

**SOUTH-SOUTH CO-OPERATION PROGRAMME ON ENVIRONMENTALLY
SOUND SOCIO-ECONOMIC DEVELOPMENT IN THE HUMID TROPICS**

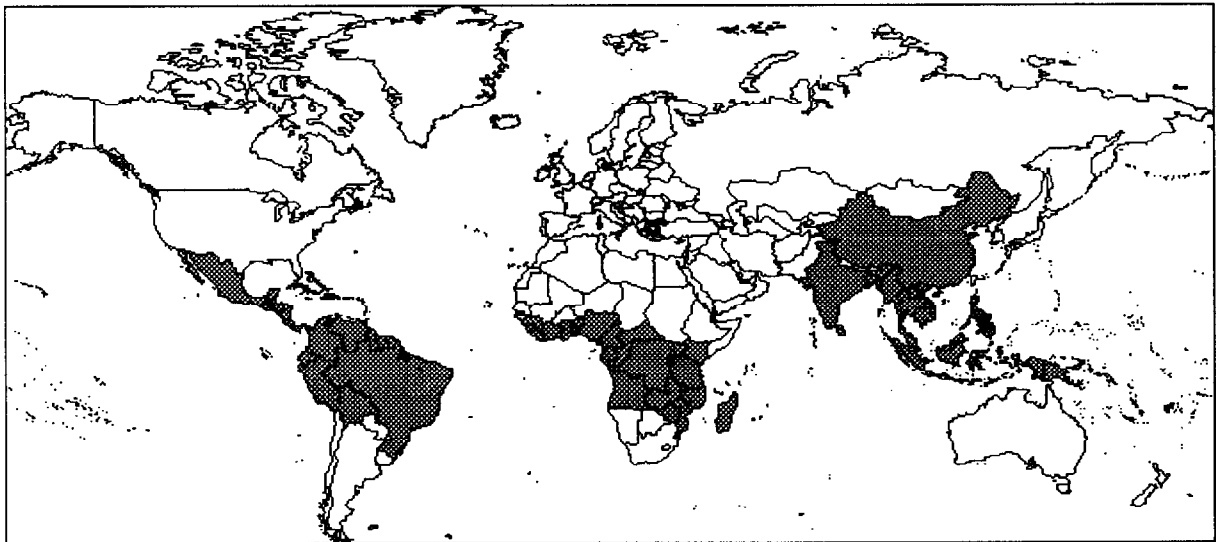
WORKING PAPERS

N° 23, 1997

**BIODIVERSITY CONSERVATION IN
MOZAMBIQUE AND BRAZIL**

by

Maria Teresa Rufai MENDES



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The Working Papers series is a publication of the *South-South Co-operation Programme for Environmentally Sound Socio-Economic Development in the Humid Tropics*. The series aims to disseminate the results of the research on Biosphere Reserves on such topics as (i) the prevailing conservation and resource-use patterns and, (ii) the ways of improving the traditional practices and orientation for applied research aimed at a more intensive and sustainable use of the biodiversity to provide a better livelihood to the local population in the buffer and transition zones. On more general issues, the Working Papers are also an attempt to identify key problems that will become areas of concentration for international co-operation.

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The Biosphere Reserves or similar managed areas that are joining the *South-South Co-operation Programme*, are requested to produce an overview of their covering area containing first hand information on its conditions and urging problems.

These reports will be primarily used as background materials for the comparative projects agreed upon in the programme of activities established at the Chiang Mai meeting, held in May 1994. For more details please report to the newsletter South-South Perspectives (N° 1, October 1994 [28 pp.], UNESCO, Paris [France]).

Given the rich information value of these reports, there are being made available to a wide audience. They may be obtained by contacting UNESCO/MAB Secretariat, Division of Ecological Sciences.

For other documents available in the series, see the back-cover.

Maria Teresa Rufai MENDES

Biodiversity Conservation in Mozambique and Brazil

Working Paper N° 23, 1997 (32 pp.)

UNESCO (South-South Co-operation Programme), Paris (France)

ABSTRACT

This text is a comparative study of biodiversity conservation practices and policies in Mozambique and Brazil. After a brief discussion of the concept of biodiversity and a general panorama of biodiversity in Mozambique, the author presents a detailed study of the Special Reserve of Maputo in Mozambique. It stresses the specific difficulties faced by conservation in a post war period and the problems to implement objectives, like those of a sustainable development and a participation of local communities, other than the direct protection of elephants which was the main reason for the creation of that reserve. Then, there is a rapid presentation of biodiversity in Brazil, particularly in the State of Ceará where are located the Ecological Station of Aiuba and the Area of Environmental Protection of Baturité which are described. Finally, the author concludes by stressing the importance of the plain participation of local populations and the recognition of their knowledge by the authorities of conservation areas to ensure a real conservation of biodiversity and fully meet the necessities of local dwellers, specially in a country like Brazil where conservation areas are already numerous.

RÉSUMÉ

Ce texte est une étude comparative sur les pratiques et les politiques de conservation de la biodiversité au Mozambique et au Brésil. Après une brève discussion du concept de biodiversité et un panorama général de la biodiversité au Mozambique, l'auteur présente une étude détaillée de la Réserve spéciale de Maputo au Mozambique. Elle met en relief les difficultés spécifiques confrontées par la conservation en période d'après guerre et les problèmes d'implantation d'objectifs, comme ceux d'un développement durable et d'une participation des communautés locales, autres que la protection immédiate des éléphants qui était la principale raison de la création de cette réserve. Ensuite, il y a une présentation rapide de la biodiversité au Brésil, en particulier dans l'État du Ceará où sont localisées la Station écologique d'Aiuba et la Zone de protection environnementale de Baturité qui sont décrites. Finalement, l'auteur conclut en appuyant sur l'importance d'une entière participation des populations locales et de la reconnaissance de leur savoir par les autorités des zones de conservation pour assurer une réelle conservation de la biodiversité et pourvoir aux nécessités des habitants locaux, spécialement au Brésil où les zones de conservation sont déjà nombreuses.

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This report has been written with a technical assistance of John HATTON (Faculty of Biology, Eduardo Mondlane University), Mateus CHAMBAL and Augusto CORREIA (National Directorate of Forestry and Wild Life).

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INTRODUCTION

This study presents a diagnosis of the state of biodiversity conservation in Mozambique and Brazil in its structural and conjunctural aspects towards preparing a single brochure of useful information which can be later used by other researchers and by those interested. It is also an outcome of institutional willingness of those who believe in the existing possibilities in carrying out research projects, notwithstanding the adverse problems and difficulties encountered in the way.

This work is a preliminary study resulting of a MAB-UNESCO consultancy mission held in Mozambique, from 16 to 22 April 1996. Its objective was to collect relevant information on the state of biodiversity conservation in Mozambique and Brazil, as a way to foster the exchange of information and experiences and of scientists, towards undertaking parallel and integrated research projects and to disseminate the knowledges through comparative publications. The main idea is to assess the fundamental importance, nowadays, of biodiversity conservation, within the framework of the objectives defined by the South-South Co-operation Programme on Environmentally Sound Socio-Economic Development in the Humid Tropics, aimed at improving the management practices of biosphere reserves and deserving special attention to the participation of local communities in the practices of the utilization and handling of natural resources existing on them.

Firstly, this text explains briefly the concept of biodiversity and is a general panorama of the biodiversity in Mozambique, particularly in the Special Reserve of Maputo with a detailed presentation of its present state. Then, there is a presentation of the biodiversity in Brazil, particularly in the State of Ceará. The preparation of this part of the text has been possible due to the support of our Brazilian counterpart, Ms. Soraya VANINE. Finally, there is a brief approach on local communities and the process of biodiversity.

