map show the existing ones, in line with the Strategic Action Program for the Integrated Management of the Pantanal and Upper Paraguay River Basin, a report published by ANA/GEF/UNEP/OAS in December, 2004. The tables list the federal, state and private areas, the latter corresponding to the Private National Heritage Reserves (RPPN), designed to promote the conservation of privately-owned land which contains relevant natural features and/or species of flora and fauna worthy of preservation.

Table 1.4 – Federal Conservation Areas

Federal Conservarion Areas	River sub-basin	Area (ha)
Estação Ecológica Serra das Araras	Paraguai	28,700
Estação Ecológica Taiamã	Paraguai	11,200
Parque Nacional da Chapada dos Guimarães	Cuiabá	33,000
Parque Nacional do Pantanal Mato-grossense	Cuiabá/Paraguai	135,000
Parque Nacional da Serra da Bodoquena	Miranda /Aquidauana	76,480

Table 1.5 – State Conservation Areas – Mato Grosso

State Conservarion Areas - MT	River sub-basin	Area (ha)
APA Cabeceiras do Rio Cuiabá	Cuiabá	473,410
APA da Chapada dos Guimarães	Cuiabá	251,848
Estrada-Parque Santo Antonio Porto de Fora	Cuiabá	-
Estrada-Parque Transpantaneira	Cuiabá	-
Estrada-Parque Cachoeira da Fumaça-Jaciara	Tenente Amaral	-

Table 1.6 – State Conservation Areas – Mato Grosso do Sul

State Conservarion Areas - MS	River sub-basin	Area (ha)
Parque Estadual das Nascentes do Rio Taquari	Taquari	30,620
Parque Estadual do Pantanal do Rio Negro	Paraguai and Miranda	78,303
Monumento Natural da Gruta do Lago Azul	Miranda /Aquidauana	78303
Parque Estadual da Serra da Sonora	Cuiabá	7,914
Estrada-Parque de Piraputanga	Miranda /Aquidauana	-
APA do Rio Cênico Rotas Monçoeiras Coxim	Taquari	-

Table 1.7 - RPPNs – Mato Grosso

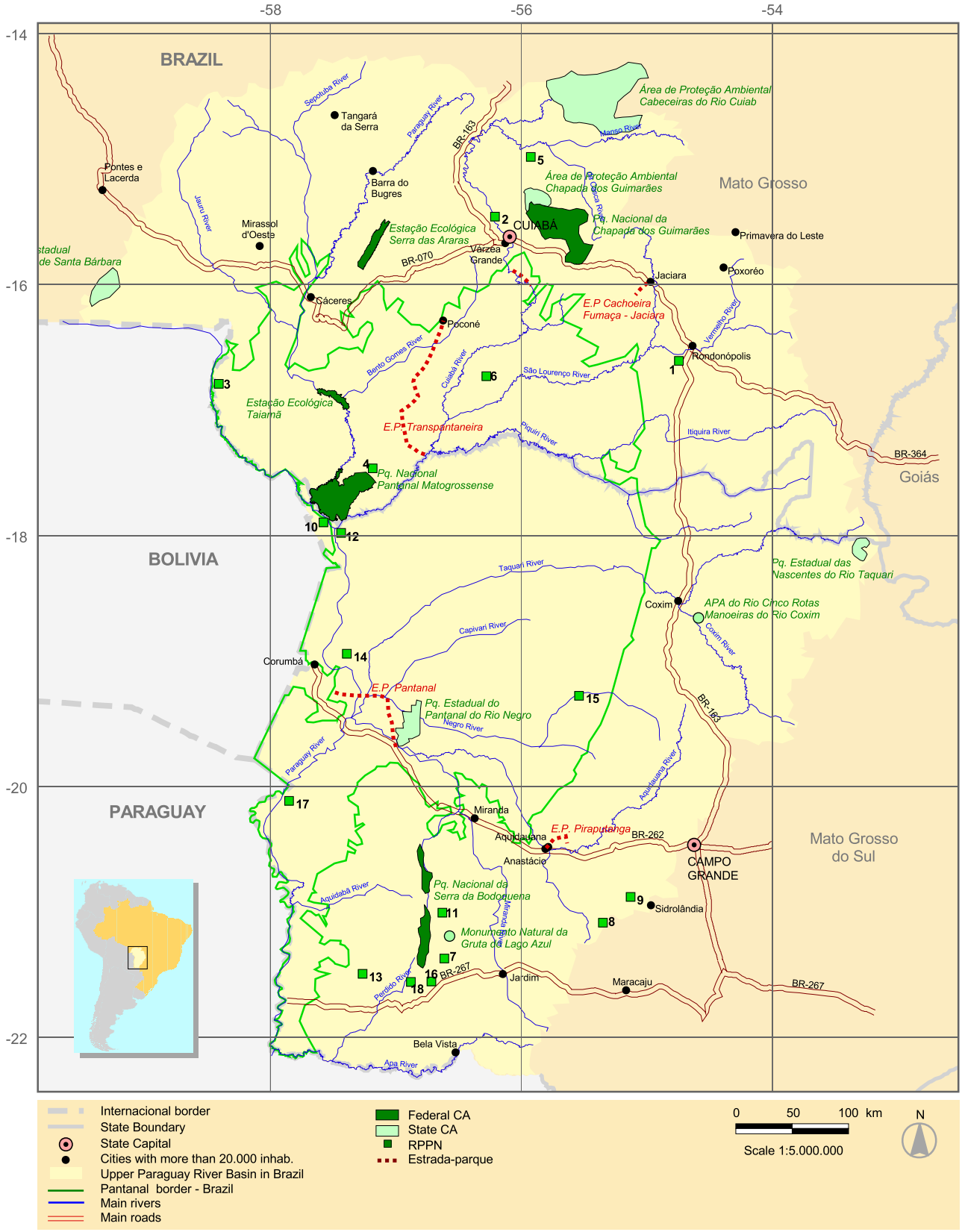
RPPNs		Municipality	River sub-basin	Area (ha)
1	Pq. Ecológico João Basso	São Lourenço and Rondonópolis	Cuiabá	3,624
2	Fazenda São Luiz	Cuiabá	Cuiabá	200
3	Reserva Jubran	Cáceres	Paraguai	35,531
4	Estação Dorochê	Poconé	Cuiabá	26,518
5	Reserva Ecológica da Mata Fria	Chapada dos Guimarães	Cuiabá	10
6	Estância Ecológica SESC-Pantanal	Barão de Melgaço	Cuiabá	87,871

Table 1.8 – RPPNs – Mato Grosso do Sul

RPPN - MS		Municipality	River sub-basin	Area (ha)
7	Fazenda Boqueirão	Bonito	Miranda /Aquidauana	87,871
8	Fazenda Capão Bonito	Maracaju	Miranda /Aquidauana	684
9	Fazenda Lajeado	Dois Irmãos do Buriti	Miranda /Aquidauana	12,550
10	Fazenda Acurizal	Corumbá	Paraguai	13,200
11	Fazenda América	Bonito	Miranda /Aquidauana	401
12	Fazenda Penha	Corumbá	Paraguai	13,100
13	Fazenda Margarida	Porto Murtinho	Apa	1,999
14	Fazenda Santa Helena	Corumbá	Paraguai	4,295
15	Fazendinha	Aquidauana	Miranda /Aquidauana	9,619
16	Fazenda Trevo	Bonito	Miranda /Aquidauana	28
17	Reserva Ecológica Fazenda Arara Azul	Corumbá	Paraguai	2,000
18	Fazenda Singapura	Bonito	Miranda /Aquidauana	456

UPPER PARAGUAY RIVER BASIN IN BRAZIL

Conservation Areas



1.5 Economy and Infrastructure

Historical background

At the beginning of colonization, it was mining that initially led to the occupation of the entire Paraguay River valley. The discovery of alluvial gold deposits in Cuiabá triggered armed conflict between the *bandeirantes* (early explorers) and the original indigenous inhabitants. The peak of the gold cycle was in the second half of the 18th century.

Thanks to the river network, shipping services led to the occupation of western Brazil. Corumbá experienced a boom, fueled by the regular steamships plying the routes to Montevideo and Buenos Aires. In fact, the Paraguay, Paraná and Plata rivers were the region's only means of communication with the outside world until the 1950's, when the former Estrada de Ferro Noroeste do Brasil railway reached the border with Bolivia. As a result, river transport gradually went into decline, a situation that was compounded as of the 60s, when road construction began to speed up. Eventually, this type of transport became the dominant one.

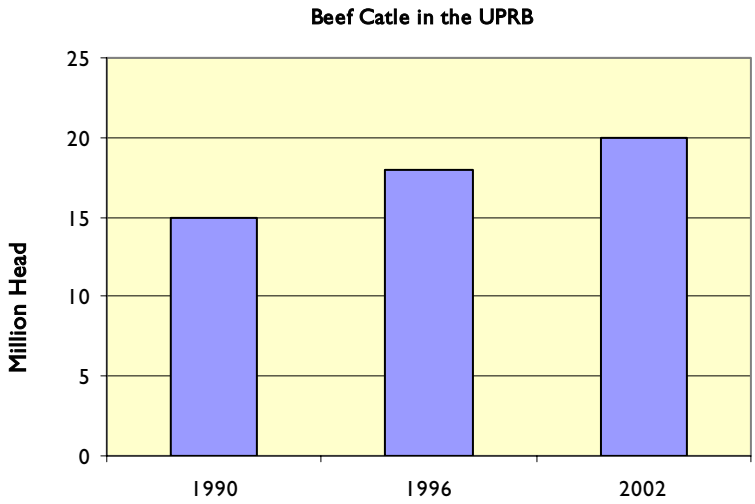
Development Programs

The regional and sector development programs, which were the main drivers behind the occupation of Brazil's Midwest, can be divided into two groups, according to their influence on the Pantanal region. The first comprises those policies that were concerned with direct action in the Midwest, but whose aims contained no such actions directly related to the floodplain itself, such as POLAMAZÔNIA (Amazonia Development Program) and PRODEGRAN (Grande Dourados Development Program). The second, comprising POLOCENTRO and PRODEPAN, profoundly altered the dynamics of the Pantanal itself. POLOCENTRO (the Program for the Development of the Cerrado) was set up to promote the settlement of parts of the cerrado considered to be unproductive and was run by EMBRAPA (Brazilian Agricultural Research Corporation). PRODEPAN (the Pantanal Development Program) was instituted in 1974 to encourage the modernization of cattle-breeding in the region by improving the herd and introducing planted pasture.

Currently, there are two Midwest development programs under way dealing specifically with the UPRB – PRODEAGRO (Agribusiness Development Program) and the Pantanal Program, which support the development of apiculture, aquaculture, aviculture, floriculture, sheep and goat farming, sericulture, pig farming and frog farming.

Agriculture

The Pantanal's economy is based on beef cattle. According to figures from the Strategic Action Program, in 2002 there were around 20 million head of cattle in the basin, distributed between the plateau (around 14 million) and the floodplain (6 million). The graph below shows the herd's growth since 1990.



Native pasture is the basis of this activity and accounts for more than 90% of the Pantanal's cattle-raising land. It comprises a huge variety of forage species highly subject to the influence of the hydrological cycle, soil conditions and pasturing techniques. In more recent years, in response to the need to increase productivity, artificial pasture has been introduced. This, replacing the native vegetation, has had a direct effect on soil degradation, causing considerable soil and nutrient loss and, consequently, the transport of greater amounts of sediment to the water courses. Currently, planted pasture area is estimated at around 10 million ha (on the plateau), and is likely to increase further, due to the building of new roads.

Cultivated area is also expanding. In 2002, such land stood at around 2.5 million ha, almost all of which (2.1 million ha) given over to soybean. Of this total, some 200,000 ha are located on the floodplain. Other crops grown in the region include cotton, corn, rice and grain sorghum.

Infrastructure

The UPRB will be directly impacted by a series of undertakings geared towards the economic integration of South America. The aim of the main such ongoing project – the IIRSA (South American Regional Integration Initiative) is to develop and integrate the continent's transport, energy and telecommunication areas by 2010.

One of the most important of the infrastructure projects is the inter-oceanic corridor between the ports of Santos, on the Atlantic, and Antofagasta, on the Pacific. This involves the construction and expansion of waterways, the recuperation of railways such as the Bauru/Corumbá and the Campo Grande/Corumbá/Santa Cruz de la Sierra, the extension of rail track and the eventual building of a new bridge over the Paraguay River, linking Porto Murtinho, in Brazil, and Colônia Carmelo Peralta, in Paraguay.

Ongoing undertakings in the UPRB

- *Power generation*

The UPRB's installed capacity is currently around 1,500 MW, most of which is generated the region's three main thermoelectric plants: Willian Arjona, (120 MW), in Campo Grande, and Cuiabá I and II (around 525 MW each). New projects include the 360 MW Corumbá thermal plant, for municipal use, and another 200 MW plant for the steelmaking complex. The biggest existing hydroelectric plant is the Usina de Manso, run by Furnas Centrais Elétricas, with an installed capacity of 212 MW, although other such facilities are in the inventory or project phase, or under construction.

- *Bolivia-Brazil Gas Pipeline*

The Bolivia-Brazil Gas Pipeline, currently in place as of Corumbá, will connect up with Brazil's Northeast via the 5,100 km Unification Pipeline (Gasun), unifying the country's natural gas distribution network. This pipeline will begin Mimoso, in Mato Grosso, then pass through Goiânia on its way to Brasília. In a subsequent stage, possibly in the next decade, the states of Goiás and Maranhão will be connected by a stretch passing through Palmas and Belém.

- *Corumbá Mining and Steel Complex*

Involving Vale do Rio Doce, Belgo Mineira and Rio Tinto Mineração, production is estimated at 1.7 t/day of sponge iron, with investments of US$ 150 million.

- *Gas-Chemical Complex*

This joint Brazil-Bolivia project to build a gas-chemical complex in Corumbá will absorb investments of more than US$ 1 billion. As of 2010, it will be consuming 3 million m^3 p.a. of Bolivian natural gas, mostly to produce polyethylene. The complex is also expected to generate further investments of around US$ 1 billion in fertilizer plants, chiefly to produce urea and ammonia.

- *Paraguay-Paraná Waterway*

This project involves Bolivia, Brazil, Paraguay, Uruguay and Argentina and envisages the execution of hundreds of dredging, blasting and straightening operations on the Paraná and Paraguay rivers as of the municipality of Cáceres, in Mato Grosso. The waterway, with a total extension of 3,440 km, will traverse 1,300 km of the Pantanal, from Cáceres to Nueva Palmira, in Uruguay. The aim is to permit year-round barge transport.

- *Inter-oceanic Multimodal Transport Corridor*

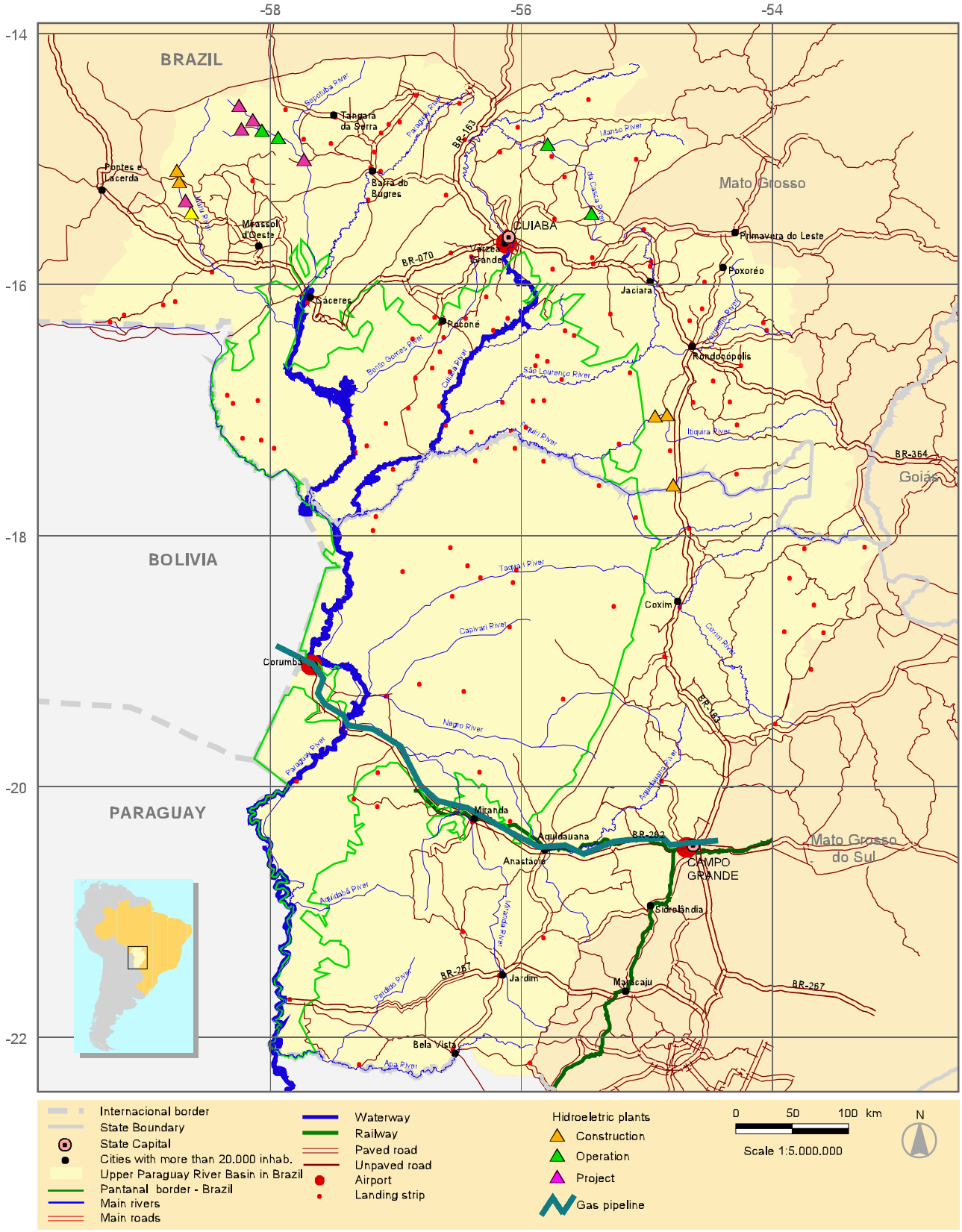
The integration of rail, road and waterway transport systems is under full expansion in Mato Grosso do Sul, forming a huge multimodal network, which will eventually consolidate the inter-oceanic corridor, linking the Atlantic and the Pacific. This will facilitate the transport of products from Brazil's Midwest, especially Mato Grosso do Sul, to countries in Latin America, Europe and Asia. In Mato Grosso do Sul, the project is being implemented by the State Housing and Infrastructure Secretariat.

