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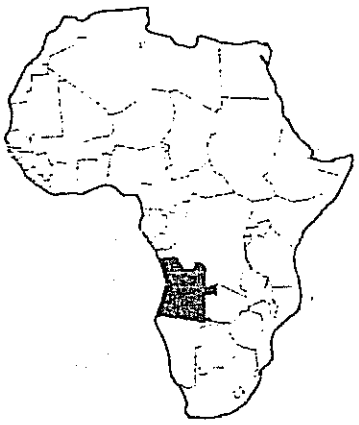
ANGOLA

ENVIRONMENT STATUS QUO ASSESSMENT REPORT

MAIN REPORT



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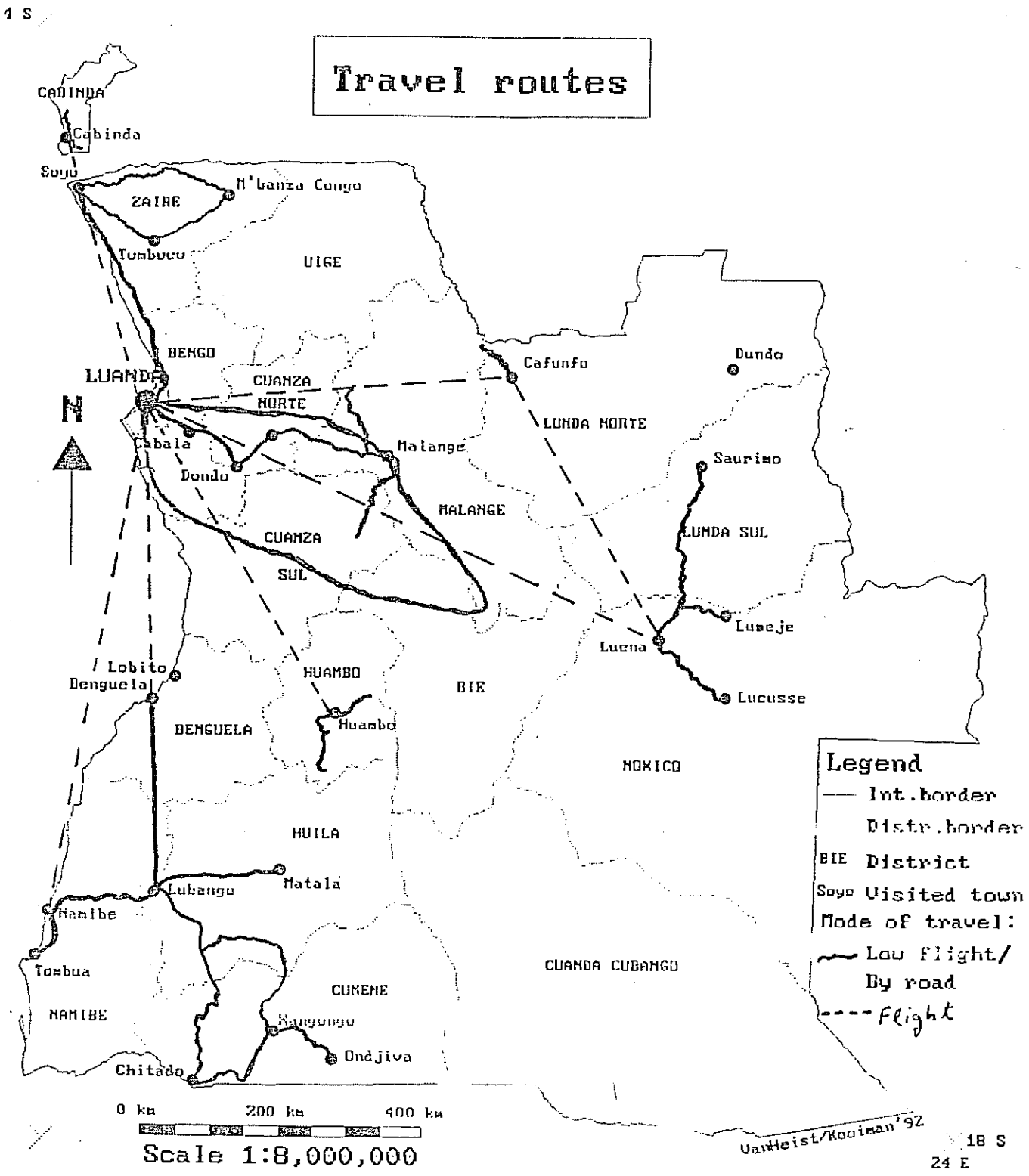
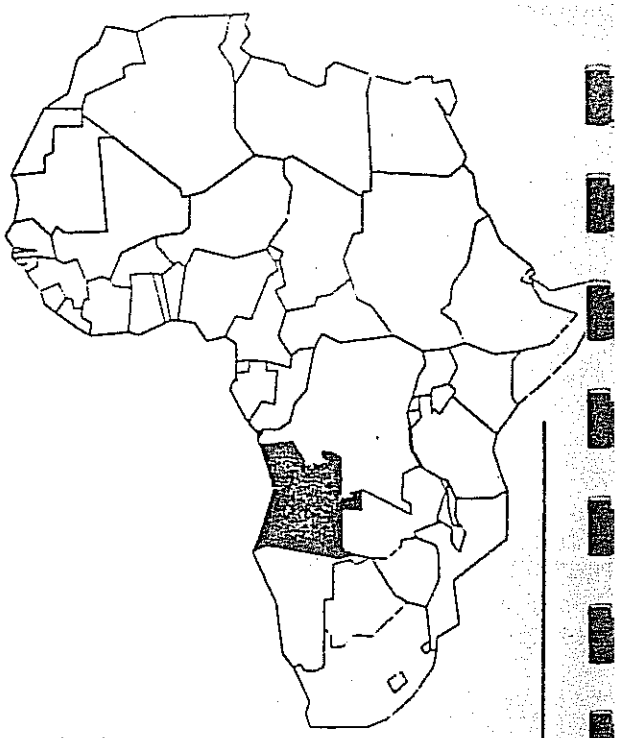


Figure 1.1 Map of IUCN Team Travels



CABINDA
Chicamba
Belize
Cegonga
Cabinda
ZAIRE
Mbanza Kongo
Tomboco
N'zeto
Luvo
Maquela do Zombo
Quimbele
ZAIRE
Songo
UIGE
Uige
Negage
Massango
Canacassala
Mangonco
Caxito
LUANDA
LUANDA
Quibaxe
Quitembo
CUANZA NORTE
MALANJE
Cabiala
N'dalatando
BENGO
Dondo
Pungo Andongo
Malanje
Cambambe
CAMBABE DAM
Chitato
Andrada
Cambulo
Luremo
Lucapa
LUNDA NORTE
Quango
Saurimo
Cacolo
LUNDA SUL
Mussende
Quibala
CUANZA SUL
Gabela
Mucanca
Cazaga
Luau
Cavanca
ATLANTIC OCEAN
N'harea
Andulo
Waku Kungo
HUAMBO
Luimbala
Alto Hama
Kaichiungo
Kuito
Camacupa
Luena
Luchano
Cazombo
Lobito
Benguela
Alto Catumbela
BENGUELA
Huambo
Quima
Gove
BIE
MOXICO
Lucusse
Caconda
Cacuquemba
Lucira
Quilengues
Kuvango
HUILA
Lumbala N'Gumbo
ZAMBIA
Menongue
Bibala
Matala
Lubango
Capelongo
Cassinga
Ninda
Namibe
NAMIBE
Chiange
Cuito Cuanavale
Caluco
KUANDO KUBANGO
Tombwa
Mavinga
CUNENE
Xangongo
Foz do Cunene
Ngiva
Luiana
Mucusso
Jamba
NAMIBIA

FOREWORD

IUCN, The World Conservation Union, was requested by the Angolan Ministry of Agriculture and Rural Development (the government focal point for environmental policy) to prepare an assessment of the status quo of the Angolan environment as a basis for planning future activities. To this end, IUCN recruited a core team composed of 6 international and 3 Angolan consultants. Given the diversity of natural resource use and environmental problems in Angola, the original team was expanded to include over 20 Angolan professionals working in various parts of Angola, many of whom proved invaluable in organizing relevant field reconnaissance and most of whom have made written contributions to the final report.

The task of assessing the environmental status quo in Angola, "from Cabinda to Cunene", proved to be an ambitious undertaking given both the size of the country and the difficulties surrounding domestic travel.

The broad coverage which was achieved (including field visits to 16 of 18 provinces) was only possible with the help of many Angolan individuals and institutions. The host institution, the Ministry of Agriculture and Rural Development, was instrumental in assuring the success of the mission. We are especially indebted to the Instituto de Desenvolvimento Florestal (IDF) and its staff for untiring intellectual and logistical support.

We would also like to thank the following institutions and their respective staff for providing the IUCN team with critical support, logistical assistance and encouragement:

British Petroleum Exploration Angola(BPANGOLA)
Canadian Physicians for Aid and Relief
Embassy of Portugal
Embassy of the Federal Republic of Germany
Food and Agriculture Organisation (FAO)
International Committee of the Red Cross
Medicos Sem Fronteiras/Espanha
Mission Aviation Fellowship
National Diamond Company (ENDIAMA)
State Oil Company (SONANGOL)
Swedish International Development Agency (SIDA/ASDI)
TRAG S.A. Espanha
United Nations Angola Verification Mission (UNAVEM)
United Nations Children Fund (UNICEF)
United Nations Development Programme (UNDP/PNUD)

Finally we would like to thank the Delegation of the Commission of the European Community in Luanda, Mr Jacques Roman in Luanda and Ms Donatella Diane in Bruxelles in particular for having provided the financial resources required for preparing this report.

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LIST OF ABBREVIATIONS

AAA	Associaçao Angolana do Ambiente (Angolan Association for the Environment)
AECCG	African Elephant Conservation Coordination Group
ADRA	Acçao para o Desenvolvimento Rural e Ambiente
ANU	Department of Biology, University of Angola
BSc	Bachelor of Science
CI	Conservation International
cu.m	cubic metres
CIDA	Canadian International Development Agency
CIMANGOL	an Angolan cement factory
Cimianto	an asbestos tubing and sheet factory
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
DNACO	National Directorate for Nature Conservation
DNAF	Direcçao Nacional da Agricultura e Florestas
ENDIAMA	state diamond company
e.g.	example
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization
FINNIDA	Finnish International Development Aid
FINA	oil refinery
GIS	Geographical Information System
GDP	Gross Domestic Product
ha	hectare
IDF	Instituto de Desenvolvimento Florestal (Institute for Forest Development)
IUCN	The World Conservation Union
INE	Instituto National de Estatista (National Institute of Statistics)
ILWIS	Integrated Land and Water Information System
ITC	International Institute for Aerospace Survey and Earth Science
IIA	Institute of Agricultural Research
INDUVE	an oil and soap factory
JEA	Juventute Ecologia do Angola
km	kilometre
km^2	square kilometres
m^3	cubed metres
MAI	Mean Annual Increment
m.a.s.l.	meters above sea level
MINADER	Ministry of Agriculture and Rural Development
MINAGRI	Ministry of Agriculture (pre 1991)
MPLA	Movimento Popular de Libertaçao de Angola
MoA	Ministry of Agriculture
MSc	Master of Science
NDVI	Normalized Difference Vegetation Index
NEPMP	Nucleo de Estudos de Populacao do Ministerio do Plano

NGO	Non-Governmental Organization
NPGRC	National Plant Genetic Resources Committee
OBRECHT	a Brazilian diamond company
PhD	Doctor of Philosophy
SADC	Southern African Development Community
SADCC	Southern African Development Coordination Conference
SDN	Sustainable Development Network
SIDA/ASDI	Swedish International Development Authority
SONANGOL	Angolan State Oil Company
ssp.	species
Tudor	a battery company
UNAVEM	United Nations Angola Verification Mission
UNDP	United Nations Development Programme
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children Fund
UNITA	Uniao Nacional para Independencia Total de Angola
USA	United States of America
USD	United States Dollar (i.e. currency)
WWF	World Wide Fund for Nature

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IUCN would like to express its gratitude and appreciation to all team members for their contributions to this report. The team faced many logistical constraints as well as an exhausting and, at times, dangerous work and travel programme. Without their commitment, personal enthusiasm and courage this report would not have been possible.

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* Countries listed in brackets denote current country of residence.

1. INTRODUCTION

1. INTRODUCTION

This study provides an assessment of the current state of Angola's renewable natural resources and the consequences of projected trends in resource use in the future. This assessment comes at a critical point in Angola's history, after 30 years of war (first for independence from the Portuguese 1961-1975, then between the two major factions MPLA and UNITA and their various foreign allies from 1976-1991) there is a viable cease-fire which is providing the impetus for more attention being paid to the economic development of the country.

The existence of a viable peace, however, has not led to economic or political stability. On the contrary, the absence of regular warfare has allowed many of the social/economic problems bubbling under the surface to emerge with renewed force. The current political vacuum manifests itself in an accelerating free-for-all in terms of the economic exploitation of natural resources, with those in positions of influence scrambling to grant concessions, aquire resources, and consolidate their positions in general.

Many of the actions being taken in the last months of the MPLA government will have environmental repurcussions throughout the decade.

This is therefore an historic moment to analyze the condition of Angola's natural resources, as the environmental problems caused by many years of warfare come to an end. The economic paralysis caused by the war (and the depopulation of certain areas and destruction of physical infrastructure) has, however, also functioned as a brake on the wholesale exploitation of certain natural resources. It is of great concern then, that instead of going forward now to repair the damages caused by 30 years of war and promote sustainable patterns of natural resource use, these damages will be further compounded by a new period of rapid and unchecked economic exploitation of those resources which are still intact.

SCOPE AND METHODS

The terms of reference for this study were:

1) to make a rapid environmental assessment of Angola's natural resource base,

(2) to provide a sustainable development capacity profile and,

(3) to provide a draft plan of action outlining a strategy framework, priority issues and potential priority projects/initiatives covering physical resource

management and institutional/human resource development issues.

To meet these terms, various methods were used. A review of literature and historical records and maps was carried out by each of the team members - sources were shared and recorded (see bibliography). Available satellite data was used, especially in determining the state of the vegetation cover. The team relied heavily on low-aerial reconnaisance (using light aircraft and helicopter) to confirm secondary data sources and land use patterns, and in assessing wetlands resources, the extent of deforestation and other land degradation. Some dramatic observations of forest and grassland fires were made by flying after dark over affected areas. As much as possible, the team relied on ground travel and on-site inspection. This had the additional advantage over aerial reconnaisance of allowing the list of those interviewed to be expanded far beyond those researchers and government functionaries accessible in the capital city.

The strength of this report lies mainly in the breadth of the primary sources it draws upon and its firm basis in actual conditions in Angola.

Reliable data on natural resources is a problem in Angola. Most data was collected in the early 1970s and, with a few notable exceptions, many recent reports have not actually collected any new data but instead presented projections based on the conditions which existed before 17 years of internal warfare and massive population movements. While the report's systematic data collection goes beyond the "rapid" nature of this assessment, the statements made on the condition of natural resources and, hence, the conclusions presented on the need for priority actions, are reliable and up-to-date.

The breadth of this status quo assessment represents a unique overview given the sheer size of the country and the logistical challenges which domestic travel imply. Nevertheless, the team actually visited 16 of Angola's 18 provinces in 6 weeks of effective travelling time on a limited budget (See Figure 1.1).

The report has been subdivided into five chapters and a series of detailed annexes for reference purposes:

Chapters 1 and 2 provide an overview of the socio/economic and political context for environmental action in Angola.

Chapter 3 reviews the key ecological determinants of biodiversity in Angola.

Chapter 4 analyses the key issues and problems and provides recomendations for specific priority actions.

Chapter 5 charts out a framework for environmental action with strategy and programme proposals.

The Annexes include detailed descriptive material (particularly important are details on biodiversity and agricultural systems) for reference as well as a portfolio of draft project proposals for future implementation.

While the report is comprehensive in its overview, not all issues could be covered with equal depth and attention to detail. Its major objectives - to conduct a rapid environmental assessment and develop a framework for environmental action - have been fulfilled. The report however, should be read and analysed in the context of the overall developmental issues including other key studies available such as The World Bank (Introductory Economic Review), UNICEF (Angola; Dados Basicos), the FAO (Tropical Forestry Action Plan) and the EC (TRAG S.A. Report)

The reports' priority recommendations in chapter 5 and the portfolio of draft project proposals (see Annex 5) provide a framework for follow-up action the most important of which is the initiation of a National Environmental Strategy Process.

2. THE SOCIO-ECONOMIC PARAMETERS

2. THE ANGOLAN ENVIRONMENT: SOCIO-ECONOMIC PARAMETERS

2.1 POPULATION

Introduction

The current pattern of population distribution in Angola is a product of 16 years of instability and does not reflect the human support capacity of the resource base. This imbalance between the environment and human pressure is responsible for some of the most pressing environmental problems in the country. In this section, a brief description of the status-quo is presented and some tentative qualitative predictions are ventured.

Total and Displaced Population

Figure 2.1 presents estimates of population for the 18 different provinces of Angola that were collected by UNICEF (UNICEF 1991). The figures are from either the last quarter of 1990 or the first half of 1991.

The most populous province in Angola is **Luanda** with 1,538,779 inhabitants, followed by **Benguela** (1,493,320), **Huambo** (1,386,370) **Uige** (1,323,992) and **Huila** (1,000,567). These five provinces account for 50% of the countries estimated 13,008,075 inhabitants. **Namibe**, situated in the most arid portion of the country, boasts the smallest number of inhabitants (99,595).

The 13 million plus figure is arrived at by summing the estimates used by the provincial governments and exceeds by 3 million the estimates made by extrapolation from the 1970 census that assumed a population growth rate of 2.9% (INE 1987).

Figure 2.1 also presents estimates of the number of displaced persons by province. No data were available for Luanda and the estimate for Cabinda seems extremely high.

Apart from Cabinda, **Cuanza Sul** hosts the greatest number of displaced persons (190,000), followed by Huambo (94,304), Uige (79,733) and Moxico (64,424). The estimate for Benguela (30,745) is suspiciously low, especially in light of the fact that the actual estimates for the total population differ from projections made based on the census of 1970 by more than 863,000 people. This large discrepancy is strong evidence that Benguela received a large contingent of displaced persons.

Excluding refugees that left the country and those that migrated to Luanda, there are an estimated **1 million persons** in Angola

Figure 2.1. Estimates of population and number of displaced persons by provinces.

PROVINCE	TOTAL	DISPLACED
BENGO	327,327	81,891
BIE	1,493,320	30,745
CABINDA	172,353	161,500
CU/CUBANGO	177,789	28,839
CUANZA NORTE	547,681	38,937
CUANZA SUL	1,069,381	190,000
CUNENE	335,953	23,120
HUAMBO	1,386,370	94,304
HUILA	1,000,567	84,974
LUANDA	1,538,779	----
LUNDA NORTE	558,760	33,175
LUNDA SUL	389,864	14,665
MALANGE	859,000	32,000
MOXICO	337,177	64,424
NAMIBE	99,595	10,423
UIGE	1,323,992	79,733
ZAIRE	194,000	11,131
TOTAL	13,008,075	1,000,764[1]

[1] Does not include Luanda.

that were forced to leave their home areas. Although current estimates of displaced persons residing in Luanda were not obtained, data from the local 1983 census indicated that 48% of the capital's population hailed from other provinces (NEPMP unpublished). If this same proportion holds today, the number of displaced persons in the province of Luanda alone is approximately 737,000 persons. Thus, at least 1.7 million people that are presently in Angola were forced to leave their original place of residence because of the civil war. Many of these moved to urban and peri-urban areas as described in the following section.

In relation to the indigenous population and excluding Cabinda, Bengo province has the highest proportion of displaced persons (25.0%) followed by Moxico (19.1%) and Cuanza Sul (17.8%).

Population Growth and Distribution

A GIS (Geographical Information Systems) analysis was undertaken to calculate population density by municipalities for all provinces except Cuando-Cubango. The area for each municipality was computed with the software ILWIS (ITC 1990) using digitized geographically referenced municipal boundaries. The population data were obtained from UNICEF (1991).

It is readily apparent from the population density map (Figure 2.2) that the distribution of population is highly uneven. As expected, the municipality with the **highest population density** is **Luanda** with well over 500 inhabitants per square kilometre. Other areas with more than 30 inhabitants per square kilometre include the municipalities of Cabinda and Landana in the province of Cabinda, the high potential mountainous areas of Cuanza Norte (N'dalatando, Golungo Alto, Quilombo), and Uige (Uige, Bungo, Negae); the municipality of Malange in the province of Malange; the semi-arid region between Sumbe and Benguela (Sumbe, Lobito, Benguela); the municipalities of Cuito Chinguar and Catabola in Bie province; Huambo and Caala in Huambo province; Ganda and Cubal in Benguela province; and Lubango in Huila province.