This topic will certainly be of a major importance in the future, given the fact that the peoples of the world are starting, even in different manners and sometimes in contradictory ways, to carry out activities taking into account relations between them and their habitat. Themes of biodiversity and sustainable development are deemed by governments, national and international governmental and non-governmental organizations (NGOs) and millions of people discovering that their economic, social, political and cultural struggles against poverty and misery are simultaneously ecological struggles. This work recognizes the important role played by biodiversity in taking into account the maintenance of biological diversity and socio-

cultural diversity of our countries. It is our wish that it must serve as a stimulus to other similar efforts and is a challenge to those who, directly or indirectly, can contribute for the protection of the world's biodiversity.

I- CONCEPT OF BIODIVERSITY

The concept of biodiversity is defined as being the set of all living beings of the planet, including not only the individuals but their functional relations. This definition includes : the variety of all living beings and their lifestyles, the genetic variability among the population, the diversity of the complex of associated species and their inter-actions, and the relevant ecological processes.

Biodiversity, also known as biological diversity, is a complete set of species genes and of ecosystems comprised in a certain region. Nowadays, this topic is a world-wide concern, due to its importance as well as the serious dangers which all the planet faces. However, there are several successful experiments undertaken by scientists in this field.

According to the American naturalist WILSON, 17 500 tropical species, animals and plants disappear every year. A recent study reveals that 25 000 to 75 000 plant species will disappear till the year 2000. It is obvious that the extinction of species has always existed but, nowadays, it occurs in a very short period of time, while its recovery has revealed to be extremely long.

The conservation of biodiversity appears clearly in the *World Strategy for Conservation*, published by the International Union for the Conservation of Nature (IUCN) in 1980. In that document, the basic objectives of conservation are : the maintenance of essential ecological processes, the preservation of genetic diversity and the sustainable use of species and ecosystems. The preservation of biological diversity is mainly integrated in the maintenance of genetic diversity in which preservation is necessary whether for assuring the provision of food, of fibers and some drugs, for scientific and industrial development, and in order to avoid that the loss of species could create damages to the effective functioning of the biological processes (Summary of the Strategy, Brazilian version, 1984).

Unfortunately, major part of this valuable heritage is being lost every day at a very high speed in relation to the real knowledge of its potentialities. The quick understanding of these values, in order to enable us to contribute effectively to the conservation of those resources for future generations, is important.

One of the causes for the reduction of biodiversity is the population growth. Man has been exploiting the land increasingly through a certain number of activities, namely,

overgrazing, deforestation, uncontrolled fires, overuse of fertilizers, pesticides, irrigation and pollution. These activities have led to destruction of several habitats of plants and animals. The industrial activities and expansion of cities have increased these consequences.

The conservation of biodiversity has its real meaning when defined as the management of the biosphere utilization by man such that it produces major sustainable benefit for present generations. On the other hand, it is necessary to maintain its potentiality in order to meet the needs of future generations.

There are evidences that human ecology will be one of the dominant theme in the XXIst. century as the rapid growth of social movements, in countries like Brazil, are at a certain extent fighting the world trend of the destruction of nature. In Brazil, in different ecosystems there are conservation sites, with specific characteristics and denominations, such as National Forests, National Parks, Ecological Stations, Areas for Environmental Protection, Ecological Reserves and most recently Particular Reserves for Natural Heritage were created¹. Perhaps this is due to the size and specific characteristics of the country as a whole, anyhow, it is an experience which has to be taken into account. So, if we want a sustainable development with the conservation of biodiversity it is necessary to implement an appropriate plan of action, mainly in Mozambique where there is a lot to be done in comparison to Brazil.

However, biodiversity conservation has to take into account the integration of local communities in its preservation. This means to outline joint policies of conservation, not a conservation ruled through compulsory measures, as the populations have a direct relation with the environment and the existing resources. In other words, there is a need to redefine the concept of different ecosystems. They must be seen as systems to support survival and be considered as important for individuals as well as for species which are sheltered there. Notwithstanding, the practice of diversity is the key for its conservation.

A prudent management of biodiversity results from an ethical justification, as a research on biodiversity concludes (*Cf. UNESCO SOURCES*). To administer our environment means that we respect the right of others, the right which is exercised here and there, and tomorrow, to safeguard the land of future generations.

¹ Private property where there is a relevant scenic beauty and presents primitive, or recovered, natural conditions and thus serves the preservation of the biological cycle of native species.

During the last decades, due to the war which affected the country and lack of skilled personnel, it was not possible to guarantee any kind of protection to the conservation sites. There were also limited economic and organizational resources which are deemed to be extremely important for the better management of the protected areas. With the restoration of peace in the country, the areas of conservation started to get more attention.

The present trend is focused on the fact that the management of areas of protection must be done with participation of local communities. This is an important component in the preservation of biodiversity and sustainable development. Several projects (*Cf.* TABLE 1) on conservation of biodiversity in Mozambique are being carried out and one of the most important is the Transfrontier Conservation Areas Project. This project includes the Maputo Reserve in Matutuine District in the northern part of Kwazulu Natal) through the Corridor of Elephants and the area to be developed within an integrated perspective for the benefit of local communities. Within the framework of its implementation, the Reserve of Elephants was identified as the major conservation project, with a population of elephants of 300 individuals. Due to its peculiar characteristic it is expected to be indicated as a Biosphere Reserve.

TABLE 1 : Areas of conservation in the Maputo Province

Area of conservation	Responsible institution	Area (ha.)	Region	Ecosystems
Special Reserve* of Maputo	DNFFB	80 000	Matutuine	Coastal dune forests
Forest Reserve of Licuati	DNFFB	19 100	Matutuine	Tropical forest
Forest Reserve of Bobole	DNFFB		Marracuene	Tropical forest
Biological Station of Inhaca	Faculty of Biological Sciences	4 500 000	Maputo	Coastal dune forests
Portuguese Island	Faculty of Biological Sciences		Maputo	Coastal region

Note : *Special Reserves are areas designed to protect one or more animal species and where any kind of hunting is prohibited unless there is special authorization by the National Directorate of Forests and Wildlife (DNFFB).

SOURCE : DNFFB

However, the indication of the Special Reserve of Maputo as a Biosphere Reserve depends on the implementation of this new MAB Project in Mozambique, to complement those ones already existing.

The Reserve is strategically located near the city of Maputo, South Africa and Swaziland. Several development projects have been proposed in the surrounding areas including industrial agriculture, tourism, reserves for private hunting and cattle-breeding. In the areas nearby, there are several local communities depending basically on natural resources for

their survival. A proposal has been made for official recognition of Futi Corridor in order to promote the conservation of biodiversity of the area through a special status of protection which enables a community management of natural resources, guaranteeing therefore to the populations the right for land and the resources.

2) The Maputo Special Reserve

Established in 1932 through the Legislative Decree n° 324, the Maputo Special Reserve has an area of 80 000 hectares (Cf. MAP 2). Its boundaries are marked : in the north by the Machangulo Peninsula and the Maputo Bay, in the south by a parallel which divides the Piti and Xingute Lakes (Cf. PHOTO 1), in the east by the Indian Ocean and in the west by the Maputo River and Ponta do Ouro highway.