- *Porto Murtinho River Port*

Cargo transport on the Brazilian stretch of the Paraguay River, is primarily concentrated between Corumbá and Porto Murtinho. The Porto Murtinho waterway terminal is chiefly concerned with the shipping out of meat, iron ore, soybean, sugar and ethanol, although it also handles demand from tourism. The new export corridor could ensure outflow of as much as 100,000 t of soybean per hour (the port's current grain handling capacity is around 400 t per hour).

UPPER PARAGUAY RIVER BASIN IN BRAZIL

Infrastructure



1.6 Threats to the Ecosystems

Land clearance and erosion

Continuing land clearance for the purpose of creating monoculture grain fields and pasture has spread to and destroyed important headwater areas and swathes of riparian vegetation. Since the beginning of the 1970's, the expansion of agriculture on the plateau surrounding the Pantanal has triggered massive soil erosion and the drastic silting up of the Taquari and São Lourenço Rivers, important tributaries of the Paraguay.

The silting up of the previously navigable Taquari has led to intense sedimentation, raising the bed of both the Taquari and the Paraguay, jeopardizing, and even preventing, natural drainage during the floods. Other adverse phenomena include the increasing devastation of riparian coverage, changes in the river courses and the appearance of "meander cuts", formerly dry areas now flooded due to rupture of the river banks.

Figures from the Strategic Action Program (ANA/GEF/UNEP/OAS) point to the production of more than 24,000 t p.a. of sediment from erosion in various river sub-basins, especially the Taquari and São Lourenço. Most is deposited in the intermediate water bodies, with around 7,000 t p.a. reaching Porto Esperança.

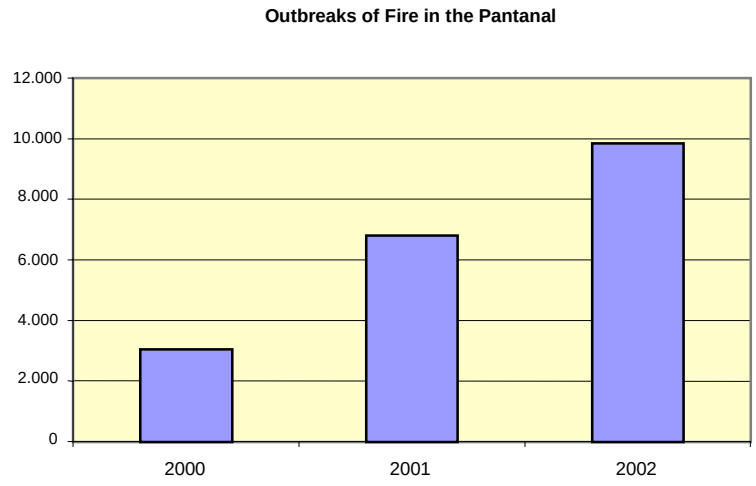
The huge volume of sediment carried to the floodplain has created shallower and permanently flooded areas, such as the Taquari river delta. According to EMBRAPA-Pantanal, it is the annual ebb and flow of the waters which ensures that elements from the dry season benefit life in the floods. One example is the flood-driven fish that feed on plant detritus or insects – which proliferate in the dry soil. If the cycle is altered, this will be lost. The so-called *piracema* – the mass upstream migratory breeding movement as fish return to the headwaters to spawn – has been jeopardized, and cattle-breeders and small farmers have lost their land. The sandbanks have also hampered navigation. In certain locations, the Lower Taquari resembles a toothpick-holder, with dead trees rising from the surface of the water.

The alteration of the natural silting process may also affect the refill points of the Guarani Aquifer. One of the world's largest groundwater reservoirs, with a capacity of 37,000 km^3, it covers an enormous area that includes parts of Brazil, Paraguay, Argentina and Uruguay, and is partially fed by the region's rivers. The excessive silting compromises this process by making the river beds impermeable.

Burning

The use of fire to clear land is a perennial problem. The main purpose is to clear the remains of crops or create pasture. The burning takes place in the driest part of the year, when farmers are preparing their soil for planting. Frequently, due to control difficulties or sheer negligence, these fires develop into full-blown forest fires. Anything in their path is destroyed as they rage out of control, causing massive environmental damage, including the irreparable loss of native vegetation and habitats, with a direct impact on biodiversity.

Data from EMBRAPA, culled from the satellite monitoring system, show that the number of fires in the Pantanal is growing, as can be seen from the graph below.



Predatory Fishing and Hunting

Intensive fishing is a predatory practice which has been threatening the fish populations in the floodplain ecosystem. Essentially, this means that precedence is given to sheer numbers, with more and more, and increasingly smaller, individuals of the region's ten leading species being caught. These include the *pacu* and the *pintado*, both of enormous commercial value.

According to SCPESCA/MS (the Mato Grosso do Sul Fishing Control System), between 1979 and 1983 the Pantanal received between 17,000 and 20,000 sport fisherman per year; by 1999, this figure had climbed to 58,966. In terms of numbers caught, the annual total has averaged around 1,350 t in recent years, only 350 t of which from commercial fishing – the rest being taken for sport.

Another problem is the demand for live bait, used to hook the more sought-after species, which has increased the trade in these small fish and crustaceans. Hundreds of low-income families are collecting and sometimes breeding these species on the banks of rivers and lakes, creating new poles of social exclusion. Around 2,000 individuals are thought to be involved.

These people, known as *isqueiros* (from *isca*, the Portuguese word for bait) come from poor backgrounds with little or no job prospects in the small Pantanal towns. They therefore venture out to the floodplain's lakes or "bays" in search of fish to sell to the tourists. Living in precarious conditions, camped under concrete bridges or in makeshift wooden huts and facing all sorts of adversity, they have created a highly risky and unhealthy profession.

In addition, some of these live-bait species are also a food source for local and migratory birds. The lack of sufficient studies to determine the magnitude of the impact on such species hampers the establishment of sustainable parameters for this activity. There is a consensus among researchers that the use of techniques, equipment and fisherman training in order to ensure sustainable management, increasing the selectivity with which such bait species are caught (and reducing their mortality) is an effective means of subsidizing such studies and establishing the parameters through participatory research.

There are still other factors threatening fish stocks: the previously-mentioned silting up of the rivers (resulting from land clearance and fires), agribusiness on the borders of the floodplain, prospecting, unorganized tourism, and, more recently, the non-intentional appearance or introduction (through aquaculture) of exotic species, such as the golden mussel, the giant African land snail and the tilapia.

As for predatory hunting, the main problem refers to the illegal hunting of alligators. Although this practice has diminished somewhat in recent years, it still persists, thanks to the area's huge size, precarious inspection procedures and a well-organized group of hunters and illegal traders. Other animals are also hunted, albeit on a lesser scale, including the collared peccary, capybara, otter and giant otter. Birds are also at risk, especially the macaws and particularly the blue macaw, which is becoming increasingly rare.

The Deterioration of Water Quality

Development in the UPRB has not been accompanied by adequate investments in urban infrastructure and basic sanitation, resulting in increasing quantities of domestic and industrial sewage being launched into the water courses, compounded by contaminant residues in surface run-off and solid waste. The following tables show the situation of the region's municipalities vis-à-vis basic sanitation.

Table 1.9 – Population Covered by Sanitation Services (2001)

State	Water Supply	Sewage Collection	Sewage Treatment
Mato Grosso	72.9 %	16.9 %	13.8 %
Mato Grosso do Sul	88.8 %	7.7 %	14.7 %

Source: Strategic Action Program (ANA/GEF/UNEP/OAS)

Table 1.10 – Solid Domestic Waste

Final Disposal	Quantity (t/day)
Controlled landfills	749
Sanitary landfills + composting plants	737
Garbage dumps	869
Drainage stations	30
Total	2,385

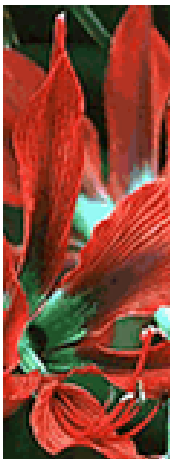
Source: Strategic Action Program (ANA/GEF/UNEP/OAS)

In the north of the Pantanal, urbanization-driven pollution is compounded by that from independent diamond and gold-mining operations, which has increased the concentration of toxic elements such as mercury. Iron, manganese and limestone are also mined in the south. The biggest such complexes are situated on the edge of the Pantanal – in the Urucum Massif and Cuiabá-Cáceres. Urucum, part of the municipality of Corumbá, contains one of Latin America's largest manganese deposits (more than 100 billion t) as well as an iron-ore deposit estimated at 2 billion t. All the manganese is mined underground while iron mining takes place on the surface.

Underground mining can affect the water tables that feed rivers, streams and wells, contaminating the water. Indeed, the negative impact has already been detected in the Urucum creek, in Corumbá. If proper pre-operational environmental studies are not undertaken and impact-minimizing measures not implemented, this process may well be repeated.

Other threats to basin water quality come from farming, which increases the concentration of residues from artificial fertilizer and pesticide use. The impact of such inputs has led to growing worries. Figures from the Marca D'Água Project show that, between 1988 and 1996, a total of 1,370 m^3 (157,000 t) of pesticides, herbicides and fungicides were applied in the Taquari River Basin, 1/3 of which in the municipality of São Gabriel do Oeste.

Other Interventions



The UPRB has been subjected to a series of physical interventions, due to the intensification of human settlement and economic activity. Many have altered the flow of the Pantanal rivers, either through the building of dams and roads or through direct changes of their course or depth (in the case of waterways and floating ports). Yet another potential threat to the regional ecosystems comes from the increase in unorganized tourism, aggravated by the lack of adequate infrastructure and effective control and inspection procedures.

2. INSTITUTIONAL AND MANAGEMENT FRAMEWORK

2.1 National Legal and Institutional Framework

The National Environmental Policy (Federal Law 6938/81) created the National Environmental System (SISNAMA), which established that federal, state, Federal District and municipal bodies, as well as government-instituted foundations, are responsible for protecting and improving the environment.

According to article 6 of the above-mentioned Federal Law, the SISNAMA comprises the following entities: (i) a **Supervisory Body**, the Government Council, which advises Brazil's president on the drafting of national policy and government directives regarding the environment and natural resources; (ii) a **Consultative and Deliberative Body**, the National Environmental Council – CONAMA, charged with studying, proposing and advising on government policy directives and discussing norms and standards compatible with environmental protection; (iii) a **Central Body**, the Ministry of the Environment, responsible for planning, coordinating, supervising and controlling national environmental policy and associated government directives at federal level; (iv) an **Executive Body**, the Brazilian Institute for the Environment and Renewable Natural Resources – IBAMA, responsible for executing and enforcing government environmental directives; (v) **Sector Bodies**, part of the direct or indirect federal administration, or government-instituted foundations; (vi) **Sectional Bodies**, involving state organs or entities responsible for executing programs and controlling and inspecting activities capable of harming the environment; and (vii) **Local Bodies**, comprising municipal organs or entities, responsible for controlling and inspecting these activities in their respective jurisdictions.

2.2 Management in the State of Mato Grosso do Sul

The environmental management framework in Mato Grosso do Sul comprises the State Environmental Control Council (CECA), the State Secretariat for the Environment and its associated body, the State Environmental Foundation (FEMAP). Complementing this are the members of the Environmental Police Force, linked to the Secretariat for Public Safety. The State Secretariat for the Environment, through FEMAP, is responsible for the state's Conservation Areas. At municipal level, Municipal Environmental Councils are being set up, as are Secretariats charged with establishing the municipal management systems in their respective jurisdictions.

2.3 Management in the State of Mato Grosso

On June 6, 1983, through Laws 4559 and 4560, the Mato Grosso governor and legislature created the Pantanal Development Foundation (FUNDEPAN). Two years later, the Secretariat for Labor and Social Development was instituted by Law 4894 of 25/09/85,.

In 1987, there was the need to set up a specific environmental body to draw up and manage a State Environmental Policy. Thus the State Secretariat for the Environment was created on 23/12/87, through Law 5218. FUNDEPAN and the Secretariat for Labor and Social Development were then transformed into the State Environmental Foundation (FEMA), a semi-private institution with administrative and financial autonomy, but linked to the State Secretariat for the Environment, whose chief responsibility was to execute the State Environmental Policy.

The State Secretariat for the Environment was then extinguished, all its powers being subsumed by FEMA. Only the post of Special Secretary for the Environment was retained, the official title of FEMA's president.

2.4 Public Bodies

National Water Agency – ANA

Set up in 2000, the ANA is an autarchy linked to the Ministry of the Environment, with administrative and financial autonomy, responsible for regulating the use of water in rivers and lakes in the federal domain, ensuring sufficient quantity and adequate quality for multiple purposes, and implementing the National Water Resource Management System (SNGRH), a conjunction of legal and administrative mechanisms aimed at rational water planning with the participation of municipal and state governments and society as a whole. These mechanisms are part of Law 9433/97, the so-called Water Law, which established the principle of multiple use as a pillar of the National Water Resource Policy (PNRH), so that the different user sectors (human supply, power generation, irrigation, navigation, industry, leisure, etc.) would have access.

The ANA also helped in the search for a solution to two of the country's most serious problems – prolonged periods of drought, especially in the Northeast, and river pollution – being responsible for carrying out the PRNH and implementing, together with the bodies making up the SNGRH, the management instruments. These include water-use licensing (and prohibition), charging and inspection/control.

Brazilian Agricultural Research Corporation - EMBRAPA

EMBRAPA, linked to the Ministry of Agriculture, Livestock and Supply, was created in 1973 with the aim of finding viable solutions for sustainable development in the rural sphere, with an emphasis on agribusiness, by generating, adapting and transferring knowledge and technology to benefit the various segments of Brazilian society. EMBRAPA is present in almost all states, with their huge variety of ecological conditions, has 8,619 employees, 2,221 of whom researchers, and an annual budget of around R$ 877 million.

It maintains around 275 technical cooperation agreements with 56 countries and 155 international research institutions, for the purposes of joint research. Supported by the World Bank, EMBRAPA has installed laboratories in the USA (Department of Agriculture, Washington) and France (Agrópolis, University of Montpellier) to research and develop cutting-edge technology in such areas as natural resources, biotechnology, IT and precision agriculture.