The population density for the municipalities in the eastern portions of the country seldom surpasses 10 persons per square kilometre. As explained below, this is misleading as the province of Moxico and Cuando-Cubango were theatres for intensive warfare and widespread movement of people to the urban centres took place. Furthermore, because of the generalized infertility of the region's soils, the population naturally tended to gravitate towards watercourses where fertile topographic depressions are found.

In contrast with other parts of the country, the arid and semi-arid regions of Huila, Cunene and Namibe were only mildly affected by war-induced urbanization. In this region the indigenous population remains dispersed among areas with key resources such as fertile soils and water points.

The INE (1987) estimated that the growth rate of the population in urban centres between 1990 and the year 2000 will be 5.5% and that of rural areas only 1%. These estimates translate into a countrywide weighted growth rate of 2.9%. Furthermore, in 1990 an estimated 37% of Angola's population lived in urban areas (INE 1987), a 260% increase over 1970. It is anticipated that by the year 2000 this proportion will increase to 48%. Amado et al. (1991) warns that in spite of the importance of war-induced immigration to cities and towns, the intrinsic growth rate of the urban areas is such that it will not decrease significantly with the cessation of hostilities.

This high level of urbanization is only partially captured by the

GIS analysis (Figure 2.2) because the only data available were at the municipality level. Thus, the fact that there are an estimated 130,000 people settled within a 20 kilometres radius around the city of Luena is obscured because of the large land area occupied by that municipality.

Returning Refugees

The UNHCR in Luanda estimates that there are 300,000 refugees in Zaire and Zambia that will return to Angola in the near future. The two most important influx areas are the borders of Zaire and Uige provinces in the North, and the Alto Zambeze region in Moxico province. Because of the precarious situation of the refugees in Zambia and Zaire and the return of peace to Angola, the repatriation process is taking place at a rapid and anarchic rate. This compromises the ability of the relief organizations to assist the refugees to re-settle and resume productive activities.

Figure 2.3 displays the number of returning refugees each of the provinces in Angola is expected to receive. In the North, Uige province is expected to accommodate 73,000 and Zaire province 56,000 returning refugees in addition to the 30,000 that have already returned to these northern provinces. At the time of writing, 5,000 individuals were near the city of M'banza Congo awaiting transport to their areas of origin. In Zaire province these include the municipalities of Cuimba and N'Zeto, in Uige province the municipalities of Bembe and Ambuila, and in Bengo province the municipalities of Nambuangongo and Ambriz. In the east, Moxico province will have to re-assimilate 82,000 citizens. Their primary destination will be the town of Cazombo in the Alto Zambeze municipality, where at least 10,000 refugees are currently settled. Other provinces that will have to cope with large numbers of returning refugees include Luanda (20,000), Malange (10,000), Cabinda (13,000), Bengo (11,000) and Cuando-Cubango (14,000). Unconfirmed reports claim that 7,000 people have returned from Zambia to Cuando-Cubango. Many of these are supposedly farming along the Cuando river.

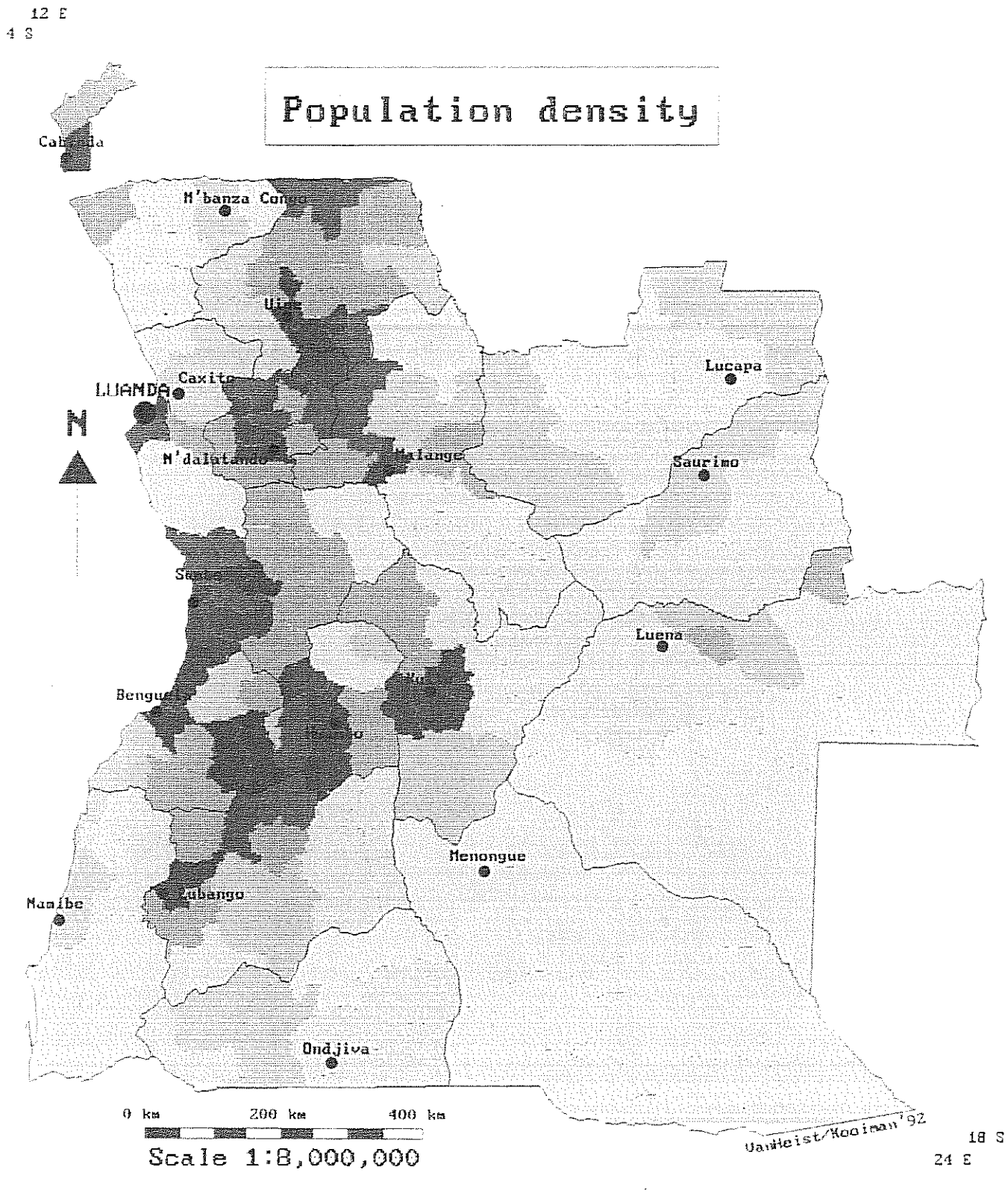


Figure 2.2. Angola's population density by municipalities.

Conclusions

It is clear from the above that Angola's population is unevenly distributed. This skewness, which can be partly attributed to differences in the productivity of the resource base, has been drastically accentuated by Angola's recent history of civil strife. The result is that people's impact on the environment is concentrated around population centres. With the return of peace, this pattern is likely to change as people return to their home areas.

Between expatriated refugees and displaced persons there are at least 2 million people in Angola that were forced from their home areas. The proportion of these that will choose to return to the rural areas is unknown, but the incipient and voluntary movement of people back to their home areas suggests that the contingent that will need to be resettled is large. At first they will have great difficulty to resume productive activities due to a lack of commercialization options and production inputs such as ploughs,

Figure 2.3 Number of returning refugees each province is expected to receive.

PROVINCE	REFUGEES
BENGO	11,000
BIE	2,000
CABINDA	13,000
CU/CUBANGO	14,000
CUANZA NORTE	6,000
CUANZA SUL	2,000
HUAMBO	2,000
LUANDA	20,000
LUNDA NORTE	3,000
LUNDA SUL	2,000
MALANGE	10,000
MOXICO	82,500
UIGE	73,000
ZAIRE	56,000
TOTAL	296,000

seeds, draught power and labour. In the absence of an alternative source of income, this recently re-settled population will have to resort to other sources of income and food. Charcoal making, firewood collection and hunting are three possible options. As illustrated in other portions of this report, these activities

have a deleterious impact on the Angolan environment. Thus, it is important that specific programmes be initiated to assist the rural population to resume their productive activities so as to prevent an unsustainable harvesting of resources for survival in the short-run.

In addition to its physical and quantifiable effects, the massive rural exodus had another extremely damaging consequence; it interrupted the flow of traditional knowledge from one generation to another and undermined the cultural set of rules that allowed rural communities to function. It is therefore essential that experienced individuals that retain a store of traditional knowledge be recruited to assist with the reconstruction of Angola's agriculture. Furthermore, it is necessary that a concerted effort be made to re-establish the authority of traditional leaders who were once responsible for setting controls that enabled the co-existence of agricultural activities and the environment.

See Annex 2.1.a for limitations of the population data

2.2 ECONOMIC ROLE OF NATURAL RESOURCES

After Independence in 1975, the agricultural sector collapsed completely and never recovered during the 16 years of internal warfare which followed. Angola changed from a food self-sufficient, coffee exporting economy with some agro-industry in 1975 to a food aid recipient country, dependent on one major source of income (i.e. oil revenues). Petroleum will continue to be the primary source of economic growth and government income in the next 10-20 years. The diamond sector is also potentially important as a source of export income, but thus far has been subject to far less government involvement than the petroleum sector and less fiscal insight.

Angola's petroleum sector is the biggest in sub-Saharan Africa after Nigeria. Oil production rose from 134,000 barrels per day in 1980 to 494,000 b/d in 1991 and is estimated this year to reach 540,000 b/d. [While estimates vary and the proportion varies between years, petroleum revenues account for 75-90% of total export earnings and 60-90% of government revenues.] Diamonds and petroleum are the two sectors of the economy which have shown a positive growth rate over the past decade.

The petroleum sector is not a panacea solution for Angola's economic woes and it displays many of the characteristics of an economic "enclave" (i.e. it does not generate significant employment opportunities). It does not produce substantial spin-off effects in other economic sectors and contributes to the balance of payments deficit through large foreign exchange outflows for exploration, profit remittance and salary transfers.

More importantly, the majority of the population are dependent upon the natural-resource based productive sectors such as agriculture, forestry and fisheries for their livelihood.

Agriculture

At the time of independence, Angola was self-sufficient in all major food crops and exported significant amounts of maize, sisal, coffee, rice, sugar, bananas and palm-oil among others (The World Bank 1991). Today, these items must be imported.

With the advent of independence, most European operated commercial farms were abandoned and the network of rural traders began to collapse. To fill the void left by the commercial farmers, the government nationalized a proportion of abandoned properties and created parastatals to operate them.

Because of a multitude of problems many state owned farms and peasant cooperatives ceased to operate in the early 80's and the properties were either abandoned or turned over to private

individuals or peasant associations.

In addition to unstable tenure and management conditions, the civil war contributed directly to the nearly complete degeneration of the agricultural sector by: (1) destroying the road network; (2) forcing the rural population from their place of origin to urban centres or ecologically different areas; (3) absorbing labour, (4) depleting the livestock population in some portions of the country; (5) absorbing government expenditures; (6) diluting the power of the local authority; and (7) disrupting the family structure and transmission of traditional knowledge. Ancillary war-related effects include the demise of the already limited agricultural extension capacity and degeneration of the formal education system.

Today, Angola's commercial farming sector is virtually non-existent, and the output of cash crops is less than 5% of the levels attained in the early 70's (The World Bank 1991). The subsistence sector fared slightly better but the estimated decline in output of subsistence crops exceeds 70%. In most of the country, the population is concentrated around urban centres and areas that were previously cultivated have been reclaimed by the natural vegetation.

Forestry

While Angola has vast biomass reserves (estimated aggregate sustained yield exceeding 150 million tons per year) and a production of round wood estimated at 4.845 thousand tons in 1988, a recent World Bank economic survey does not even mention the economic contribution of the forestry sector. [The location and potential of productive forests in Angola is discussed in Annex 2.2.b.] The economic potential of the forestry sector is generally recognized, but no quantitative analysis could be obtained by the team. This type of analysis should form the basis for a forestry development strategy. The FAO is currently in the process of preparing a Tropical Forestry Action Plan for Angola which should provide a framework for more specific assessments and the preparation of a management plan.

The majority of the population is dependent upon fuelwood and charcoal as their **primary energy source**. There is evidence that charcoal production around major urban areas is both inefficient and causing severe land degradation. This is a classic example of where short-term survival strategies give people no choice but to degrade the resources they are dependent upon.

Traditional susbsistence agricultural production has been made extremely difficult given the lack of agricultural inputs, and the insecure conditions in rural areas. The disruption in the transport network due to the war, and the lack of domestic

processing facilities to transform crude petroleum into usuable fuels, have resulted in woodfuels being the only alternative for most of the population. This in spite of the fact that Angola possesses the second largest petroleum sector in sub-Saharan Africa.

For further information on Forestry, please refer to Annex 2.2.b

Coastal Fisheries

Fishing activities along the coast of Angola are very important in socio-economic terms (fish exports, employment, food supply), although the contribution of the fisheries sector to GDP is modest (World Bank estimates 1%). There is significant untapped potential given the variety and richness of the fish supply, and substantially underdeveloped processing capacity. Much of the capacity that existed at Independence was abandoned or sabotaged by the previous owners. Currently, there is little or no control of the fishing done by international vessels, which then do not deliver the catch to be processed in Angola.

The trends of registered fish catches between 1956 and 1989 is shown in Figure 2.4. During the 1950's, Angola became the second most important fishing country in Africa (after South Africa). Fish catches declined dramatically after Independence but a few years afterwards an impressive increase in fish catches was recorded.

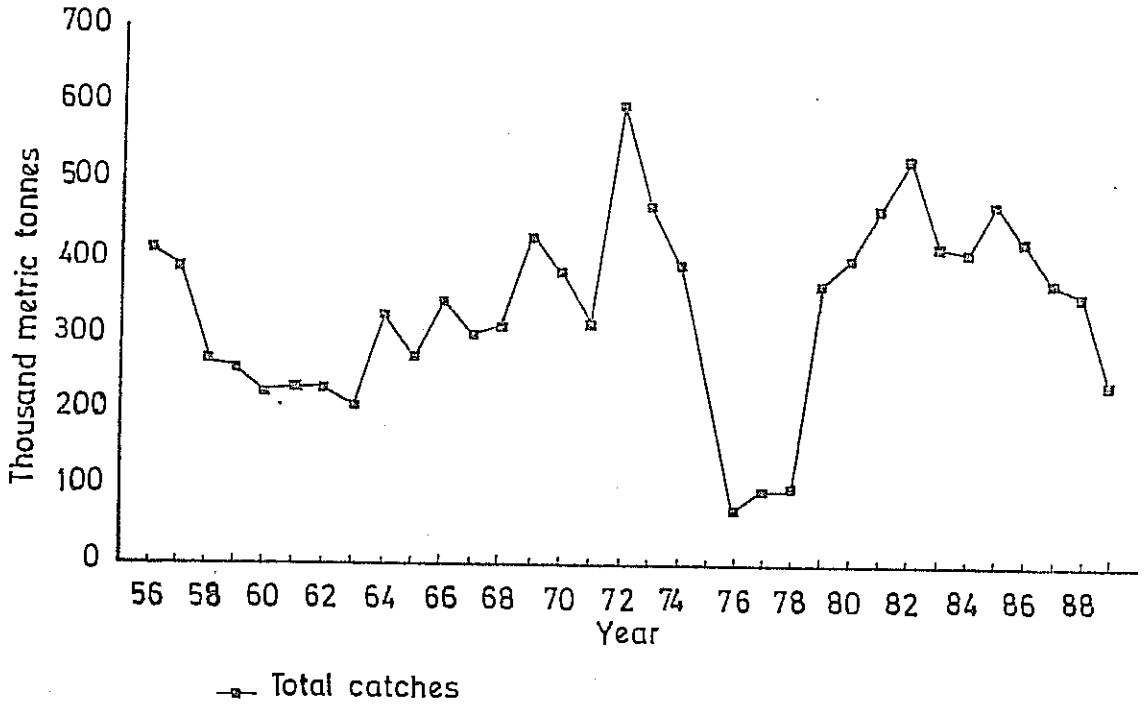
However, since 1982 fish catches have tended to decline and unpublished data for 1990 and 1991 confirm this trend. Whether this is due to over-exploitation of fish stocks or whether due to other causes needs to be urgently investigated. There is evidence that environmental problems (urban wastes and other types of water pollution, overfishing, oil spills etc.) are threatening this very important source of foreign exchange, employment and protein.

Whatever economic recovery strategy the new government and the private sector in Angola pursue, it will be dependent on natural resources. While the most dramatic income sources for government and the private sector will continue to be non-renewable natural resources such as petroleum and diamonds, the great majority of the population will be dependent on agriculture, forestry and fishing for their livelihoods. They represent Angolas resource base for a sustainable development strategy.

Using these natural resources wisely, and improving the health conditions of the urban population, are therefore the major sustainable development issues in Angola. These issues form the core of a survival strategy for the majority of the population

and a growth strategy for the country as a whole.

Figure 2.4 Angolan fish catches, 1956-1989



For further information on fish species distribution and abundance, please refer to Annex 2.2.a.

2.3 INSTITUTIONAL CONTEXT

The present situation in Angola is very much a legacy of its recent history - colonial domination, turbulent and abrupt independence and lastly 16 years of civil war as a pawn in regional and cold war superpower rivalries. It has left the country with much of its economy and scientific potential in disarray, with much of its traditional social structures, cohesion and polity destroyed, and with a large part of its inhabitants uprooted and transformed into internal refugees. In terms of the country's "sustainable development potential," the

impact of this legacy appears mixed and contradictory. The country's natural resource base is on the whole, and compared to neighboring countries, in good condition since the forced abandonment of large parts of the countryside during the 16 years of war has allowed natural resources to regenerate. In institutional, social, political and generally human terms, however, one can hardly imagine more difficult starting conditions for a country that wishes to embark on a sustainable development approach.

Environmental issues and concerns are not a priority, and often not even an issue in Angola today, neither for the government, nor for the main political forces, nor for the majority of the Angolan people. This is understandable given the present situation where the first and principal priority for all is simply to survive - physically, politically, economically. The second priority is to reconstruct and rehabilitate a country which is to a large extent destroyed and whose basic infrastructures, public services, education system, main productive activities and trade are broken down or practically inoperative. The third priority is development, which for most leading political and economic forces and interest groups means above all the rapid exploitation of the country's abundant natural resources, with the help of foreign capital and interests, and which for the common people represents a vague hope to catch some crumbs of this expected bonanza.

"Sustainable development" as an approach is not on the agenda, nor is the concept known or understood outside a small group of intellectuals, NGOs, scientists and government technicians who have travelled abroad or have recently been involved with the Rio Conference. The same is true more generally for concepts of natural resource management and environmental conservation. Consciousness of broader environmental issues and of environment/development relationships seems generally very low among the public, political parties and the government. This is despite the fact that they are all directly affected by environmental hazards and degradation - disastrous urban environmental conditions, desertification in the south and southern coastal area, increasing scarcity of fire wood, and decreasing fish catches in coastal areas.

This low level of **environmental consciousness** is of course a serious handicap, since without a certain level of awareness of environmental problems and of their link to development issues sustainable development policies can neither be designed by government nor supported by the people.

The situation has fortunately started to change in the past few years as a result of the democratic opening and the end of the war. Many of the planned or recently implemented institutional and legal reforms reflect a desire to adapt the country's

institutional, political and legal infrastructure to a new understanding of government, development and environment. But such awareness remains limited to small circles and, for most Angolans, environmental issues remain limited to problems of national parks and the conservation of plant and animal species.

THE INSTITUTIONAL CONTEXT

The institutional context reflects the meagre interest that environmental issues have received so far. There is no governmental body or institution in Angola specially set up to deal with such issues. Responsibility for environmental questions has since colonial times been given to the Ministry of Agriculture and within it, to the National Directorate for Nature Conservation (DNACO). DNACO has now become the Ministry's **Institute for Forest Development** (IDF) and is placed under the authority of the Vice-Minister for Forestry. This reflects the limited understanding of environmental management that was and still is prevalent and that equates it with the management of national parks, the conservation of certain animal and plant species and the management and control of national forests.

Even these limited tasks proved however increasingly difficult to fulfil for the ministry, as the extending war made access to and control over parks and forests difficult. Also, the attribution of environmental management and protection to the Ministry of Agriculture (originally MINAGRI) created conflicts of interest, as this Ministry was responsible for promoting **capital intensive "modern" state agriculture**, a policy that was precisely one of the main causes of environmental degradation in rural areas. This changed officially in 1991 when MINAGRI became MINADER (Ministry of Agriculture and Rural Development). MINADER's principal task is no longer the promotion of state controlled agricultural production but the planning, regulation and support of the country's primarily private agricultural sector. However, the negative environmental impact remains unchanged if the scale and technology of the new, privately owned units remains the same as when they were under state ownership.