MAP 2 : Location of the Maputo Special Reserve

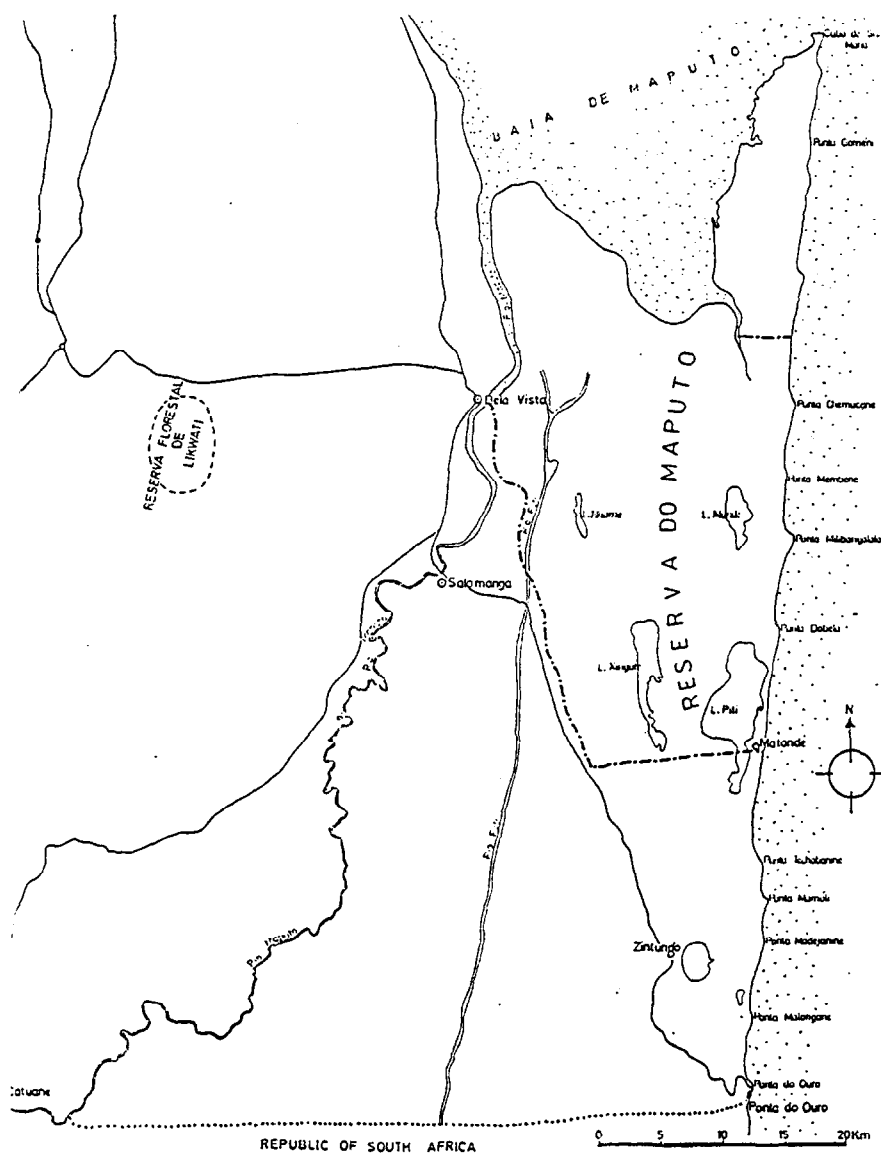




PHOTO 1 : Xingute Lake, 6 hypopotamus can be seen on the background.

a- Objectives

The initial objective was to protect the elephant (*Loxodonta africanus*), objective which was in 1969 extended to cover other endangered species of major mammals, specially white rhino which now is considered as extincted in the district. The population of elephants, a population genetically original, is concentrated in the northern part of the Reserve. In accordance to the National Directorate of Forests and Wildlife (DNFFB), the population is estimated between 250 to 350 rhinos in 1996.

b- Importance

The Maputo Special Reserve is situated in a centre of flora diversity with a significant level of endemism at the international level. This reserve is located at a strategic site as it is situated to the south of the tropics, where many species are located in this southern limit. The precise number of endemic populations in the Reserve is unknown, but there are some sources revealing that this number is high.

The Maputo Special Reserve has a potential which enables it to have the status of a Biosphere Reserve therefore, considering that it has a human population that co-existed during hundreds of years with nature, it is proposed that the Reserve be extended (*Cf.* MAP 3) to the

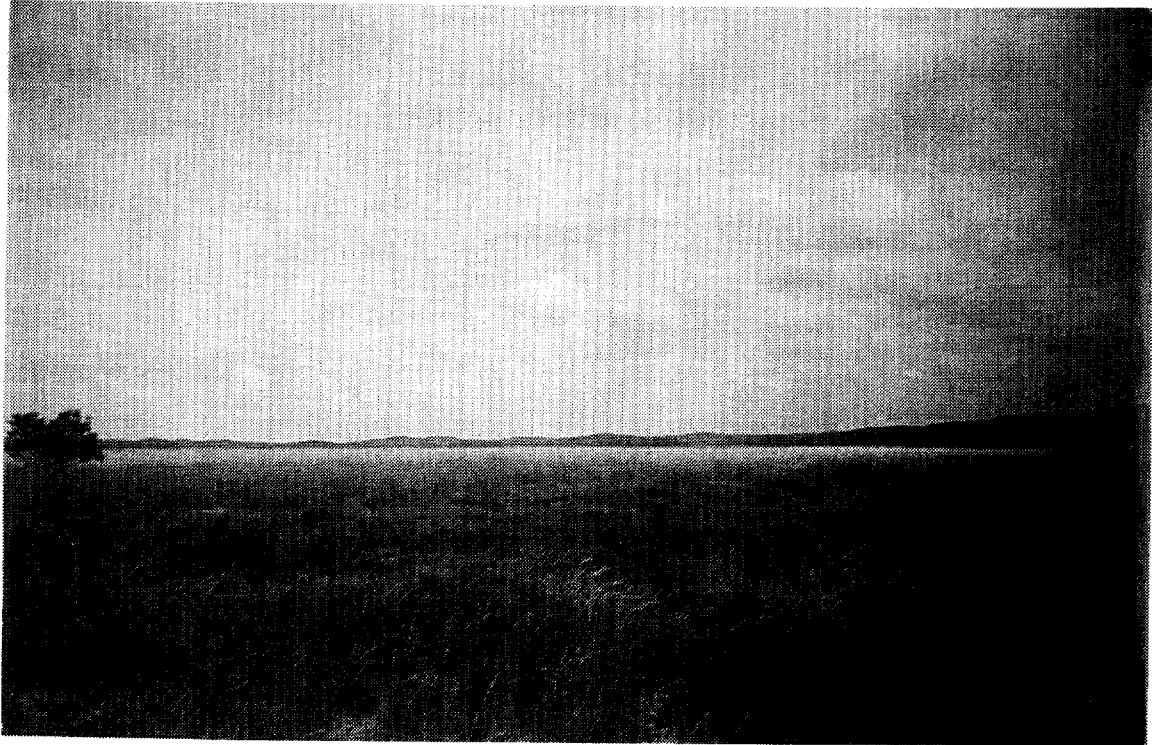


PHOTO 2 : *Piti Lake.*

c- Fauna

From a zoogeographic point of view, the fauna is very rich. It is important to enable migration of species to the South. As for the flora there is, in Mozambique, no Red Data Lists. Although it is known that more than 3 337 species of birds spread through the region, 4 species and about 43 sub-species are endemic or almost endemic to the region. Van Wick reveals other endemic or almost endemic species and the rate infraspecific (the total in brackets) including 14 mammals (102 species, about 4 locally extinct), 23 reptiles (about 1 112 species or sub-species) and 3 amphibians (45 species or subspecies).