Research into the Mato Grosso Pantanal began more than 25 years ago, focusing on the beef herd and resulting in improvements in such areas as genetic stock, management, nutrition, health, mineral supplements and breeding. Native pasture was also improved and cultivated pasture introduced. In 1984, the priority shifted to the region's renewable natural resources, its socio-economic aspects and their environmental impact. Agricultural research identified problems and suggested solutions, generating results that can ensure the sustainable development of the Pantanal:

- Herbarium of the Pantanal Agricultural Research Center – CPAP: created in 1984, it contains the biggest collection of plants from the Brazilian Pantanal (approximately 1,900 species);
- Identification of Plant Species: 1,863 species have already been identified and the uses described for 740. This study contributed to the agro-ecological zoning of the UPRB, permitting the drafting of a management plan and the definition of ecological reserves and environmental preservation areas;
- Sustainable Management of Fish Stocks: studies on fish biology and ecology and the Mato Grosso do Sul Fishing Control System (SCPESCA) provide technical and scientific information, helping define the minimum catch size for individual fish, the breeding protection period and catch quotas, and increase awareness of the importance of environmental integrity, riparian vegetation and the flood cycle in maintaining stocks (feeding, breeding and growth);
- Preservation of Fauna: production of information on and knowledge of their biology, ecology and behavior, plus management and breeding techniques, and a large-animal monitoring program;

- Cattle Productivity: technologies and management systems that increase the herd's productivity by 25%, with reduced investments;
- Environmental Impact Assessment: identification of mercury contamination in the riparian food chains, increased silting levels in and flooding of the Taquari River on the floodplain and alterations to its dry season/rainy season cycle associated with deforestation; and the proposal of measures to minimize erosive processes and silting;
- Flood Forecasting: methodology for determining the likelihood of small, normal or major floods and the month in which the river will reach its maximum level;
- Aerial Animal Population Census: the counting of individual wild animals via low-altitude flights (between 50 and 200 m);
- Control of Equine Infectious Anemia: management system that gradually eliminates infected animals and increases the number of uninfected ones without destroying the carriers; includes a diagnostic kit developed in association with Laboratório Vallée S.A.; and
- Horn Fly Control: although impossible to eradicate, two forms of controlling this insect in the Pantanal were found: tactical and strategic, based on the fly's ecology.

Mato Grosso State Research, Assistance and Extension Corporation - EMPAER-MT

EMPAER was founded in 1992, from a merger between EMATER (State Extension Corporation), EMPA (Agricultural Research Corporation) and CODEAGRI (Agricultural Development Corporation). It is linked to the Mato Grosso State Agricultural and Landholdings Secretariat, but is semi-autonomous.

It is present in 128 municipalities in Mato Grosso, with an operational technical assistance, extension and research mode geared towards family farming. The aim is to ensure a sustainable productive system that provides small and mid-sized farmers with socio-economic growth. It operates through a central office and six regional ones and also maintains offices in each of the 128 municipalities. It also runs research centers and a soil-analysis laboratory. Its main products and services are listed below:

- Providing training for farmers;
- Drafting of farming credit projects;
- Support for basic health, education and nutrition services;
- Support for rural organization;
- Advising on municipal agricultural planning and development and drafting of the Municipal Rural Development Plan (PMDR);

- Technological research and/or validation projects related to annual crops, fruit- and oil-bearing crops, pasture, livestock, fish-breeding, aromatic forest plants and renewable natural resources;
- Laboratory, phytopathology, manure, soil corrective, animal feed and plant feed analyses;
- Production and sale of fruit-bearing, ornamental, perennial and native forest species;
- Production and sale of pig and fish breeding stock (alevins);
- Support for and execution of State and Federal Government Projects (PRONAF) and projects related to agrarian reform, cashew, mamona (the castor oil plant), cotton, etc.;
- Drafting and execution of restoration, conservation and preservation projects related to renewable natural resources.

Brazilian Institute for the Environment and Renewable Natural Resources - IBAMA

IBAMA was created by Law 7735, of February 22, 1989. Its main bodies are listed below:

Specific Bodies:

- Forestry Department;
- Fauna and Fish Stocks Department;
- Ecosystems Department;
- Environmental Licensing and Quality Department;
- Environmental Protection Department;

Decentralized Bodies:

- Executive Departments;
- Regional Offices;
- Federal Conservation Areas; and
- Specialist Centers.

According to its constitutional charter, IBAMA has the following objectives:

- to reduce prejudicial effects and prevent accidents arising from the use of agrotoxic agents and products, their components, associated compounds and residues;
- to promote the adoption of measures to control the production, use, sale, transport and disposal of chemical substances and potentially hazardous residues;

- to exercise environmental controls and carry out inspections at regional and national level;
- to intervene in any development processes that generate significant environmental impact at regional and national level;
- to monitor changes in the environmental and natural resources;
- to execute actions to manage, protect and control the quality of water resources;
- to maintain the integrity of the permanent preservation areas and legal reserves;
- to regulate the use of fish stocks in federal waters;
- to regulate the use of national forest resources;
- to monitor the state of conservation of Brazil's ecosystems, species and natural genetic heritage, aiming to expand ecological representativeness;
- to execute actions to protect and manage Brazilian flora and fauna;
- to promote technical/scientific research and development concerning environmental management and to disseminate the results;
- to promote access to natural resources and their sustainable use;
- to develop analytical, prospective and situational studies to verify trends and scenarios for environmental planning purposes.

2.5 NGOs

The Nature Conservancy – TNC

Founded in 1951, The Nature Conservancy is a non-profit organization geared towards nature conservation whose mission is to protect plants, animals, and ecosystems that represent the diversity of life on Earth. It has been operating in Brazil since the 1980s, became a Brazilian organization in 1994 and has already helped to conserve more than 1.2 million ha, acting in association with local partners.

In the 90s, it was chiefly concerned with creating private reserves around the Parque Nacional do Pantanal (Pantanal National Park). The Fazendas Dorochê, Acurizal and Penha, totaling some 60,000 ha, were acquired and donated to ECOTRÓPICA, a local NGO which currently runs them. It also maintains a partnership with Brazil's Ministry of the Environment, UNESCO and the GEF in order to implement the Parque Nacional do Pantanal and the surrounding areas.

In a recent association with FEMA, it has been engaged in a project to protect and restore aquatic ecosystems, including the headwaters of the Cuiabá River, monitoring the impact of dam construction on the natural water cycle.

World Wildlife Found – WWF

Active in the country since 1971, WWF-Brasil is a Brazilian NGO which is part of the world's biggest nature conservancy network. Its mission is to help Brazilian society to conserve nature by harmonizing human activity with the preservation of biodiversity and the rational use of natural resources, for the benefit of this and future generations. It acts in partnership with other NGOs, universities, government bodies and companies. Some of its projects are thematic and national, such as environmental education and ecotourism, while others seek sustained development solutions for specific regions, such as Amazonia, the Cerrado, the Pantanal and the Atlantic Forest.

In the case of the Pantanal, WWF-Brasil is developing the Pantanal para Sempre Program, which is designed to conserve the biodiversity of this biome by creating and implanting a Conservation Area and encouraging sustainable development and economic activities with a low environmental impact. The program operates on several fronts, notably: supporting the creation of protected areas, identifying and fostering environmentally-viable economic activity, training for the introduction of sustainable ecotourism into the region, expanding scientific knowledge of the area, encouraging society to participate in environmental debates and supporting the drafting of public conservation policies.

Conservation International do Brasil – CI-Brasil

Conservation International is a non-profit private organization dedicated to the conservation and sustainable use of the planet's biodiversity. CI-Brasil, a non-profit national NGO, was founded in 1990 by Brazilian scientists and other professionals to preserve the country's biodiversity and show how humanity can live in harmony with nature. It makes use of a variety of scientific, economic and environmental awareness-building tools and employs strategies to identify environmental-friendly alternatives.

In 1993, CI-Brasil established itself in the Pantanal with the aim of protecting threatened species and supporting the setting up of private reserves. In 1999, it acquired the Fazenda Rio Negro in order to convert it into a reference for ecotourism, research and conservation in the area. In 2000, the first National Park in the Mato Grosso do Sul portion of the Pantanal was created with equal funding from CI-Brasil and the government.

Fundação de Apoio à Vida nos Trópicos – ECOTRÓPICA

ECOTRÓPICA is a non-profit environmentalist NGO founded in Mato Grosso in 1989 and declared a State Public State Utility. In 2002, it was qualified as an OSCIP (a civil society organization in the public interest). Its aim is to help conserve natural resources and maintain the quality of life in tropical ecosystems. In recent years, it has been especially concerned with the protection of the Pantanal, so much so that in the mid-90s it carried out one of its most important actions: the *in situ* protection of the biodiversity around the Parque Nacional do Pantanal Mato-grossense.

The Fazendas Acurizal, Penha and Estância Dorochê, totaling around 60,000 ha, were acquired by ECOTRÓPICA and transformed into an RPPN, which, together with the National Park, became one of the most important protected wetland complexes in the world and a haven for the animal species, some of which are threatened with extinction.

Ecologia e Ação – ECOA

ECOA is an NGO based in Mato Grosso do Sul and has been dedicated to promoting environmental actions aimed at defending the quality of life and preserving the natural heritage since 1989. Through a network of partnerships, it has implanted a series of projects geared towards the sustainable development of the Pantanal and Cerrado biomes, prioritizing tried-and-tested practices disseminated by the local population. It is also active in environmental education, communications, public policies, ecotourism and sustainable development projects with traditional and indigenous communities.

Instituto Brasileiro de Pesquisas e Estudos Ambientais - PRO-NATURA

Founded in 1986, PRO-NATURA (Brazilian Institute of Environmental Study and Research) is an NGO specializing in sustainable development. Its aim is to conserve biodiversity by implanting integrated sustainable development projects on a regional scale, in association with public and private bodies and community organizations. In specific relation to the Pantanal, its main concerns are forest agriculture systems and the sustainable management of tropical forests; the restoration of degraded areas; conserving and promoting the sustainable use of diversity; public health; and environmental education. It also handles integrated projects which combine various of these aspects.

Consórcio Intermunicipal para o Desenvolvimento Sustentável da Bacia do Rio Taquari – COINTA

COINTA, the Municipal Consortium for the Sustainable Development of the Taquari River Basin, is a non-profit organization set up in 1997. It was the first organization in the UPRB region geared towards meeting socio-environmental demands and promoting, organizing and guiding actions to foster sustainable development in the Taquari river basin. Its mission, therefore, is to organize its members and consultative and advisory bodies to undertake coordinated and integrated action to draft and implement sustainable high-quality projects, activities and services in the basin.

It seeks to ensure integrated action on the part of organizations and society and has become a reference for the establishment of partnerships to promote sustainable development. Its members include representatives of basin municipalities, public, private and mixed-capital companies and foundations. Society participates directly through its representatives or in the plenary sessions of the various bodies.

Consórcio Intermunicipal para o Desenvolvimento Sustentável das Bacias dos Rios Miranda e Apa– CIDEMA

Like COINTA, CIDEMA, the Municipal Consortium for the Sustainable Development of the Miranda and Apa River Basins, is a non-profit organization designed to meet socio-environmental demands and promote, organize and guide actions to foster sustainable development in the Miranda river basin, the Apa river basin (which crosses the border with Paraguay) and the Nabileque river sub-basin. It has also developed several projects in these areas involving diagnostics, environmental education , etc.

2.6 Educational and Research Institutions

Federal University of Mato Grosso – UFMT

Founded in 1970, the UFMT promotes regional development in its undergraduate, post-graduation, research and extension spheres, possessing campuses in Cuiabá, Rondonópolis, Médio Araguaia and Sinop. Since its creation, it has been developing actions based on academic policies formulated for specific regional needs, including public education, the environment, preservation of the regional memory, science and technology and public health. It also maintains exchange programs with institutions in various countries, especially related to scientific research and post-graduation courses.

In the context of the Pantanal, UFMT runs the Amazonia, Pantanal and Cerrado Study Center (ICHS-GERA) and has developed such projects as Studies for the Conservation of the UPRB (UPRB/IBAMA/EMBRAPA), Socio-economic Studies of the UPRB (German government/CNPq) and the Gran-Pantanal Project (German government /CNPq).

Federal University of Mato Grosso do Sul – UFMS

UFMS was founded in 1979 when the state of Mato Grosso was divided. It has campuses in Aquidauana, Campo Grande, Corumbá (Pantanal Campus), Coxim, Dourados, Paranaíba and Três Lagoas. Aiming to exceed the normal (and essential) goals of higher education and encourage research and extension activities, it also holds courses in the preservation of natural resources and the environment, especially the flora and fauna of the Pantanal, which has led to the institution undertaking ecological research and projects of great important to the sustainable development of the Pantanal.

University for the Development of the State and the Pantanal Region – UNIDERP

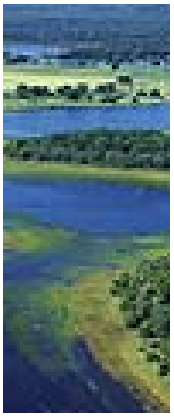
UNIDERP, located in Mato Grosso do Sul and maintained by the privately-run Campo Grande Higher Education Center (CESUP), aims to integrate scientific, technical and philosophical efforts on the part of public and/or private institutions for sustainable regional development. It places a particular emphasis on subjects of regional importance, such as the environment (especially the Pantanal), administrative planning and management, ecotourism, regional integration and development, services, sanitation, public health, and educational programs. It also runs the Pantanal and Cerrado Biodiversity research center, which adopts an integrated approach to studying biodiversity in the Pantanal and Cerrado regions of Mato Grosso do Sul, aiming to conserve the important ecosystems and their associated species and obtain the necessary input to implement sustainable development policies and improve the local inhabitants' quality of life.

University of Várzea Grande – UNIVAG

UNIVAG, maintained by the Mato Grosso Educational Institution (IEMAT) is a new and up-to-date graduation facility, which opened in 2000. Courses are closely bound up with regional needs and the institution has developed a series of community service projects and programs that combine quality of teaching with extension and scientific initiation. Despite its youth, UNIVAG has been extremely active in a wide variety of the Pantanal's sustainable development programs.

3. RELEVANT LEGISLATION AND INTERNATIONAL AGREEMENTS

3.1. Brazilian Laws and Norms



There are a series of laws, both national and international, aimed at conserving and preserving the UPRB. Paragraph 4 of article 225 of the Brazilian Constitution, promulgated in 1988, states that the Pantanal is a national heritage whose use must respect the preservation of natural resources.

The following tables list the main legal documents that are applicable, in some way, to the study region, together with their promulgation dates, main dispositions and principal focus. Table 3.1 refers to the federal sphere and the subsequent ones to the states of Mato Grosso do Sul and Mato Grosso respectively.

Table 3.1 Federal Legislation

Document	Date	Main Dispositions	Focus
Federal Law 4771	15/9/1965	Brazilian Forestry Code	Flora
Federal Law 7803	18/7/1989	Alteration of the Brazilian Forestry Code	Flora
IBAMA Edict 006 and 37N	1992	Recognizes the official list of Brazilian Species of Flora Threatened with Extinction	Flora
Federal Decree 76623	1975	Promulgates the Convention on International Trade in Endangered Species of Wild Fauna and Flora	Flora
Federal Law 5197	1967	Deals with the protection of wild fauna, regulates wildlife breeding facilities and creates national, state and municipal bioreserves	Fauna
IBAMA Edict 45-N	27/4/1992	Deals with the protection of endangered fauna	Fauna
IBAMA Edict 541	6/4/1990	Defines km 117 of the Rodovia Transpantaneira highway (Poconé/MT) as the physical base for supporting fauna protection and management projects in the Brazilian Pantanal – Porto Jofre	Fauna
IBDF Edict 0324	22/07/1987	Prohibits the breeding of alligators in the Pantanal outside the Paraguay River Basin	Fauna
Decree-Law 221	1967	Deals with the protection and encouragement of fishing and establishes authorizations, prohibitions and concessions	Fauna
Federal Law 7653	1988	Defines the infractions and penalties associated with non-bailable offenses against wildlife.	Fauna
Federal Law 9433	1997	Institutes the National Water Resource Policy and the National Water Resource Management System - SNGRH	Water Resources
Federal Law 9984	18/7/2000	Institutes the National Water Agency - ANA	Water Resources
Interministerial Edict 001	19/12/1996	Institutes the Upper Paraguay River Basin Integration Committee – Pantanal CIBHAPP	Water Resources
Law 6902	1981	Deals with environmental protection areas and ecological stations	Conservation Areas

Table 3.1 Federal Legislation (continued)

Document	Date	Main Dispositions	Topic
Federal Law 9985	18/7/2000	Approves the National Conservation Area System - SNUC	Conservation Areas
Federal Decree 86/92	24/9/1981	Creates the Parque Nacional do Pantanal Mato-grossense (area of 135,000 ha and perimeter of 260 km)	Conservation Areas
CONAMA Resolution 001	23/1/1986	Establishes the directives for the implementation and use of Environmental Impact Assessments.	Licensing and Management
Resolutions 03, 12 and 16	1985/1986	Regulate environmental zoning aspects in the Paraguay River Basin	Licensing and Management
Federal Law 9605	13/2/1998	The Environmental Crime Law – defines the penal and administrative sanctions governing crimes against the environment.	Other
Federal Decree-Law 227	28/2/1967	Establishes the Mining Code	Other
Law 9795	27/4/1999	Deals with environmental education and institutes the National Environmental Education Policy	Other
Law 7802/89	1989	Deals with aspects of agrotoxin use	Other
Federal Law 7797	10/7/1989	Creates the National Environmental Fund - FNMA	Other
Federal Law 1533	1951	Institutes the Safety Mandate	Other
Federal Law 7347	1985	Regulates the filing of public suits for environmental damage.	Other