For a variety of reasons the present situation, with IDF as the only body responsible for environmental questions within the whole government structure, is unsatisfactory. The IDF, which has only recently been formed in the framework of the general reorganization of the Ministry and which lacks clear policy guidelines, is at present not in a position to implement a coherent parks and forest policy, and even less to develop an environmental policy for the country as a whole. **The Rio Conference** and its aftermath have made this situation worse: as a result of the increasing awareness of environmental issues and of increasing activity in this field, the IDF is expected to deal with ever broader questions of environmental management and

sustainable development. This situation moreover creates tensions between MINADER and other governmental bodies. The latter accuse the former of attempting to monopolize the environmental questions, and this even in areas beyond its competence (urbanization, petroleum, industry, mining, education, transports etc.).

Such tensions have increased as the institutional scene has become more complicated in the aftermath of the Rio Conference. The preparation for Rio started in January 1991 with a seminar on environment and development, organized by the Angolan Association for the Environment (AAA), the country's oldest NGO concerned with such issues. Following this seminar, an inter-ministerial technical commission was created to prepare Angola's contribution to the conference. In October of the same year the commission made a formal statement, arguing that environmental issues were by definition multi-sectorial and should be handled by an independent environmental body, to be institutionalized at the highest governmental level and that responsibility for such issues should therefore be removed from the exclusive control of MINADER. The commission also proposed that it be transformed into a permanent inter-ministerial commission, with wider participation from the academic and possibly NGO community, and whose task would be precisely to prepare the creation of such a new environmental institution.

In December 1991, the Council of Ministers ignored this proposal and made MINADER formally responsible for Angola's contribution to the Rio Conference, a decision which was revoked two months later when this responsibility was again given to the inter-ministerial technical commission, now placed under the presidency of the Vice Minister for Forestry. This commission has now formally ended after Rio; it continues however to meet in a semi-official and somewhat ambiguous capacity in order to prepare a report about the Rio Conference and to draw up follow-up proposals. Among these proposals figures again the one that the commission be made into a **permanent national commission** with the task of preparing the constitution of a new environmental ministry or secretariat of state.

The driving force behind this and the former commissions is a group of selected individuals - people linked to the academic community, AAA and some high-level government officers from various ministries. These latter represent a new generation of qualified technicians who have attempted to depoliticize their functions. Their advocacy for a new understanding of development and environment issues seems to have received a limited but gradually widening hearing in most ministries and other governmental bodies. As a result of this advocacy, but also in response to indirect pressure from the international donor community (introducing environmental conditionalities for aid) and in the wake of the general impetus created by the Rio

Conference, most ministries and other governmental bodies and institutes are now making plans to create some sort of environmental focal point or unit (such as the Cabinet for Environmental Protection in the Oil Ministry). Few have so far actually been set up and none seems to be operational. Also an adviser on environmental questions has recently been named among the Prime Minister's staff.

Environmental concerns will no doubt receive a rapidly growing institutional expression at various levels in the government administration. A general note of caution regarding the functioning of this latter is thus necessary. The IDF, the MINADER as well as most other governmental bodies and institutions that were studied suffer from a conjunction of general problems, problems that are not related or limited to the environmental field and that reduce considerably their efficiency. A first problem has to do with the overall instability of the country's political and institutional situation. As a result of the political changes of the last few years many government institutions have been and still are in the process of reorganization. There has been an unfortunate tendency to excessively compartmentalize many institutions, creating a multitude of small units with ill-defined and at times overlapping responsibilities.

The government administration suffers also from a high turnover of leading cadres, from a shortage of financial means, material support, basic equipment and qualified personnel, and from very low standards of work ethics. This latter is a reflection of the unrealistically low salaries, of the general feeling of insecurity and is one expression of what one could more generally call a persistent "war syndrome".

The efficiency of government administration is finally affected by the lack of clearly defined policies in most fields. The questioning and criticism of the MPLA's former government and party policies seems to have led in many fields to a <u>de facto</u> absence of policy all together - a policy vacuum. Former policies and approaches have been revoked or simply abandoned without being replaced. IDF, and other units within MINADER, seem thus to function without a clear forest policy, without a clear land-use strategy, without a clear approach to land reform issues, without a clear agricultural strategy that would define the respective roles of the traditional subsistence and the modern sector, and without a clear idea as to the respective functions of the state and the private sector.

2.4 THE LEGAL CONTEXT

The situation is similar in the legal field. There is no appropriate legal framework for the protection of the environment in Angola, and the few laws that relate to questions of conservation - such as the land law, the forest law or the national park regulations - all date from colonial times. [Annex 3.4.a Legislacao em vigor no periodo colonial sobre a proteccao ambiental.] Most of them have lack a direct connection with a monitoring or enforcement body. The lack of forceful initiatives in drafting and proposing environmental legislation is one of the symptoms of a missing policy focal point, or Ministry, responsible for the environment.

As is the case in the institutional field, recent political change has led to a process of reforms with a wide range of new legislation now being drawn up in all fields. Some of these new laws intend to address environmental issues, such as the new land law, the legislation that is planned in the field of tourism, and the one that should govern the oil industry.

However, most new laws are vague and ambiguous and leave too much room for contradictory interpretations. The new **land law**, still a mere proposal, is a case in point as it simply lacks a clear definition of the legal owner of land in Angola - the state, communities or private individuals. The **mining law** is equally ambiguous, and so is the law on foreign investments which is so vague that everything is negotiable. The weakness of the **foreign investment law** and the total absence of environmental safeguards in it is particularly dramatic and may well have disastrous consequences for Angola's natural resource base. One field where precise and relevant legislation seems to exist, based on ongoing research, is the **fishery sector** which in some respects seems to constitute somewhat of a positive exception.

Given the lack of communication and information and given the ongoing reforms in this field, it is often difficult to know which legislation is actually in vigor, and many government officers seem to ignore the exact legal framework within which they work. A typical response to this is that "all this doesn't really matter since legislation is in any case not going to be enforced." This seems unfortunately true in many fields. Due to the war, the scarcity of resources and to the inefficiency of public administration, **enforcement mechanisms** seem often nonexistent or inoperative. Even in fields where relevant legislation exists, such as the fishery sector, the lack of means makes enforcement practically impossible.

2.5 THE POLITICAL CONTEXT

The democratic reform of the ruling MPLA party, which led to a loosening of its direct control over government and to the opening of new legal and political space, has initiated a series of important changes since 1990: opposition parties have been created, the first national NGOs have emerged, and a wide range of reforms have been carried out or are planned in the field of economic policy, in the institutional set up and in the legal and constitutional framework. The erosion of the MPLA's monopoly of power and of its direct authority over government seems not to have led, however, to a concomitant increase in the power and authority of another social or political force. It has rather led to a chaotic dispersion of power and authority between the two main traditional parties and a host of new parties, some mainly foreign, economic and political interests, and different parts of the government bureaucracy. An **effective power vacuum** has been created which manifests itself through a fair degree of confusion and ambiguity as to lines of authority. This ambiguity is not only manifest within government ministries but reaches the highest levels of power.

The policy vacuum is an obvious expression of the present vacuum of power. It also expresses the preoccupation of existing political forces with the elections and internal power struggles. Until recently none of the parties has worked out a coherent programme of government that would define a future development strategy, and none have shown interest in environmental questions. Though the two major parties, the MPLA and UNITA, and some of the smaller ones such as the FPD, have recently worked out a programme as a platform for the elections, they do not address sustainable development considerations in a substantive way.

Political systems, before and after independence, did not provide legal or political space for **civil society** to emerge and consolidate, and with the exception of the **churches** no organizations or associations were allowed to exist after independence. This has changed only recently. The main proponents of civil society, which may play a role in the near future, are probably the political parties, the churches, the NGOs and of course, the Angolan people if they can organize to collectively defend their interests.

The two main parties that control the political scene (deadlocked at present) remain the ruling MPLA and the opposition UNITA which have been fighting each other over the past 16 years in a bitter civil war. The other political parties do not have any decisive political strength. Most of them seem to be either dissident factions of the two main protagonists, or else are temporary expressions of public concern of the urban elite.

The **Catholic church** has regained influence and prestige during the war, and despite its decentralized structure and political divisions during the war it is relatively strong. It represents today the probably best organized force outside the two main parties. The Catholic church is on the whole conservative and sectarian, and with the exception of some humanitarian and relief work, does not intend to get involved in developmental or environmental issues, nor work with other organizations in this field. The **Protestant church** is divided in a large number of denominations which are active all over the country, mainly on a local or regional level. Many of them are carrying out relief and humanitarian work and a few have started with developmental work.

The **NGO community** in Angola is just emerging after decades of authoritarian rule. Some NGOs are linked to churches and are mainly active in charity and relief work. Others have emerged in response to the need of foreign donors and international NGOs for local interlocutors and intermediaries through which to channel foreign aid and relief services. Some small NGOs have been created by students who have returned from Western European universities, where they have established contacts with Northern NGOs. Some former mass organizations of the MPLA also try to bestow upon themselves a new NGO identity.

While most of these organizations are highly motivated, and some quite dynamic, most of them are conceptually and politically inexperienced and have not yet been able to constitute a real popular base or constituency. There is an unfortunate tendency among them to make up for lack of experience and popular constituency by forming institutional structures that provide visibility but often represent, so to speak, empty shells with little content. Foreign donors and NGOs are in part responsible for this, as they are eager to deal rapidly with institutionalized local NGOs.

Some of these new NGOs, often in collaboration with foreign NGOs, have started development projects with strong environmental components, such as reforestation projects in various provinces, water and sanitation projects in slum areas of Luanda, projects in support of refugees or of demobilized soldiers returning to the countryside or projects to clean up Luanda and create green spaces in the capital. The ones most active in environmental fields are the AAA (Associacao Angolana do Ambiente), the ADRA (Accao para o Desenvolvimento Rural e Ambiente) and the JEA (Juventude Ecologica Angolana).

The AAA is a special case. It was created ten years ago under the tutelage of the State Secretariat for Culture by a few members of the urban and political elite, some of which had formerly been associated with the pre-independence League of Nature Protection. For many years the AAA has been the main advocate for environmental protection in Angola. Under difficult conditions,

it has represented, so to speak, the ecological conscience of th country. It has naturally been a driving force behind the government's preparatory work for the Rio Conference.

The JEA is primarily composed of members of Luanda's urban youth They are highly motivated and dynamic but lack experience. The ADRA gives emphasis to base work with people (combined with participatory research) rather than institution building and carries out interesting field work in the development and environment field. ADRA has close links with some of the other advanced NGOs in other African countries.

The majority of the Angolan people do not participate in a regular, direct and significant way in politics. Past experience of regimented participation and mobilization have left most of the Angolan people disillusioned with the two warring parties an with politics in general. Decades of authoritarian or paternalistic and centralized regimes have taught them to mistrust new initiatives from above and to pursue multiple survival strategies. With the end of the war, and if peace lasts beyond the elections, a very large number of the Angolan people will start moving back to rural areas from where they have fled In a new democratic setting, with state and army presence and pressures probably greatly reduced, they are likely to associat in a variety of collective and participatory forms in order to solve their personal problems of livelihood. They may use existing party organizations for this, or may return to more traditional communal relations proper to the Bantu culture.

From a political perspective, there are thus few chances that a sustainable development strategy can be popularly defined and implemented in Angola in the immediate future. Those who are likely to support such a strategy - a few isolated individuals that are spread throughout the government administration, some NGOs, and the people if they were organized - do not have much effective power, and those who hold power seem to have little interest or incentives to pursue such a strategy. This all the more as a sustainable development approach requires long-term investment and planning within a stable framework and does not bring in visible or spectacular results in the short term. The challenge in Angola, where political instability is likely to prevail for quite some time, and where a newly elected governme will need to show quick and impressive results before the next elections, will be to deal with some of the more visible and acute environmental problems (i.e. public health) to build up public awareness. Work on a long-term sustainable development strategy could commence as a parallel effort and be initially supported through the Information Centre effort described in th Framework for Action.

For further information on the institutional, legal and political framework of Angola, please refer to Annexes 2.3.a, 2.3.b and 2.4.a

3. THE ECOLOGICAL DETERMINANTS OF BIODIVERSITY

3. THE ANGOLAN ENVIRONMENT: THE ECOLOGICAL DETERMINANTS OF BIODIVERSITY

The key determinants of biodiversity are evolutionary history and size. Those sites which have been subject to substantial fluctuations in climate, especially during the last two million years, resulting in an ebb and flow of animal and plant migrations, usually exhibit a greater mix of species today than those which have experienced a stable environmental conditions over a long period of time.

Angola's biological richness, primarily determined by its history (with major shifts in vegetation belts through the past 20,000 years) and size (the second largest country in sub-Saharan Africa), is also strongly influenced by its climate, hydrology, geology, soils and consequent habitat diversity.

These ecological determinants are analyzed in the following sections.

3.1 CLIMATE

Two factors have a strong effect on Angola's climate; the South Atlantic high pressure cell and the cold northward flowing Benguela current (Trewartha 1981). The former limits the southward migration of the intertropical convergence zone whereas the latter generates a strong temperature inversion along the coast that has a pronounced stabilizing effect on the lower atmosphere. The result is a gradient of increasing precipitation as one moves from south to north and from west to east (Figure 3.1). Thus, mean annual rainfall is 50mm for Namibe in the southwest and 1,344mm in Saurimo in the northeastern quarter of the country. The steepnes of the west to east rainfall gradient is most pronounced along the transitional slopes that link the coastal belt to the interior plateau. The relatively high rainfall values achieved in the northern portions of this zone are supplemented by significant amounts of condensation. This form of moisture is an important determinant of vegetation (Barbosa 1973).

Figure 3.2 depicts the distribution of mean annual temperature over Angola. On the average, the warmest regions (>26^{0}C) are low altitude areas located to the east of Luanda and in the northwestern corner of the country where the cooling influence of the Benguela current is relatively weak and the altitudes are moderate. The coolest regions (16-18^{0}C) encompass the interior plateau and the southwestern desert region along the coast. Mean annual temperatures in the remainder of the country are generally mild (20-26^{0}C).

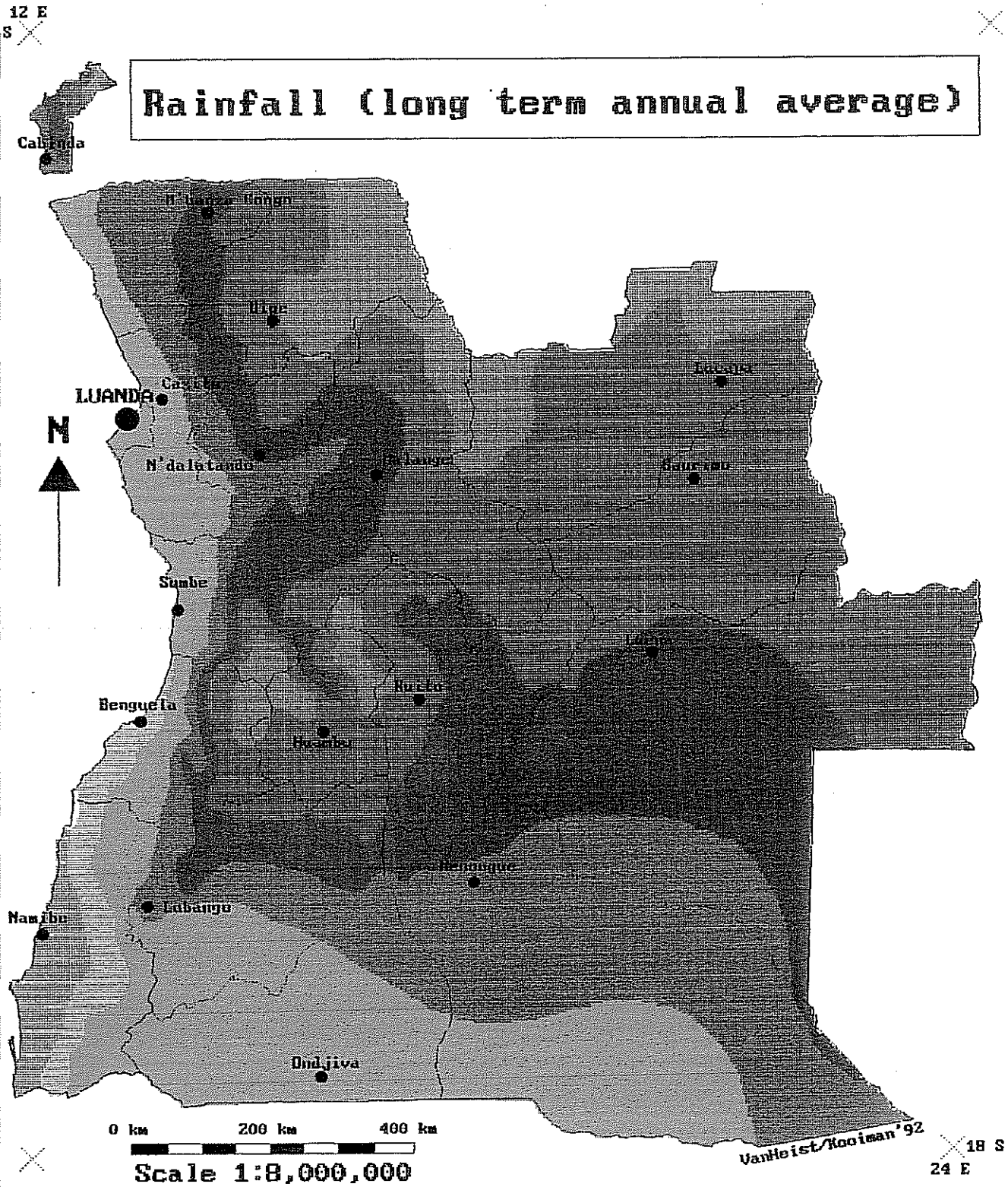


Figure 3.1. Spatial distribution of mean annual rainfall in Angola.

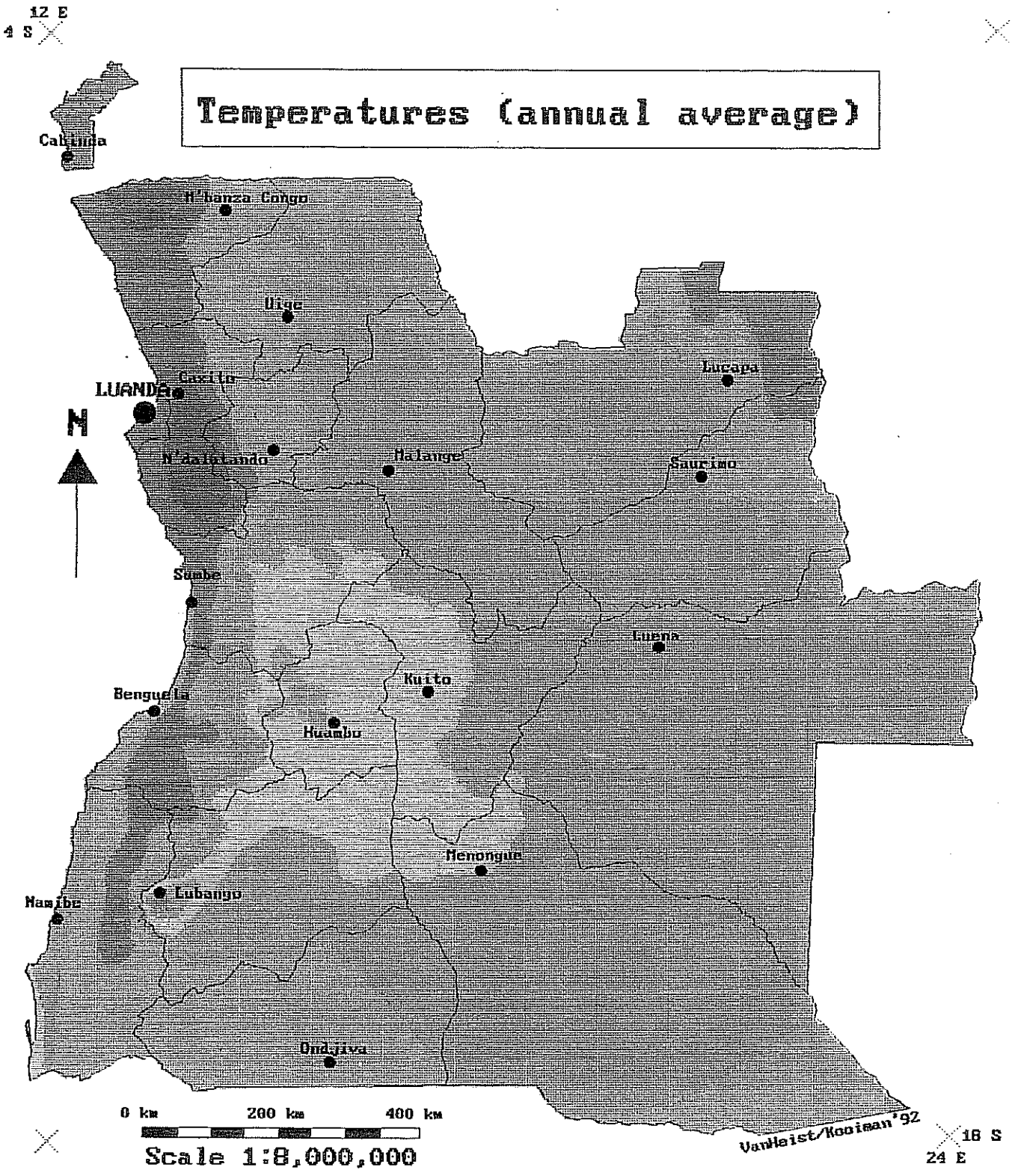


Figure 3.2. Spatial distribution of mean annual temperature in Angola.