Such animals like grey-goats (*Sylvicapra grimmia*), chipenes (*Raphiceros campestris*), chacals (*canis mesomelas* and *canis audustus*) and porcupine (*Hystrix africaeausralius*) are going to be extinct. Some species are in danger of extinction, like crocodiles and jiboa. The reserve has also a major population of crocodiles of Nile, the maritime coast is an important location of nidification of two species of marine tortoises with large head (*Caretta caretta*) and tortoise-de-couro (*Dermochelys coreacea*).

In terms of conservation, it is well known that man is despoiling fauna reducing not only its diversity but also its population density. Regular burst of fires have contributed for the reduction of certain effective and sometimes up to its eventual extinction. Besides the intensive

hunting which contributes highly to the reduction of animals, animals became more attentive and most of them maintain themselves hidden or run away long distances.

d- Flora

In this area there are very scarce detailed studies and studies are outdated as they are from the 1960s and 1970s by WILD and FERNANDES (1967) and MYRE (1971), among others. The present studies are based on observation and recognition, most of the times without deep details. For this reason, the present state of endangered species is not duly known. In accordance with some sources, some plant species deemed as endemic in the phytogeographic region of Maputanland Pondoland, can be found in the District as a whole. In Mozambique there is no official and updated list of protected species. There is only an approximative number referring to tree species which is indicated in the Forest Legislation of Mozambique.

Based on a study visit, a list of endemic species or almost endemic of the District has been raised (Cf. HATTON *et al.*). There are in the District the following protected species : i) species commercially valuable as *Entrandrophragma caudatum*, *Spirostachys africana*, *Berchemia zeyheri*, *Podocarpus falcatus*, *Podocarpus spp.* and *Diospyros mespiliformis* which nowadays are very limited due to an intensive exploitation ; ii) some species of limited distribution in the area are as *Ficus trichopoda*, *Ficus politi*, *Ficus verruculosa*, *Encephalotos ferox* and *Raphia australis* ; and iii) other specific species of the phytogeographic region, which can also be found in the area of the Reserve, such as *Pandus livinstonianus*, *Strelitzia spp.* and *Ekebergia capensis* ; iv) *Barringtonia racemosa*, a mangal species already considered in danger in the Natal region and occurring in the Maputo Special Reserve.

The majority of terrestrial communities can be found in the southern part of the District, as there is a slight change-substitution of natural vegetation. There are, meanwhile, areas well located where major activities, such as deforestation caused by firewood and coal explorers, are concentrated which have conducted to a complete destruction of the ecosystems. The cutting of species like *Warburgia Salutaris* or African Sandalo (*Spirostachys africana*), a precious timber species, for the production of firewood and coal is rapidly increasing the deforestation. There is also a lack of control in the harvest of food and medicine plants putting in danger the survival of certain species.

In general, the use of terrestrial resources is practiced near some population agglomerations in a relatively small scale. However, if the number of people increase and if there is a commercialization of terrestrial resources or if the level of living and well-being of

population improve, it is expected that the re-introduction of cattle in the Special Reserve of Maputo (common practice in previous years), could create negative impacts on a vegetation and its biodiversity.

e- Management and monitoring of the Reserve

The Maputo Special Reserve was abandoned during the war. During and after the war, the wild animal populations were severely killed due to illegal hunting and, with the emerging of peace, by commercial (licensed) hunters. This reserve was re-occupied by management and monitoring personnel of the National Directorate of Forest and Wildlife (DNFFB) and, since January 1995, a Mozambican Official was set up in the Reserve, but they are facing some problems : **i)** shortage of basic equipment and non-existence of basic facilities ; and **ii)** the management capacity of the Reserve is presently very limited due to the lack of qualified personnel and of financial resources, transportation and inadequate equipment. The marine part of the Reserve particularly was not appropriately administered.

Elephants usually invade farms and eat the plantations causing serious damages, sometimes they destroy all properties of several families. So, they are always deemed as being "animal problem" by local communities. To alleviate the damages caused by animals to human properties, several meetings were held with the populations residing in the interior of the Reserve, in order to sensibelize and to arise support from the populations in the implementation of the Emergency Programme. A survey of the damages caused by animals was carried out to show the interest that the Administration of the Reserve has for protecting the properties of the residents and taking into account that the majority of the residents are new-returnees from neighbouring countries since the end of the armed conflict.

With an efficient monitoring, the Reserve would probably be in security. But a long term agreement depends on the relations between human beings and the natural resources in or out of the Reserve. An appropriate Administration within the Reserve is only possible if the conflicts between the authorities of the Reserve and local communities are solved peacefully. The personnel presently in service in the Reserve has few years of experience in community activities in issues related to the Reserve. An intervention of the Technical Adviser of the DNFFB responsible of community projects is recommended to address injustices and/or to advise the community personnel of the importance of participation local communities.

Therefore, some activities were carried towards the improvement of the administration of the Reserve. The National Directorate of Forest and Wildlife, the Provincial

Services of Forests and the Foundation Endangered Nature produced an Emergency Plan. It is worth mentioning that the Foundation Endangered Nature has been providing logistical support to the DNFFB since 1992. The main objectives of the Emergency Plan were the following : **i)** rehabilitation and/or construction of monitoring posts in order to guarantee a sustainable socio-economic utilization of renewable resources ; **ii)** protection of human lives and goods, particularly the agricultural properties (agricultural associations) ; and ecological studies on fauna and flora. The other objectives were : **i)** studies of migration of elephants within the Futi Corridor ; **ii)** studies of the potentialities of the fauna and their impact on the local communities ; **iii)** study of population density in the Reserve ; **iv)** study of sacred sites of local communities in order to integrate them in the management planning ; **v)** improvement of the socio-economic conditions of the populations using certain incentives ; **vi)** submit tourism to a regulation using environmental instruments ; and **vii)** opening of contemplative tourism to guarantee the sustainability of financial resources donated by NGOs and financial institutions.

Towards guaranteeing the effective administration of the Reserve's resources, it is necessary to revise the present limits in order to include marine resources. Data gathered on the coastal area in April reveals that the distribution of coral reefs is spread through an area of 6 km. in the sea, and Milibagalala, Dobela, Membene and Chemucane are one of the major areas for the conservation of dolphins, marine tortoises, whales and other range of marine beings. Therefore, recognizing the importance of the coastal habitat it has been proposed to extend the present limits in order to declare a Marine Reserve. This proposal if implemented would allow a better control of all fishing boats in the coral zones. Such an area must be signalled by buoys, so that all tourists wishing to undertake tourist activities in the area would have to get a licence and the control of fishing activity by tourists in the surrounding areas of the Reserve would be guaranteed.

f- Relations between communities and the Reserve

Part of the population which was residing there before the war (estimated between 5 000 and 10 000) returned to the Reserve. The other part remained in South Africa, awaiting to see the development of the situation. Now, the population is of about 500 to 1 300 people. The long-term ambitions of the population consists in re-establishing the previous way of living, including cattle. Formerly, the cattle exploitation caused a serious problem of over-grazing, competition and disturbances to wildlife.

The local communities are very poor, depending largely on subsistence agriculture and use of natural resources, including fishing resources, material of construction (wood), reed, eatable plants like fruits and roots, medicine plants and hunting meat. There are small but significant lands cultivated in the interior of the Reserve. Some resources, as mangal products, are still being used by outsiders.