Table 3.2 State Legislation – Mato Grosso do Sul

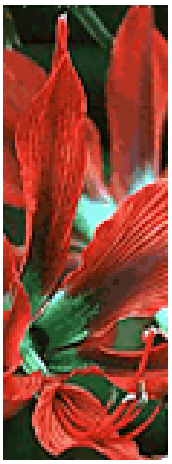
Document	Date	Main Dispositions	Topic
State Law 1458/93 (and Decree 7808/94)	1993/1994	Deals with reforestation.	Flora
Decree 7508/93 (and SEMA/MS Resolution 009/94)	1993/1994	Deals with Forestry Activity Environmental Licensing	Flora
State Law 1488	1994	Grants fiscal concessions to logging firms who replant native, exotic and fruit-bearing species	Flora
Decree 5646	28/9/1990	Deals with the exploitation of fish stocks	Fauna
Decree 7511	23/11/1993	Institutes environmental authorization for fishing	Fauna
State Law 1826	1998	Deals with the exploitation of fish stocks and establishes measures for fish protection and control	Fauna
Law1787	1997	Deals with fishing in the state	Fauna
Decree 8056	1994	Prohibits commercial fishing in the state	Fauna
State Law 5405	1992	Institutes the Environmental Protection Code and defines the wetlands to be preserved	Fauna
CECA Deliberation 003	20/6/1997	Deals with the preservation and use of the water in the state river basins	Water Resources
State Law 2223	2001	Holds proprietors and tenants of rural properties responsible for polluting scenic rivers	Water Resources
State Law 328 and Decree 1581	1982	Deals with the protection and preservation of the state's portion of the Pantanal	Conservation Areas
State Law 1787	25/11/1997	Creates the State Fishing Council	Licensing and Management

Table 3.2 State Legislation – Mato Grosso do Sul (continued)

Document	Date	Main Dispositions	Topic
State Law 1067	5/7/1990	Deals with the State Environmental Control Council	Licensing and Management
State Decree 9765	10/1/2000	Creates the State Regional Park Council	Licensing and Management
State Decree 9705	18/11/1999	Creates the State Indigenous Policy Council	Licensing and Management
Decree 9938	5/6/2000	Institutes the Management Committee for the Estrada-Parque do Pantanal , an Area of Special Tourist Interest	Licensing and Management
Decree 7467	25/10/1993	Institutes the Program for the Support and Organized Implantation of Agribusiness in the Pantanal and surrounding region	Other
Decree 6444	24/4/1992	Regulates the use, production, sale, consumption, storage, transport and disposal of agrotoxin packaging and residues	Other

Table 3.3 State Legislation – Mato Grosso

Document	Date	Main Dispositions	Topic
Federative Pact	30/12/1999	Decentralized and Shared Environmental Management Pact, signed by the Ministry of the Environment, IBAMA and the state of Mato Grosso, via FEMA	Flora
State Law 7083	23/12/1998	Authorizes charging for services executed by the State Environmental Foundation	Flora
Complementary Law 38	21/11/1995	Creates the Mato Grosso State Environmental Code	Flora
Decree 1292	14/4/2000	Places the commitment to restore environmental damage within the ambit of the State Environmental Foundation	Flora
Law 7155	21/7/1999	Fishing Law – deals with fishing and fish protection measures	Fauna
Decree 2545	14/9/1998	Regulates the State Water Resource Council	Water Resources
Decree 1795	4/11/1997	Deals with the State Conservation Area System - SEUC	Conservation Areas
Law 4.087, altered by Law 5612	1979/1990	Creates the National Environmental Council - CONSEMA	Licensing and Management
CONSEMA Resolution 06	20/8/1996	Dispenses with the need for Environmental Impact Studies and Reports for certain small-scale undertakings	Licensing and Management
CONSEMA Resolution 022	13/6/1995	Regulates the licensing procedures for small-scale mining activities	Licensing and Management
CONSEMA Resolution	22/3/1995	Introduces Simplified Licensing for mining activities	Licensing and Management
Decree 767	26/11/1999	Institutes the State Environmental Consulting and Services Register.	Licensing and Management
Decree 561	1/10/1999	Institutes the State Interinstitutional Environmental Education Commission	Other



Among the legislation and norms cited, the following are worth highlighting:

- **Brazilian Forestry Code - Law 4771, of 15/09/65 (and subsequent modifications):** Since its adoption in 1965, the Forestry Code has played a pioneering role in protecting the forest and other vegetation and, consequently, biological and genetic diversity. By introducing notions such as the "common interest", the "injurious use of property" and "forestry education", it has proved its capacity to adapt to the demands imposed by the sustainable development imperative, where the protection of nature and natural resources, the promotion of economic development and the establishment of social justice must be tied together. The Code instituted two types of permanently preserved forests: those not requiring a declaratory act of government, i.e. existing as a consequence of the Code itself (e.g. riparian vegetation), and those constituted by such an act (e.g. conservation areas).

- **Federal Law 5197 of 1967** deals with protection of the fauna. Article 1 declares that animals of any species, in any phase of development, that are naturally undomesticated, as well as their "nests", shelters and breeding places are the property of the State and prohibits their use, persecution, destruction, hunting or killing. It also prohibits the sale of such wild animals and all products and objects derived from the hunting, persecution, destruction or killing of such animals, except those specimens from authorized breeding facilities (article 3, paragraph 1).

- **Decree-Law 221, of 28/02/67**. This Decree-Law deals with the protection and encouragement of fishing, defining this term as every act designed to capture or remove animals or plants whose natural (or principal) habitat is water. It places these flora and fauna under the public domain, permitting their use for commercial, sporting or scientific purposes. The effects of the Decree-Law cover inland waters; territorial waters; areas of the high seas or those established in international instruments ratified by Brazil; and the continental shelf.

- **Law 7347, of 24/07/85**. Filing public civil suit against those responsible for damage to the environment, regulated by this law, constitutes the most typical and important judicial environmental protection procedure. As a result, the attitude of the State or the Community when faced with repeated harm to the environment lost its inertia and *a posteriori* nature and became pro-active and preventive. In the years since the law's adoption, the debate concerning ecological issues and, above all, the practice of environmental management, has advanced substantially.

- The **Safety Mandate**, instituted by **Federal Law 1533 of 1951**, is another mechanism by which individuals and companies/institutions can go to court to protect their civil or collective rights, including the right to an ecologically-balanced environment. In this context, it is also worth mentioning **Federal Law 4717/65 (the Popular Action Law)**, which allows any citizen to resort to the courts to nullify any administrative acts or events that may damage the public, historical and cultural heritage, administrative propriety and the environment.

- **National Water Resource Policy (Federal Law 9433/97):** this law is a veritable landmark in Brazilian water resource management, abolishing many of the outmoded concepts in the 1934 Water Code (such as privately-owned waters) and establishing that water is an inalienable property and a limited natural resource with economic value, which should be subject to decentralized management shared by government, users and the community. It declared the river basin to be the territorial unit for implementing the National Water Resource Policy and instituted the National Water Resource Management System (SINGRH), which also laid down the guidelines for the state management systems. The SINGRH includes the National Water Resource Council (responsible for arbitrating disputes and deliberating issues involving interstate or international waters); the State and Federal District Water Resource Councils (responsible for deliberating issues in their respective jurisdictions); the River Basin Committees (consultative and deliberative powers in the ambit of the river basin); federal, state and municipal public bodies associated with water resource management; and the Water Agencies (normally with consultative and/or executive powers).

- **National Conservation Area System - SNUC (Federal Law 9984 of July 18, 2000)** - The SNUC is the conjunction of federal, state and municipal conservation areas "and their environmental resources, including their jurisdictional waters, with important natural characteristics, legally constituted by the government for the purpose of conservation and with clearly defined boundaries, under special administration, to which appropriate protection shall be given)". Article 60 of Law 9985 of 2000 revoked articles 5 and 6 of the Forestry Code, which granted government the right to create national, state and municipal parks, forests and bioreserves and allowed unpreserved forest owners to take care of such property in perpetuity. The SNUC's institutional advance was to standardize the criteria for creating and maintaining the conservation areas, defining two basic types: wholly-protected areas and those for sustainable use. The law also institutes buffer zones around the conservation areas, in line with their type, which cannot, due to their so environmental and institutional importance, be transformed into urban zones.

- Regarding punishment for environmental infractions, there is the Brazilian Penal Code (the object of Federal Decree-Law 2848, of 07/12/40 and subsequent legislation, which envisages a series of such penalties) and **Law 9605, of 12/02/98 (the Environmental Crime Law)**, which protects the environment in general, but with a special emphasis on the conservation and sustainable use of biodiversity.

3.2. International Treaties and Conventions

The importance of the Pantanal and its environmentally-protected areas is emphasized by several international treaties, conventions and programs aimed at establishing and managing protected areas to conserve their biodiversity and permit the sustainable use of their natural and cultural resources. To date, Brazil has ratified several such conventions, including:

- Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere. Washington, 12/10/40. Legislative Decree 03, of 13/02/48, and Decree 58054, of 23/03/66;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Washington, 03/03/73. Legislative Decree 54, of 24/06/75 and Decree 76623, of 17/11/75. Article 11, paragraph 3 of the latter was altered by Legislative Decree 21, of 01/10/85 and Decree 133, of 24/05/91, and article 21 by Legislative Decree 35, of 05/12/85 and Decree 92446, of 07/03/86;
- Convention of Wetlands of International Importance, especially Waterfowl Habitat. Ramsar, 02/02/71. Legislative Decree 33, of 16/06/92;
- United Nations Framework Convention on Climate Change. New York, 09/05/92. Legislative Decree 01, of 03/02/94;
- Convention on Biological Diversity. Rio de Janeiro, 05/06/92. Legislative Decree 02, of 03/02/94;
- The Kyoto Protocol (12/97). Among the 84 signatory countries, Brazil was the 30th to ratify the Protocol (signed on 29/04/1998 and ratified on 21/06/99), which establishes commitments to reduce atmospheric emissions between 1990 and 2008-2012.

The World Heritage Convention was adopted by UNESCO in 1972 in order to ensure the protection of natural or man-made sites considered to be of great importance for the history or culture of mankind. Several such (natural) sites in Brazil are currently on the World Heritage List, some of which in the Pantanal. The Pantanal, as well as being considered a National Heritage by the 1988 Brazilian Constitution was also designated by the Ramsar Wetlands Convention and declared a Biosphere Reserve by UNESCO in 2000.

STRATEGIES FOR THE JICA

4 REGIONAL PLANS, PROGRAMS AND PROJECTS
5 JICA PARTICIPATION PROPOSALS

4 REGIONAL PLANS, PROGRAMS AND PROJECTS

The Upper Paraguay River Basin Conservation Plan (UPRCP), coordinated by the National Environmental Program (Ministry of the Environment) and concluded in 1997, laid down the bases for the basin's management and is considered the most comprehensive plan ever devised for the region.

As a result, the Natural Environmental Areas, Environmentally Fragile Areas and Socio-economic Environmental Areas were defined, complete with catalogued data and maps. The Plan also established the overall norms and directives for land use and occupation which has provided the guidelines for most of the technical planning for the region.

Using the Plan as a basis, in 2001 the federal government, via a loan from the IDB, in association with the Mato Grosso and Mato Grosso do Sul state governments, began to execute the Pantanal Sustainable Development Program for the conservation and management of natural resources. The program also encourages compatible economic activities and promotes improvements in the living conditions of the region's populations. It contained seven major projects:

- water resource management;
- soil and agrotoxin management;
- protection of the ecosystems, fish and fauna;
- urban sanitation;
- support for environmentally sustainable economic activities;
- building roads and scenic roads in the parks;
- a special project to help the indigenous populations.

COFIEX (the External Financing Commission, under the Ministry of Planning, Budget and Management) allocated up to US$ 400 million, in two phases, between 2001 and 2009. However, the project's development has been hampered by lack of political support and poor interaction among the executive agents. As a result, the Program, linked to the Ministry of the Environment, has benefited from very few of the funds envisaged in the federal budget.

Recently, there was an attempt to reorganize the Program by proposing the transfer of some of the executive components to other ministries, thereby fragmenting and decentralizing the budget funding. However, the first contractual phase (2001-2005) is now over and it has reached an impasse, due to a mixture of politics and scarcity of financial resources. It is clearly an ambitious program, but perfectly acceptable given the sheer magnitude of the problem, the river basin's enormous size and the importance of the ecosystem in question. But the current budget limitations, which also affect the states of Mato Grosso and Mato Grosso do Sul, jointly responsible for a mere 2.47% of Brazil's GDP, constitute a serious barrier against its progress.

The Program, whose achievements over the past four years have been virtually nil, is now in a state of indecision and gloom. Various environmentalist organizations and politicians (congressmen and senators) from the region have been protesting against its paralysis and the federal government's neglect and indifference. Recently, the latter postponed any decision on the Program (still officially ongoing despite being at a standstill) until September 2005.

In line with the priorities of the UPRBCP, the project denominated Implementation of Integrated Management Practices for the Pantanal and Upper Paraguay River Basin, but usually referred to as the GEF Pantanal/Upper Paraguay Project is funded by the Global Environment Facility and has the support of the ANA, UNEP, the OAS, the states of Mato Grosso and Mato Grosso do Sul and various civic institutions. Its aim is to identify priority interventions to promote sustainable development in the UPRB, including the entire Brazilian Pantanal. A Strategic Action Program was drawn up with the following important objectives:

- improving the environment of the predominant ecosystem;
- protecting the Pantanal flora and fauna, particularly wetland and endangered species;
- institutional strengthening of the basin's integrated natural resource management system;
- building organizational capacity; and
- integrating environmental issues into sustainable economic development activities.

The project is a three-phase one. The first two, already concluded, consisted of preparing the diagnostics, executing 44 sub-projects selected from the proposals presented in workshop discussions and, based on an analysis of the latter's results, the development of a Strategic Action Program for Integrated Management. The third phase, still awaiting funding, is the implementation of this Program, whose cost is estimated at US$ 7 million, to be freed over four years.