Throughout the Angolan territory, the annual distribution of precipitation is characterized by distinct wet and dry seasons. This is evident in Figure 3.3 where rainfall data from four weather stations are summarized. Although the month of peak rainfall varies somewhat from station to station, they all experience a dry period from June through September. This fact is of utmost importance to Angola's farmers and pastoralists.

The effect of this dry period on the vegetation is striking as indicated by the Normalized Difference Vegetation Index (NDVI) images for the dry and wet seasons (Figure 3.4). This index which is derived from satellite acquired reflectance data is sensitive to the amount of photosynthetic tissue present in an area. Consequently, green vegetation has high and dry vegetation low NDVI values. The dry and wet regions of the country can also be easily identified in these images.

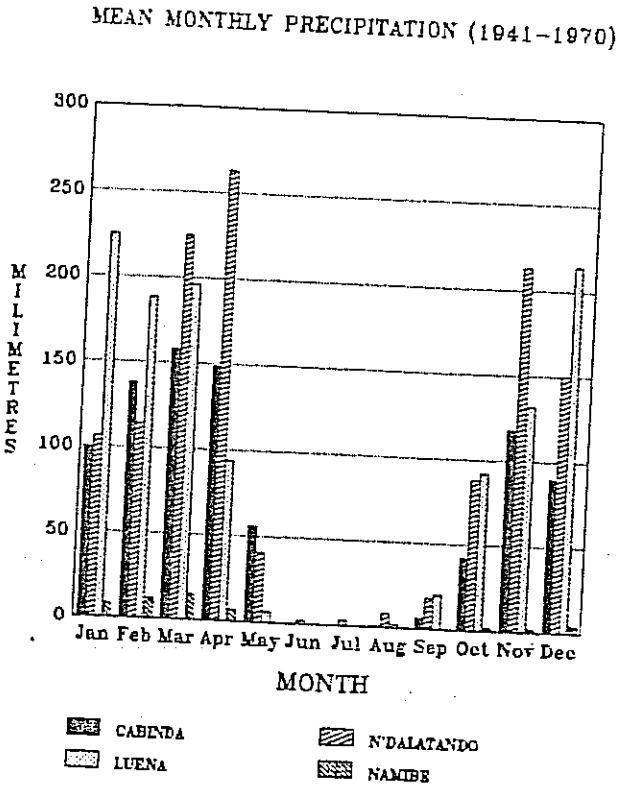
Mean monthly temperatures show a distinct drop that coincides with the onset of the dry season (Figure 3.3) and reach a low point in June-July. With the exception of Namibe, mean monthly maximum temperatures remain relatively constant throughout the year (Figure 3.5). In contrast, mean monthly minimum temperatures drop significantly between June and August, especially along the eastern (Luena) and southern (Namibe) areas of the country. During these months frosts are common in the southern half of the interior plateau and the southeastern quarter of the country.

For further information on Angola's climate, please refer to Annex

3.2 HYDROLOGY/WETLANDS

The importance of Angola as a water catchment area for central and southern Africa cannot be overemphasized. Precipitation that falls in the interior of the country find its way to the Atlantic and Indian oceans via two of the most important watercourses in Africa, namely, the Zambezi and Zaire rivers. Furthermore, the Cuito and Cubango rivers are responsible for the existence of the Okavango delta, an ecosystem of extreme ecological and economic importance (IUCN 1992) and the Cunene is the only perennial source of water along Namibia's northwestern frontier.

The **principal hydrographic basins** are shown in Figure 3.6 and 3.6a. Three large basins (Zambezi, Zaire, Cuando) are mostly contained within the sand covered area of Angola. In this region, runoff is minimal because of the high infiltration rates associated with coarse textured soils.



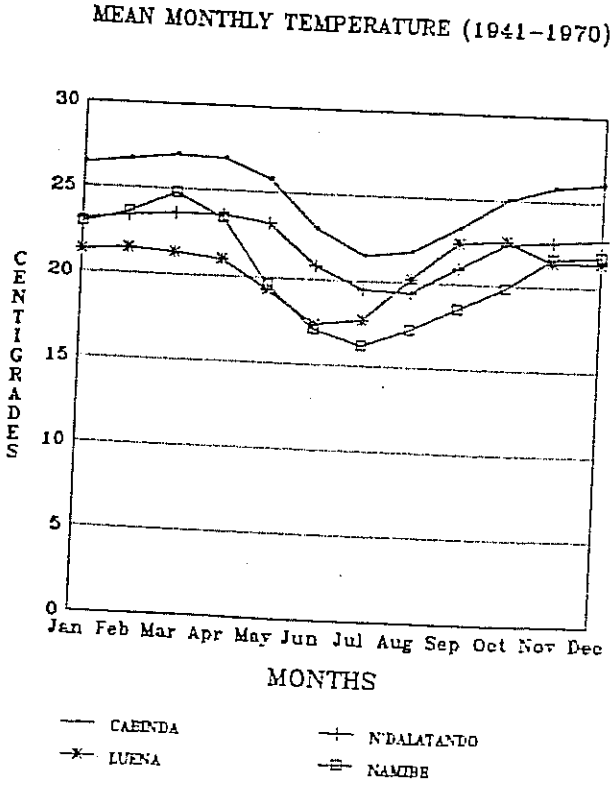


Figure 3.3 Mean monthly precipitation and temperature for Cabinda, N'Dalatando, Luena, and Namibe.

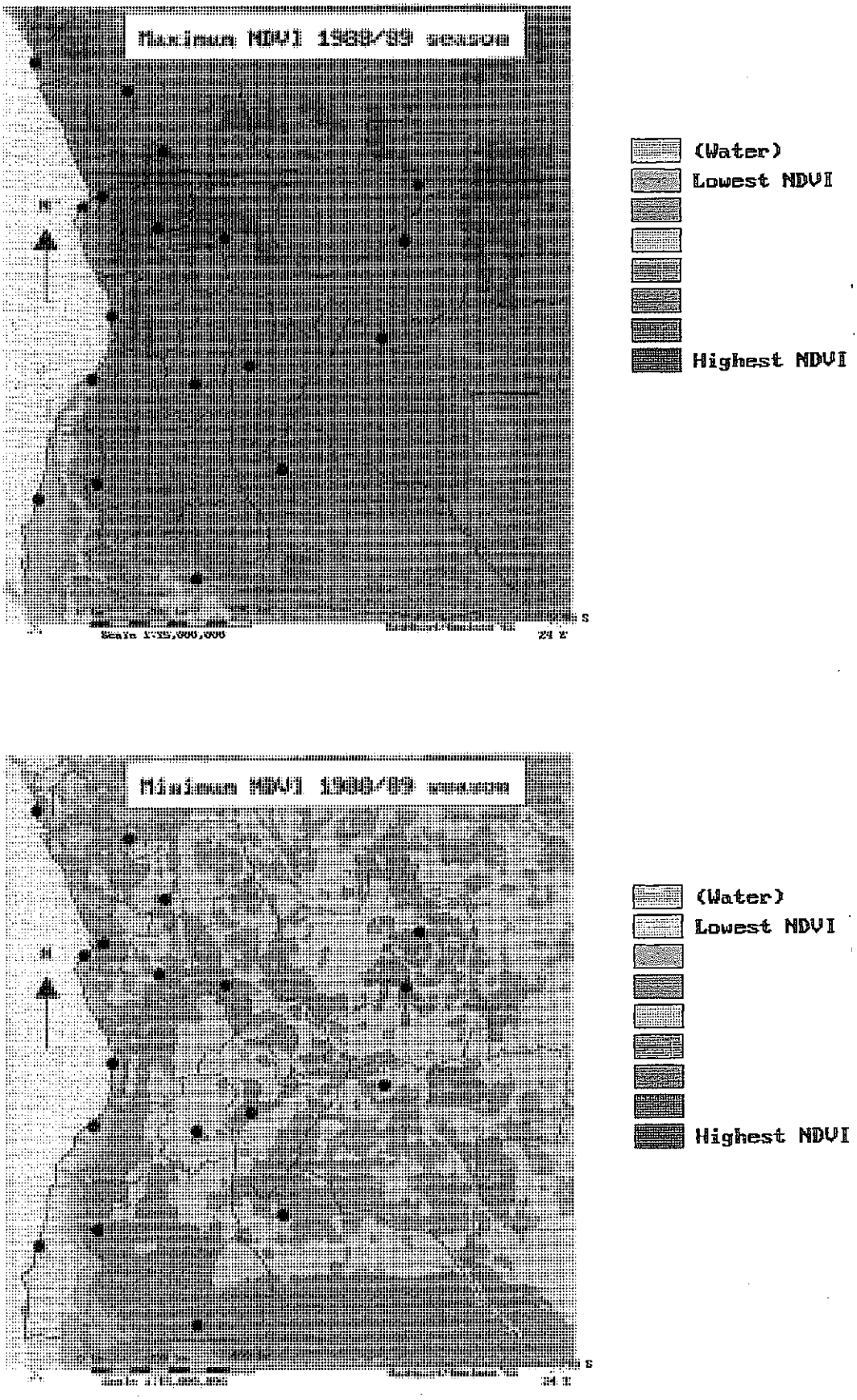
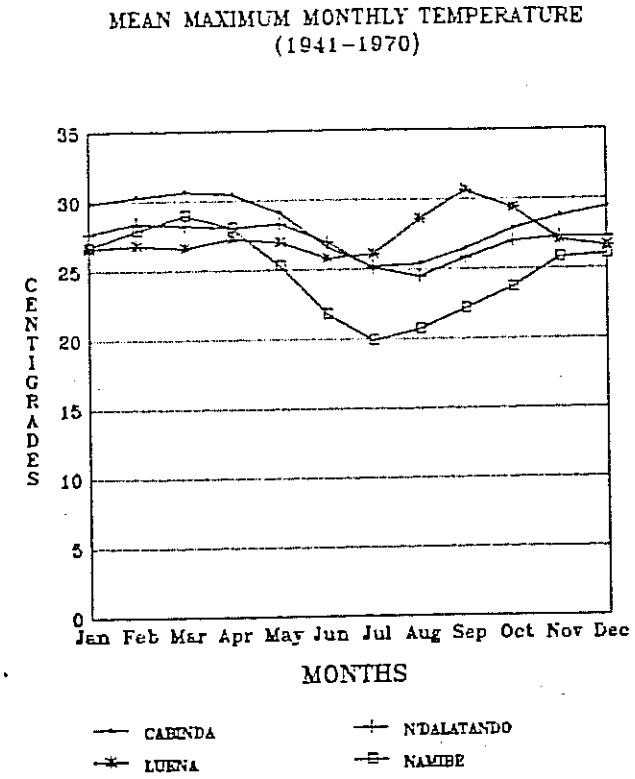


Figure 3.4.

Normalized Difference Vegetation Index (NDVI) images for the wet (top) and dry seasons (1988-1989). High NDVI is associated with green vegetation.



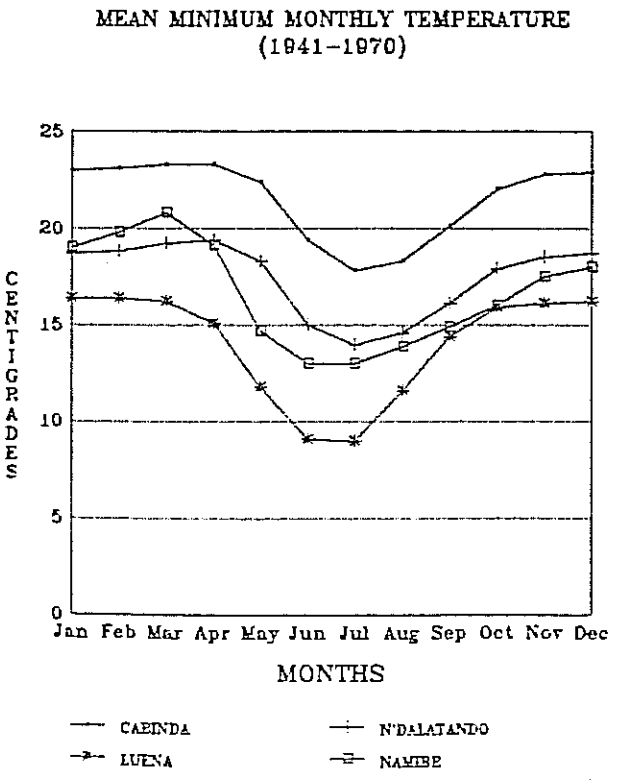


Figure 3.5 Mean monthly maximum and minimum temperatures for Cabinda, N'dalatando, Luena, and Namibe.

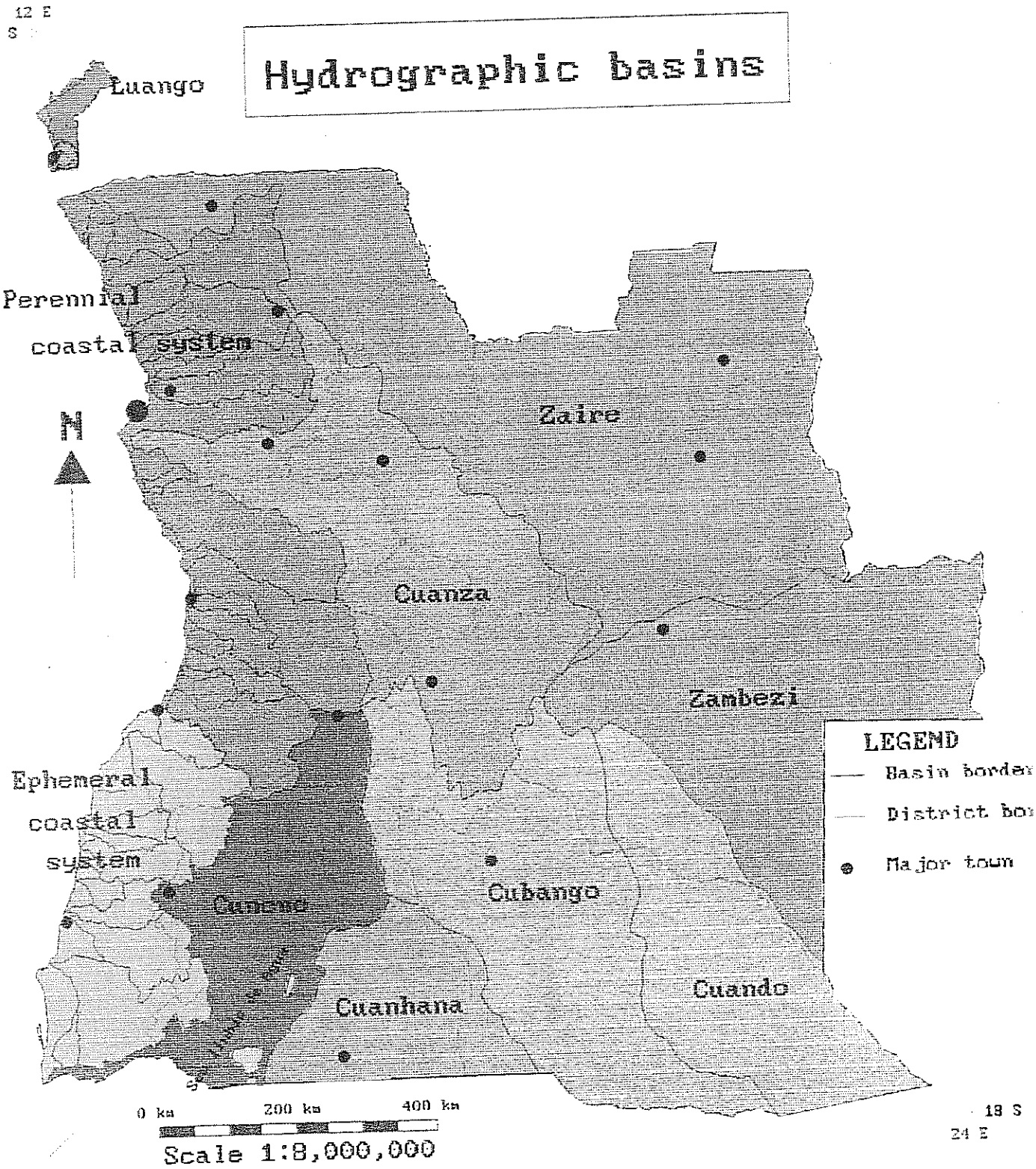


Figure 3.6. Principal hydrographic basins of Angola.

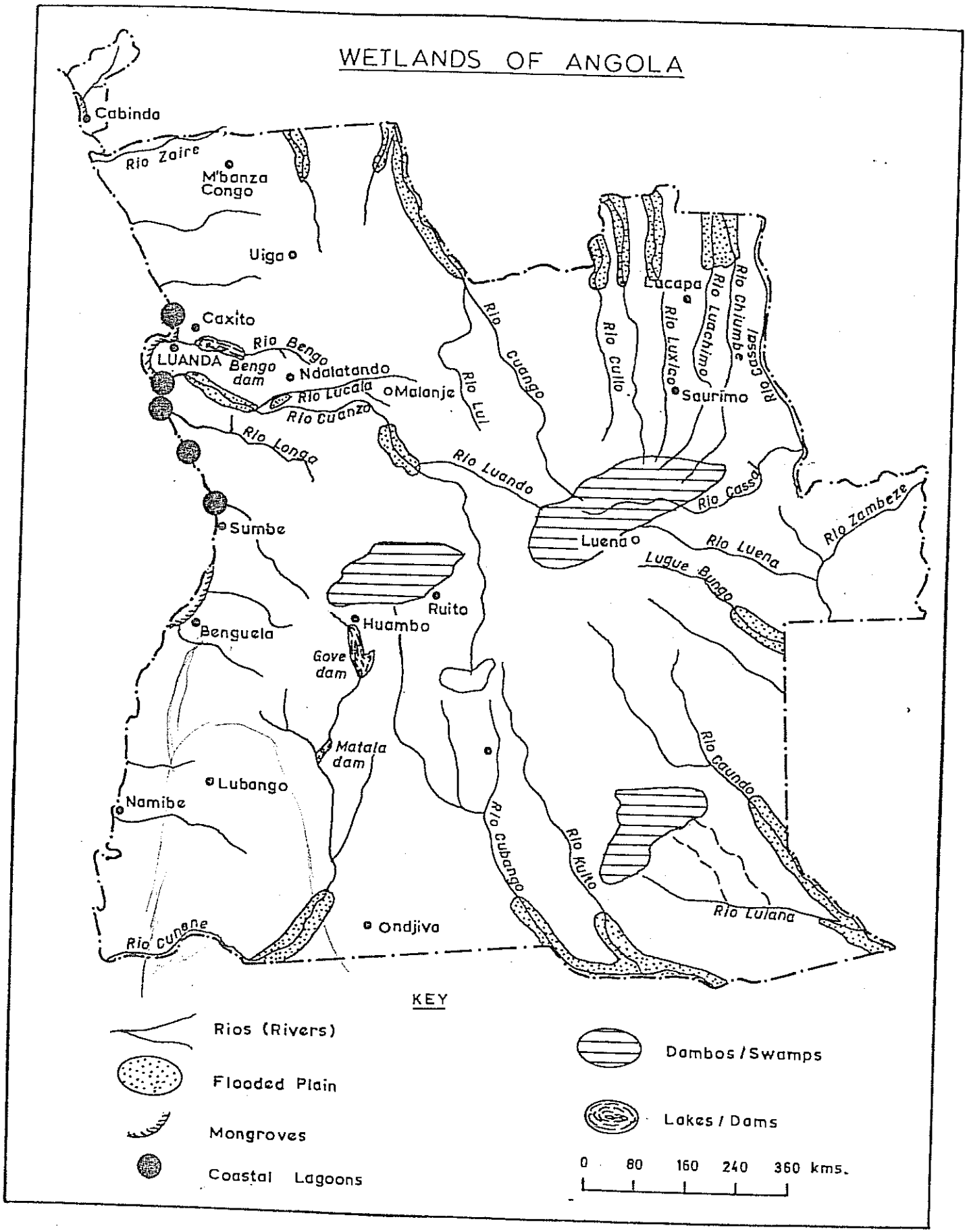


Figure 3.6a Map of Major Wetlands of Angola

Nonetheless, observations made in disturbed areas indicate that sandy mantle is susceptible to severe gully erosion. The Cunene and Cubango originate in the interior plateau within 50 kilometres of each other. The first finds its way to the Atlantic after crossing several hundred kilometres of arid country whereas the second, strengthened by the Cuito, traverses Namibia's Caprivi strip and creates the Okavango delta in Botswana.