The Reserve needs to associate conservation and sustainable development towards avoiding an environmental degradation. Presently, the local communities are obtaining few benefits from the Reserve besides its natural resources. In the Reserve there are many sacred cemeteries and ceremonial places of major significance for the former and present residents and when these places are, in a certain extent, considered as untouched, these populations are contributing for their conservation and such places must be maintained and secured.

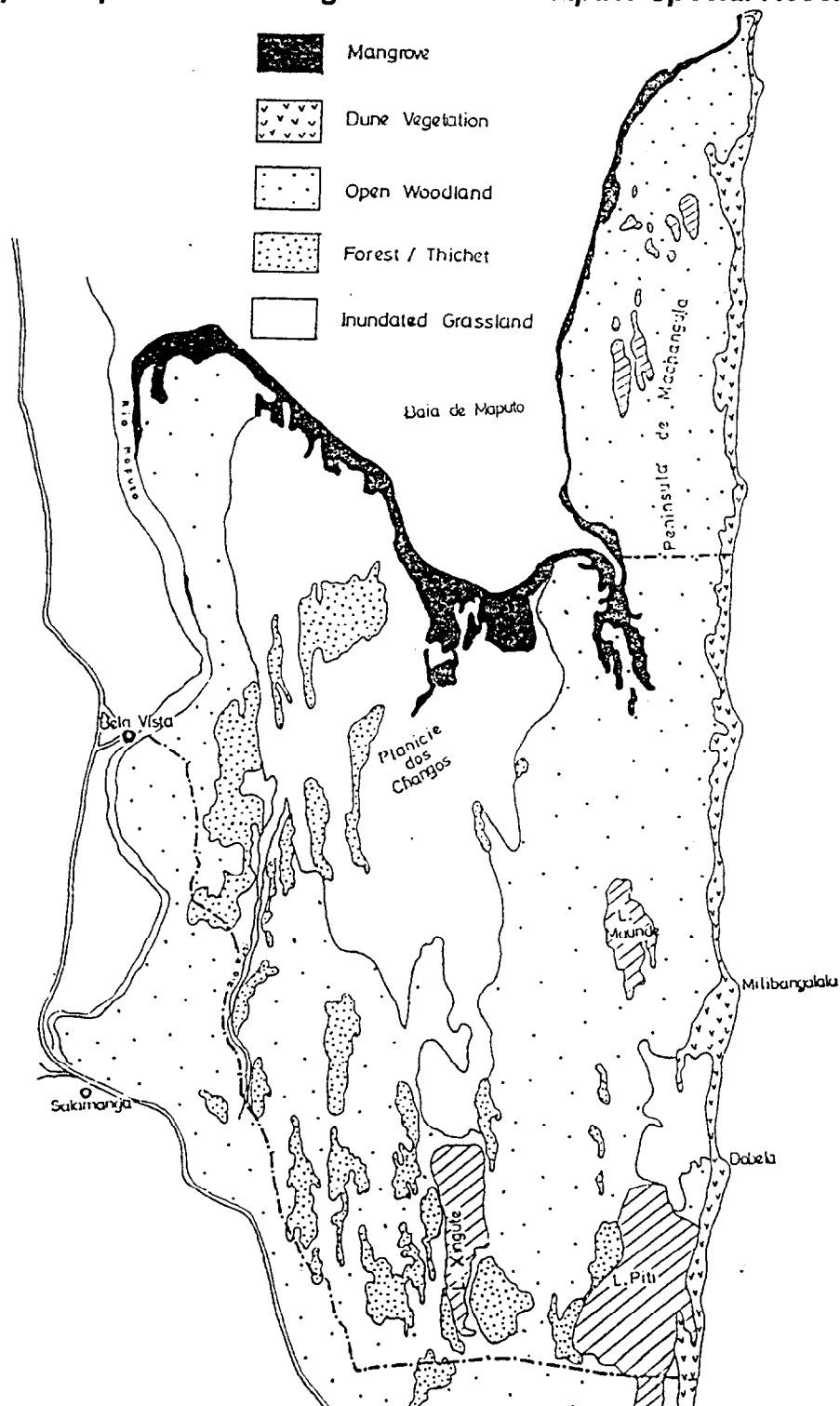
g- Landscape and touristic potentialities

The Reserve combines and preserves a wonderful variety of terrestrial plant communities and ecosystems (*Cf.* MAP 4). Some of them are not protected in any part of Southern of Africa. These include forests of flooded plain lands, mango grove, marshy forest, coastal dune forests, open forests and savanna, prairies, hygrophile prairies (fresh and saline). By associating all these varieties, it is more probable to find here a huge richness in species.

The variety range of ecosystems in this zone, associated to the biodiversity of the District, the scenic beauty and its state of conservation gives a high aesthetical value to the landscape with, therefore, very high potentialities. Good climate, beautiful beaches, clean water and coral reefs and stones, the huge diversity of fish and shellfishes are major contributions to the attractiveness of this area for divers and tourists.

The major touristic attraction of the Reserve, and which constitutes the reason of its creation, is its population of elephants. They are spread throughout the Reserve, but exceptionally in the mango grove or in the strip extending from the sea and the Zitundo-Machungulo highway. It is very common to see them crossing the Futi Corridor and sometime the male reach Kwazulu in South Africa. However, the barrier avoids this movement and has genetic consequences for the animals of the Reserve and the Tembe Park.

MAP 4 : Types of predominant vegetation of the Maputo Special Reserve



3) Conservation of natural resources and policy measures

a- Conservation of natural resources

The protection and sustainable use of ecosystems constitutes an essential objective of conservation of natural resources. Any area when duly conserved preserves the natural and

cultural heritage of a country. Conservation implies the maintenance of representative sites of natural regions viewing the preservation of biological diversity and maintenance of environmental stability of neighbouring regions. The protected zones give, also, an opportunity for rural development and for the rational use of marginal lands, as well as at it allows at the same time investigation, conservation, education, entertainment and tourism. The systems of protected areas vary considerably from country to country depending on their needs, priorities and legislations, institutional and financial differences.

b- Policies and legislation

The treaties, agreements and conventions are important legal instruments which guarantee the preservation of critical habitats against harmful consequences of certain development activities.

In Mozambique, most part of legislation related to environmental issues are still based on colonial rules. The legislation of the colonial period and the one established after Mozambique became an independent country do not reflect the intersectorial character of management of natural resources. The position of Mozambique in relation to some conventions, agreements and treaties is detailed below (*Cf.* NIPP).

At the international level. Mozambique agreed and signed, in 1972, the Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention). In 1973, Mozambique signed but did not ratified the International Convention on Trade of Endangered Species. In 1992, it supported the Convention on Biological Diversity.

At the regional level. Mozambique is signatory of the Southern African Development Community (SADC) Treaty which all member states state their commitment to protect the environment. It signed the African Convention of Nature and Natural Resources in 1968 in which the concepts of National Parks and Natural Reserves were defined.

At the national level. Mozambique promulgated, on 20 January 1955, the Decree n° 40 040 which defines six categories of protected areas : National Parks, Integrated Natural Reserves, Partial Reserves, Special Reserves, Forest Reserves and Zones under the regime of Special Vigilance. It promulgated the status n° 7/78 of 18 April 1978 which governs the cynegetic activity and provides guidelines for the establishment of protected areas on which hunting is prohibited. In 1996, the Rules and Procedures to be Observed by Tourists in Mozambique was published by the National Directorate of Tourism of the Ministry of Industry, Trade and Tourism), the National Plan for Environmental Management, which is the

Master Plan for Management, Conservation of Environment was also published and a Law on Environment is being prepared.