In addition to these major undertakings, there are also dozens of smaller projects or programs that are in some way related to the Pantanal or the UPRB. The following table lists some of them according to their main focus:

- Ecology;
- Water Resources;
- Hunting and Fishing;
- Economic Activities;
- Environmental and Water Resource Management;
- Social and Development and Citizenship;
- Conservation Areas;
- Soil Conservation;
- Environmental Education

Table 4.1 Projects Related to the UPRB – ECOLOGY

Project	Proposing Body
Pantanal Animal Genetic Resource Conservation Center	EMBRAPA Pantanal, University of São Paulo - IZ, Embrapa Recursos Genéticos
Sustainable Use of Fauna	EMBRAPA Pantanal, University of Franca, São Paulo State University - UNESP/Jaboticabal, Dom Bosco Catholic University, EMBRAPA Clima Temperado, EMBRAPA Acre
Projeto Arara Azul (Blue Macaw Project)	WWF - Brasil
Long-term Ecological Responses to Multi-year Rainfall Variations on Flooding in the Brazilian Pantanal	EMBRAPA Pantanal, Federal University of Mato Grosso do Sul - UFMS
Assessment of Exotic Fish Species in the Pantanal and their Distribution	EMBRAPA Pantanal
Development of Control Measures for the Dispersal of Golden Mussels (*Limnoperma fortunei*) in the UPRB	EMBRAPA Pantanal, Minas Gerais Technical Foundation - CETEC, UFMT
Monitoring of Jacaré-do-Pantanal (*Caiman crocodilus yacare*) and Jacaré-Paguá (*Paleosuchus palpebrosus*) Movements in the Southern Pantanal	EMBRAPA Pantanal
Assessment of the Role of the Flooding Cycle on Fish Numbers and Biodiversity in a Flood-prone Environment in the Southern Reaches of the Paraguay River (Baía dos Papagaios)	EMBRAPA Pantanal
Sustainable Management of Pacu (*Piaractus mesopotamicus*) - Survey and Assessment of Inter- and Intra-populational Genetic Diversity in the UPRB by Mitochondrial DNA and Microsatellite RFLP-PCR	EMBRAPA Pantanal, University of Mogi das Cruzes - UMC
Drafting of an Illustrated Electronic Guide for the Identification of Pantanal Herbivore Diet via Feces	EMBRAPA Pantanal
Cultivation and Propagation of Nó-De-Cachorro (*Heteropterys aphrodisiaca O. Mach.*) seedlings	EMBRAPA Pantanal

Table 4.1 Projects Related to the UPRB – ECOLOGY (continued)

Project	Proposing Body
Pantanal – Rapid Assessment Program	CI – Conservation International, Center for Applied Biodiversity Science
Inventory of Biodiversity in the Serra do Amolar	Ecotrópica, Ministry of the Environment - MMA, PROBIO, GEF, CNPQ, World Bank
Study of the Estrada Parque Transpantaneira Road	Ecotrópica, WWF
Student Exchange Program in Floodlands Ecology	Ecotrópica, SCA-USA - Students' Conservation Association
Delimitation of Critical Areas and Proposal for the Sustainable Use of the Pantanal Ecosystem in Mato Grosso – *Pantanal - Água e Vida*	University of Várzea Grande – UNIVAG/MT
Restoration of Degraded Areas and Native Species Planting in Urban Green Areas – Native Species Nursery	IBAMA – Cuiabá Regional Division

Table 4.2 Projects Related to the UPRB – WATER RESOURCES

Project	Proposing Body
Water and Soil Management in the Upper Taquari River Basin	EMBRAPA Pantanal, CNPGC, CNPF, Agropecuária Miguel Sérgio Ltda.
Proposal of Measures to Control Water Pollution and Manage Solid Waste	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Monitoring and Control of Water Flows and Water Quality
Expansion and Modernization of Surface Water, Groundwater and Sedimentation Monitoring Systems	ANA/GEF/UNEP/OAS – Strategic Management Program - Monitoring and Control of Water Flows and Water Quality
Proposal of Rural and Urban Flood Control Actions	ANA/GEF/UNEP/OAS – Strategic Management Program - Monitoring and Control of Water Flows and Water Quality
Environmental Restoration of the Baia de Xacororé in the Municipality of Barão de Melgaço	Brazilian Institute of Environmental Study and Research - Pró-Natura

Table 4.3 Projects Related to the UPRB – HUNTING AND FISHING

Project	Proposing Body
Intensive Aquaculture Breeding of Tuvira (*Gymnotus carapo*)	EMBRAPA Pantanal, *Projeto Isca Viva*
Development of Breeding System for Tuvira (*Gymnotus carapo*) and Lambari (*Astianax spp. Characidae*)	EMBRAPA Pantanal, *Projeto Isca Viva*
Fishing Monitoring in the UPRB in Mato Grosso do Sul	EMBRAPA Pantanal, (SUPESCA/MS), IMAP/SEMA/MS, 15th Battalion of Environmental Police

Table 4.3 Projects Related to the UPRB – HUNTING AND FISHING (continued)

Project	Proposing Body
Population Dynamics, Assessment of Fish Stock Exploitation and the Survival of Fish Returned to the Rivers by Leisure Fishermen in the Southern Pantanal	EMBRAPA Pantanal, Earthwatch Institute, Corumbá Regional Travel Industry Association (ACERT), Paraguay River Company Association, Conservation International, Fazendas Rio Negro, Recanto Barra Mansa, Barranco Alto, Diacuí and Pousada Araraúna (UNIDERP)
Sustainable Management of Fish Stocks and Ecotourism	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Directives for the Use of Environmentally Sustainable Methods and Techniques
Pantanal Fish Sperm Bank	EMBRAPA Pantanal
Consolidation of the UPRB Fish Stock Monitoring Center	IBAMA – HQ, IBAMA - MS

Table 4.4 Projects Related to the UPRB – ECONOMIC ACTIVITIES

Project	Proposing Body
Monitoring the Sustainability of Beef Cattle Breeding Systems in the Pantanal	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division, Southeast, HQ, Agriculture Information Systems, UNESP Jaboticabal, Botucatu, USP, UFMG, UFMS
Aquaculture Competitiveness and Sustainability: Environmental and Socio-economic Assessment	EMBRAPA Pantanal
Validation of the Campylobacter Fetus Elisa IgA Antibody Method for Diagnosing Bovine Venereal Campylobacteriosis (BVC)	EMBRAPA Pantanal
Detection of Horn Fly Resistance Mechanisms to Pyrethroid Insecticide in Mato Grosso do Sul	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division, USP, UNESP
Epidemiology, Prevention and Treatment of Umbilical Myiasis in Calves in the Mato Grosso do Sul Pantanal	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division
Participatory Agro-ecosystem Diagnostics in Rural Settlements in the Municipality of Corumbá-MS	EMBRAPA Pantanal, IDATERRA, CPT, Dom Bosco Catholic University - UCDB, Settler Farmer Associations
Contribution of the Flood Cycle to Native Pasture Productivity in the Pantanal	EMBRAPA Pantanal, EMBRAPA Agricultural Division, West
Forage Potential of Above-ground Manioc Grown by Small Farmers in the Corumbá Region, MS	EMBRAPA Pantanal, UFMS, UFMG, Fundação Ezequiel Dias
Feed Supplements as a Management Option for Africanized Bees	EMBRAPA Pantanal
Genetic Characterization of Pantanal Cattle by Y Chromosome and Mitochondrial DNA Studies	EMBRAPA Pantanal, Federal University of Minas Gerais - UFMG, Dom Bosco Catholic University - UCDB
Adaptability of Native Graminea (*Mesosetum chasae*) to Sandy Pantanal Soils	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division, Dom Bosco Catholic University - UCDB, UNESP/Botucatu

Table 4.4 Projects Related to the UPRB – ECONOMIC ACTIVITIES (continued)

Project	Proposing Body
Food Management Strategies for Organic Veal Production in the Pantanal: Effects on Animal Performance, Carcass Characteristics, Meat Quality and Economic Efficiency in Production	EMBRAPA Pantanal, Federal University of Minas Gerais - UFMG
Assessment of the Types of Native Pasture in the Pantanal and Support Capacity Indicators	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division
Texel Sheep Productivity and Breeding Assessment in Band'Alta – UCDB – Corumbá Campus, MS	EMBRAPA Pantanal, Dom Bosco Catholic University - UCDB
Analysis of the Effects of Genotype v. Environment Interaction on the Production of Nelori Cattle in the Pantanal	EMBRAPA Pantanal, EMBRAPA Beef Cattle Division
Cattle Health/Sickness Process Characteristics in Settlements in the Municipality of Corumbá	EMBRAPA Pantanal, ICB/UFMG
Ensuring Compatibility between Shipping and Environmental Protection	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Directives for the Use of Environmentally Sustainable Methods and Techniques
Bahia dos Garcez (Municipality of Santo Antonio do Leverger)	Brazilian Institute of Environmental Study and Research - Pró-Natura

Table 4.5 Projects Related to the UPRB – ENVIRONMENTAL MANAGEMENT

Project	Proposing Body
Support System for the Taking of Management Decisions on the Taquari River in the Pantanal	EMBRAPA Pantanal, WL/Delft Hydraulics, ITC Enschede, Arcadis NV, Pantanal Program – Brasília, Arcadis Logos
Survey of Climate Sensitive Indicators in the Pantanal	EMBRAPA Pantanal, Federal University of Mato Grosso do Sul - UFMS
Use of Multi-scale Species-habitat Relationship Models in the Pantanal to Define Ecological Sustainability Indicators	EMBRAPA Pantanal, Federal University of Mato Grosso do Sul - UFMS
Assessment of Fish Production through the Fishing Control System de Mato Grosso do Sul and Development of an Action Plan for the Implantation of a Similar System in Mato Grosso	EMBRAPA Pantanal, SEMA/MS, FEMA/MT
Consolidation of the UPRB Digital Cartographic Base	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Implantation of Management and Institutional Strengthening Instruments
Water Resource Management – Structuring and Basic Organization	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Implantation of Management and Institutional Strengthening Instruments

Table 4.5 Projects Related to the UPRB – ENVIRONMENTAL MANAGEMENT (continued)

Project	Proposing Body
Ensuring Compatibility of Legislation and Establishing Directives for the Application of Water Resource Management Instruments	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Implantation of Management and Institutional Strengthening Instruments
Water Resource Management – Capacity Building, Communication and Awareness Raising	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Implantation of Management and Institutional Strengthening Instruments
Proposal for Integrated Action by Brazil, Bolivia and Paraguay	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Partnerships with Paraguay and Bolivia
Strategic Environmental Assessment of the Regional Centers and of Training for Environmental Licensing	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB - Environmental Protection of the Pantanal
Monitoring of the Pantanal	IBAMA – Remote Sensing Center
Georeferenced Environmental Licensing System	Ministry of the Environment - MMA
Environmental Education KIT and Notebooks	WWF, Fundação ECOAR
Pantanal GIS – Pantanal Georeferenced Information System	Ecotrópica, Ducks Unlimited, INC
Management Plan for Federal and Private Indirect Use Conservation Areas in the Pantanal	Ecotrópica, GEF/ANA/UNEP/OAS
Environmental Monitoring and Inspection in the Pantanal	Pantanal do Mimoso - Sociedade Ambientalista (PAM)

Table 4.6 Projects Related to the UPRB – SOCIAL DEVELOPMENT

Project	Proposing Body
Food Safety and Citizenship: The Contribution of Urban Agriculture to Communal Food Safety in Corumbá	EMBRAPA Pantanal, Pastoral da Criança, Corumbá Settlement Agricultural Association - ATAAC, Federal University of Mato Grosso do Sul - UFMS, Corumbá Municipal Education Secretariat - SMEC, Ladário Municipal Education Secretariat, Ladário Municipal Health Secretariat
Participatory Diagnostics of Antônio Maria Coelho Community in the District of Albuquerque, Corumbá, MS	EMBRAPA Pantanal

Table 4.7 Projects Related to the UPRB – CONSERVATION AREAS

Project	Proposing Body
Support for the Consolidation of Existing Conservation Areas	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB – Implantation of Conservation Areas
Support for the Implantation of New Conservation Areas	ANA/GEF/UNEP/OAS – Strategic Management Program for the Integrated Management of the Pantanal and the UPRB – Implantation of Conservation Areas
Support for the Conservation of the North/South Corridor in the Pantanal	Ecotrópica, Conservation International
Parque Regional do Pantanal	Pantanal Park Institute/MS government
Consolidation of the RPPNs	Ecotrópica, WWF

Table 4.8 Projects Related to the UPRB – SOIL CONSERVATION

Project	Proposing Body
Mapping of Critical Degraded and Silted-Up Areas	ANA/GEF/UNEP/OAS – Strategic Management Program – Strengthening the System for the Control of Plateau Land Use and Occupation
Support for the Strengthening of State Systems for the Control of Plateau Land Use and Occupation	ANA/GEF/UNEP/OAS – Strategic Management Program – Strengthening the System for the Control of Plateau Land Use and Occupation
Development of the Multiplying Model for the Restoration of Degraded Areas.	ANA/GEF/UNEP/OAS – Strategic Management Program – Strengthening the System for the Control of Plateau Land Use and Occupation
Mato Grosso State Strategic Riparian Vegetation Preservation Program – PEPE (Critical Sub-basins)	FEMA/University of Mato Grosso – UNEMAT – EMPAER
VIDA NOVA Project – Program for the Support of Family Agriculture and the Conservation of Natural Resources	State Environmental Foundation – FEMA, SEDER, EMPAER, EMBRAPA
Restoration of the Paraguay River Headwaters	State Environmental Foundation – FEMA, State Rural Development Secretariat - SEDER/MT, EMPAER, EMBRAPA
Degraded Prospecting Areas in the Municipality of Poconé	Brazilian Institute of Environmental Study and Research - Pró-Natura

Table 4.9 Projects Related to the UPRB – ENVIRONMENTAL EDUCATION

Project	Proposing Body
EMBRAPA & School Program	EMBRAPA Pantanal
Schools in the Pantanal	WWF-Brasil

5 JICA PARTICIPATION PROPOSALS

Based on the surveys and research carried out, those projects and programs with the most appropriate technical and/or institutional characteristics for the JICA's involvement were identified. The selection also considered their political implantation or development feasibility and projects that were highly controversial or which generated extremely diverse opinions among the agents active in the region were avoided.

Table 5.1 below lists the projects themselves, their current stage, their coordinating bodies and their priority vis-à-vis the JICA's participation (in descending order). This priority is based on two aspects, also shown in the table: i) the environmental aspect, which grades the importance of the project's expected results in alleviating threats to the region's ecosystem, and ii) the technical-political aspect, indicating the greater or lesser opportunity of the JICA's participation, given the project's current conditions. The final column indicates the main focus of each project, using the following categories: sustainable development, local development, ecological preservation and the restoration of degraded areas.

Each project is then described in detail, showing its main aspects, objectives and activities. In every case, this is complemented by a table divided into topics, permitting a rapid comparative analysis.

Table 5.1 – Selected Projects and Priorities

Priority/PROJECT		Current Stage	Coordination	Threat to ecosystems	Opportunity for the JICA's Involvement	Focus (*)
1	Coordination of Fish Stock Monitoring in the UPRB (Pantanal) in Mato Grosso and Mato Grosso do Sul	Planning	FEMA	High	High	1/3
2	Restoration of the Paraguay River Headwaters Mato Grosso State Strategic Riparian Vegetation Preservation Program – PEPE VIDA NOVA Project – Program for the Support of Family Agriculture and Conservation of Natural Resources (Water, Flora, Fauna, Soil)	Ongoing	FEMA / EMPAER	High	High	1/2/4
3	Sustainable Urban Drainage Program	Ongoing	Ministry of the Cities	High	High	2/4
4	Long-term Ecological Responses to Flooding Variations in the Pantanal	Ongoing	EMBRAPA	High	Medium	3
5	Monitoring and Control of Water Flow and Quality in the UPRB	Planning	ANA	Medium	High	1
6	Proposal for the Sustainable Use of the Pantanal Ecosystem: Production of Beef Cattle	Planning	EMBRAPA	Medium	Medium	1/2
7	Parque Estadual Encontro das Águas (Águas do Pantanal)	Planning	FEMA	Medium	Medium	1/2/3/4

(*) 1. Sustainable development; 2. Local development; 3. Ecological preservation; 4. Restoration of degraded areas

5.1 Coordination of Fish Stock Monitoring in the UPRB (Pantanal) in Mato Grosso and Mato Grosso do Sul

The main aim of the Coordination of Fish Stock Monitoring in the UPRB (CMRP-UPRB), which involves various institutions, particularly IBAMA, EMBRAPA and the Mato Grosso and Mato Grosso do Sul state governments, is to promote cooperative actions and projects that provide for more efficient fish stock management, always from the point of view of sustainability. In order to do so, it is necessary to: (i) expand and effectively consolidate the existing network; (ii) centralize, democratize and disseminate the scientific data surveyed in the basin and transform such data into technical solutions; (iii) offer workshops and courses for professional and sport fishermen, opinion makers, those responsible for taking decisions and community leaders.

Fishing is an extremely important socio-economic activity in the UPRB, only ceasing for three months every year at the height of the breeding season, usually between November and February. It is divided into three main categories: i) subsistence fishing, part of the regional culture and an important source of protein for the riparian inhabitants; ii) sport fishing, which has become one of the Pantanal's prime tourist attractions; iii) commercial fishing - a commercial activity involving fishermen in both Mato Grosso and Mato Grosso do Sul.

The Fishing Control System (SCPESCA-MS), implanted 12 years ago in Mato Grosso do Sul, has produced relevant inputs for decisions regarding fish stock management. Thus the aim of the project is to develop and integrate the monitoring activities of the research institutions in both states, IBAMA, EMBRAPA and the universities, and establish a network of laboratories and researchers from associated institutions through the following activities:

- Coordinating fish stock monitoring in the UPRB, requiring the acquisition of basic infrastructure, including furniture, computers, computer programs and databases;
- Developing a networked server-client-type information management system, aimed at systematizing and cataloging the information in the form of databases and containing the relevant spatial data;
- Establishing a network of laboratories and researchers from the institutions taking part in order to monitor fish stocks, in terms of both field studies and data analysis;

- Evaluating fish stocks, analyzing fishing's socio-economic and environmental effects, drawing up diagnostics aimed at defining the strategies for improving and/or modernizing the activity, aquaculture and the conservation of fish stocks;

- Establishing methodologies for monitoring fishing and fish breeding, including the creation and standardization of protocols, to provide input for the selection and use of indicators, training personnel to structure and compile field teams to use these methodologies;
- Structuring a group support program in order to establish the most appropriate monitoring methodology, with a particular emphasis on fish stocks;
- Implementing awareness-building and training programs for bodies in the various spheres of government and society dealing with fish stock monitoring procedures, the evaluation of biodiversity and the factors affecting it, and the environmental impact, geared to the specific nature of inland waters;
- Integrating the state's existing monitoring and management systems, by establishing this center and disseminating the resulting knowledge to opinion-makers, those responsible for taking decisions and community leaders.