The Cuanza drains the eastern and central portions of the interior plateau. As it turns west, south of Malange, it is joined by the Luando and creates impressive wetlands as it meanders across the sandy substratum. Several kilometres further west it enters the transitional belt between the coastal zone and the interior plateau where it is contained between rock walls and creates small cataracts and rapids. It is in this area where the Capanda hydroelectric dam is being constructed. Within the coastal fringe, the Cuanza once again gives rise to large wetland areas.

The **coastal belt** is traversed by medium-sized watercourses that originate in the transitional belt and interior plateau. These may be subdivided into perennial rivers to the north (perennial coastal system), and ephemeral (ephemeral coastal system) rivers to the South of Benguela. These watercourses are extremely important from an agricultural viewpoint. The upper Etosha system is a closed basin with extensive imperfectly drained grasslands.

Wetlands

Wetlands, in the Angolan context, include all areas affected by water whether natural or artificial, permanent or temporary, water that is static or flowing, fresh, brackish or salt including areas of marine water of both intertidal and subtidal regions not exceeding a depth of six metres.

Five wetland systems are distinguished:

1) **Marine Systems:** This includes the subtidal region (the portion that is continuously submerged to a depth of not more than six metres at low tide) and the inter-tidal region. The system includes sandy beaches, mudflats and lagoons or sheltered bays.

2) **Estuarine Systems:** These are wetlands bounded by land in which fresh water and sea water are allowed to mix. In Angola this system is entirely of the river delta system.

3) **Riverine Systems:** This system comprises the perennial and seasonal rivers and includes flood-plains, swamps and riparian woodlands associated with the river system. This

is an extremely important wetland system in Angola.

4) **Palustrine Systems:** This system in Angola is dominated by shrubs and grasses when seasonally inundated, and includes seasonal flood plains (chanas or anharas), dambos (chanas) and shallow lakes with poorly developed limnetic zones due to limited depth.

5) **Lacustrine Systems:** these are deep water systems found in topographic depressions or dammed river channels. This system has limited occurrence in Angola and is mainly associated with artificial impoundments.

Coastal Zone Systems

Coastal Zone Systems include those systems not included in the estuarine and marine systems above. These include dune formations and the strip of vegetation and soils of varying width along the Angolan coast directly associated with the coastal zone.

For further information on Wetlands in Angola, please refer to Annex 3.2.a.

3.3 GEOLOGY

A coastal belt composed of sedimentary rocks and weakly consolidated sediments stretches from Cabinda in the north to the Cunene's mouth at the border with Namibia (Figure 3.7). It ranges in width from 200km south of Luanda to around 10km between Benguela and Namibe and has an undulating relief that ranges from sea level to around 200 metres (Figure 3.8). The dominant rock types belong to the coastal facies (Figure 3.9), and include quaternary and tertiary sandstones, marls, alluvium and argillites.

The transitional belt is a deeply incised strip of land that separates the low lying coastal strip and the interior high altitude erosional surface, designated the interior plateau (Figure 3.7). It is composed of pedimented surfaces (South), residual hills, mountains and valleys, and stretches from the Zaire to the Cunene rivers. This transitional zone ranges from 250 to 60 kilometres in width and from 400 to 1,200 metres in altitude (Figure 3.8). In its southern half, there are inselbergs and massifs that tower 1,000 metres above the regional base level. The unit is underlain by schists, arkoses, quartzites and

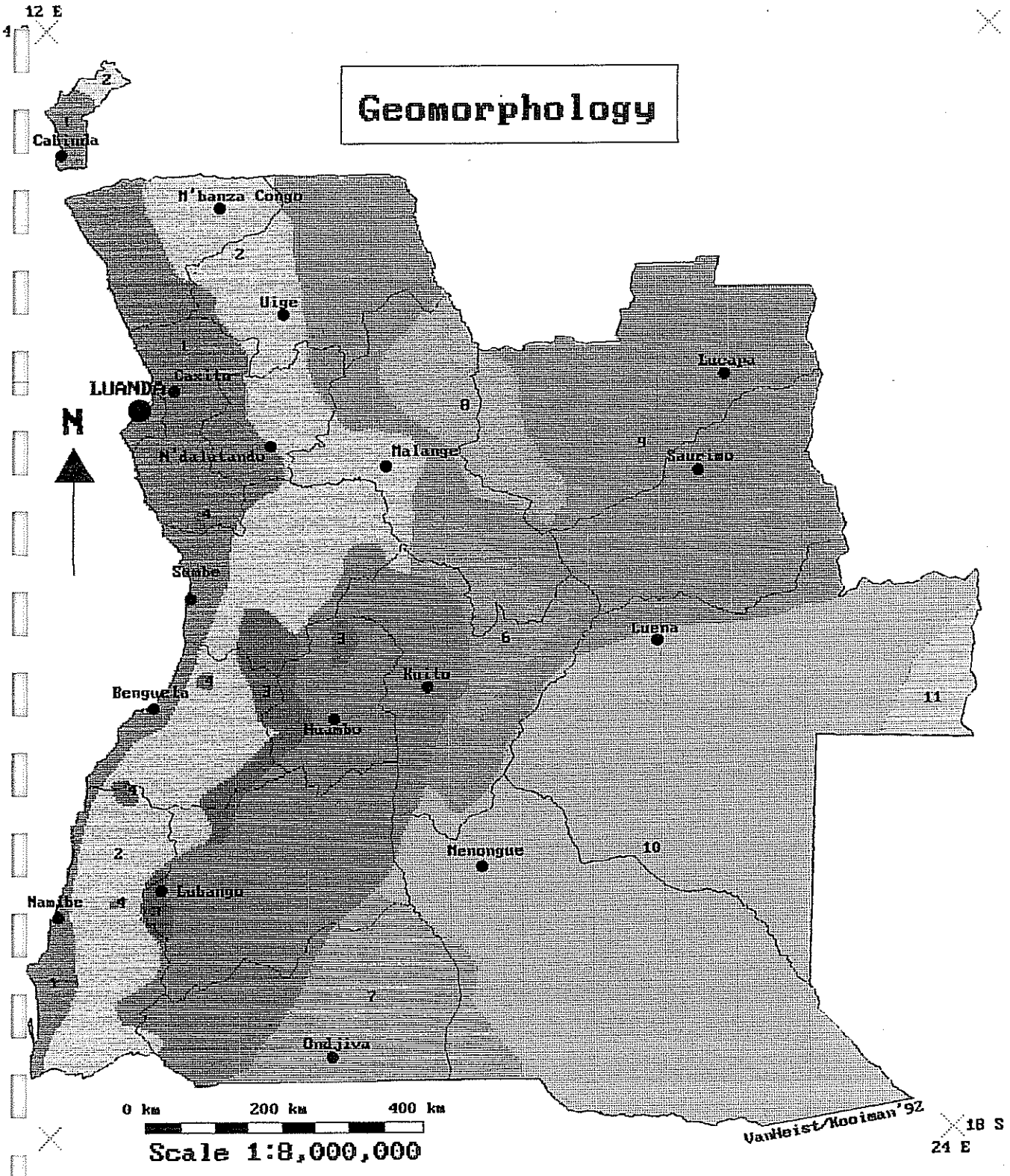

Geomorphology
12 E
18 S
24 E
Cabinda
M'banza Congo
Uige
LUANDA
Dasilva
N'dalatando
Malange
Lucapa
Saurimo
Sumbe
Luena
Kuito
Benguela
Huambo
Menongue
Lubango
Namibe
Ondjiva
N
0 km
200 km
400 km
Scale 1:8,000,000
Vanleist/Kooiman'92
Coastal belt
Transitional belt
Residual mountain chain
Residual mountain peaks
Interior plateau
Upper Cuanza basin
Etosha basin
Cassangue depression
Zaire basin
Zambesi basin
Upper Zambesi massif
See report for description of units

Figure 3.7.

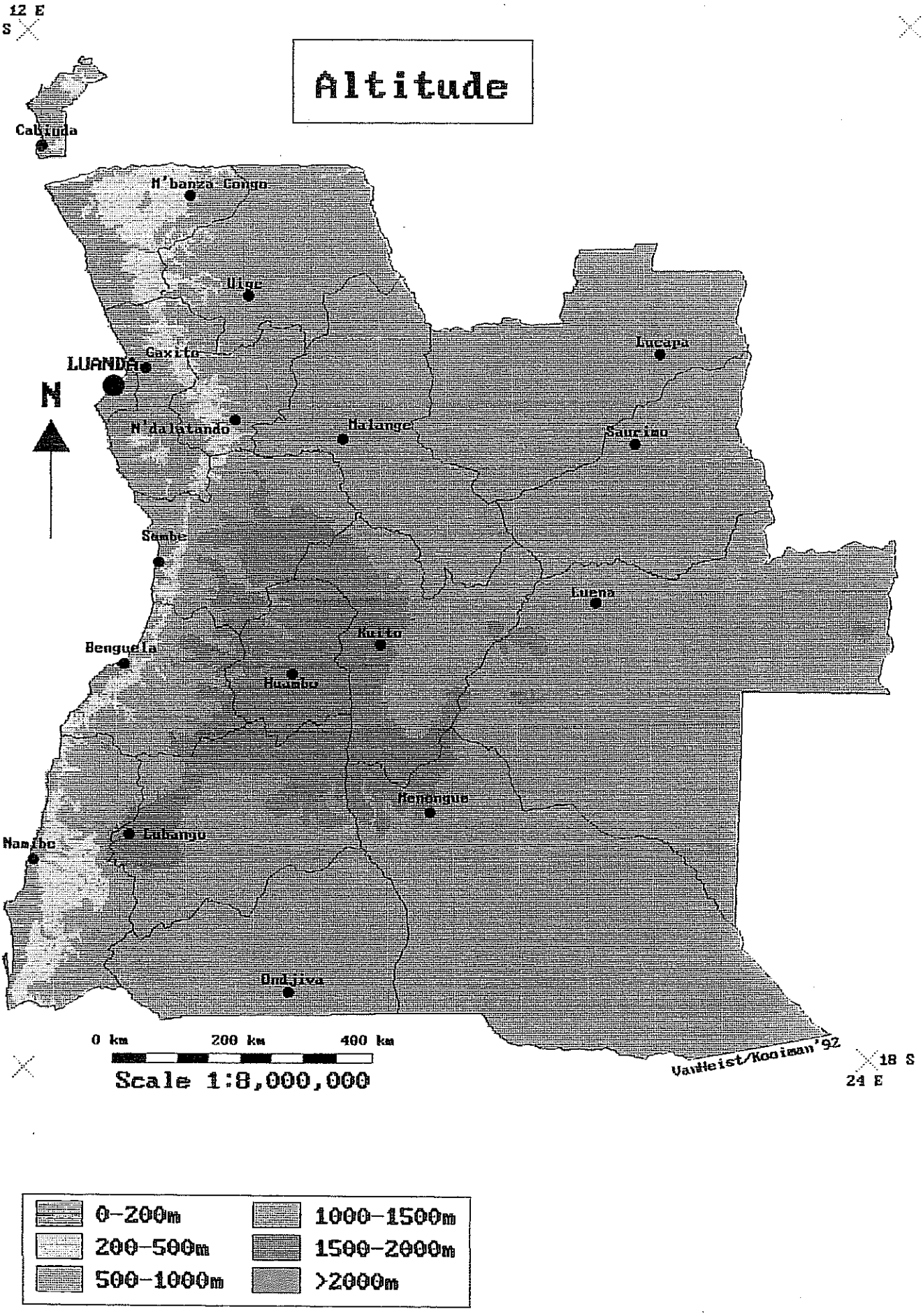


Figure 3.8. Angola's relief. 36

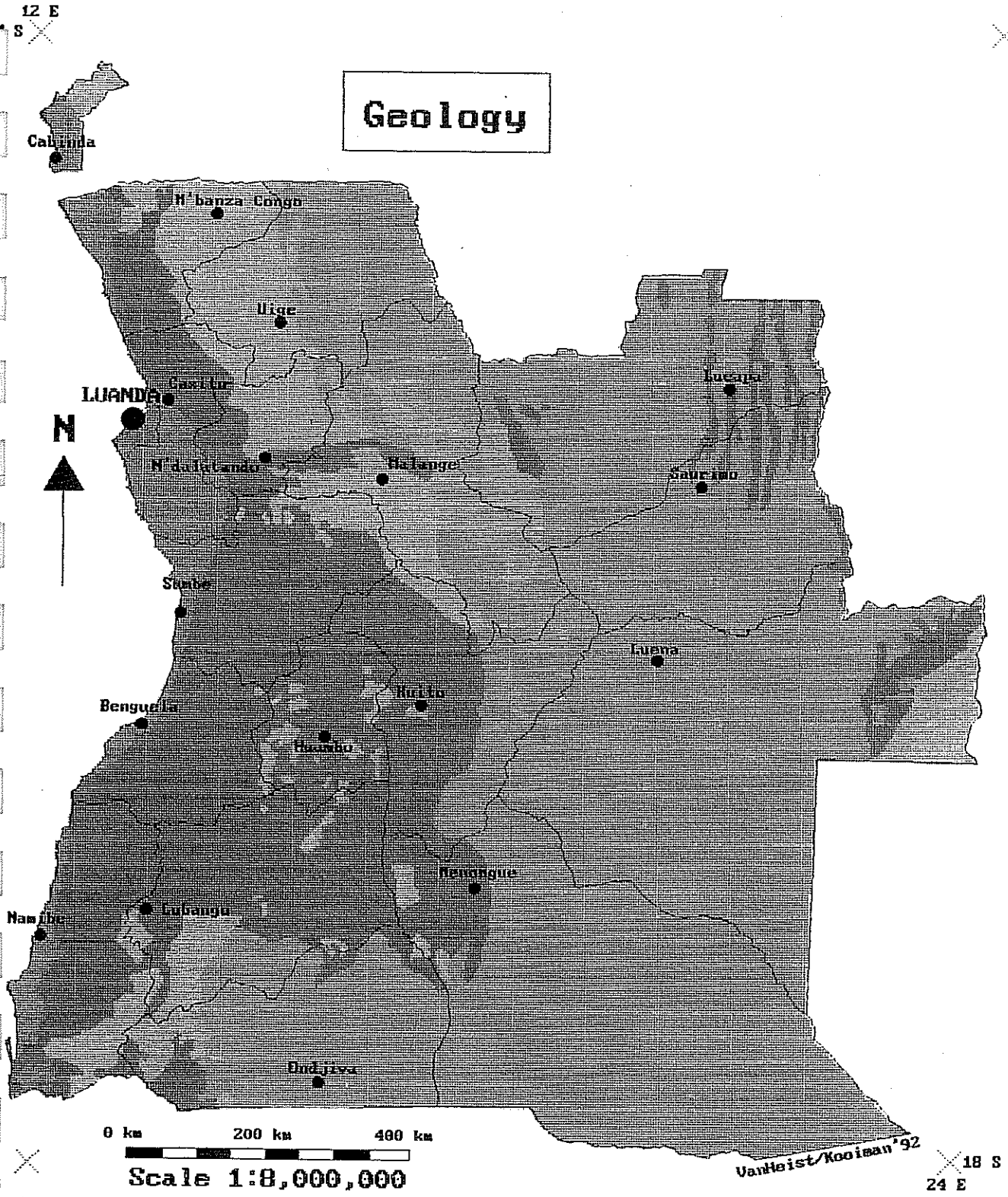


Figure 3.9. · A generalized geologic map of Angola (adapted from Azevedo et al. 1972; Carvalho 1980; Diniz 1973).

limestone in its northern third and by basement complex rocks such as granite, gneiss migmatites and quartzite in the remaining two thirds.

Along the boundary separating the southern half of the interior plateau and the transitional belt lies a chain of residual mountains (Figure 3.7). These elevated landforms range from 1,500 to over 2,000 metres in altitude (Figure 3.8) and are underlain by quartzite and other metamorphic rocks. Prominent peaks within this unit support small patches of forest found nowhere else in Angola.

The interior plateau (Figure 3.7) is a rolling to gently undulating erosion surface that sits mostly between 1,200 and 1,500 metres above sea level (Figure 3.8). It is underlain in its northeastern and southern portions by rocks from the basement complex such as gneiss, granites and migmatites (Figure 3.9).

The upper Cuanza geomorphic unit (Figure 3.7) is a low lying area wedged between the interior plateau and the sand-covered Zambezi and Zaire river basins. Its surface is traversed by the meandering Cuanza and Luando rivers and their tributaries. These rivers create large patches of wetland areas along the northern portion of the area. The upper Cuanza unit is underlain by kalahari sands in the east, sedimentary rocks along its mid-portions and metamorphic rocks from the Congo and Karroo systems in the north and west (Figure 3.9).

The Cassange depression (Figure 3.7) is a low lying peneplain (Diniz 1973) that sits between 300 to 400 metres below the surrounding geomorphic units (Figure 3.8). Its floor ranges from 600 to 1,000 metres above sea level with occasional ferricrete-capped mesa-like hills rising to 1,500 metres. The dominant underlying rocks belong primarily to the Karroo and Congo systems and include schists, limestone, tillites, arkoses and graywackes (Figure 3.9). These rock types give origin to fine textured fertile soils.

The eastern half of the country, with the exception of the upper Zambezi massif, is covered by an extensive plain covered with a deep layer of Kalahari sands. This vast area is subdivided into the Zambezi and Zaire drainage basins (Figure 3.7). The underlying bedrock is of little ecologic consequence within this unit, except where down cutting of the north flowing rivers have reached the basement complex rocks. Known deposits of alluvial diamonds are found throughout the northern portions of the Zaire hydrographic basin.

In the easternmost corner of Angola the upper Zambezi massif sits a few hundred metres above, and differs significantly from, the surrounding sandy plains of the Zaire and Zambezi basins. Topographically it can be divided into a gently undulating plain

that oscillates between 1,100 and 1,250 metres and a northeast to south west oriented doleritic rise that surpasses 1,600 metres. Other rocks underlying the upper Zambezi massif include acid intrusive rocks and schists. This geologic matrix is associated with the occurrence of relatively fertile soils, a rare commodity in the eastern half of Angola.

For further information on Angola's geology, please refer to Annex 3.3a

3.4 SOILS

It can be seen at a glance in Figure 3.10 that Angola is dominated by infertile soils. The sandy Arenosols (unit S) cover over 57% of the country (Diniz 1991) and the acidic Ferralsols (unit F, Lf) 22%. Furthermore, with the exception of small pockets of alluvial soils (unit A) within river valleys and floodplains and some cracking clays (unit V), the soils of semi-arid and arid regions along the coast and southwestern corner of the country (units D, Rc, C, Cc) are moisture limited and shallow (Leptosols) or excessively alkaline (Solonetz, arid Calcisols, Gypsisols).

While some of these can be made productive by the addition of soil amendments (Ferralsols) other are permanently (Leptosols, Solonetz) or practically (Arenosols) unsuitable for intensive agricultural production.

This means that **only around 10% of Angola's soils have inherently high agricultural potential**. These are Luvisols, Cambisols, Nitosols and Lixisols (units L, Lf) concentrated along the north-south transitional belt (Figure 3.7), where the accentuated relief prevents the development of excessively weathered soil profiles and in areas underlain by basic rocks of the Karroo system to the northeast of Malange (unit Lg).

For further information on soils, please refer to Annex 3.4.

3.5 VEGETATION

Over the years a number of studies have been made to classify the vegetation of Angola (see Annex 3.5.a). One of the most well known and widely used is the study by Barbosa (1970) which subdivided Angola's vegetation into 32 mapping units (see Figure 4.2). A slightly modified rendition of this vegetation map is reproduced in Figure 3.11.

