BRAZILIAN MANGRONES ATLAS

Executive Summary The Brazilian Mangroves Atlas is a realization of Chico Mendes Institute of Biodiversity Conservation (ICMBio) through the Project "Conservation and Sustainable Use of Mangrove Ecosystems in Brazil", implemented by United Nations Development Program (UNDP) - Brazil, with the support of the Global Environment Facility (GEF).

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Executive summary in English, produced with support of WWF-Brazil Team Diego Carvalho Mariana Corá Raphael Scire Taís Meireles



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Mangroves are one of the most important ecosystems on the planet. With their high productivity, they provide numerous goods and services both to the marine environment and to people. They capture and store carbon in their biomass and soil, reduce the shorelines vulnerability to climate change by reducing the damage of the extreme events and of the rising sea levels, and also prevent erosion, by stabilizing sediments with their tangled root systems.

Brazil presents remarkable mangrove conservation efforts, both through the sustainable use by local traditional communities and the protected areas. Nevertheless, this is not enough yet, particularly due to the high level importance of this ecosystem, which should not be put in danger.

The irregular and illegal occupation, the lack of water and sewage treatment system, the changes on rivers and coastlines hydrodynamics, and, mainly, the loss and fragmentation of their vegetation cover are responsible for quality decrease and biodiversity erosion of these ecosystems, not to mention the climate changes increasing pressures and risks. Therefore, the traditional communities and some economic sectors that depend directly on the mangroves resources are having a hard time to keep their reproduction conditions.

Since the beginning of the 20th century, the Brazilian mangroves loss is estimated in 25%. Considering the interest in their high level conservation, the situation is more serious in the Northeast and Southeast regions, where the ecosystem is more fragmented. According to a recent estimation, these regions have lost around 40% of what was once a mangrove continuous area.

On the other hand, Brazil has 123 protected areas that cover mangroves areas (58 federal, 46 state and 19 municipal), of which 83% allow sustainable use and 17% are strict preservation areas. All of these PAs together represent 87% of the whole ecosystems coverage in the country.

The mangrove conservation is a priority for the Brazilian government. Through the Chico Mendes Institute of Biodiversity Conservation (ICMBio) and the Ministry of Environment, it was possible to elaborate the national program for the mangrove conservation and sustainable use.

The Brazilian Mangroves Atlas is a milestone for this ecosystem conservation. The complete version of the document presents the large territory mapping and a diagnosis of the Brazilian mangroves current situation, with the conservation efforts, main threats and key areas under threat.

The document also highlights the need for further conservation actions on the north coast of Brazil, once it is acknowledged as the largest remain-ing well-conserved continuous mangrove areas. The states that contain the largest mangrove areas are Maranhão (505 thousand hectares) Pará (around 390 thousand ha), and Amapá (226 thousand ha).

This document is an English version of an executive summary that aims to highlight the main points of the Atlas. For more details, it is recommended to consult the full version (in Portuguese), with references and bibliography, available here:



www.icmbio. gov.br/portal/ images/stories/ manguezais/atlas_ dos_manguezais_ do_brasil.pdf

THE BRAZILIAN COASTAL ZONE AND THE MANGROVES

The Brazilian coast provides a favorable environment for the mangroves to establish, develop and maintain. The only exception is the coast of Rio Grande do Sul, because of the state's high latitudes and its climate conditions.

- 17 states are on the Brazilian coast, 16 of them with mangrove;
- 7,408 km of mangrove extension, including Fernando de Noronha, as the only oceanic mangrove in the South Atlantic;

- Around **14,000 km² is the mangrove extension** in the Brazilian coast;
- About 80% of the mangroves are distributed in 3 states of the Amazon biome: Maranhão (36%), Pará (28%) and Amapá (16%);
- The mangrove area in northern Brazil is the largest continuous portion of the ecosystem under legal protection worldwide.

Adriano Gambarini / WWF-Brazil



Mangrove in Verde river, Juréia-Itatins Ecological Station, in Brazil



Clemente Coelho Jr / ICMBio



THE MANGROVE FLORA

In the mangrove, plants demand sunlight (heliophiles), so there are only treeforming species. They support low concentrations of oxygen in the sediment, co-exist with salt water (halophyte) and manage to sustain themselves on muddy substrates (poorly consolidated). The aerial structure of mangrove roots, besides serving as a substrate for algae, provides shelter and food for many animals, from fungi and bacteria to larger individuals such as invertebrates, vertebrates and mammals, including the human being.