Meanwhile, for the population residing in and out of the reserves or in adjacent areas, the problem is not the rules, procedures and policies governing for conservation of reserves and other protected areas, but it is a matter of bringing and disseminating the message among them, in order to help the populations to undertake actions following the best procedures to take advantages of the existing natural resources.

c- Some relevant NGOs operating in the Maputo Special Reserve

Endangered Wildlife Trust (ETW). This organization works in close co-operation with the National Directorate of Forest and Wildlife (DNFFB) in the recovering of the Reserve providing logistical support (including two four-wheel-drive vehicles, communication radios, binoculars and uniforms). It helps also in the payment of salaries of the Reserve's guards and fiscal officials under the funds of the Global Environmental Facilities.

Helvetas. This NGO has a project (planning to spend 2 million US dollars) with the communities along the Futi Corridor for the integration of community and socio-economic development of the region, support through agrarian credits and small scale projects like breeding of petty animals.

IUCN. It collaborates with DNFFB providing technical assistance.

CARE. Logistical support to DNFFB under the Project Transfrontier Conservation Areas Project and projects with local communities.

INTERMON. Support to the local communities in conflict resolution, in regard to the destruction of plantations of populations by elephants and with the Reserve authorities.

League for the Promotion of Development and Socio-Economic and Cultural Assistance (LIDAS). Socio-economic assistance to the local communities in : **i)** training on conservation techniques and on management of natural resources ; **ii)** social assistance to the poorest families with scarce resources and means for their survival ; **iii)** dynamizing the civil society for the defence of its own interests, through the lectures, seminars and/or round tables ; and **iv)** support to the legalization of property of land for the cooperatives of peasants and juridical assistance through civil associations.

d- Research in the Maputo Special Reserve

Taking into account that the Special Reserve of Maputo has enormous biotic potentialities and that the number of animal and plant species existing in the area being

unknown, as well as the genetic diversity that the area may possess, it is pertinent to carry out deep taxonomical and anatomical studies aiming at determining the number of species and the genetical variety within the populations. Bearing in mind also that this area is of great interest for private investment, the Administration of the Reserve should give priority to applied investigations which can support the management programmes.

University students and research institutions who may wish to develop research activities should initially consultate the Administration of the Reserve towards defining the areas of immediate interest and those which are more of long term interest. These studies should concentrate their approach in the conservation and management aspects, legislation, tourism and socio-economic aspects linked to the use of natural resources by the residents of the area, such as the sustainability of fishing resources in the lakes.

III- BIODIVERSITY CONSERVATION IN BRAZIL

The loss of vegetation is an evident proof of a reduction of biodiversity in a certain area. Indeed, with a change of primitive vegetation some changes occur in the capacity of fauna maintenance, thus modifying the number of species of the area as well as the number of individuals of each species. Brazil is among the three countries of the world with the major biological diversity. It has the richest flora of the world and its fauna is the first in terms of number of vertebrate species, primate and fish of fresh water. The number of species of birds, mammals, reptiles and amphibians is remarkable.

For the protection of this valuable natural heritage which can be coupled to its landscapes of exceptional scenic beauty and other resources and non-biological values of basic importance for life on Earth, Brazil started 55 years ago to set up protected areas. Today, these areas are known as conservation sites which constitutes an essential instrument for the protection of biodiversity of the country. About 3.9 % of the national territory is under governmental protection through the National Parks, Biological Reserves, Ecological Stations, National Forests and Areas for Environmental Protection (APA). Each type playing distinct and complementary roles starting from strict preservation to the direct utilization of natural resources. The conservation units, besides the protection of biodiversity also protect other natural heritage such as geologic monuments, landscapes of scenic beauty and other biotic richness.

It is worth mentioning that Brazil represents in the international scenario a strategic country for the conservation of biodiversity in natural ecosystems and for the implementation

of environmental projects which are favourable for the application of sustainable development models. Notwithstanding the fact that Brazil is a country of megadiversity in its territory of 8 511 996 km.², there are high number of endangered species or under anthropic pressures. According to the IUCN report, the northern part of Brazil has a population of 42 million inhabitants and is being under an ever increasing urban occupation and a remarkable demographic expansion in the coastal region caused the deforestation of the Atlantic region up to 3 % of its vegetation cover.

The degradation of the protected areas makes necessary to outline concrete measures in order to avoid the increase of degradation, mainly through the hunting of wild animals, destruction of natural resources, selective cutting of trees for extraction of wood and grazing for domestic animals. It is not admissible anymore to tolerate illegal and delatory activities due to its harmful and irreversible consequences to the biodiversity. Some institutions have suggested to protect conservation sites with fences and effective vigilance, as they consider such measures as the minimum for an effective preservation of biodiversity in these areas. Nevertheless, the unique practical and effective way to protect biodiversity is through the creation of large number of conservation sites.

Although the present legislation being a global one, it is still necessary to establish the system of conservation sites and to create new categories of management not prevailed in the law, as : sheltering of wildlife, natural monument, reserve of resources and reserve of fauna. It is also recommended to make an inventory of the present real situation and the representation framework of conservation sites already existing in financial and social terms, conservation state and degree of implementation, as well as setting up a data bank on conservation sites, with registration, mapping and dissemination of all protected areas including particular reserves. Implementation of conservation sites existing through the emergency plans in favour of those which are in danger must be done, as well as the establishment and implementation of appropriate strategies for the involvement of communities in the valorization and protection of the conservation sites. Finally, there must be a permanent concern in the conservation sites to dynamize them into real natural laboratories, enabling the training of human resources through the interaction of education and research.

1) Conservation sites in the State of Ceará

This State has an area of 148 000 km.², of which 1 199 km.² (0.8 %) are occupied by interior waters, self-renewable natural resources (climate) and the conservable resources (soil, vegetation and water), which are jointly composing the physical potential of the State (*Cf.*

CCSED). The potentialities of these resources and the manner how they are administered and handled depend on the type of model of development adopted. The plant resources of the State of Ceará are classified globally into *caatingas*, forest formations and others.

The forest formations which are predominant in the ridge of mountains and wetty valleys are the green spots in the middle of aride zones. The main conservation sites in the State of Ceará are located in these green spots. However, the *caatinga* represents the most important and most extensive plant landscape in the semi-aride zone. Botanically, the plant resources in the semi-aride zone are considered as the more rich given to their diversity. In the other formations are included those characterized by dune vegetation and of mango grove.

In the State of Ceará, it is almost compulsory to preserve what is still remaining in terms of natural potentialities, as well as to utilize adequately the potentialities bearing in mind the limitations of the natural conditions, as the extinction of environment such as the continuing extinction of flora and fauna, the deforestation mainly in the rivers, the rational use of agricultural soil,... It is important to consider that the mango grove is being destroyed in certain areas to exploit the wood and implement tanks of pisciculture.

The major environmental degradation problems are in wet lands, while the dry ridge of mountains have the same characteristics as the inland area. In the wet ridge of mountains there are predominance of small rural settlements dedicated to the exploitation of subsistence farming undertaken by dwellers and small landowners who exploit land with their families. The lack of knowledge about conservation techniques, agricultural credits and the non-availability of lands imply deforestation of high lands. The agricultural practice in this specific case consists of a deforestation followed by fires for plantations of long areas in the *caatinga*, after the crops are temporarily abandoned in order to be re-used after long periods of rest. Besides that, deforestation is undertaken to exploit wood for domestic consumption to supply small and medium companies without the practice of restoring the natural resources withdrawn.

The conservationist activity (*Cf.* TABLE 2) should be more comprehensive and include all resources (water, soil, air, flora and fauna) taking into account that the elimination of one of these causes unbalances for all, as they constitute a sole system.