PROJECT: **CMRP-UPRB / Coordination of Fish Stock Monitoring**	
Objectives	• To create a center (physical and/or virtual) uniting and consolidating the entire database related to fishing (monitoring, control and research) in the UPRB.
Area covered	• UPRB
Urgency of implantation	• Mato Grosso do Sul already has a fishing control system in place (SCPesca-MS), that will provide decision-taking and resource-management input) • Mato Grosso is currently attempting to implant a similar system. • EMBRAPA-Pantanal has been undertaking systematic research (isolated) into fishing development and monitoring. • Various actions and isolated research projects have been undertaken in recent years by several regional bodies and professionals. • There is a general consensus (obtained from Cobrape's contacts) that the lack of more refined controls (including that of predatory fishing) impedes the full development of ecotourism in the Pantanal, given that sport fishing is one of the most sought-after activities. The time is ideal, therefore, for the coordination of institutional actions allowing for the implementation of the CMRP-UPRB. This should include incorporating the experience of the Japanese experts regarding the means of monitoring, controlling and planning the sustainable exploitation of fish stocks.
Existing / available facilities	New proposal. No structure in place.
Existing / available human resources	The institutions directly involved have qualified personnel who can be allocated to developing the project in conjunction with the JICA's specialists.
Current funding	Financial resources are both limited and allocated by the funding bodies to isolated projects.
Feasibility	Requires initial interaction between the various interested bodies. Initially, the JICA can send a specialist with experience in monitoring and controlling fish stocks to draft and detail the CMRP-BA. Subsequently, the JICA can provide an expert with experience in putting together computerized support systems for fishing monitoring and control. It may also be possible to supply and provide operational training for "model" units successfully employed in Japanese monitoring systems.
Institutions / partners	*Direct*: Fema-MT / Femap-MS / EMBRAPA-Pantanal / IBAMA-DF / IBAMA-MT *Potential*: GEF, IDB, universities, NGOs, other IBAMA agencies.
Benefits / improvements arising from the JICA's participation	Fishing monitoring and control initiatives in the UPRB have occurred in an isolated and sector-based manner, even those sponsored by federal bodies and agents. Thus the technical cooperation agreement can ensure integrated action that is not confined by regional limits and/or to the actions of particular management bodies. It will also be possible to improve technical capacity, particularly regarding the operation and interpretation of the monitoring data.
Possibilities / forms of cooperation	**Local involvement of the Japanese specialists** • 1 long-term: interacting with the institutions, preparing and detailing the project, overall coordination • 1 short-term (1st to 3rd month): fish stock planning, monitoring and control • 1 short-term (3rd to 12th month): computerized support systems for fishing monitoring and control, and the training of local personnel
Duration	There is no predetermined duration for the project. This should be defined when the design is complete.
Adverse factors	• Possible difficulties vis-à-vis Mato Grosso's implantation of the SCPesca-MT. In this case, the project will be feasible only in Mato Grosso do Sul.

5.2 Restoration of the Paraguay River Headwaters, the PEPE and VIDA Projects

Given the characteristics of these three projects and the fact that they are closely related and, to a certain extent, interdependent, they have been considered as a whole in the context of the JICA's involvement.

Restoration of the Paraguay River headwaters

This project is aimed at reversing the environmental and social problems in the UPRB. The basic strategy is to alleviate the two main causes of the degradation of the headwaters: soil erosion and water contamination from the indiscriminate use of agrotoxins. The idea is, therefore, to promote the sustainable development of the UPRB by managing and conserving its natural resources, encouraging economic activities that are compatible with the ecosystem and providing better living conditions for the region's poor.

When the Paraguay's headwaters, located between the Serra da Bocaina and the Serra do Tombador, reach the plain, the conditions are ideal for the presence of diamond deposits, which have in fact been explored since 1805. This practice, together with the farming and pasture-related activities, intensifies soil loss and accelerates erosion. The headwaters themselves are formed by the Paraguaizinho and Sete Lagoas creeks. The area, with an undulating relief, extends for around 10,000 ha, and farming, particularly of soybean and rice, is the dominant activity. The soil is deep and well-drained, but with low natural fertility and a very high aluminum content, necessitating large quantities of correctives and fertilizers to ensure satisfactory crop development.

The advance of soybean and rice farming to the edge of the riparian vegetation, the reduction in fauna and the interruptions in the water courses to build embankments have modified the make-up of this vegetation, which is indispensable in maintaining the equilibrium of the natural ecosystems. It has several strategic functions, including: providing shelter and food for the wild fauna, thereby preserving biodiversity; ensuring the perpetuity of the rivers and headwaters; reducing erosion and containing water-borne silt; protecting the rivers against contamination by agrotoxins; and improving the volume and quality of water for human use.

The UPRB is strategic in terms of water resources, containing the upstream section of the Paraguay River, and occurrences there have reflections on the entire basin, especially in the floodplain region. Corrective actions to the headwaters are therefore a priority. This project envisages:

- Promoting the preservation and restoration of natural resources in the Paraguay headwaters region and its areas of influence by fomenting, implanting and disseminating practices related to soil and water conservation, and the protection and restoration of permanent preservation areas;
- Disseminating soil and water-conservation actions and techniques and protecting and restoring permanent preservation areas, in conjunction with farmers and experts from government and private institutions;
- Monitoring the execution of the permanent preservation area restoration and soil and water-conservation activities.

There are also certain specific objectives:

- Promoting the preservation and restoration of natural resources in the 10 critical sub-basins by implanting practices related to soil and water conservation and the restoration of riparian vegetation;
- Disseminating soil and water-conservation actions and techniques and protecting and restoring permanent preservation areas, in conjunction with farmers and experts from government and private institutions;
- Monitoring the execution of the permanent preservation area restoration and soil and water-conservation activities.

Mato Grosso State Strategic Riparian Vegetation Preservation Program - PEPE

Given the need to restructure and organize the various works related to restoring and maintaining the state's riparian vegetation, the Mato Grosso government created the State Committee for the Restoration of Degraded Areas, which was charged with drawing up the Mato Grosso State Strategic Riparian Vegetation Preservation Program (PEPE).

The program's primary objective is to revitalize and/or replant the state's degraded riparian vegetation, control erosive processes, restore unprotected headwaters, repair roads and promote environmental awareness. It is also aims to educate farmers, envisaging the creation of municipal councils or consortia, responsible for drafting, in a participatory manner, a plan for the restoration of the most critical areas.

Overall supervision will be by FEMA and EMPAER. The municipal committees will be responsible for selecting the critical areas, drawing up the integrated action program and producing and distributing seedlings to rural proprietors, who will be responsible for implanting and maintaining the project.

The main results expected are as follows:

- Motivating and educating municipal governments, farmers, specialists and the community in general to monitor and expand the riparian vegetation restoration activities and to adopt soil-conservation practices;
- Providing environmental education in the schools in those municipalities taking part in the program;
- Restoring the pattern of riparian vegetation, thereby recuperating its ecological functions;
- Providing specialist training for the personnel involved in water-basin management;
- Implanting and consolidating the basin management plans and the Technical Operations Manual in the priority municipalities.

The costs of making the PEPE operational will be borne as follows:

- FEMA will bear the cost of allocating the specialized labor needed to identify the critical areas, prepare the cartographic bases and technical documents, and organize meetings with the municipality and rural proprietors. This includes transport expenses for the specialists involved.
- EMPAER will bear the cost of the technical specialists who will accompany and provide *in loco* advice on the restoration activities;
- The municipalities and IBAMA will be responsible for producing and supplying the seedlings (species defined in the project);
- The rural proprietors will bear those expenses directly related to the environmental restoration services (planting, leveling, installation of drainage devices, etc.).

VIDA NOVA Project – Program for the Support of Family Agriculture and the Conservation of Natural Resources

The disorganized clearance of thousands of hectares along roadsides in the cerrado portions of the UPRB for human settlement purposes, coupled with certain cultural aspects of the settlers themselves (internal migrants encouraged by federal development programs), resulted in the implantation of huge areas of arable land and pasture, accompanied by little attempt to conserve natural resources. This has provoked alterations in the natural characteristics of the soil, such as compactation from the intensive use of agricultural machinery and the loss of its fertile layer, which, coupled with erosive processes, has had an extremely adverse impact on water resources, provoking imbalance in the river dynamic and, consequently, the loss of biodiversity.

In the state of Mato Grosso, innumerable critical micro-basins within the Pantanal system have been so impacted. The most evident environmental alterations are those related to agriculture – water erosion processes, especially on land inappropriate for mechanization.

In summary, the Vida Nova Project aims to promote soil conservation and the restoration of degraded areas by providing small farmers and/or resettlement units with technical assistance, helping to improve their quality of life. This includes an emphasis on social issues and environmental aspects, such as reducing the production of sediments and agrotoxin residues on the UPRB plateau.

There are also certain specific objectives:

- Diagnosing the critical microbasins with a high concentration of small farmers;
- Training specialists and farmers in subsistence, commercial, associative, cooperative and agro-ecological practices;
- Implanting educational facilities for teaching subsistence and commercial activities in the micro-basins;
- Training specialists and farmers in natural resource conservation and maintenance techniques;
- Implanting Integrated Soil and Water Conservation Plans in the critical micro-basins;
- Promoting basic sanitation on the rural properties.

PROJECT:	**Restoration of the Paraguay River Headwaters – Fema-MT** **Mato Grosso State Strategic Riparian Vegetation Preservation Program – Fema / Empaer-MT - PEPE** **Vida Nova Project – Program for the Support of Family Agriculture and the Conservation of Water Resources – Empaer-MT**
Objectives	Small rural properties: • Providing sanitary and environmental education on the final disposal of effluents and solid waste, soil conservation and the preservation of native riparian vegetation. • Educating, training and raising awareness on the use of sustainable farming techniques (crops and livestock) in order to reduce pollution from agrotoxins and promote social inclusion (in order: self-sustainability, associations / cooperativism / sales). • Encouraging the replanting of riparian vegetation by raising awareness of its importance, supplying native species seedlings and providing technical planting assistance. Medium-sized and large-scale rural properties: • Encouraging the replanting of riparian vegetation by raising awareness of its importance, supplying native species seedlings and providing technical planting assistance. • Encouraging the restoration of degraded headwater areas (erosion / cave-ins) by raising awareness and providing technical support. • Raising awareness and encouraging the repair of roads and other transport routes that have been subjected to erosive processes, by providing technical support. Support activities: • Installing and maintaining nurseries for the production of native species seedlings. • Identifying and planning actions in the critical sub-basins. • Institutional strengthening in the benefiting communities by the creation of local natural resource management groups / councils.
Area covered	UPRB – already identified critical sub-basins.
Urgency of implantation	Various degraded areas have already been identified as contributing to the silting up and pollution of the water courses. The implementation of conservation practices is, therefore, of extreme urgency.
Existing / available facilities	No new infrastructure needs to be installed. The local installations of the benefiting municipalities and communities are sufficient. The support structure will be contained in the facilities of the participating bodies.
Existing / available human resources	Potentially, the main participating bodies (Fema and Empaer) have sufficient professional staff to act in conjunction with the JICA's experts.
Current funding	Current resources are limited and allocated by Fema and Empaer. This limits actions to those in a few critical sub-basins.
Feasibility	The projects were lumped together given their similar aims and forms of action. One of them, however, the PEPE Program, is already under way, under joint Fema / Empaer-MT responsibility, as part of the Pantanal Project. The implantation of the project in a critical sub-basin demands intense institutional interaction in order to add the greatest number of interested parties (municipalities, communities and rural proprietors). It requires the planning and installation of native species nurseries – one at the headquarters of IBAMA-MT and others in the benefiting municipalities.
Institutions / partners	*Direct*: Fema-MT / Empaer-MT / IBAMA-MT *Potential*: EMBRAPA / EMBRAPA-Pantanal / universities / NGOs

continued

PROJECT:	**Restoration of the Paraguay River Headwaters – Fema-MT** **Mato Grosso State Strategic Riparian Vegetation Preservation Program – Fema / Empaer-MT - PEPE** **Vida Nova Project – Program for the Support of Family Agriculture and the Conservation of Water Resources – Empaer-MT**
Benefits / improvements arising from the JICA's participation	• The introduction of new concepts and techniques for the sanitary and environmental education of underprivileged rural communities (resettled populations) in the most appropriate practices for soil management and the final disposal of effluents and solid waste. • Increasing the project's credibility (trust) in the sense of raising farmers' awareness of issues related to the restoration of degraded areas (riparian vegetation soil erosion on roads and in headwater areas). This is especially important in the case of the medium-sized and large properties). • Facilitating institutional interaction (coordination and planning). • The introduction of new sustainable management techniques (farming, livestock and fishing), particularly in the case of the smaller properties. • Making it feasible to expand the program to Mato Grosso do Sul.
Possibilities / forms of cooperation	**Local involvement of the Japanese specialists** • 1 long-term: interacting with the institutions, sanitary and environmental education, overall coordination • 1 long-term: rural technical assistance (subsistence farming and the conservation of natural resources)
Duration	Part of this project is already under way (the PEPE and VIDA NOVA programs). The period envisaged for the critical sub-basins already identified in Mato Grosso is around 5 years. Extending the project to Mato Grosso do Sul needs to be detailed.
Adverse factors	• Limited resources on the part of FEMA and EMPAER • Possible institutional interaction difficulties between the state and municipal bodies.

5.3 Sustainable Urban Drainage Program

The Sustainable Urban Drainage Program has been developed by the federal government in conjunction with Brazil's municipalities, through the Ministry for the Cities and with financial support from the Caixa Econômica Federal (a federal bank). The objective is to promote sustainable urban drainage management, integrated with urban development policies and the management policies of the respective water basins. This involves structural and non-structural actions geared towards restoring wetlands and preventing, controlling and minimizing the adverse impacts provoked by urban floods and the overflow of urban water courses.

The maximum surface run-off from an urban basin increases with the increase of built-up areas and canalization of the run-off. It therefore depends on the state of the soil's impermeability and the level of human occupation. The relative increase can be as more than six times the previous level, triggered by reduced evapotranspiration and underground drainage and the basin's reduced time of concentration.

The impact on water quality is the result of the following factors: (a) air pollution which precipitates into the water; (b) the cleaning of urban surfaces that are contaminated with different organic and metal components; (c) solid waste – sediments eroded by the increased velocity of the run-off and urban garbage deposited in or transported by the drainage system; (d) uncollected bodily wastes that travels through the drainage system.

In order to implement sustainable measures in a given town, it is necessary to draw up an Urban Drainage Master Plan, based on the following main directives: (a) new developments must not increase the maximum downstream run-off; (b) measures for planning and controlling existing impacts should be drawn up by considering the basin as a whole; (c) the planning horizon should be integrated into the city's Master Plan; (d) control of effluents should be assessed in an integrated manner with that of sanitary sewage and solid waste.

The Master Plan should be developed using non-structural measures (chiefly legislation) for new urban expansions (individual and multiple building lots) and structural ones for the sub-basin. In the latter case, these measures are projected to avoid existing basin impacts for a given period of economic development and with a built-in risk tolerance.

The aim of the project is to develop Drainage Master Plans for three municipalities in the UPRB, located in the plateau regions of Mato Grosso (Coxim) and Mato Grosso do Sul (Rio Verde and Aquidauana), utilizing the concepts of the Sustainable Urban Drainage Program. It comprises the following activities:

- Ensuring that the general principles and directives of the Drainage Master Plan are compatible with the Municipal Master Plan, if there is one;
- Diagnosing the urban drainage services by analyzing the effectiveness of the drainage devices in relation to human health and safety, as well as environmental protection;
- Analyzing previously-adopted solutions via field inspections and verifying existing studies and projects;
- Defining project criteria and parameters that are compatible with the directives of the Sustainable Urban Drainage Program;
- Establishing future population-growth scenarios and, therefore, projections of land occupation and the respective degrees of impermeability to be expected from future engineering projects;
- Defining solutions that limit the impact from the expansion of flooding and limit rainwater run-off caused by impermeable areas;
- Defining structural measures, corresponding to such interventions as: large-scale drainage works; construction of dykes; the canalization of and modifications to perpetual water courses; retention basins; the restoration of flood-prone areas, including decanalization; and the building of linear parks;
- Defining non-structural measures, corresponding to such actions as: control of vegetation coverage; regulating land use or the zoning of flood-prone areas; control of erosion; introduction of a forecasting and alert system; resettlement of populations; and environmental education;
- Non-structural institutional development and capacity-building measures covering technological innovations and rainwater planning systems adopted in different Brazilian regions and in the developed nations;
- Capacity-building initiatives should be geared towards producing professionals equipped to produce and enforce Master Plans and to take part in the development of urban drainage projects; decision-takers should be made aware of and kept up to date on the issue of urban drainage; society should be prepared to exercise social control over drainage initiatives.