THE MANGROVE FAUNA

Unlike the flora, the fauna is not exclusive to this ecosystem. Its organisms can survive in other similar habitats, such as estuary, sandbank, rocky shore and even on the beach. Thus, the mangrove ecosystem is made up of a complex community, offers several environments for animals and supports the biodiversity in other, particularly marine, ecosystems.

The mangrove has fauna representatives of terrestrial, marine and estuarine environments that, together with the flora species, make up the biodiversity of the ecosystem. Typical mangrove (*Avicennia* schaueriana mangrove) and marsh vegetation (grass Spartina sp.).



MANGROVES AND PROTECTED AREAS

Protected areas are territorial spaces, including their natural resources, with relevant natural characteristics, which have the function to ensure the representation of significant and ecologically viable samples of the different populations, habitats and ecosystems of the national territory and jurisdictional waters, preserving the existing biological heritage.

In some cases, the sustainable use reserves have objectives to assure the conditions for sustainable development of local traditional communities.

The Brazilian protected areas categories are organized in two groups: strict preservation areas and sustainable use reserves. The first ones aim to protect nature, allowing only the indirect use of the natural resources, which does not involve consumption, collection or damage to natural resources.

The sustainable use aims to reconcile nature conservation with the sustainable use of natural resources. In this group, activities involving the collection and use of natural resources are permitted, provided that they are practiced in a way that ensures the sustainability of renewable environmental resources and ecological processes.

Mangroves can be found in 123 protected areas;

- Area: 16,385 km²;
- 87% of the ecosystem in Brazil;
- 58 federal, 46 state and 22 municipal MPAs;
- 7% are strict preservation areas;
- 83% are Marine Protected Areas that allow sustainable use.

EXTRACTIVE RESERVES

These category VI protected areas are used by traditional communities whose subsistence is based on the extractivism, subsistence farming and small animal husbandry. The creation of extractive reserves aims to protect the livelihoods and culture of these populations, focusing on the sustainable use of natural resources. Extractive reserves are de facto co-managed by non-indigenous traditional communities, with important possibilities to strengthen conservation conditions and innovate on management schemes.

ENVIRONMENTAL PROTECTION AREAS

They are generally large extensions containing a certain degree of human occupation, as well as biotic, abiotic, aesthetic or cultural attributes, all important to the quality of life and well-being of human populations. They are classified as a category V – protected landscape/ seascape, according the IUCN system. The objective of this category is to protect biological diversity, to discipline the process of occupation, to promote a sustainable land and natural resources use. It is up to the managing body to establish the conditions for research and public visitation in these areas. The category is intrinsically linked to territorial planning and should restrict the development of potentially harmful activities to the environment through the zoning of its territory. As sustainable use reserves are often large and require a zoning process, they are particularly conducive to the conservation of mangroves, one of the most productive and rich ecosystems in the world, a place that promotes a social, cultural and economic relationship between the nature and humans.



MAP OF MANGROVES AND PROTECTED AREAS IN BRAZIL

Geographic Coordinates System Datum Sirgas 2000. SOURCE: IBAMA, IBGE, ICMBio, MMA. - Brazilian Mangroves Atlas.

Wigold B. Schäffer / ICMBio



Cassurubá (BA) Extractive Reserve.

THREATS TO MANGROVES

Despite their importance, mangroves are vulnerable to a number of anthropogenic threats, including climate changes. They worsen the stress conditions of mangroves, such as conversion, fragmentation and degradation. This is particularly important in relation to the strong pressure for occupation of coastal areas, including immediately upstream from the very mangrove area. With the sea level rise tendency, the mangrove ecosystems would try to adapt by retracting, which is limited by occupation of their backs.

Despite the long-term legal protection, there is more recently a legal major problem, for the revision of the law on natural vegetation cover, in 2012, that introduced a division within the mangrove complex of ecosystems, between the wet forests and the upstream salty marsh area, allowing certain amount of the latter to be converted to shrimp farms and salt production tanks. This Atlas does not endorse the division of the mangrove complex of ecosystems, but, following the current legal conditions, parts of the mangroves are less legally protected than others. Although Brazil has built and implemented a rather comprehensive framework to promote the protection of mangroves through protected areas and legal conservation approaches, the gaps in social grassroots organization and institutional and operational obstacles prevent the effective conservation of this ecosystem. These bottlenecks mean the loss of habitats and the decreasing supply of resources on which many local communities and sectors depend upon.