Historically, an occupied area by a native population undergoes some changes which are basically the result of subsistence activities carried out mainly in agriculture and artisanal fishing, exploitation systems which maintain the environmental degradation in frightening levels.

TABLE 2 : *Distribution of some conservation sites in the State of Ceará*

Conservation sites	Administration*	Area (ha.)	Region	Ecosystem
National Forest of Araripe Apodi	Federal (IBAMA)	38 262	Chapada	Wetlands
National Park of Ubajara	Federal (IBAMA)	563	Serra de Ibiapaba	Wetlands
Aiuba Ecological Station	Federal (IBAMA)	12 000	Inhamuns	<i>Caatinga</i>
APA de Jericoacoara	Federal (IBAMA)	5 480	Litoral North	Coastal
Rio Coco Ecological Park	State (SEMACE)	4 462	Fortaleza	Mangrove
APA da Serra Baturité	Federal (IBAMA)	32 690	Serra de Baturité	Baturité Serra
Lagoa da Fazenda Ecological Park	Park (SEDURB/ SEMACE)	19	Sobral	Lacustrine
Lagoa Maraponga Ecological Park	State (SEDURB/ SEMACE)	31	Fortaleza	Lacustrine

Note : Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), State Superintendency for Urban Development (SEDURB) and State Superintendency for the Environment of Ceará (SEMACE).

SOURCE : SEMACE

2) Ecological Station of Aiuba (Ceará)

The Ecological Station of Aiuba was established on 16 June 1978 through the Decree of Public Service n° 81 218 and it is located in the Municipality of Aiuba, between the Southern latitudes 6°35' and 6°46' and the Western longitudes 40°20' and 41°20' covering an area of 12 000 hectares with an ecosystem characterized by *caatinga*. Geomorphologically, the area is characterized by wasted lands and lowlands with ponctual alternances of soils and accidental or smooth spots. The vegetation of *caatinga* is practically untouched. In some scattered places, the soil is being destroyed with occurrences of typical tree species. It has a short period of torrential rain, an intermittent hydrographic network, the drainage covers the fluvial basin of Jaguaribe River. There is a large quantity of xerophyla plants used to the lack of water. The predominant vegetation is of shrubby *caatinga* existing also of arboreous kind in some ridge of mountains (*serras*). Near the Station headquarters, there can be found weir vegetation where typical species of aquatic environment exist and can also be found in small casual lagoons. The dry season varies from 6 to 8 months with high rates of evaporation.

The fauna of the region is limited, the pigeon (*pomba de bando*) known as *avoante* (*Arriabaça zenaida auriculata*) deserves special attention (Cf. PHOTO 3). It is a medium size pigeon which spreads out through all Brazil. In the northern region its main distribution corresponds to *caatinga* strips. Aiuba is an area of traditional posture where the colony of

pigeons are under major pressure of hunters and consequent demand for an effective protection by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA). The commercial hunting is practiced by the population for their living, mainly to supply the commercial fairs, snack-bars and restaurants which represent a serious threat for the species. Under the menace of professional hunt, the *avoante* tries to find a shelter in this Ecological Station during the period of reproduction. A list of endemic species of fauna is provided by IBAMA : *Aratinga cactorum* (Psittacidae); *Caprimulgus hirundinaceus* (Caprimulgidae); *Phaethornis gounellei* (Trochilidae); *Sakesporus cristatus* (Formicariidae); *Furnarius figulus* (Furnariidae); *Casiornis fusca* (Tyraniidae); *Cyanocorax cyanopongon* (Corvidae); *Thryothorus longirostris* (Troglodytidae); *Sericossypha loricata*, *Sphorphila albogularis* and *Paroaria domicana* (Emberizidae).

The lack of information on biotic components in this Station is evident but it is important to say that the Aiuba Ecological Station corresponds to a former plantation farm (estate), so as such there is a need for the regeneration of native vegetation. Aiuba is an Ecological Station badly treated in a precarious situation. The Federal Government has not yet paid the area for more than 10 years. Until now the case is still pending and the former landowners have invaded, chopped down the fences and leave the cattle grazing in the area.



PHOTO 3 : Avoante (*Arribaça zenaída auricultea*), endangered bird species due to illegal hunting

In order to explain to the population the reason for surrounding the area with fences, through the conservation site, it has been implemented a programme of interaction with the community creating therefore environmentalist agents (through seminars, upgrading courses for teachers of the municipalities' schools and community leaders) making them allies in the struggle against the destruction of flora and fauna. An other example which is worth

mentioning is the radio programme for all neighbouring municipalities and the campaign has functioned with the accordance of IBAMA and the local communities have the tendency of respecting strictly what belongs to the Government. But anyway, the research activity is still incipient and there are some attempts to establish contacts with the University of Crato towards undertaking research.

3) Area of Environmental Protection of Baturité (Ceará)

Established through the State Decree nº 20 956 on 18 September 1990, the Area of Environmental Protection (APA) of Baturité is situated 600 meters from the coast, between the Southern latitudes 4°8' and 4°47' and Western longitudes 38°50' and 39°5' at 90 kilometers from Fortaleza and covers an area of 32 690 hectares. Situated in the Baturité Serra, it has an ecosystem of wet ridge of mountains (*Cf. PHOTO 4*). This area is under the administration of the State Superintendency for the Environment of Ceará (SEMACE) and is an area of environmental protection which is aimed to combine the human activities with the wildlife preservation, protecting the environmental resources and improving the quality of living conditions of the population. It has also the intention of protecting the native biotic communities, river dawning and soils.



PHOTO 4 : *Partial view of the Environmental Protection Area of Baturité*



PHOTO 5 : Intensive deforestation of Baturité Ridge of Mountains

As its ecosystem is a very fragile ecological equilibrium, concentrating significant demographic effectives, the level of degradation of its renewable natural resources has reached frightening proportions due to the negative impacts caused by the presence of man. The main problem is the result of erosive processes through constant sliding on the hills and uncontrolled deforestation (*Cf.* PHOTO 5), among other factors. So, in order to cope with this problem, the SEMACE implemented a project of reforestation with a creation of a plant nursery (*Cf.* PHOTO 6) in the *serra*. Sometimes, the native vegetation can be confounded with long plantation of banana trees, it is easy indeed to find banana trees along the slopes (*Cf.* PHOTO 7).

In accordance to SEMACE's technicians and under the distribution of conservation sites in the State there is a clear need for assessing areas of preservation and conservation in the region, establishment of new conservation sites and/or postures of safeguard of ecological heritage.

As for immediate activities, there should be a set up of priorities, effective establishment of existing sites, identification of critical and of priority areas, in accordance to the biodiversity criteria, abiotic factors, geological monuments. Units already proposed should be set up and major exchange should be organized among the sites of conservation and communities. Finally, actions must enable a practical application of legislation, a reinforcement of the law of coastal management and others, a regulation of activities (as mining, exploitation of timber, water pollution, use of agro-toxic products,...) deemed as dangerous for the

environment in Areas of Environmental Protection and other peripheral areas of sites of conservation.



PHOTO 6 : *Visit at the experimental plant nursery*



PHOTO 7 : *Banana trees along serra slopes*

Most recently, three Particular Ecological Reserves were set up in the State of Ceará. Fazenda Olho D'água do Uruçu is the most important, it has 3 048 hectares and is located in the Municipality of Parambu, at 400 kilometers from Fortaleza, in Sertão dos Inhamuns, the most devastated region of the State.