PROJECT: Sustainable Urban Drainage **Program**	
Objectives	• To promote the sustainable management of urban drainage integrated with urban development,, land-use and occupation and water-basin management policies, minimizing erosive processes and the introduction of solid waste into the Pantanal water courses.
Area covered	• Urban areas in the municipalities of Rio Verde and Aquidauana, in Mato Grosso do Sul, and Coxim in Mato Grosso.
Urgency of implantation	Urban drainage interventions are needed to minimize flooding and its effects. However, such interventions have given rise to numerous erosive processes, in turn leading to the silting up of the downstream water courses. This situation is becoming increasingly frequent in the Pantanal, chiefly due to the fact that the urban centers are located in the headwater and intermediate stretches of the area's drainage system. The silting up of the water courses alters the dynamics of river flow, in turn impacting the local biodiversity.
Existing / available facilities	Project teams can make use of the municipal government headquarters.
Existing / available human resources	The local specialists involved will be provided by the municipal governments.
Current funding	The federal government through the Ministry for the Cities (MinC), administered and financially supported by the Caixa Econômica Federal - CEF.
Feasibility	The project will require a good deal of institutional interaction between the federal government, through the Ministry of the Cities, and the municipal governments, establishing agreements (or other forms of interaction) to ensure its financial feasibility. Once these agreements are in place, the next step is to develop the urban drainage master plans of the selected municipalities (Coxim-MT, Rio Verde-MT and Aquidauna-MT).
Institutions / partners	*Direct*: MinC / CEF / ANA / municipal governments *Potential*: GEF / Femap-MS / Fema-MT
Benefits / improvements arising from the JICA's participation	The JICA can initially help with institutional interaction, speeding up the signing of the agreements. Subsequently, its specialists can help draw up the urban drainage master plans, complementing this with training activities for the municipal specialists that will be accompanying the work.
Possibilities / forms of cooperation	**Local participation of the Japanese specialists** • 1 long-term: interacting with the institutions and overall coordination • 1 medium-term: specializing in management, urban drainage and the training of local specialists
Term	There is no predetermined duration for the project. This should be defined when the design is complete.
Adverse factors	• Resistance to a change of mentality and culture on the part of the local specialists. • The use of more expensive technology than normal. • The need for a high degree of institutional interaction given the diversity of the administrative spheres involved.

5.4 Long-term Ecological Responses to Flooding Variations in the Pantanal

The annual flood rhythm is a hugely important ecological factor for the floodplain's flora and fauna and also affects human activity. It is therefore essential to understand the effects on the plants and animals. In this context, the aerial wildlife population surveys carried out by EMBRAPA Pantanal since 1990 have contributed greatly to knowledge of the regional biodiversity's state of conservation.

EMBRAPA Pantanal's Research Unit has adapted and standardized the evaluation methodology. The operations consist of low-altitude flights, generally at a height of between 50 and 200 m, which is an inexpensive and efficient means of obtaining information on the population densities of the large vertebrates in open and remote areas, where ground-level surveys are seriously hampered.

The results indicate, for example, that the Pantanal alligator (or cayman) is not threatened with extinction, as was previously thought. This animal was the target of illegal hunting for decades and was on the endangered species list for many years. Thanks to the survey, however, we know this is not the case. In fact, it was worries over the excessive exploitation of the alligator that first led to demands that the area's species be monitored, since extended to the pampas deer and the capybara.

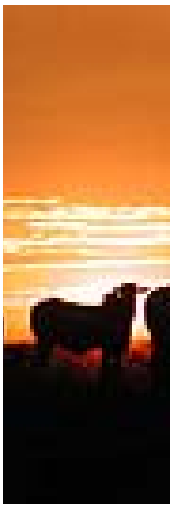
In addition to the aerial surveys, this project also includes limnological, ecotoxicological and hydrological monitoring via measuring stations and the monitoring of flooded areas via satellite. The main project activities are as follows:

- Aerial surveys to monitor the population densities (or density indices) of four large Pantanal vertebrates – alligator, marsh deer, pampas deer and capybara;
- Alligator population studies in Nhumirim: the number of alligator nests, built on floating carpets of vegetation will be monitored using an ultralite, while nest numbers in the undergrowth will be estimated by collecting samples. In addition, the recently-hatched alligators in the Nhumirim experimental station will be captured and tagged until there is a field population of a "known" age, permitting longer-term studies;

- Monitoring of bird nests in Miranda-Abobral: nest location, numbers and species composition in the breeding colonies of wetland birds in the Pantanal do Abobral will be monitored and related to environmental factors;
- Limnological and ecotoxicological monitoring: the system's limnological and ecotoxicological variations will be monitored (in the former case in large temporal and spatial scales and in the latter at four points);
- Hydrological monitoring: via limnographs along the Paraguay River, allowing for continuous readings of water levels throughout the basin;
- Monitoring of the Pantanal's flooded areas: the flooded areas will be mapped and quantified by interpreting images from the NOAA satellite.

PROJECT: **Long-term Ecological Responses to Flooding Variations in the Pantanal.**	
Objectives	• Counting and monitoring the evolution of Pantanal alligator, marsh deer, pampas deer and capybara populations in different ecological compartments. • Assessing the effects of the Pantanal's multi-year flooding variations on these populations. • Assessing the effects of anthropic modifications on these populations. • Assessing the effects of river pollution on these populations.
Area covered	• UPRB – Pantanal area
Urgency of implantation	The activities related to monitoring the populations of the species in question have been developed by EMBRAPA-Pantanal from low-altitude aerial surveys. In order to conclude the studies it will be necessary to monitor limnological and ecotoxicological conditions and the flooded areas (and their variations).
Existing / available facilities	Thanks to the work developed at EMBRAPA-Pantanal headquarters, there is no need for further units.
Existing / available human resources	A EMBRAPA-Pantanal employs specialists in matters related to the species under study, but there is need for support regarding the limnological and ecotoxicological monitoring and the interpretation of satellite images.
Current funding	Allocated by EMBRAPA.
Feasibility	Part of the studies are already under way. Their continuity requires basic diagnostics and overall planning regarding the sizing and distribution of the monitoring network and the limnological and ecotoxicological parameters to be followed up and which have repercussions on the species under study. There is also a need for remote-sensing technology. Water resource monitoring will also require that EMBRAPA personnel be trained in this activity.
Institutions / partners	*Direct*: EMBRAPA-Pantanal / ANA *Potential*: GEF / IBAMA-MT / Fema-MT / Femap-MS
Benefits / improvements arising from JICA's participation	The JICA can join the ongoing project, initially promoting the planning of the monitoring activities. Subsequently, EMBRAPA-Pantanal personnel will have to be trained to collect the field samples and interpret the results. These activities may also include training in remote-sensing technologies, chiefly related to the interpretation of satellite images.
Possibilities / forms of cooperation	**Local participation of the Japanese specialists** • 1 long-term: interacting with the institutions, preparation and detailing of the project and overall coordination; • 1 medium-term: biologist specializing in native species population studies; • 1 medium-term: specialist in the monitoring and analysis of water quality, remote sensing and training local specialists.
Duration	There is no predetermined duration for the project. This should be defined when the design is complete, taking into consideration the activities already undertaken by EMBRAPA.
Adverse factors	• The need for integration with the NGOs active in the area, ensuring that the project's objectives are clearly understood and that it is not viewed as hunting management scheme.

5.5 Monitoring and Control of Water Flow and Quality in the UPRB



The aim of institutional strengthening for the integrated management of water resources is to provide support for institutional interaction among the management bodies and to pursue the water basin's environmental sustainability. This includes joint-management with Bolivia and Paraguay, who share the Pantanal and the UPRB with Brazil. In order for this interaction to be successful, it must be based on studies, data and information that provide input for the decision-taking process. According to the water resource management model adopted in Brazil, this involves, in addition to government, water users, water resource organizations and society as a whole. It is therefore worth emphasizing the role of capacity-building in ensuring a better performance from the specialists and society, aiming to expand social control over environmental issues. Another important point is the development of auxiliary management instruments, exemplified by the monitoring of water flow and quality.

Measures should be proposed to control water pollution and manage solid waste for implementation at the basin's critical points. This includes both concentrated and diffuse pollution, arising from urban and rural areas, from mining, domestic sewage, agrotoxins and nutrients. The benefits will not be limited the locations where such measures are applied, but will also favor the downstream areas of the basin, including its border and cross-border stretches.

The project also involves the restoration and upgrading of the hydrometric and sedimentometric network and the qualitative and quantitative monitoring of surface water, groundwater and sedimentation. This will be based on a survey of the existing network and a project to resize it. This is necessary because the existing hydrometric network was projected and implanted more with the aim of providing support for power-sector planning and operations than with multi-purpose water use in mind.

It will also be necessary to gain a better understanding of the basin's existing aquifers in order to draw up directives for the integrated management of groundwater use and protection. This will be achieved through geological, structural, geomorphological and hydrogeological knowledge, allowing the available groundwater reserves to be determined. In this context, close relations will be maintained with the Project for the Environmental Protection and Sustainable Development of the Guarani Aquifer System (SRH/PGEF/UNEP/OAS).

The natural flooding of the basin mostly affects the rural areas, but is also important for the urban ones. Flood maps already exist for certain towns in the UPRB and real-time flood-forecasting models are being employed, covering the lower stretch of the Paraguay River.

The nature of the basin's critical events is not compatible with a prevalence of structural measures to defend against floods. This is a typical case in which non-structural measures should be introduced, exemplified by real-time alert systems, based on reliable and extensive rainfall and water-level monitoring. The benefits of this activity are economic, environmental and social and will affect the vast majority of the area's rural and urban population.

In order to protect the riparian population and that of the basin's other flood-prone areas, programs should be drawn up to prevent, monitor and assess flooding impacts, due to the worsening of the situation and the damage caused by such floods.

PROJECT: **Monitoring and Control of Water Flow and Quality in the UPRB.**	
Objectives	• The restoration, upgrading and technological/operational improvement of the hydrometric, sedimentometric water-quality monitoring networks in the UPRB.
Area covered	• UPRB
Urgency of implantation	The drawing up of water resource proposals for the UPRB is currently based on data and information obtained from a network whose coverage (spatial or related to the parameters and variables monitored) is insufficient. Planners are therefore forced to adopt conservative hypotheses for the formulation of qualitative and quantitative water resource evolution scenarios. Thus improvements to the monitoring networks are necessary in order to provide more reliable information and sufficient input for the taking of decisions and water resource planning.
Existing / available facilities	There is need for new facilities. The state and federal bodies already possess all the necessary facilities for the processing and filing of the monitored data.
Existing / available human resources	The state and federal bodies can provide the trained specialists needed to accompany the studies.
Current funding	Current financial resources are allocated by the state and federal bodies. However, given the gradual reduction in monitoring investments, the quality of the existing networks has been visibly diminished.
Feasibility	Requires an initial survey of the registry and of available monitoring data, plus a survey of the monitoring stations' operational situation. The next step is to analyze the existing networks and propose the necessary reorganizations and expansions, as well as the technical specifications of the equipment.
Institutions / partners	*Direct*: GEF / ANA / IBAMA-DF *Potential*: EMBRAPA-Pantanal / IBAMA-MT / Femap-MS / Fema-MT
Benefits / improvements arising from the JICA's participation	• Facilitating institutional interaction (coordination and planning), articulating and speeding up the signing of the necessary agreements. • Support for monitoring network diagnostics and planning. • Training of the local monitoring network operation and maintenance specialists.
Possibilities / forms of cooperation	**Local participation of the Japanese specialists** • 1 long-term: interacting with the institutions, preparation and detailing of the project, overall coordination • 1 medium-term: specializing in water resource monitoring network planning and operations and training local specialists
Duration	There is no predetermined duration for the project. This should be defined when the design is complete.
Adverse factors	• Financial difficulties related to the acquisition of the equipment and its operation and maintenance.

5.6 Proposal for the Sustainable Use of the Pantanal Ecosystem: Production of Beef Cattle

The Pantanal has a drainage system with unique characteristics, from the point of view of the landscape. The floodplain, with elevations of around 100 m, is surrounded by escarpments, which clearly delimit the difference in the types of occupation. The extremely shallow declivities of the depression create diversified situations due to the graduation between land which is periodically flooded and that which is not, and the differing depositions of sediments and nutrients caused by the periodic flooding. This environment produces a mosaic of vegetation types - swampland, riparian, alluvial formations, deciduous forest, grassland and cerrado – each with their own specific associated fauna.

In recent years, economic pressure has been mounting to increase the productivity of the Pantanal's beef-cattle production systems. This has threatened the sustainability of the ecosystems due to the introduction of technologies with a negative impact, such as the clearance of the plane's higher areas, generally not flood-prone) for the purposes of pasture and the systematic burning of the same area.

This project is designed to assess and monitor the sustainability of the Pantanal's agro-ecosystems, by means of biophysical, economic and social indicators, and establish adaptive management strategies which can ensure that sustainability. Three types of anthropic interference in the agro-ecosystems will be evaluated: (i) natural interference (without the presence of cattle); (ii) traditional interference (little anthropic activity); and (iii) conventional interference, where the production system is intensifying. The project is based on the following activities:

- Characterizing the Pantanal's different agro-ecosystem creation systems and mapping them for different landscape units;
- Characterizing the natural resources (water soil, climate, flora, fauna) and the pasture's state of conservation in the different agro-ecosystems, and identifying possible sustainability indicators;
- Characterizing the social and economic aspects of the different agro-ecosystems and identifying possible sustainability indicators;
- Establishing the cattle health, nutrition and well-being indicators cattle in the different agro-ecosystems;
- Defining sustainability indicators and limits for the different agro-ecosystems;
- Developing mechanisms to monitor the sustainability of the different agro-ecosystems;
- Defining adaptive agro-ecosystem management strategies compatible with their sustainability.

PROJECT: **Proposal for the Sustainable Use of the Pantanal Ecosystem: Production of Beef Cattle**	
Objectives	• To assess and monitor the sustainability of the Pantanal's agro-ecosystems and establish adaptive management strategies.
Area covered	• UPRB: sub-regions of Nhecolândia and Paiaguás in Mato Grosso do Sul and Poconé in Mato Grosso.
Urgency of implantation	In evaluating the urgency of this project, the following should be taken into consideration: • The intensification of the beef-cattle production system. • The need to establish indicators and limits which safeguard the sustainability of the different agro-ecosystems.
Existing / available facilities	The facilities of EMBRAPA-Pantanal.
Existing / available human resources	Trained specialists are available to accompany the work of EMBRAPA-Pantanal and the local universities.
Current funding	None.
Feasibility	• Requires initial articulation among the various interested bodies. • The identification and mapping (qualitative and quantitative) of the already explored agro-ecosystems can be handled by NGOs and universities. • Defining the sustainability indicators and adaptive management strategies for the different agro-ecosystems.
Institutions / partners	*Direct*: EMBRAPA-Pantanal / Univag / IBAMA-DF *Potential*: EMBRAPA / IBAMA-MT / Femap-MS / Fema-MT
Benefits / improvements arising from the JICA's participation	• Facilitating inter-institutional interaction (coordination and planning), articulating and speeding up the signing of the necessary agreements. • Helping integrate the universities into the project. • Incorporating their specialists' experience into the diagnostics and the drawing up of indicators, proposals and directives for the different agro-ecosystems.
Possibilities / forms of cooperation	**Local participation of the Japanese specialists** • 1 long-term: interacting with the institutions, preparation and detailing of the project, overall coordination • 1 short-term (3 months): specializing in sustainable cattle management techniques • 1 medium-term (15 months): implantation, follow-up and training local specialists
Duration	There is no predetermined duration for the project. This should be defined when the design is complete.
Adverse factors	• Resistance from NGOs to the extensive economic exploration of the Pantanal • A lack of consensus among the specialists and researchers involved on the best solution for this issue • Resistance from current cattle breeders to changes in the production system

5.7 Parque Estadual Encontro das Águas (ÁGUAS DO PANTANAL)

This Conservation Area covers 108,960.18 ha in the municipality of Poconé, in Mato Grosso, and comprises Pantanal floodplains whose conditions ensure a wide range of biodiversity.

The area is exceptionally heterogeneous in terms of animal, fish, amphibian, reptile and bird habitats, due to the great abundance of food, the result of local water and topographical conditions (characterized by the confluence of several rivers). These characteristics have had a strong influence on the landscape and offers breeding and feeding niches for the wild fauna, including species unique to the area and threatened with extinction

The area in question is a basin for several important tributaries, including the Cuiabá, Piquiri, Pirigara, Cassange, Três Irmãos and Alegre, as well as other smaller ones. Thanks to lack of adequate control and inspection procedures, intensive overfishing and predatory fishing has reduced the commercial stocks of certain species in these rivers.