Even if the original extension of Brazilian mangroves was not calculated, it is estimated that around 25% of this ecosystem has already been lost in the country, mainly due to inadequate coastal development, mostly urban occupation, as well as to shrimp farming in rural areas. The destruction rates of mangroves are estimated to be 3 to 5 times higher than the estimated means for other forests.

More than 1/4 of the original mangrove cover has disappeared, by ecosystem conversion to urban growth, agriculture and aquaculture, as well as by pollution and overexploitation of natural resources.

SOURCE: Brazilian Mangrove Atlas

A MAJOR THREAT: SHRIMP FARMING

Shrimp farming affects mangroves by building tanks and dams that change the flow and disrupt the hydrological balance of these areas. Damages to mangroves result from water pollution from chemical spills, the introduction of pathogens and parasites, increased competition between endemic and exotic species, and genetic alterations caused to local fauna by exotic species. In some cases, shrimp farming causes the displacement and exclusion of human communities from their traditional fishing territories.

THE PROBLEM

- 60,000 ha occupied by shrimp tanks in Brazil;
- Responsible for 38% to 50% of the destruction of mangrove areas in Brazil;
 SOURCE: Valiela et al., 2001; Coelho Jr & Schaeffer-Novelli, 2000.
- From 1997 to 2003, shrimp production increased by 97%;
- More than 36,000 hectares of mangroves converted into shrimp farming tanks, between 2013 and 2016;
- 70% of them are in operation, almost entirely with incomplete authorization and licensing processes, and with scarce biosecurity procedures;
- It is one of the fastest growing activities along the coast, due to the abundant availability of water and exits to the ocean;
- This situation is especially worrisome in the northern region, where the progress of these ventures is just beginning, due to the current conservation conditions and importance for dozens of thousands families social reproduction;
- The ventures expel the fishermen, inducing migratory phenomenon and abandoning traditional mangrove uses.

OTHER THREATS

THREAT	WHERE IT IS	MAIN PROBLEM
Agriculture	Along the coast	 Reduction of water quantity and quality; Water courses pollution.
Timber harvesting	Peri-urban areas of the North and Northeast	• Timber harvesting does not observe the levels or sustainable techniques of extraction and rarely counts on plans of forest management.
Fishing industry	Estuarine areas	 Overfishing; Threat to species, such as Swamp Ghost Crab; Habitat destruction, with loss of coastal biodiversity.
Urban, industrial and tourist facilities	Mostly in urban areas, but also in previously isolated coastal areas	 Deforestation, landfill of mangrove areas, erosion and changes in hydrological regimes.
Climate change	Mangroves as a whole	 Increased frequency of storms and changes in currents; Increase in sea level; Retreat of mangroves with species escape.

As mangroves are considered "living" areas, local economies highly depend on them and their resources. The interruption of environmental dynamics alters the social and economic balance of the territories. Shrimp farming is a monoculture and therefore excludes the possibility of multiple uses that is proper to the ecosystem.

WHAT A MANGROVE CAN OFFER US

PROVISION	 food production; raw material supply; genetic resources/gene bank; biochemical compounds.
REGULATION	 climatic and microclimate; erosion and sediment; atmospheric particle; biological control; atmospheric CO² stocking/removal; pollination; infiltration and rainfall; aquifer recharge; prevention of diseases proliferation; prevention of natural disasters; wind protection; coastline stability; dune fixation.
SUPPORT	 water supply; soil formation; nutrient cycling; seed dispersal; landscape connectivity; biodiversity maintenance; biomass export.
CULTURE	 recreation; ecotourism; educational value; spiritual and religious values; scenic beauty; landscape conservation.

Mangroves are also extremely important for the maintenance and recovery of fishery stocks, especially in the context of overfishing.

SOCIOECONOMIC RELEVANCE

In order to identify the traditional families that live in or use the territory of the federal protected areas of sustainable use, the Chico Mendes Institute of Biodiversity Conservation, with the support of the Ministry of the Environment and the partnership of the Ministry of Social and Agrarian Development and the Federal University of Viçosa, carried out the registration and the socioeconomic diagnosis of the residents in these areas.