IV- LOCAL POPULATIONS AND BIODIVERSITY CONSERVATION

Different cultures have different visions on the environment surrounding them, there are rich knowledges that could be not wasted. In countries like Mozambique and Brazil the biodiversity conservation can be reached if there is a real interaction and participation of local communities which, in a large extent, were responsible for biological diversity that today is to be saved. Not all dwellers are natural conservationists, but among them there are traditional populations that have gathered wide empiric knowledge on the functioning of the natural world. These populations, with their traditional practices, can effectively contribute for the maintenance of biological diversity as long as they are strictly respected and maintained on their own traditional manners. It frequently happens that researcher discuss themes that are roughly known, while the local population that never takes part to the discussions and decision-makings is much more aware.

Normally the decision-making bodies define conservation and preservation policies of protected areas without taking into account that local populations possess a vast knowledge and use of plant species. Therefore it is not viable to decree areas of protection without taking into account the existence of population of dwellers, given the fact that the protected areas are residences of peoples with traditional cultures and with irreplaceable knowledges about nature. So, it is necessary to support policies of protected areas which are sensible to the costumes and tradition, safeguarding the interests of native populations, considering the roles and interests of men and women, respecting the rights of the present and future generations.

Human populations, particularly those who leave within and in the surroundings of protected areas, usually have important and lasting relationships with those areas and depend largely upon local resources for their lifestyle and cultural survival. These relations recover most of the time their cultural identity, spirituality and subsistence practices which contribute, to a large extent, to the maintenance of biological diversity. The awareness that local populations have in relation to their natural environment has been developed through centuries and continues presently to change. They possess their ecological knowledge by observing nature and learning from the eldest full of wisdom and by also participating in productive

activities such as agriculture, grazing and harvest of wild fruits. Notwithstanding the fact that the survival of local communities is based on the harvest of natural resources for their subsistence. They traditionally develop an intense relationship with wetlands which overcomes the economic dimension and is integrated in their own culture.

The relationship between local communities and wet ecosystems constitute an example of such interactions developed between man and the biosphere. Excluding human beings from the use of large areas of forests and reserves will not protect biodiversity, but will change it significantly and possibly will diminish it throughout time. Therefore, such areas must be free and available for the conservation after detailed and careful studies including in-depth interviews with local dwellers and of adjacent areas.

So, local populations are savers or destroyers of the environment ? Either savers or destroyers of the environment. According to a romantic point of view, in the tradition of ROUSSEAU, they cultivate a paradise moulding their social behaviour to the natural law of local environment. According to a negative approach, the populations which live in protected areas are responsible for deforestation, reconversion of agriculture and erosion which put in danger natural ecosystems. While others propose that traditional knowledges be the key of sustainable development of natural sites, other experts continue to assign the responsibility of ecological destruction to local populations caused by the excess population density and the competition of green zones and the ever-increasing commercialization of resources for the national economy (*Cf. Sue Williams in UNESCO SOURCES*).

To harmonize the protection of biodiversity with the presence of local populations, DIEGUES (1996) suggests : **i)** to recognize the need of non-settlements of traditional populations which lived in the areas transformed in conservation sites, maintaining them in appropriate place ; **ii)** to execute measures improving the living conditions of the populations in these areas, investing in management and production systems which, in one hand, safeguard areas deemed as essential and, on the other hand, promote the well-being of populations living inside and in the surroundings of reserves and areas of environmental protection. The traditional systems of management (fishing, harvest, agriculture) coherent with the conservation of resources should be studied, recognized and even improved ; and **iii)** to introduce new categories of conservation taking into account integrally the need to harmonize the presence of traditional dwellers and preservation.

Presently in Brazil there is only one type of conservation site, the Extractive Reserves, that covers and favours the staying of local populations. The concept of Extractive Reserve

(Cf. CLÜSENER-GODT *et al.*) came from the struggle of Amazonian rubber-tappers (*seringueiros*). The Extractive Reserve is defined as a natural area, or slightly transformed, occupied by social groups using it as a source of subsistence (harvest of wild fruits or artisanal fishing) and undertaking their activities based on a traditional way sustainably under specific regulations.

The other type of conservation site which could help to solve the problem of the staying of local populations within conservation sites is the Biosphere Reserve, established by UNESCO, which foresees the presence of populations (harvestors, artisanal fishermen) in the buffer zones. The first Biosphere Reserve set up in 1992 under the auspices of UNESCO covers the major part of the Atlantic Forest in several States of Southeastern Brazil. However, the way it was established did not take into consideration the interests of local populations as there were no wide process of their involvement (Cf. DIEGUES, 1995).

Up to now the strategy has been to transform the existing units of restrictive use (Parks, Biological Reserves, Ecological Stations) into core zones without having to solve the problem of the presence of traditional populations (harvestors, artisanal fishermen). An example of such a practice is the Jureia Ecological Station which was integrated as a whole as a core zone in the Biosphere Reserve, without the preoccupation of the existence of hundreds of families deemed to be native populations. While the dimension of this Reserve should contribute for a real definition of the settlement of these populations.

FINAL CONSIDERATIONS

The information obtained during the data inventory and institutional contacts indicated a significative consensus between the consulted experts in regard to some issues of relevance for technical discussions proposed and recommendations afterwards presented.

According to some ideas, the critical point for the implementation of a conservationist and environmental policy refers to inefficient measures for legal implementation, controlling and monitoring. They admit that although the governmental authorities have the peculiar tradition of issuing decrees for the establishment of conservation sites, either in Brazil or in Mozambique, the provision of financial resources for their implementation are largely insufficient to meet the expenditures for the development of infrastructures and the fulfillment of control and fiscal measures for these areas. For this reason it is deemed, with some exceptions, that the existing conservation sites do not fulfill the objectives for which they have been created.

About the awareness of biodiversity conservation, the suggestions included the need for specific training for the personnel directly involved in management and fiscal measures of protected areas. As well as the upgrading of primary and secondary teachers in order to assure to those professionals the possibility to work in effective programmes of environmental education (an experience has been held in the Area of Environmental Protection of Aiuba in Ceará), training of community members on principles and environmental concepts, technical training and strengthening of multidisciplinary groups towards acting in an integrated manner, at national and regional levels, for the resolution of environmental problems. The preparation of a basic guide on biodiversity conservation and preservation and of audio-visual materials serving as didactic materials is considered, among others.

Finally, some suggestions were made to take into account the potentialities of conservation sites :

- i)** to enforce discipline in the extraction of wood for fuel and other objectives, in order to allow only sustainable management of the protected areas ;
- ii)** to reforest with native plants towards recovering degraded areas for production objectives ;
- iii)** to recognize the historical shortage of financial resources assigned to governmental activities aimed at protection, conservation and biodiversity studies, it is suggested that the development of ecotourism be a way of generating funds to cover the costs of these activities. Ecotourism is compatible with the principle of sustainable development, and with major profitable potential the funds obtained should fund the maintenance and research in conservation sites ;
- iv)** to prepare recovering plans for endangered plant and animal species ;
- v)** to carry out surveys for flora and fauna, in order to know better the quantity and the distribution of plants and animals in conservation sites ;
- vi)** to implement compulsory environmental education at all levels, from primary to university, to complement patrolling action to save biodiversity and specially to raise ecological awareness of the rural populations, to enable the coming out of ideas and habits to help the implementation of policies of biodiversity conservation ;
- vii)** to reduce human population in the conservation sites and eradicate misery as a way to diminish the pressure on natural resources of the region, as it is recognized that it is extremely difficult to avoid subsistence hunting or other harmful activities to biodiversity in the particular case where hunters are in absolute misery trying to survive from natural resources.

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