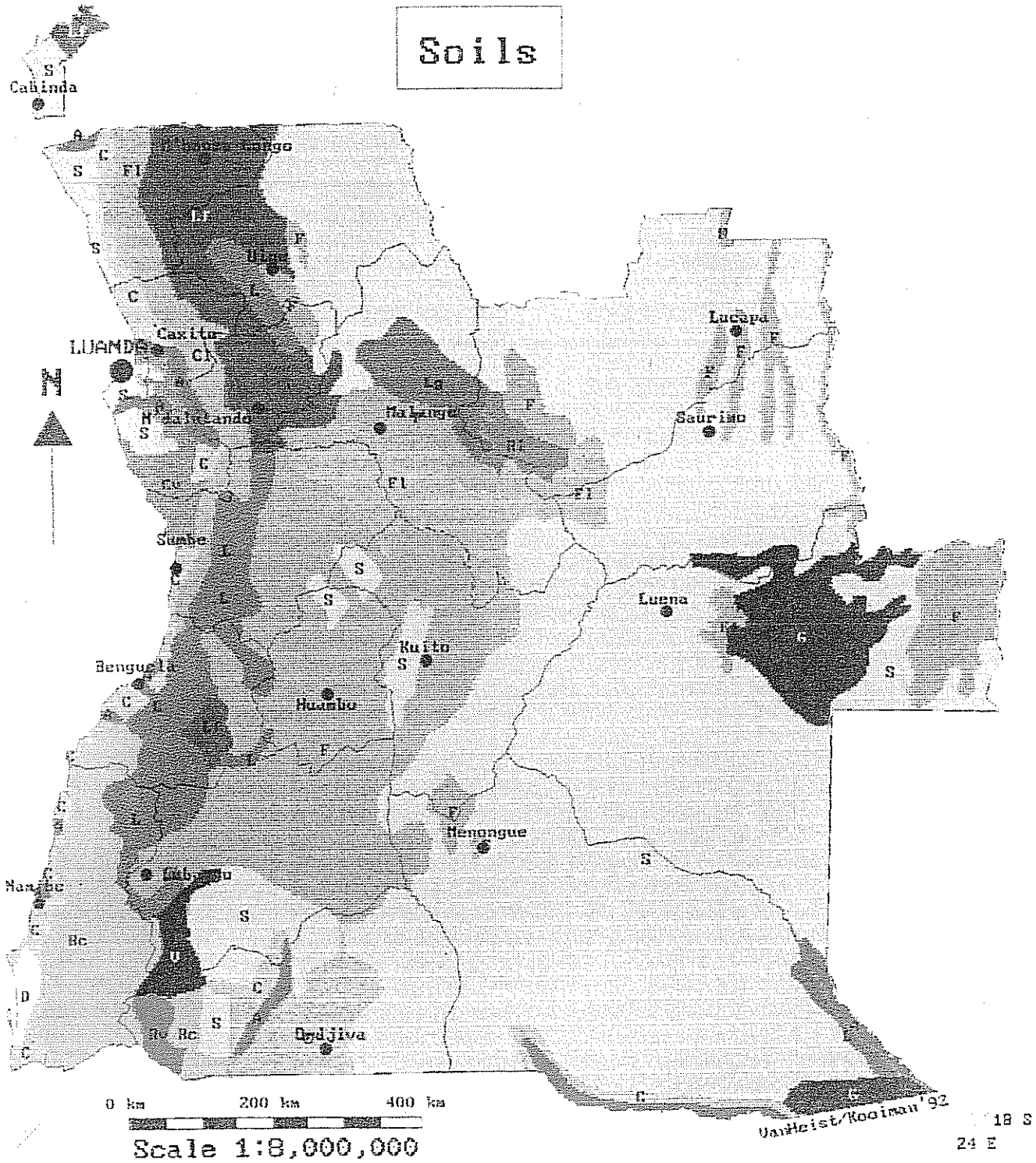
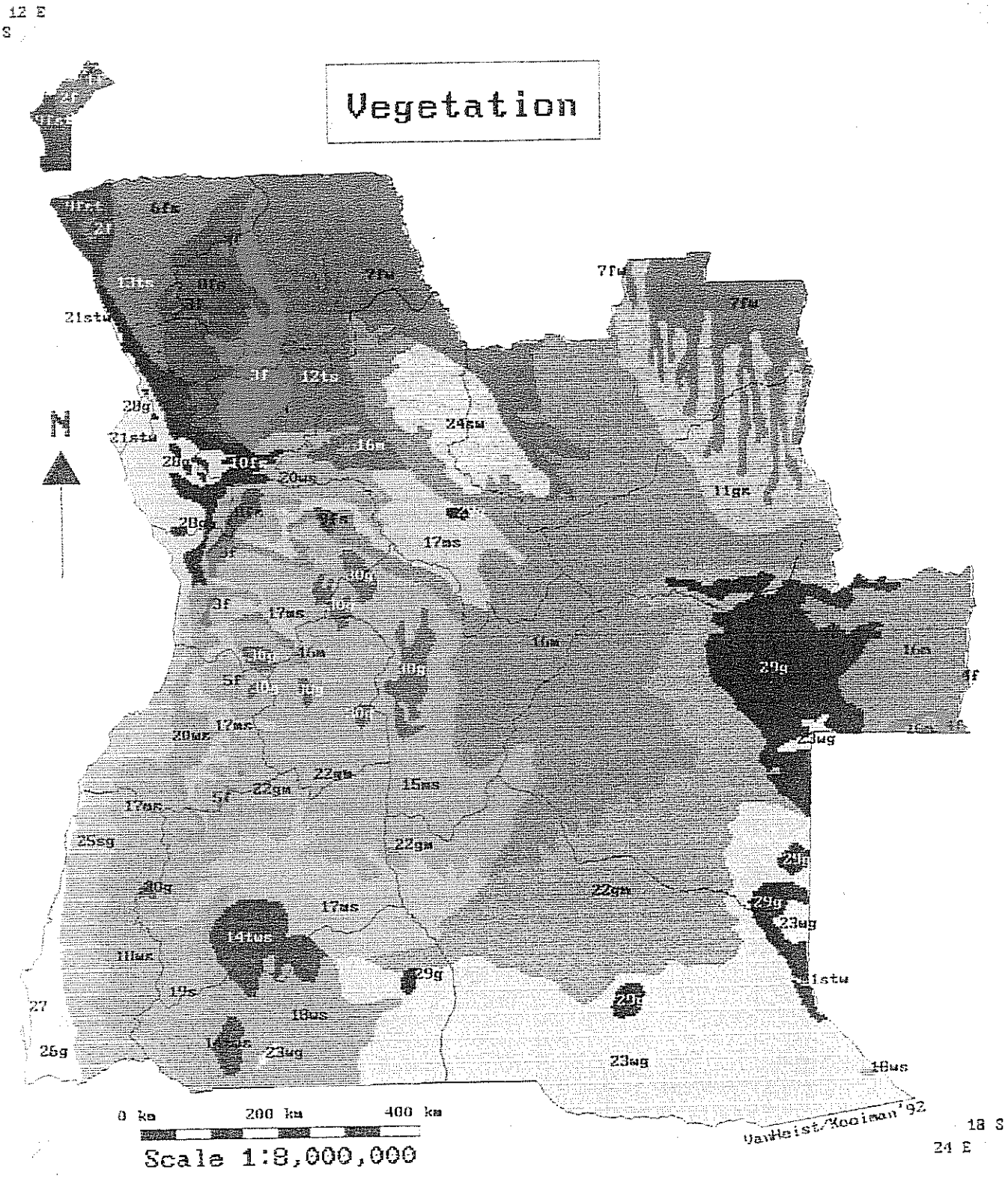


Figure 3.10. Generalized soils map of Angola (adapted from Diniz 1973, 1991; Azevedo et al. 1972.



See report for description of vegetation types

Figure 3.11. Generalized vegetation map of Angola (after Barbosa 1970).

LEGEND

VEGETATION MAP

Adapted from Barbosa (1970)

MAP-UNIT	DESCRIPTION
1F.	Evergreen species-rich fog-dependent tropical forests of low altitude. [*Julbernardia spp., Gilbertiodendrum spp., Tetraberlinia spp., Librevillea spp.*]. Cabinda.
2F.	Semi-deciduous humid forests of low altitudes. [*Gossweilerodendron spp., Oxystigma spp., Pentaclethra spp., Piptadeniastrum spp.*]. NE Zaire, NW Uige.
3F.	Semi-deciduous fog-dependent humid forest, largely. disturbed. [*(Ficus spp., Albizia spp., Morus spp.)* Uige, Cuanza Norte, Cuanza Sul].
4F.	Dense semi-deciduous forest on Kalahari sands. *(Cryptosepalum exfoliatum, Brachystegia, Guibourtia*]. Alto Zambeze.
5F.	Semi-deciduous fog-dependent high altitude forests. [(*Newtonia spp., Bridelia spp., Ficus spp.*]. (High altitude areas in Benguela, Huambo, Huila).
6FS.	Mosaic of: (1) dense humid forest; (2) tall grass savannas. [(1) *Piptadeniastrum africanum, Boschia angolensis,* (2) *Hyparrhenia spp., Andropogon spp., Schyzachyrium spp.*].
7FW.	Mosaic of: (1) dense gallery forests; (2) woodlands; (3) tall grass savannas. [(1) *Xylopia spp., Piptadeniastrum spp.*, (2) *Marquesia spp., Uapaca spp., Pericopsis spp., Dialium spp., Burkea spp.* (3) *Hyparrhenia spp., Andropogon spp., Trachypogon spp.*]. E. Zaire, N. Uige.
8FS.	Mosaic of: (1) vegetation type 3F; and (2) tall grass savannas. [(2) *Hyparrhenia spp., Panicum spp., Paspalum., Erythrina spp., Entadopsis spp., Piliostigma spp.*]. Uige, Cuanza Norte, Cuanza Sul.
9FST.	Mosaic of: (1) ground-water dependent forests and forested swamps; (2) tall grass savanna; (3) shrubland thickets. [(1) *Allanbackia spp., Entandophragma spp., Xylopia spp., Symphonia spp., Mytragine spp., Homalium spp., Cyperus spp., Raphia spp.*; (2) *Hyparrhenia spp., Andropogon spp., Adansonia spp.* (3) *Strychnos spp.,*

Angraecum spp., Sanseveria spp.]. NW Zaire.

10FS. Mosaic of:(1) semi-deciduous and deciduous forests; (2) dry savannas of low altitude. [(1) *Ceiba spp., Bombax spp., Pteleopsis spp., Adansonia spp., Sterculia spp.*, (2) *Heteropogon spp., Hyparrhenia spp., Albizia spp., Piliostigma spp., Combretum spp.*]. NW Bengo, W. Cuanza Sul.

11GS. Mosaic of: (1) imperfectly drained grasslands; (2) savannas; (3) riparian forest clumps, on Kalahari sands. [(1) *Loudetia simplex, Trystachia spp. Landolphia spp.*; (2) *Andropogon spp., Trachypogon*]. Lunda Norte, Lunda Sul.

12TS. Mosaic of: (1) shrub-thickets; (2) tall grass savannas, of mid altitudes. [(1&2) *Anona spp., Combretum spp., Hymenocardia spp., Hyparrhenia spp., Andropogon spp., Panicum spp.*]. SW. Cuanza Norte, W. Malange, N. Cuanza Sul.

13TS. Mosaic of semi-arid: (1) shrub-thickets; (2) savannas; xeric grasslands of low altitude. [(1) *Crossopteryx spp., Adansonia spp., Schmidtia pappophoroides, Heteropogon spp.*]. SE. Zaire, N. Bengo.

14TWS. Mosaic of: (1) tall shrub thicket; (2) woodland; (3) imperfectly drained savannas. [(1) *Croton spp., Combretum spp., Commiphora spp.*; (2) *Baikiaea spp., Brachystegia spp., Julbernardia spp.*, (3) *Themeda spp., Andropogon spp., Heteropogon spp., Hyparrhenia spp.*]. S. Huila.

15MS. Mosaic of: (1) degraded miombo; (2) hyparrhenia savannas. [(1) *Julbernardia spp., Brachystegia spp.*; (2) *Hyparrhenia spp., Andropogon spp.*].

16M. Tall to medium height (10-20m) miombo woodlands of variable density on deep sands. [*Brachystegia spp., Guibourtia spp., Marquesia spp., Julbernardia spp., Pterocarpus spp.*].

17MS. Mosaic of: (1) open miombo woodlands; (2) savannas. [Genus as for 16 and Hyparrhenia savanna].

18WS. Mosaic of: (1) xeric (deciduous) woodland; and (2) xeric savannas. [(1&2) *Colophospermum mopane, Terminalia spp., Commiphora., Boscia spp., Schmidtia spp., Aristida Enneapogon spp.*].

19S. Imperfectly drained Colophospermum shrubland on cracking clays. [*Colophospermum mopane, Dichrostachys*

spp., Acacia kirkii].

20WS. Mosaic of: (1) low growing woodlands (2) tall grass savannas. [(1) *Cochlospermum spp., Terminalia spp., Piliostigma spp. Albizia spp.*].

21STW. Mosaic of: (1) xeric savannas; (2) xeric shrub thickets; (3) Adansonia woodlands. [(1) *Heteropogon spp.; Panicum spp., Digitaria spp., Schmidtia spp.,* (2) *Strychnos spp., Dychrostachys spp., Combretum spp.,* (3) *Adansonia spp., Sterculia spp.*].

22GM. Mosaic of: (1) imperfectly drained grasslands; and (2) miombo woodlands. [(1) *Loudetia simplex, Trachypogon spp. Ctenium spp.*].

23WG. Mosaic of: (1) Baikiaea woodlands; (2) imperfectly drained grasslands. [(1) *Baikiaea plurijuga, Diospyros spp. Combretum spp., Ricinodendron spp.*].

24SW. Mosaic of: (1) tall grass savanna; and (2) Adansonia-Sterculia woodlands on calcareous soils. [(2) *Sterculia spp. Adansonia spp., Marquesia spp. Lannea spp.*].

25SG. Mosaic of: (1) xerophytic shrublands; (2) annual grasslands; (3) dwarf shrubland. [(1,2,3) *Colophospermum spp., Acacia mellifera, Terminalia prunioides, Rhygozum spp., Schimidtia spp., Aristida spp., Welwitschia mirabilis*].

26G. Annual grasslands with patches of Welwitschia. [*Aristida spp., Rhynchelytrum spp.*].

27D. Active dunes

28G. Imperfectly drained grasslands on Kalahari sands. [*Loudetia spp., Eragrostis spp., Tristachya spp.*].

29G. Papyrus swamps.

30G. High altitude imperfectly drained grasslands on acid shallow soils. (*Loudetia spp., Ctenium spp., Eragrostis spp., Myrsine spp., Geigeria spp.*).

Closed canopy evergreen forests (units 1F, 2F, 3F,) occur as the predominant physiognomic type in Cabinda and in the mountains that form the transition from the coastal facies to the interior plateau in the provinces of Uige, Cuanza Norte and Bengo. To the west of these elevated landforms (unit 6FS), in the northern portions of Zaire, Malange and Lunda Norte (unit 7FW) and along the northwestern coast (unit 9FST), closed canopy semi-deciduous forests are found in association with tall grass savannas and/or thickets. Important genus in Cabinda include *Gilletiodendrum spp., Tetraberlinia spp., Julbernadia spp., Librevillea spp., Terminalia spp., Oxystigma spp.* and *Guibourtia spp.* In the transitional mountains (unit 3F) of Uige and Cuanza Norte where the occurrence of fog is a regular climatic feature, the genus *Celtis spp.* and *Morus spp.* become important components of this physiognomic type. In the low lands along the northern regions of the country common genus include *Piptadeniastrum spp., Canarium spp.* and *Marquesia spp.*

Savannas are found throughout most of the country in mosaics with woodlands, thickets and forests. These can be subdivided into two broad groups: (1) a tall grass savanna of humid and sub-humid areas (units 7FW, 8FS, 9FST, 12TS 15MS, 17MS, 20WS, 24SW) and (2) xeric savannas of semi-arid areas (units 10FS, 13TS, 18WS, 21STW)

The tall grass savannas are present in vast areas within the interior plateau and along the northern portions of the country. They are dominated by *Hyparrhenia spp., Andropogon spp., Pennisetum spp.* and *Panicum spp.* These mostly coarse and unpalatable grasses reach well over two metres in height and provide fuel for violent fires that prevent the increase in the density of woody species and the transformation of the tall grass savannas to woodlands or forests. The sparce woody component includes *Hymenocardia spp., Piliostigma spp., Cussonia spp.* and *Erythrina spp.*

The xeric savannas are found in semi-arid and arid areas along the coastal fringe and along the southern portions of the country. In the arid portions of Cunene and Namibe Districts the herbaceous strata is dominated by annual grasses such as *Aristida spp., Enneapogon spp.* and *Schimidtia kalaharensis*. Woody species include *Commiphora spp., Combretum spp., Acacia mellifera, A. kirkii, A. Tortilis, Boscia spp.* and *Colophospermum mopane* among others. In semi-arid areas along the northern coastal fringe, perennial grass species such as *Heteropogon contortus, Schimidtia papophoroides, Eragrostis spp., Digitaria* and *Panicum spp.* are important herbaceous components. The overstorey includes *Adansonia digitata, Strychnos* and *Sterculia spp.*

Woodlands are perhaps the most widespread physiognomic vegetation type in Angola. Several versions of Miombo woodlands occupy nearly 50% of the country (units 15MS, 16M, 17MS, 22GM). They occur primarily in Kalahari sand areas (Figure 3.10) and the

interior plateau. Typical species include *Julbernardia paniculosa, Brachystegia spiciformis, B. floribunda, B. boehmi, Guibourtia coleosperma* and *Marquesia*.

In the sand-covered semi-arid portions of Cuando Cubango, Cunene and Huila, there are extensive areas covered by woodlands and shrublands composed of *Baikiaea plurijuga, Spirostachys africana, Pterocarpus angolensis, Albizia spp.* and *Burkea africana* (units 14TWS, 23WG). In the drier and rockier areas of western Cunene and eastern Namibe, the woodlands are composed of *Commiphora spp., Terminalia spp., Colophospermum spp., Boscia spp.* and *Combretum spp.* with an understorey of annual grasses (units 18WS, 25SG).

Grasslands are found in high altitude areas of the interior plateau in the provinces of Huambo, Bie, Cuanza Sul and Huila often in association with imperfectly drained soils (units 30G). Species common in these high altitude patches include *Parinari spp., Protea spp., Myrsine spp., Dissotis spp., Phillipia spp.* and *Loudetia spp.* In eastern Moxico there is a vast patch (200 X 200 kilometres) of **poorly drained grasslands** (chanas) of which *Loudetia simplex, Trystachia* and *Eragrostis* are important components (unit 28G). Patches of this grassland occur in other riparian areas throughout the kalahari sand plains (unit 22GM). In the northeastern part of Lunda Norte, edaphic grasslands occupy a vast areas in association with patches of riparian forests (unit 11GSF). Xerophytic grasslands dominated by annual grasses such as *Aristida spp.* and *Schmidtia spp.* are found in western Namibe province (unit 28G, 25SG). These intergrade with shrublands composed of *Acacia spp., Colophospermum spp.* and others.

Shrubland thickets are common throughout the country. In the semi-arid coastal fringe they occur in association with savannas and *Adansonia spp. - Sterculia spp.* woodlands (units 21STW, 13TS). Important species of these xerophytic formations include *Strychnos spp., Combretum spp.* and *Dichrostachys*. In the arid and semi-arid regions of southwestern Angola (units 25SG) they are composed of *Acacia spp., Colophospermum spp., Terminalia spp., Boscia spp.* and *Dichrostachys* among others.

Finally, relatively small but ecologically crucial **palustrine vegetation patches** occur within the flood plains of major rivers such as the Cuanza and Luando. Significant **mangrove patches** are also found along the coast.

For further details on Angola's vegetation, please refer to Annex 3.5.a

3.6 MAJOR BIOMES/PROTECTED AREAS

The great range of biomes and ecosystems found in Angola is probably unequalled in any other African state. The term Biome refers to a major biogeographic division and is defined as much on the genetic composition and origin of its component plant and animal species as it is on physiognomic, climatic or edaphic factors. A biome comprises numerous ecosystems. The term ecosystem is used in reference to a particular animal and plant community and its associated physical environment. Ecosystems can be classified according to their physiognomy (forest, woodland or grassland), climate (moist, mesic, arid, temperate, tropical or equatorial) or substrate (marine, freshwater or terrestrial).

A detailed survey of Angolan ecosystems has yet to be undertaken. The preparation of the present preliminary inventory is based on the brief references made to biogeographic features of Angola in the literature (Chapin 1932, Traylor 1963, Barbosa 1970) and on personal experience gained during four years of extensive travels throughout the country during the period 1971/75 (Huntley 1974d).

White's (1983) 'regional centres of endemism' offer the best synthesis of the biological characteristics of Angola within an African context. The major divisions and the percentage area of Angola occupied by them are:

a. **Guineo-congolian:** 10.7% (includes forest, thickets and tall grass savannas);

b. **Zambezian:** 86.2% (includes woodlands, savannas, grasslands and thickets);

c. **Afromontane:** 0.5% (includes forests, savannas and grasslands); and

d. **Karoo-Namib:** 2.6% (includes desert, shrubland, savannas, woodlands and thickets).