The panorama allowed identifying, for each protected area, the peculiarities and similarities of the populations that inhabit several types of ecosystems, including the mangroves in Brazil. Thus, families' socioeconomic registration and diagnosis offer valuable information for the definition of public policies and public and private investments in federal protected areas of sustainable use.

- 88 of the Brazilians Sustainable Use Reserves cover mangroves;
- About 32,000 families registered within the federal extractive reserves;
- 15,000 families in the states of Maranhão, Piauí, Ceará, Paraíba, Alagoas and Bahia, before the recent creation of 3 new extractive reserves in Maranhão, in 2018, with some more 13,000 traditional fishing families.
- 17,000 families in Pará, within the coastal protected areas;
- 100 families in São Paulo and Santa Catarina.

INCOME GENERATION

Fishing, gathering, community-based tourism and beekeeping are among the main economic activities of the traditional coastal communities in mangroves. All of them have a high potential for generating income on a sustainable basis. Although mangrove fisheries data are limited, it is estimated that in some Brazilian states the contribution of these ecosystems correspond to almost 50% of total artisanal fisheries production.

In mangrove protected areas, fish and shrimp fishing, as well as the collection of crab and shellfish, are the main economic activities and predominantly use family labor. Vegetal extractivism in fishing communities is quite diverse, either having commercial importance or being practiced only to supply the own needs of the producers.

Poultry farming for self-consumption or for selling their meat and eggs production are other common activities that keep the cultural tradition and constitute the basis of the income of the people who live in the mangrove surrounds.



Swamp Ghost Crab.

FINANCIAL SUSTAINABILITY

A study hired by Chico Mendes Institute and prepared by the Brazilian Fund for Biodiversity (Funbio) and Conservation Strategy Fund (CSF Brazil) identified the funding gap to the mangrove protected areas, based on their needs and current financial situation, and suggested complementary funding sources, in a proposed sustainable finance strategy. Due to the difficulties in data and others, this proposal presented scenarios for a share of mangrove protected areas, considering only 28 federal protected areas with mangroves.

FINANCIAL GAP

The financial gap is the real additional funding needed to the protected areas that is not covered by any type of financial resource among the available ones. This financial gap for the ten-year period is calculated to be around US\$ 40 million, an amount that should be used as an estimated goal of funding for the maintenance and consolidation of the protected areas at two levels of demand.



Juréia-Itatins Ecological Station, Brazil.

FUTURE PERSPECTIVES AND SCENARIOS

Brazil has the fifth largest population in the world, with a little more than 204 million people, heavily concentrated in the coastal region. Although population growth has been slowing down, by 2050 Brazil will have around 246 million habitants. The country is also increasing food productions, converting forests into pastures and arable fields, especially dedicated to monocultures. Mangroves are under constant pressure from urban development, the shrimp farming industry, port activities and back-up support for oil exploration in shallow or deep water.

There are not encouraging scenarios that point to an increase in climate change impacts by 2050, including an increase in the relative average sea level. It is known that a mangrove can deal with moderate rates of variation in the average sea level, which helps to enhance the local resilience.

Furthermore, mangrove losses will have other kinds of impacts on human well-being, depreciation of health conditions and livelihoods: reduced incomes, increased poverty and reduced food security. There are strong links between mangrove degradation and the persistence of poverty in the coastal zone. In this context, actions aiming at the ecological restoration of mangroves would represent an important strategy for managing and dealing with hunger and extreme poverty.

MANGROVE RECOVERY

In Brazil, mangrove ecological restoration projects are limited to a few isolated attempts – around 25 – rarely exceeding half a hectare and with high mortality rates. There are, though, some successful experiences, even if limitated. More expressive actions are non-existent, but needed.

- Mangroves are disappearing globally at an annual rate of between 1 and 2.1%;
- Historical losses range from 35% to 86% and rates continue to rise, especially in developing countries, where more than 90% of the world's mangroves are located;
- Brazil has lost about 100,000 hectares of mangrove forest since 1980, mainly along the southeastern and southern coasts;
- 50% of the losses are attributed to shrimp farming.

SOURCE: (FAO, 2007; MMA, 2010)



THE BRAZILIAN MANGROVE PROJECT – GEF MANGUE

Execution Period: from 2008 to 2017.

Executed by: Chico Mendes Institute of Biodiversity Conservation, under the coordination of the Department of Socio-environmental Actions and Territorial Consolidation.