From the phytogeographical point of view, the region presents an integrated mosaic of landscapes, associated with an important ecological corridor linking the surrounding federal, state and RPPN Conservation Areas. According to studies undertaken by the Strategic Action Program for the Integrated Management of the Pantanal and the Upper Paraguay River Basin, developed by the ANA/GEF/UNEP/OAS, this is a priority preservation area (09/2004).

The project proposes the conception and development of a Sustainable Management Plan for the recently-created Parque Encontro das Águas. The strategic importance of such a plan is underlined by the fact that it contains a major stretch of the Estrada Parque Transpantaneira road and has been subject to anthropic alterations from the installation of flood-retention dykes on the former Fazenda São João.

PROJECT: **Parque Estadual Encontro das Águas (Águas do Pantanal)**	
Objectives	• The strategic preservation of an important link between biodiversity corridors (The Ministry of the Environment's Conservation and Sustainable Use of Brazilian Biodiversity Program – PROBIO). • Continuation of the protected areas, connecting with the Parque Nacional do Pantanal Mato-grossense and the RPPN's Estância Ecológica CESC-Pantanal, Parque Dorochê, Parque Acurizal and Fazenda Penha. • Appropriate integration with the Estrada Parque Transpantaneira road.
Area covered	• An area of the municipality of Poconé – MT.
Urgency of implantation	• The Conservation Area was recently regulated (Jan/05). There is no management plan as yet. • Part of the Estrada Parque road (which could trigger a series of ecotourism initiatives) cuts through the Conservation Area. • Although Fema-MT is responsible for the Conservation Area, it does not have much experience in drafting and implementing management plans. Most Conservation Areas in MT are private or federal. • The Conservation Area is recognized for its fishing potential (confluence of the Cuiabá, Piquiri, São Lourenço and other rivers), but also overfishing and predatory fishing are common.
Existing / available facilities	There are no available facilities for housing Conservation Area management., nor has Fema-MT allocated any human resources for this purpose (only for office duties).
Existing / available human resources	Fema-MT has its own qualified technical specialists who can accompany the development of the studies and, subsequently, manage the Conservation Area.
Current funding	No specific funds have been allocated to drafting the management plan. Current expenses come from certain Assepro/Fema-MT specialists responsible for studying the Conservation Area's regulatory framework.
Feasibility	Initially, an overall diagnosis needs to be drawn up, given that the area has been subject to significant anthropic alterations (e.g. the dyke on the former Fazenda São João – Construtora Camargo Corrêa). This will be followed by the drafting of the management plan.
Institution / Partners	*Direct*: Fema-MT *Potential*: IBAMA-DF / IBAMA-MT.
Benefits / improvements arising from the JICA's participation	IBAMA-DF already possesses a Conservation Area management plan development model. However, due to financial difficulties, it has never been not been adequately tested in the Pantanal (the plan exists on paper but has never been fully implemented) . The experience of the Japanese specialists can breathe new life into this model, chiefly regarding issues related to feasibility of implantation, the seeking out of partners, etc.
Possibilities / forms of cooperation	**Local participation of the Japanese specialists** • 1 medium-term: interaction with the institutions, preparation and detailing of the project, overall coordination • 1 short-term (1st to 3rd month): environmental diagnostics specialist • 1 short-term (3rd to 12th month): biologist / forestry engineer specializing in management plans, training of local specialists.
Duration	There is no predetermined duration for the project. This should be defined when the design is complete.
Adverse factors	• The area's ownership issue has not yet been resolved. • Limited funding for the effective implantation of the management plan.

ANNEXES

ACRONYMS

ABC – Brazilian Cooperation Agency

ANA – National Water Agency

IDB – Interamerican Development Bank

BPMA – Mato Grosso do Sul Environmental Police

CIBHAP-P – Upper Paraguay River Basin Integration Committee – Pantanal

CI-BRASIL – Conservation International do Brasil

CIDEMA – Intermunicipal Consortium for the Integrated Development of the Miranda and Apa River Basins

CMRP-UPRB – Upper Paraguay River Basin Fish Stock Monitoring Agency

CNURH – National Registry of Water Resource Users

CONSEMA – National Environmental Council

COINTA – Intermunicipal Consortium for the Taquari River Basin

DAB – Analytical Diagnosis of the Pantanal and Upper Paraguay River Basin

EMBRAPA – Brazilian Agricultural Research Corporation

EMPAER – Mato Grosso State Research, Assistance and Extension Corporation

FEMA/MT – Mato Grosso State Environmental Foundation

FUNAI – National Foundation of the Indian

GEF – Global Environment Facility

IBAMA – Brazilian Institute for the Environment and Renewable Natural Resources

IBGE – Brazilian Institute of Geography and Statistics

IMAP – Pantanal Environmental Institute

MMA – Ministry of the Environment

MS – State of Mato Grosso do Sul

MT – State of Mato Grosso

NGO – Non-governmental Organization

OAS – Organization of American States

PAE – Strategic Action Program for the Integrated Management of the Pantanal and the Upper Paraguay River Basin

UPRBCP – Upper Paraguay River Basin Conservation Plan

PNDPA – National Sport Fishing Development Program

PNMA – National Environmental Program

PRODECER – Cerrado Development Program

SANESUL – Mato Grosso do Sul Sanitation Corporation

SCPESCA/MS – Mato Grosso do Sul Fishing Control System

SEDER – Mato Grosso State Rural Development Secretariat

SEMA/MS – Mato Grosso do Sul State Environmental and Water Resource Secretariat

SEPLAN – Mato Grosso State Planning and Coordination Secretariat

SIGRHI – National Integrated Water Resource Management System

SINGRH – National Water Resource Management System

SNUC – National Conservation Area System

SRH – Natural Resources Secretariat

TNC – The Nature Conservancy

UFMS – Federal University of Mato Grosso do Sul

UFMT – Federal University of Mato Grosso

UNDP – United Nations Development Program

UNEP – United Nations Environment Program

UNESCO – United Nations Organization for Education, Science and Culture

UNIVAG – University of Várzea Grande

UPRB – Upper Paraguay River Basin

UPRBCP – Upper Paraguay River Basin Conservation Plan

INTERVIEWS

There follows a list of those professionals interviewed regarding the programs and projects related to the Upper Paraguay River Basin and/or Pantanal during visits to Brasília, Cuiabá, Campo Grande and Corumbá.

Name: **Adriana Heibel**
Body: IBAMA - Brasília
Dept.: CGREP – Fauna and Natural Resources
E-mail: adriana.heibel@ibama.gov.br
Telephone: (61) 316-1229

Name: **Heloísa Helena Costa Ferreira**
Body: IBAMA - Brasília
Position: Coordinator of the Pantanal Project
E-mail: heloisa.fererreira@ibama.gov.br
Telephone: (61) 316-1731 / 316-1086

Name: **Antonio Alberto F. da Silva**
Body: IBAMA - Brasília
E-mail: antonio-alberto.silva@ibama.gov.br
Telephone: (61) 316-1464

Name: **Ana Cartaxo**
Body: IBAMA - Brasília
Dept.: CGEUC – Conservation Area
E-mail: ana-cartaxo.melo@ibama.gov.br
Telephone: (61) 316-1131

Name: **Maria Rosa Gonçalves**
Body: IBAMA - Brasília
Dept.: CGECO – Conservation Area Management Plan
E-mail: maria-rosa.gonçalves@ibama.gov.br
Telephone: (61) 316-1775

Name: **Mário Schwingel**
Body: Ministry of the Environment
Position: Pantanal Program Monitoring and Evaluation Manager
E-mail: marioschwingel@yahoo.com.br
Telephone: (61) 4009-9150

Name: **Valmir Ortega**
Body: Ministry of the Environment
Position: National Pantanal Program Coordinator
E-mail: valmir.ortega@mma.gov.br
Telephone: (61) 4009-9150

Name: **Paulo Lopes Varella Neto**
Body: National Water Agency - ANA
Position: ANA Program and Project Superintendent
E-mail: paulovarella@ana.com.br
Telephone: (61) 2109-5221

Name: **Nereu Fontes**
Body: IBAMA – Campo Grande
E-mail: nereu@ms.ibama.gov.br
Telephone: (67) 382-2966/382-1802/324-4914

Name: **Job Abrão**
Body: SEMA/MS – Pantanal Program
Position: Overall State Coordinator of the Pantanal Program
E-mail: jabrao@net.ms.gov.br
Telephone: (67) 327-1024/327-1080

Name: **Humberto Cardoso Gonçalves**
Body: Pantanal/Alto Paraguai Project
Position: Technical Coordinator
E-mail: humbertogef@msmt.org.br
Telephone: (67) 312-6430

Name: **Emiko Kawakami de Resende**
Body: Embrapa Pantanal
Position: Overall Supervisor
E-mail: chgeral@cpap.embrapa.br
Telephone: (67) 233-2430

Name: **Aiesca Oliveira Pellegrin**
Body: Embrapa Pantanal
Position: Assistant Head of Research & Development
E-mail: aiesca@cpap.embrapa.br
Telephone: (67) 233-2430 – Ext. 234

Name: **Giancarlo Lastoria**
Body: Federal University of Mato Grosso do Sul
Position: Head of Pantanal Studies
E-mail: lastoria@nin.ufms.br
Telephone: (67) 345-7217

Name: **Carlos Nobuyoshi Ide**
Body: Federal University of Mato Grosso do Sul
Dept.: Hydraulics and Transport
E-mail: cide@nin.ufms.br
Telephone: (67) 345-7491

Name: **José Ignácio Ribeiro Neto**
Body: FEMA – State Environmental Foundation
Dept.: Special Projects Advice
Position: Advisor
E-mail: assepro@fema.mt.gov.br
Telephone: (65) 613-7207/613-7281

Name: **Eucilene Porto**
Body: FEMA – State Environmental Foundation
Dept.: Fisheries
Position: Coordinator
E-mail: assepro@fema.mt.gov.br
Telephone: (65) 613-7207/613-7281

Name: **Eliane Fachin**
Body: FEMA – State Environmental Foundation
Dept.: Conservation Areas
E-mail: assepro@fema.mt.gov.br
Telephone: (65) 613-7207/613-7281

Name: **Luis Francisco Martinelo**
Body: SEDER – State Rural Development Secretariat
Position: Advisor
E-mail: seder@seder.mt.gov.br
Telephone: (65) 613-6211

Name: **Aréssio Jose Paquer**
Body: EMPAER
Position: Chairman
E-mail: pres@empaer.gov.br
Telephone: (65) 613-1708/ 613-1709/613-1710

Name: **Jaime Bom Despacho da Costa**
Body: EMPAER
Position: Director of Operations
E-mail: pres@empaer.gov.br
Telephone: (65) 613-1708/ 613-1709/613-1710

Name: **Osmano de Freitas Silva**
Body: EMPAER
Position: Rural Extensionist
E-mail: pres@empaer.gov.br
Telephone: (65) 613-1708/ 613-1709/613-1710

Name: **Carlos (Carlão)**
Body: EMPAER
Dept.: COPER
E-mail: pres@empaer.gov.br
Telephone: (65) 613-1727

Name: **Hugo José Scheuer Werle**
Body: IBAMA – Cuiabá Regional Chapter
Position: Executive Manager
E-mail: hugo.werle@ibama.gov.br
Telephone: (65) 648-9100

Name: **Marcelo Guena Oliveira**
Body: IBAMA - Cuiabá Regional Chapter
Position: Environmental Analyst
E-mail: marcelo-guena.oliveira@ibama.gov.br
Telephone: (65) 648-9141

Name: **Antonio Guilherme Cândido da Silva**
Body: IBAMA - Cuiabá Regional Chapter
Position: Environmental Analyst
Telephone: (65) 648-9100

Name: **Yênes Jesus de Magalhães**
Body: SEPLAN – State Planning and Coordination Secretariat
Dept.: Policy Administration - CPA
Position: State Secretary
E-mail: yenes@seplan.mt.gov.br
Telephone: (65) 613-3200

Name: **Eleonora Duze da Costa Duarte**
Body: SEPLAN – State Planning and Coordination Secretariat
Dept.: Policy Administration - CPA
Position: Information Superintendent
E-mail: sinfo@seplan.mt.gov.br
Telephone: (65) 613-3249

Name: **Lígia Camargo Madruga**
Body: SEPLAN – State Planning and Coordination Secretariat
Dept.: Policy Administration - CPA
Position: Cartographic Engineer
E-mail: sinfo@seplan.mt.gov.br
Telephone: (65) 613-3249

Name: **Tereza Neide Nunes Vasconcelos**
Body: SEPLAN – State Planning and Coordination Secretariat
Dept.: Policy Administration - CPA
Position: Geologist
E-mail: sinfo@seplan.mt.gov.br
Telephone: (65) 613-3249

Name: **Maria Aparecida Cerci Paiva**
Body: SEPLAN – State Planning and Coordination Secretariat
Dept.: Policy Administration - CPA
Position: Agronomy Engineer
E-mail: sinfo@seplan.mt.gov.br
Telephone: (65) 613-3249

Name: **Luiz Antônio Pagot**
Body: SINFRA – Sate Infrastructure Secretariat
Dept.: Policy Administration - CPA
Position: State Secretary
E-mail: pagot@sinfra.mt.gov.br
Telephone: (65) 613-6603

Name: **Sérgio Adão Simião**
Body: UNIVAG – University of Várzea Grande
Position: Agronomy Engineer
E-mail: sergiosimiao@brturbo.com.br
Telephone: (65) 688-6108

Name: **Luis Duarte Silva Júnior**
Body: UNIVAG – University of Várzea Grande
Dept.: Agrarian and Biological Sciences
Position: Manager
E-mail: univag@univag.com.br
Telephone: (65) 688-6108

Name: **Fernando Roberto Palma de Moura**
Body: Pantanal do Mimoso – Sociedade Ambientalista
Position: President
E-mail: fernandorpm@aol.com / pantanalmimoso@aol.com
Telephone: (65) 3028-6139

Name: **Ewerson Duarte da Costa**
Body: Pró-Natura – Instituto Brasileiro de Pesquisa e Estudos Ambientais
Position: Technical Coordinator
E-mail: ewerson.duarte@uol.com.br / info@pronatura.org.br
Telephone: (65) 322-3760

REFERENCES

Programa de Ações Estratégicas para o Gerenciamento Integrado do Pantanal e da Bacia do Alto Paraguai, Relatório Final – ANA/GEF/UNEP/OAS, 12/04;

Paulo Affonso Leme Machado - Direito Ambiental Brasileiro. Editora Revista dos Tribunais, 2000 (11th Edition)

Edis Milaré. **Direito do ambiente**: doutrina, prática, jurisprudência, glossário. 2nd ed. rev. updated and exp.. São Paulo: Revista dos Tribunais, 2001

Edis Milaré & Paulo José da Costa Junior - **Direito penal ambiental**: Campinas: Ed. Millennium, 2002

Ann Helen Wainer. Legislação ambiental brasileira: subsídios para a história do direito. Rio de Janeiro: Forense, 1991

José Celso de Melo Filho - Constituição Federal Anotada, 2nd ed. Ed Saraiva, 1986.

José Afonso da Silva - **Direito ambiental constitucional**. São Paulo: Malheiros, 1994

Legislações Estaduais: Diagnóstico da Gestão Ambiental das Unidades da Federação / Mato Grosso e Mato Grosso do Sul – Ministério do Meio Ambiente – Plano Nacional de Meio Ambiente II (PNMA II) – Brasília, February, 2001.

Sérgio Luiz Morelli - Legislação Ambiental do Estado de Mato Grosso do Sul Ed. UFMS - 2000

SITES CONSULTED

http://www.ana.gov.br
http://www.ibama.gov.br/
http://www.embrapa.gov.br/
http://www.cidades.gov.br/
http://www.mt.gov.br/
http://www.ms.gov.br
http://www.empaer.mt.gov.br/
http://www2.fema.mt.gov.br
http://www.guiageo.com/
http://www.parqueregionaldopantanal.org.br
http://www.pantanal.com
http://www.marcadagua.org.br
http://www.riosvivos.org.br
http://www.ambientebrasil.com.br/
http://www.wwf.org.br
http://www.mma.gov.br
http://www.redeaguape.org.br
http://investigate.conservation.org
http://www.mercedessanchez.com.br
http://www.cpap.embrapa.br
http://www.ambientebrasil.com.br
http://www.serradabodoquena.hpg.ig.com.br
http://www.araraslodge.com.br
http://www.chapadadosguimaraes.com.br/
http://atlas.sct.embrapa.br
http://marte.dpi.inpe.br
http://www.fotospantanal.rg3.net


JICA