These divisions correspond closely to the 'biomes' recognised by Huntley (1974a, b, d) and are useful categories for a general account of the biodiversity of Angola. Transitional zones and mosaics occur at the interfaces of each of these major 'centres of endemism.' These transitional zones are of particular interest along the Angolan escarpment and at the interface between the Guineo-congolian and Zambezian systems in northern Angola.

For further further information on the major features of these biomes, please refer to Annex 3.6.a.

PROTECTED AREAS

The extended history of the establishment of conservation areas in Angola has tended to follow international trends in the definition and classification of such areas, but no formal system has been spelt-out in legislation. The four categories that have been generally recognised are National Park, Strict Nature Reserve, Regional Reserve and Forest Reserve. Other categories, such as Partial Reserve and Public Hunting area (Coutada Publica) have enjoyed limited or no recognition - they have existed on paper, but little else. A revision of the protected area system applied in Angola is needed to bring it into line with current international systems. In particular, a system of zonation within protected areas, from total protection to multiple land use, is appropriate in Angola (Serodio 1992).

It is evident that the clear definition, understanding and respect for the status and significance of all categories of conservation areas is an urgent necessity in Angola. A re-statement of definitions is therefore appropriate at this point.

National Park is defined as an area subject to the direction and control of public authorities, reserved for the protection, conservation and propagation of wild animal life and indigenous vegetation, and furthermore, for the conservation of objects of aesthetic, geological, prehistoric, archaeologic or other scientific interest, for the benefit and enjoyment of the public.

A **Strict Nature Reserve** is an area under the direction and control of public authorities for the total protection of wild fauna and flora.

A **Regional Nature Park** is defined as an area reserved for the protection and conservation of nature, in which hunting, fishing and the collection or destruction of wild animals and plants, and the execution of industrial, commercial or agricultural activities, is prohibited or conditioned.

The lack of legislation for the conservation of **natural monuments** is clearly apparent. Although such areas should preferably fall within the responsibility of a department of the central government, practical and administrative factors support the view that they should be managed by the government of the province in which they occur. In the absence of specific legislation for natural monuments these areas should be conserved as Regional Nature Parks until such time as more suitable legislation is formulated.

Figure 3.12 provides an overview of exisiting National Parks, Strict Nature Reserves, Partial Reserves and Regional Nature Parks.

Figure 3.12

List of National Parks, Strict Nature Reserves, Partial Reserves and Regional Nature Parks of Angola. Centres of endemism follow White (1983); vegetation types according to Barbosa (1970).

NAME	AREA KM²	STATUS	DATE ESTABLISHED	CENTRE OF ENDEMISM	VEGETATION TYPES TYPES
Iona	15 920	National Park	1937	Karoo-Namib	21, 27, 28, 29
Kameia	14 000	National Park	1938	Zambezian	17,31
Kisama	9 960	National Park	1938	Zambezian	11,23,30
Luando	8 280	Strict Nat Res	1938	Zambezian	17,18
Bikuari	7 900	National Park	1938	Zambezian	15,18
Mupa	6 600	National Park	1938	Zambezian	15,18,20
Namibe	4 680	Partial Reserve	1957	Karoo-Namib	27,28
Kangandala	600	National Park	1963	Zambezian	18
Chimalavera	160	Regional Park	1972	Karoo-Namib	27

Description of Existing and Proposed Protected Areas

In the following summaries the name, recommended status, province, approximate area, biome, main ecosystems, animal species of special interest and pertinent remarks are given for each of the conservation areas discussed in this report. An asterisk (*) indicates a proposed new conservation area.

a. National Parks

1. IONA NATIONAL PARK, Namibe province. 15,920 km². Karoo-Namib Biome. Mobile dunes, calcrete plains, perennial inter-montane grasslands, arid montane and arid savanna ecosystems. Black

Rhinoceros, Hartmann's Zebra, Brown Hyaena, Aardwolf, Suricate, Oryx, Springbok, Dik-dik and Black-faced Impala.

Remarks: A development plan for Iona was prepared in 1974 (Huntley 1974c) and can serve as a basis for new proposals. The game populations of this spectacular park were severely reduced during the war. Landmines and the destruction of park infrastructure present major problems. Proposals for a trans-frontier park, linking with Namibia, need to be further formulated.

2. KAMEIA NATIONAL PARK, Moxico province. 14,000 km². Zambezian Biome. Floodplain grassland ecosystem. Tsessebe, Wildebeest, Lechwe and Roan.

Remarks: The brief visit to the border of the Park made during the IUCN mission of July 1992 was unable to examine the situation in the Park, but it is clear that the game animals have been severely reduced if not eliminated. Expanding human populations around the east and northern borders are gradually invading the Park.

3. KISAMA NATIONAL PARK, Luanda province. 9,960 km². Karoo-Namib Biome and Escarpment Zone. Mangrove, floodplain, *Setaria welwitschia* grasslands, dry thicket and gallery forest ecosystems. Elephant, Manatee, Talapoin, Roan, Eland and Red Buffalo.

Remarks: A wide range of information on the park is contained in a series of unpublished reports (Huntley 1972a, b, c, 1973a, b, d). Game populations dramatically reduced during the war. Park infrastructure and staffing in urgent need of rehabilitation. The development of the Luando/Lobito national road through the Park in 1975 has introduced easy access for poachers, developers and picnickers - while the establishment of a major military airbase has resulted in 10,000 people moving into the Cabo Ledo area, previously occupied by not more than 50 oil company workers. The Park is in a critical state, with intensive poaching continuing

in the absence of any effective Park administration. International assistance is urgently needed if it is to be maintained as a National Park.

4. BIKUAR NATIONAL PARK, Huila province. 7,900 km². Karoo-Namib/Zambezian Biome transition. *Baikaiea, Brachystegia* and *Julbernardia* woodland, grassland, dry thicket and riverine ecosystems. Black-faced Impala, Roan, Eland, Blue Wildebeest and Elephant.

Remarks: Game populations dramatically reduced during the war, part of the park used for artillery practise, rehabilitation of infrastructure required. The south-west corner of the Park is being encroached on by commercial farmers, while the north is being invaded by peasant farmers.

8a. MUPA NATIONAL PARK, Cunene province. 6,600 km². Karoo-Namib/Zambesian Biome transition. *Brachystegia, Julbernardia* and *Colophospermum* woodland and savanna ecosystems. Giraffe, Red Hartebeest and Black-faced Impala.

Remarks: Mupa was established as a Reserve in 1938 and raised to national park status in 1964. To the present, no game ranger has ever been posted in the park. Populations probably dramatically reduced during the war, but no recent information available. In 1975, it was recommended that the park be deproclaimed, with a small area of *Colophospermum mopane* forest being retained as a Strict Nature Reserve (cf Mupa RNP, below).

5. KANGANDALA NATIONAL PARK, Malange district. ca 600 km². Zambezian Biome. *Brachystegia* woodland ecosystems. Giant Sable and Roan.

Remarks: The Park was created to protect a small population of Giant Sable found in the vicinity of Kangandala village. Since its creation several other herds of Giant Sable have been found in the area both within and outside the Park limits. In view of the very limited size of the Park, its unnatural limits, its paucity of mammal species and lack of variety of ecosystems, it is recommended that the Park should preferably be administered by the provincial authorities and developed as a Regional Nature Park devoted to photo-safaris with Giant Sable as the obvious attraction.

b. <u>Strict Nature Reserves</u>

6. LUANDO STRICT NATURE RESERVE, Malange province. 8,280 km². Zambezian Biome. Woodland, riverine forest, swamp forest and floodplain grassland ecosystems. Giant Sable, Lechwe, Defassa Waterbuck, Puku, Sitatunga and Oribi.

Remarks: Proposals for the development of this protected area are

provided in Huntley (1972d). The area has not been visited in nearly 17 years and a detailed evaluation of the situation is urgently required. A brief aerial reconnaisance in May 1992 indicated that many of the villages within the Park have been abandoned and the former manoic fields are now overgrown, roads and bridges impassable and the Park infrastructure destroyed. Only three lechwe were observed on the Luando floodplains, which previously had several hundreds.

7. LUIANA STRICT NATURE RESERVE (*), Cuando Cubango province. ca 3,000 km². Zambezian Biome. Deciduous dry woodland and floodplain ecosystems. Elephant, Common Waterbuck, Sable Antelope, Giraffe, Tsessebe, Lechwe and Sitatunga.

Remarks: The ecological conditions of the extreme south eastern corner of Angola are ideal for larger ungulates and the Luiana area contains the largest variety of antelope found anywhere in the country. The area is especially important as it is the only place in Angola in which the Common Waterbuck, *Kobus ellipsiprymnus*, is found and also the only area in the country with Sable Antelope, *Hippotragus niger niger*, Cape Buffalo and Tsessebe, besides 22 other larger mammal species. The area was also one of the last refuges of Giraffe and Black Rhinoceros and before the war, the only area in which White Rhinoceros have previously been recorded in Angola. Luiana may now contain the most important population of elephants in Angola's protected area system. Detailed proposals for the creation of a conservation area in this region, to link as a trans-frontier park with conservation areas in Namibia, Botswana and Zambia, should be formulated.

8. MAIOMBE STRICT NATURE RESERVE (*), Cabinda province. ca 400 km². Guineo-Congolian Biome. Climax tropical rainforest ecosystems. Gorilla, Chimpanzee, Golden Potto, Forest Elephant, Water Chevrotain, Bay Duiker, Black-fronted Duiker, and Giant Pangolin.

Remarks: Proposals for the creation of this Strict Nature Reserve were presented by Huntley (1973c). The importance of this area on both national and international conservation levels cannot be over-stated. The tropical rainforest ecosystem is one of the world's greatest biological wonders and the area selected in Cabinda includes spectacular flora and avifauna and no fewer than 20 species of larger mammal not found in any other conservation area of Angola.

8b. MUPA STRICT NATURE RESERVE (*), Cunene province. ca 150 km². Zambezian Biome. *Colophospermum mopane* woodland ecosystem.

Remarks: The conservation of a small area of the *Colophospermum mopane* ecosystem of this area is desirable.

9. CUANGO STRICT NATURE RESERVE (*), Uige province. ca 100 km². Guineo-Congolian Savanna Biome. Gallery forest ecosystem. Primates, avi-fauna and flora of great biological interest.

Remarks: The fauna and flora of the lower Cuango is very poorly known but studies undertaken in the Zaire Republic indicate that many plants and animals not yet recorded in Angola await discovery in this valley. An ecological survey of the area is required before detailed recommendations can be presented.

10. NAMBA STRICT NATURE RESERVE (*), Cuanza Sul province. ca 100 km². Afromontane Biome. Forest, savanna and grassland ecosystems on the slopes and high country surrounding Mt Namba (2,420 m). Similar endemic avifauna to Mt Môco.

Remarks: The Namba area has several relatively large patches of Afromontane forest and a survey of the region should be undertaken to select a suitable area for a Strict Nature Reserve.

11. SERRA DE NEVE STRICT NATURE RESERVE (*), Namibe province. ca 80 km². Karoo-Namib and Zambezian Biomes. Arid Savanna, woodland and ravine forest ecosystems. Rare endemic avifauna, including White-headed Barbet, *Lybius leucogaster*.

Remarks: This remarkable inselberg, rising abruptly to 2 489 m from the coastal plain, has numerous geological and biological features deserving conservation. A detailed study of its ecology has yet to be undertaken.

12. MONTE MÔCO STRICT NATURE RESERVE (*), Huambo province. ca 60 km². Afromontane biome. *Podocarpus* forest, *Protea* savanna and montane grassland ecosystems. Rare and endemic birds: *Caprimulgus poliocephalus, Heterotrogon vittatus, Viridibucco coryphaca, Pseudoalcippe abyssinicus, Bradypterus mariae, Apalis cinerae, Poliospiza burtoni, Francolinus swierstrai, Xenocopsychus anzorgei* and *Ploceus nigrimentum*.

Remarks: The tremendous scientific importance of the relic montane forests of Huambo and Huila provinces has been referred to earlier in this study. The rare and endemic birds, plants and insects found in the Môco forest community have ranges extending from the Cape through the Zimbabwe, Moçambique and Tanzanian highlands to Ethiopia and westwards to the Congo, Cameroons, Fernando Po, Sao Tomé and the Angolan plateau. The few remaining patches of the biome are rapidly shrinking due to clearing, logging and burning. If the current trends are not reversed, the entire forest ecosystem will disappear and with it, its constituent fauna.

13. GABELA STRICT NATURE RESERVE (*), Cuanza Sul province. ca 50 km². Escarpment Zone. Transition forest ecosystem. Endemic birds - *Prinops gabela* and *Sheppardia gabela*.

Remarks: A representative sample of the Escarpment Zone transition forest occurring in the Gabela area should be established as a Strict Nature Reserve for the conservation of its unique avifauna. At least two species of birds are known only from these forests while several sub-species are peculiar to the region. A detailed study of this forest as well as those in the Chongoroi, Vila Novo do Seles and Serra de Neve areas is required to provide an ecological basis to the formulation of a plan for their conservation. A preliminary study has been undertaken (August/September 1992) by the International Council for Bird Preservation (ICBP) and this area is estimated to be one of the most important centres of endemicism in Africa for birds.

14. CHONGOROI STRICT NATURE RESERVE (*), Huila district. ca 20 km². Escarpment Zone. Endemic birds - *Macrosphenus pulitzeri, Lybius leucogaster.*

Remarks: The conservation of a small sample of the biogeographically important escarpment forests is desirable in view of their rapid destruction by agricultural activities.

15. ILHA DOS PASSAROS STRICT NATURE RESERVE (*), Luanda district. ca 10 km². Mangrove ecosystem. Nesting colonies of numerous species of herons, egrets, ibis and waterfowl.

Remarks: The existence of a very important nesting colony of a great variety of birds within 10 km of Luanda is of considerable scientific and educational interest. The mangrove ecosystem of the islands is not represented in the mangrove communities of Barra do Cuanza in Kisama National Park and their botanical interest alone justifies the islands' proclamation as a Strict Nature Reserve.

c. <u>Regional Nature Parks</u>

16. NAMIBE REGIONAL NATURE PARK, Namibe province. 4,684 km². Karoo-Namib Biome. Sub-desert grasslands, shrubland and arid savanna ecosystems. Hartmann's Zebra, Oryx and Springbok.

Remarks: The administration of Namibe Partial Reserve is an unnecessary extension of the IDF's responsibilities which are adequately fulfilled in terms of the region's ecosystems by Iona National Park. The Reserve should be reclassified as a Regional Park to be administered by the Namibe government and developed as an area for mass tourist as opposed to low intensity tourism recommended for Iona.

17. CUELEI REGIONAL NATURE PARK (*), Cuando Cubango province. ca 4,500 km². Zambezian Biome transition. Brachystegia woodland, dry thicket and riverine ecosystems. Defassa Waterbuck, Roan, Eland, Kudu, Reedbuck and Oribi.

Remarks: This area had one of the highest densities of ungulates to be found in Angola, besides magnificent scenery along the course of the Cuelei river. The area is of particular importance to conservation because of its abundant Defassa Waterbuck and Oribi, two species which are very rare in other conservation areas. Current situation unknown.

18. LUIA REGIONAL NATURE PARK (*), Lunda Norte province. ca 1,500 km². Guineo-Congolian/Zambezian Biome transition. Gallery forest, *Cryptosepalum* woodland, *Brachystegia* woodland and grassland ecosystems. Puku, Roan, Reedbuck and Colobus Monkey.

Remarks: Puku is one of the rarest mammals found in Angola and a conservation area is required that will provide for its future. The Luia valley in eastern Lunda Norte province is reported to have a good population of Puku in addition to several other species typical of the district. An ecological survey of this and several other river valleys in the Lunda Norte province is urgently required to select a suitable area for the creation of a Regional Nature Park for both conservation and tourism objectives.

19. CARUMBO REGIONAL NATURE PARK, Lunda Norte province. ca 1,500 km². Guineo-Congolian/Zambezian Biome transition. Gallery forests, swamp forests, wetlands, *Brachystegia* woodland and grassland ecosystems. Roan, Puku, Hippopotamus, Reedbuck and Colobus Monkey.

Remarks: Angola has very few large inland lakes. Lagoa Carumbo is probably the largest, least disturbed and biologically richest lake in the country. It lies in the centre of a rich diversity of landscapes in an area with very low population density. A survey of this area, with recommendations on the definition of boundaries, is an urgent need.

20. CUTATO REGIONAL NATURE PARK (*), Huambo and Bié districts. ca 300 km². Zambezian Biome. *Brachystegia* woodland and grassland ecosystems. Oribi, Reedbuck, Roan, Sitatunga and Lechwe.

Remarks: The rapid disappearance of larger mammals from the Angolan highlands during the last half century will soon culminate in the complete extinction of the once-rich planalto fauna. The scientific, educational and recreational importance of establishing a conservation area in a representative example of the planalto ecosystem needs no explanation. A very suitable location, along the Cutato-dos-Guelengues river south of Chinhama, despite the present paucity of game in the area, includes habitat considered excellent for a wide variety of species including Eland, Sitatunga, Bushbuck, Roan, Defassa Waterbuck, Lechwe, Reedbuck, Common Duiker, Oribi and Steenbok.

21. RUACANA REGIONAL NATURE PARK (*), Cunene province. ca 200 km². Zambezian Biome. *Colophospermum mopane* savanna woodland and riverine woodland ecosystems. Black-faced Impala, Kudu, Dik-dik and Klipspringer.

Remarks: This Park could be stocked with game species typical of the Biome. Burchell's and Hartmann's Zebras, Giraffe, Eland, Kudu, Oryx, Red Hartebeest, Black-faced Impala, Springbok, Leopard and Cheetah are all species which could be kept in the Park in small numbers. The capture and translocation of nucleus herds of these species to the Park and their subsequent management is a task requiring great expertise and could only be successfully executed by a professional wildlife biologist.

22. CHIMALAVERA REGIONAL NATURE PARK (*), Benguela province. 160 km². Karoo-Namib Biome. Arid savanna ecosystem. Hartmann's Zebra, Dik-dik, Kudu and Springbok.

Remarks: The Park could constitute a good example of arid savanna ecosystem in which it lies and will provide ideal conditions for tourist utilization from Benguela and Lobito. Oryx and Ostrich are two animal species which should be re-introduced once conditions permit.

23. TUNDAVALA REGIONAL NATURE PARK (*), Huila province. ca 40 km². Afromontane biome. *Podocarpus* ravine thicket, *Protea* savanna, montane grassland ecosystems. Rare and endemic birds - *Xenocopsycos ansorgei, Francolinus swierstrai*.

Remarks: The magnificent scenery of Tundavala is one of the best known tourist attractions of southern Angola and the Gorge IS one of the country's most impressive natural monuments. Unfortunately the scenery of this area has been attacked by vandals and graffiti artists. Unless the whole Tundavala-Ruinas-Cascadas complex is actively conserved, it will not be long before the area's unique values are destroyed. The region has very important scientific values in addition to its aesthetic interest and it is recommended that a Regional Park be proclaimed which would include the entire complex. The tourist interest of the Park would be increased if a suitable area was fenced and stocked with game species indigenous to the area. Such species include Burchell's Zebra, Eland, Reedbuck, Oribi, Duiker and Roan antelope.

24. LUACHIMO REGIONAL NATURE PARK (*), Lunda North province. ca 20 km². Guineo-Congolian/Zambezian Biomes. Gallery forest ecosystem. Colobus, Brazza's and Greater White-nosed Monkeys, Yellow-backed and Black-fronted Duiker, Long-snouted Crocodile and Hippopotamus.

Remarks: The unusually rich fauna and flora of the gallery forests of the Lunda Norte province are not protected in any

conservation area. Several of the animals found in these forests and their associated rivers are threatened with extinction in Angola and require special conservation action - in particular the future of Colobus Monkey and Long-snouted Crocodile is cause for serious concern. An ecological survey should be made of the Luachimo valley in the vicinity of Dunda in order that a representative sample of the gallery forest and adjoining savanna could be selected for proclamation as a Regional Park. If possible the area selected should include suitable habitat for stocking with species indigenous to the area such as Roan, Reedbuck, Eland, Defassa Waterbuck and Red Buffalo.

d. Natural Monuments

25. TALA MUNGONGO NATURAL MONUMENT (*), Malange province. ca 30 km². Escarpment forests. Woodland and thicket ecosystems. Rare avi-fauna.

Remarks: This magnificent escarpment area is of very great aesthetic as well as biogeographic interest, as it forms one of the main migratory routes of Guineo-Congolian Biome elements into the Zambezian Biome.