Funded by: Global Environment Facility (GEF).

Implemented by: United Nations Development Program (UNDP).

The objective of the Project was to develop and test a protected area management approach for the effective conservation of a representative sample of Brazilian mangroves. For its development, the project focused its activities on five pilot areas along the Brazilian coast, and once the good practices and lessons learned had been extracted, they were replicated in other mangrove areas. It is estimated that these actions have impacted on the conservation of 568,000 hectares of mangroves of global relevance, besides generating positive impacts on the livelihoods of communities that depend on this ecosystem.

Mangrove ecosystem, Brazil.

THE MANGROVE NATIONAL ACTION PLAN

The National Action Plans (NAPs) for the Conservation of Endangered Species are a public policy whose purpose is to identify and guide priority actions to combat threats to species populations and natural environments and thus protect them.

The Mangrove National Action Plan aims to increase the conservation status of Brazilian mangroves, reducing degradation and protecting target species, keeping their traditional areas and uses from the integration between the different instances of public power and society, incorporating the academic and traditional knowledge.

It foresees innovative, participatory and consensual planning of actions, incorporating traditional knowledge in all steps of its preparation, reconciling them with scientific knowledge that will promote a more effective conservation of endangered species and resource use in the mangrove ecosystem as a whole. It is an important institutional legacy, since the ecosystem did not have a public policy that would identify and guide priority actions to combat threats to species populations and the ecosystem itself.

TARGET SPECIES

The Mangrove NAP establishes conservation actions for 74 target species, 20 of which are considered endangered, 9 listed exclusively on state lists and 45 species of socioeconomic importance and not threatened with extinction.

Main Target Species:

- Franciscana Dolphin (Pontoporia blainvillei),
- American Manatee (Trichechus manatus),
- Buff-headed Capuchin (Sapajus xanthosternos),
- Royal Tern (Thalasseus maximus),
- Atlantic Goliath Grouper (*Epinephelus itajara*),
- Daggernose Shark (Isogomphodon oxyrhynchus),
- Smalltooth Sawfish (Pristis pectinata),
- Largetooth Sawfish (Pristis pristis)
- Blue Land Crab (Cardisoma guanhumi).

THE MANGROVE NATIONAL PLAN - MAIN RESULTS

- Promotion of creation and expansion of extractive reserves in strategic areas for the conservation of the ecosystem;
- In 2014, the Northern coast in Brazil had become the largest contiguous mangrove area under legal protection in the world;
- 3 MPAs were created.

PROPOSED NATIONAL STRATEGY FOR THE CONSERVATION AND SUSTAINABLE USE OF MANGROVES

TOPICS	COMPONENTS OF ACTION
Mangrove Conservation	 Actions to ensure the conservation and protection of mangroves within protected areas; Spatial macroplanning; Control of water resources; Protection of endangered species; Recovery and restoration of mangroves.
Promotion of the Sustainable Use of Natural Resources	 Development of local productive chains and arrangements; Articulation of credit mechanisms and promotion of productive chains; Registration of beneficiaries of protected areas of sustainable use; Payment for environmental services.
Knowledge Generation: Participatory Biodiversity Monitoring and Research Integrated knowledge management, appropriate to the reality of mangroves	 Participatory monitoring of biodiversity and resources of socio-economic interest; Scientific research; Structuring of a system for storing and disseminating information; Strengthening of social participation and training; Multispectral training.
Actions to ensure the implementation and strengthening of the plan	 Regulation and standardization instruments; Instruments to promote the conservation and sustainable use of the mangrove ecosystem; Improvement of management tools.

The great challenge of mangrove biodiversity conservation is given by the broad expansion of economic activities in preserved or little altered environments causing severe interventions and impacts, still largely unknown and, if the consequences of climate change are added, they can be even more disastrous. It is necessary to search for qualified knowledge to reduce uncertainties about the consequences of the country's accelerated economic development, trying to make it compatible with the conservation of the mangrove biodiversity.

Brazilian mangroves are very significant at the global level, in terms of area, ecological importance as well as its level of conservation. Such areas and ecosystems are vital for traditional fishing families, for social and economic reasons, and also for the sustainability of fisheries stocks. Mangrove ecosystems and traditional coastal communities are also vulnerable to climate change and key elements for adaptation strategy.





MINISTRY OF THE ENVIRONMENT