26. QUEDAS DO CALANDULA (*), 28. DALA, 29. SALTO DO CAVALO, 30. CUTATO, 31. LUANDO and 32. BINGA NATURAL MONUMENTS. The surroundings of all these waterfalls should be protected against the activities of vandals and opportunists by their integration within conservation areas as is the custom with such natural monuments in most countries. Surveys of all of these sites are required before detailed proposals can be made.

33. PUNGO ANDONGO (*), 34. ALTO HAMA, 35. MONTE BELO NATURAL MONUMENTS. In common with waterfalls, geological monuments such as these vast rock outcrops should also be protected against the undesirable activities of humans.

For information on large mammal biodiversity in Angola please refer to Annex 4.2.a and Annex 3.6a for descriptions of Angolan Biomes and biodiversity.

4. KEY ISSUES, PRIORITIES AND RECOMMENDATIONS

4. KEY ISSUES, PRIORITIES AND RECOMMENDATIONS

Whatever economic recovery strategy, the new government and the private sector in Angola pursue, it will be dependent on natural resources. While the most dramatic income sources for government and the private sector will continue to be non-renewable natural resources such as petroleum and diamonds; the great majority of the population will be dependent on agriculture, forestry and fishing for their livelihoods. Many of these activities, as they have traditionally been carried out, use environmentally sound methods and technology. The challenge is to modernize and make these natural-resource based production systems more effective, while using the store of traditional knowledge as to carrying capacity and natural regeneration (see sections 4.3 on forestry and 4.4 on agriculture for additional details).

Using these natural resources wisely and improving the health conditions of the urban population are the major sustainable development issues in Angola. These issues, then, form the core of a survival strategy for the majority of the population and a growth strategy for the country as a whole. They deserve a higher priority in government planning and in the political arena than they currently receive, as sustainable development is so far viewed as an abstract, foreign preoccupation and environmental issues have been confined to the realm of the national parks.

There are two fundamental, underlying trends which pose a serious threat to the sustainable use of natural resources in Angola. **The first is the threat of massive and uncontrolled exploitation of Angola's natural resources** by mainly foreign capital which could start as soon as stability has returned; thus within a very short time. The need for strict foreign investment laws is discussed below, but the drafting of such legislation takes time. Unless some minimal precautions (i.e. introduction of environmental monitoring and/or making concessions subject to approved environmental impact analyses) are taken immediately, the impact on the country's natural resource base could be disasterous.

The extent to which the **extraction of mineral resources and petroleum** is damaging the environment, while observable, has yet to be quantified.

Much of the **industrial and processing capacity** that Angola had in 1975 has been standing idle due to the exodus of skilled Portuguese labor and the disruptions of the war. Now that the economic climate is changing, many of these facilities are being rehabilitated with no thought being given to "environmentally friendly" technology.

The government is currently positive towards measures which would attract capital investment to the agricultural sector. In this

context, the land use policy which is emerging now, favoring large-scale production units, will lead not only to greater economic inequality but will also have serious negative environmental effects.

The second major underlying trend has to do with the environmental impact of the large-scale population movements back into rural areas. This is expected to take place in the very near future (or which has in fact, already begun). According to conservative estimates 15 to 20 % or even more of the country's total population may be or is already involved in such a process. Unless resettlement and land tenure policies take into account the ecological limits of the various ecosystems, the environmental impact of such movements could be disasterous in a short term.

This is already visible in terms of the **land degradation** which has resulted due to the initial displacement of the refugees to the urban and peri-urban areas. While this problem is only acute in the coastal zone near urban centers, large areas of land are currently being stripped of forest and vegetation cover due to the use of fire as an agricultural land preparation and hunting tool, and for charcoal production. This damage will multiply dramatically with a large-scale, unplanned movement of the population back to the rural areas.

Here international donors can play a key role, as they support financially and logistically a large part of these operations. Immediate attention should be given to define in quantitative terms (of maximum "carrying capacity" or maximum population density) the relative use-limits of different ecosystems and draw precise maps in this sense that could serve as a guide to such resettlement. This will not prevent damage, as much of the movements will probably be spontaneous and uncontrolled, but would help to limit it. An appropriate policy of incentives could be devised in addition, to attempt to steer such spontaneous movements of people.

In the short run, **urban environmental problems** are the most serious (in terms of percentage of the population directly affected) and visible of the environmental problems Angola is currently facing. This is especially true of those urban areas located on the coast. Equally dramatic, but far less visible, is the **decimation of a once abundant wildlife.** This Chapter provides an analysis of the key issues and provides a series of recommendations for short and medium term action.

4.1. THE URBAN ENVIRONMENT

The urban environment is a focal point for a variety of environmental problems which are a function of the concentration of population, the inadequate infrastructure which characterize urban centers (see Figure 2.2) and the disruptive effects of war which

have determined pattens of urban development. According to INE (1987) an estimated 37% of Angola's population lived in urban areas in 1990 - projected to increase to 48% by the year 2000 (in 1970 only 15% of the population lived in urban areas).

While there are a number of important urban centers in Angola including (Huambo, Benguela, Lubango, Lobito, Malanje and Namibe; see Figure 2.2 for a visual representation of population concentration by numicipality), the problems of the urban environment are most acute and most visible in the capital city of Luanda. No reliable data could be obtained by the team on pollution, waste management, hazardous wastes etc. However, an hour long drive through Luanda is sufficient to observe that Luanda's system of urban waste and pollution management has virtually collapsed. The following provides an overview of observed issues and critical conditions:

i) **Rapid and unplanned settlements** (musseques) for more than a million people have created a city with virtually no sanitation facilities, sewage system and refuse collection.

ii) **Limited investment and grossly inadequate maintenance** in public utilities has led to a virtual collapse of public utilities (while in theory an estimated 20% of the population has water connections and 67% have access to public fountains, these figures represent a gross overestimate).

iii) Only 13% of Luanda's urban population is estimated to have sewage **connections** and 16% has septic tanks - and much of this infrastructure is in a serious state of disrepair.

iv) **Solid waste collections** is sporadic at the best of times and non-existent in many of the 'messeque' settlements. Untreated garbage dumped on open ground (streets, parks etc) is prevalent in most parks of the city.

v) The situation regarding the **disposal of industrial effluents and solid waste** is critical. At one of the public waste disposal sites, untreated waste from a hospital was seen to be unloaded at a site where hundreds of people scavenge for food and reusable materials.

vi) **Marine pollution** in the vicinity of major cities has in some cases reached toxic levels - the Bay of Luanda is one example where untreated industrial wastes are being pumped into the bay, ships are washing out bilges and painting walls with anti-corrosive and molluscidal paints and storm water drains are discharging contaminated human waste. This has resulted in bacterial contamination and pollution with high levels of hydrocarbon, heavy metals and

molluscidal components. (see section 4.6 for a more detailed description of these issues in the major cities along the coast).

There are several reasons why it is imperative to begin to deal constructively with these problems:

a. Public health in most cities is seriously affected by the lack of sewage and waste treatment, and the poor quality of potable water and household electricity supply. (It is estimated that at least one in five children die before the age of five and the average Angolan life expectancy is 44 years, making it one of the lowest in the world).

b. Food supply to the city and employment in the fishing sector is seriously threatened by the level of water pollution in the coastal waters near major settlements.

c. Luanda and the provincial capitals serve as a role models for other urban areas in the country and are the most visible example for central decision-makers. The urban environmental problems are more directly related to the everyday survival of a broad segment of the population than are other environmental concerns, such as endangered species. A good entry point for environmental education on a massive scale would be in programmes to solve the health problems created by lack of waste management. Pollution which kills the primary source of protein in the diet of the average inhabitant of Luanda generates a degree of interest and participation which could be the momentum for a broader environmental awareness on the part of the general public.

d. Luanda serves as an entry point for technical assistance and donor attention, making donor-assisted environmental projects easier to implement.

Recommended Actions

Government and donor agencies need to address the issue of urban environmental problems with the utmost urgency, transcending environmental issues to include basic needs and survival considerations. Ideally, an action plan for urban rehabilitation should be developed which address:

- public health issues,
- infrastructure rehabilitation (water, sewage, refuse collection etc),
- urban waste management systems and contracts,

- public utilities rehabilitation and management,
- clean up operations for critical hazardous waste/pollution sites (e.g. waste dumps, bays and restinges, ports etc), and
- public awareness and NGO support programmes, including educational campaigns and co-funding schemes for neighbourhood initiatives (e.g. clean up, tree plantations etc).

Clearly an urban rehabilitation programme will take years to begin to reverse the current situation. Nevertheless, short term improvements could have a major impact as well as create urgently needed employment for the hundreds of thousands of unemployed city dwellers. However, there is a need for developing creative solutions to overcome the constraints of a slow-moving Government administration. Self-interest and individual initiative represent a major asset for urban rehabilitation. The Government and donors should seek to identify schemes whereby NGO's and neighbourhood committees could be supported with equipment and small funds to undertake programmes for their particular areas/neighbourhood, thereby, greatly enhancing the capacity for rapid and visible improvements.

4.2. THREATS TO BIODIVERSITY/WILDLIFE CONSERVATION

"Recent advances in biotechnology have pointed out the likely potential for agriculture, health and welfare and for environmental purposes of the genetic material contained in plants, animals and microorganisms. At the same time, it is particularly important in this context that States have the sovereign right to exploit their own biological resources pursuant to their environmental policies, as well as the responsibility to conserve their biological resources sustainably ..."

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What is Biodiversity?

Biodiversity is the term used to describe the total variety of living organisms - plants, animals, fungi, microbes - and the diversity of communities, ecosystems and biomes - found on our planet. Biologists usually consider biodiversity at three levels of complexity - genetic diversity, species diversity and ecosystem diversity.

Thus although the web of life is inextricably woven together into communities, ecosystem and biomes, life itself is not a continuum. It is separated into species, populations, and individuals, each with its own genetic content. This variation in

genetic constitution and the barriers between species, form the basis of biodiversity. It is most simply measured as numbers of species per unit area.

Why Should Biodiversity be Conserved?

Our essential goods and services depend on this variety and variability of genes, species, and ecosystems. We depend on biological resources to feed and clothe us and provide housing, medicines and spiritual welfare. The ecosystems of forests, savannas, deserts, lakes and seas, farmers' fields and gardens contain most of the world's biodiversity. Smaller, but significant quantities, are found in gene banks, botanical gardens and zoos.

The number of species in the world is estimated as between 10 and 30 million, but species are disappearing at the alarming rate of several dozen every day, mainly as a result of human activity. This represents a serious threat to human development because the greater the genetic variability (biodiversity) available, the greater the opportunities for adaptation and resilience in the face of climate and other environmental changes.

A new dimension has been added to the value of biodiversity in recent years with the growth in biotechnology. This is a set of techniques which allow specific man-made changes to be made in the genetic material of plants, animals and micro-organisms, leading to the increased availability of food and the protection of the environment. But the promises of biotechnology are essentially dependent on the biodiversity that has evolved over millions of years. Every loss in biodiversity, every species extinction, is not only an intrinsic loss to its own ecosystem, but also a loss of future potential use to humans.

Why Should Angola Conserve its Biodiversity?

Angola's extremely rich biodiversity is both its own national capital asset, over which it has sovereign right, but also part of the world's natural resource heritage. Its value to Angola, if properly conserved and exploited, is in its potential to feed, clothe, house and provide physical and spiritual wellbeing for this and future generations, as well as providing the basis for eco-tourism and systematic and ecological studies of life.

Angola's exceptional biodiversity is due to a number of factors: its size (1,267 million km²); its intertropical geographical position (from 4° 20'S to 18° 02'S and 11° 4'E to 24° 5'E); its range in altitude from sea level to peaks rising to 2,620 m. The resultant diversity of the climate, combined with equally variable geological and soil formations, have resulted in

bioclimatic zones ranging from dense rain forests to vegetationless desert.

This range of habitats supports a high level of biodiversity (Stuart, Adams and Jenkins 1990). Of the estimated 5,000 species of plants thought to occur in the country (excluding the Cabinda Enclave) 1,260 are endemic - making Angola the second richest country in Africa for plant endemics. The mammal diversity is also one of the richest in the continent with 275 species recorded including the endemic Giant Sable *Hippotragus niger variani* and Black-nosed Monkey *Cercopithecus ascanius atrinasus*. Angola is the only range state (IDF and Anstey, 1991) to contain 2 subspecies of elephant (Bush Elephant *Loxodonta africana africana* and Forest Elephant *L. a. cyclotis*) plus the Desert Elephant (an ecotype of *L. a. africana*). The avifauna is diverse (872 species listed) with the forests of the escarpment (Gabela) and montane areas being of international importance for bird conservation (Collar and Stuart 1988).

For further details of Angolan biodiversity please refer to Annex 3.6a and Annex 4.2a.

However, the living conditions of the majority of Angolans are so difficult and precarious that we should rightly ask ourselves, "what are the benefits of biodiversity for Angola"? Should biodiversity in this country be considered as little more than the academic cataloging of plants, animals and micro-organisms? If this were the case, we may expect little interest in it within the country, apart from that of a few individuals in research institutions and some dedicated naturalists. Perhaps **the most compelling arguement for the conservation of biodiversity in Angola is its social relevance - the integrated management of wildlife resources for the benefit of rural development.**

The potential for wildlife utilization programmes in Angola to contribute to rural development and human welfare is as high as anywhere else in Africa with Angola having a wildlife estate that is in excess of 300,00 km^2 in area (larger than that of any other southern African state).

International interest in Angola's extraordinary biodiversity may be gauged by the number of proposals that have been received from research institutions since the peace agreement of 31 May 1991. In the field of plant diversity alone, institutions in Portugal, Great Britain, Sweden, USA, Belgium and South Africa have made proposals to explore and collect in Angola.

The conservation of biodiversity can bring long- and short-term and specific and general benefits to the country and its people.

Biodiversity should be considered as great a potential national asset as is diamonds or oil. This wealth is generally unrecognised within the country, despit the fact that the majority of rural Angolans have been highly dependent on wildlife for meat protein and other products during the past 20 years of conflict. The returns and benefits from biodiversity are longer term and in Angola's case it is largely unstudied and, at present, quite unmanaged. It requires the most urgent attention, appraisal and enforced protective legislation for its conservation and future sustainable use. The biodiversity of local crops and their wild relatives, medicinal plants, tree species and plant and animal species in general, should contribute to Angola's food self-sufficiency, local pharmaceutical and other industries, construction materials and eco-tourism. The importance of indigenous plants as the basis of traditional medicines, which are used by over 80 percent of the people of sub-Saharan Africa, cannot be over-emphasised.

Vegetation Conservation Status

Conservation of representative examples of Angola's rich diversity of vegetation types can best be achieved in the national parks and reserves which fall under the control of the Instituto de Desenvolvimento Florestal. These conservation areas total over 68,000 km² (Figure 4.1) yet very few were free from serious disturbing factors, even in 1975. In some cases, the intensity of these disturbances has reduced due to the collapse of agricultural and mining activities and in general the state of the vegetation of nearly all protected areas of Angola has improved considerably since independence.

From Figure 4.3, it will be noted that only the Karoo-Namib and Zambezian biomes are represented in existing conservation areas. This situation is a direct consequence of the policy of creating national parks and reserves for the sole or primary object of protecting certain large mammal species, neglecting biologically unique ecosystems possessing less spectacular faunas. This policy should be revised and attempts made to proclaim conservation areas in all major ecosystems. The percentage of each major type of vegetation falling within existing conservation areas was determined. The results (Figure 4.2; also refer to Figure 3.11) illustrate the very uneven protection provided Angolan vegetation types.

Of the 32 vegetation types described by Barbosa (1970), only 11 are represented within existing conservation areas. The disparity of protection afforded the major biogeographic divisions is alarming. The **Karoo-Namib**, represented by vegetation types 27, 28 and 29 which occupy 2,6% of the country's land surface, has 50,6% of its cover conserved, while the **Guineo-Congolian**, comprising 10,7% of Angola's total area, is unrepresented in any

conservation area. The relic Afromontane *Podocarpus* Forests, without doubt the most seriously threatened of all ecosystems in Angola, are also without protection. It is therefore evident that current conservation efforts should be directed towards the creation of parks and reserves within examples of these two biomes.

The establishment of a Strict Nature Reserve in the Maiombe **Forest of Cabinda** is a high priority. Detailed proposals for the proclamation of the reserve (Huntley 1973c) have not yet been implemented. When established, the reserve will provide for the conservation of examples of Barbosa's vegetation types 1 and 2 which are the most typical representatives of the Guineo-Congolian centre in Angola.

Further reserves in examples of this biome need to be identified in the Cuango, Luachimo and Luia valleys and in the Gabela mountains. These areas include Barbosa's types 3, 8 and 12. The survey and selection of suitable conservation areas in types 5, 7, 9, 10 and 14 (all of Guineo-Congolian affinities) is still needed.

Interest in the relic **Afromontane forests** of Môco and Namba was first stimulated by the discovery of their rare and endemic avifaunas nearly sixty years ago. Unfortunately very little attention has been paid to these areas by botanists and the status of the remaining forest patches is rapidly deteriorating due to excessive burning and felling. Proposals for the creation of a Strict Nature Reserve at Mount Môco and a Regional Nature Park at Tundavala are needed. These areas will conserve examples of vegetation types 6 and 32.

The vegetation types of the **Zambezian biome** are reasonably well conserved. Of the 24 types which include Zambezian constituents, nine are presently conserved while five of the remaining types fall within proposed reserves and natural monuments proposed later in this study. The eight vegetation types which have not yet been studied include several (4, 5, 19) with important faunal communities besides their phytogeographic interest, and deserve priority treatment.

The extremely favourable conservation status of the **Karoo-Namib** vegetation types of Angola has been noted above. The **Angolan Namib** (type 29) falls wholly within the limits of Parque Nacional de Iona, while 74% of type 28 falls within this Park and the Reserve Parcial de Namibe. Vegetation type 27, which has both Karoo-Namib and Zambezian affinities is also well protected in these conservation areas and in the Reserva Regional da Chimalavera.

The **maritime** and **estuarine ecosystems** of Angola are in need of detailed study before proposals can be made for their

conservation. Mangrove systems are offered protection in Parque Nacional da Kisama (Rio Cuanza and Rio Longa) but the richest inter-tidal communities apparently fall outside the limits of this Park and Iona, whose combined sea shores total over 270 km.

Protected Areas

Seventeen years of civil war, with troop movements through national parks, uncontrolled hunting and the paralysis of government park administration have left the system of National Parks and reserves in a shambles. This in a country with a uniquely rich biodiversity and an undeveloped tourism potential.

National Parks and Reserves were first established in Angola in the 1930s, following the London Convention of 1933, when colonial powers met to consider ways of protecting the extremely rich wildlife of their African territories. In Angola, most of the protected areas were established in remote regions of little agricultural or economic value at that time, but with good large mammal populations (see Figure 4.1 and 4.2). The intention, even in the 1930s, was that these areas would serve to preserve Africa's fauna, while also offering opportunities for game viewing, even hunting, to the privileged minority of the colonial administration. For many Africans, national parks and reserves became symbols of privilege and oppression.

The many benefits that conservation areas can offer African states have never been experienced in Angola. Despite the attempts by the Portuguese government to develop Angola's national parks for tourist use in the early 1970s, little had been achieved by the time of independence. Even Kisama National Park, with its hutted camp at Kaue, attracted less than two or three thousand visitors a year, even though it was only two hours' drive from Luanda, and possessed healthy populations of roan, eland, red buffalo, elephant, reedbuck, harnessed bushbuck, hippo etc, plus spectacular scenery. Few of the local villagers benefitted from the park, while many were subject to difficulties of transport, health, education and other social services due to their location within the one million hectare park.

It is therefore understandable that after independence the national park infrastructure collapsed, and all protected areas were invaded by huge numbers of hunters. IDF as the management authority for protected areas was severely constrained in countering these developments (IDF and Anstey 1991) by a serious lack of staff (less than 40 field staff for 80,000 sqkm of protected areas), funds (a recurrent field budget of less than $20,000/year) and equipment (no field equipment, no firearms, no vehicles). The Angolan people have not experienced, first hand, the great potential of the country's protected area system. Yet despite the critical state of most of the parks and reserves, the

potential remains and an active programme for the drafting of development plans for each area, prepared with strong participation by the local communities, is needed. The benefits, both short and long term, of properly managed conservation areas will need to be demonstrated through examples from other African states.

Figure 4.1

List of Existing and Proposed Protected Areas

Name and recommended classification	area km²	biome
1. Iona NP	15 920	Karoo-Namib
2. Kameia NP	14 000	Zambezian
3. Kisama NP	9 960	Karoo-Namib/Escarpment Zone
4. Luando NP	8 280	Zambezian
5. Bikuar NP	7 900	Karoo-Namib/Zambezian
Mupa NP	6 600	Karoo-Namib/Zambezian
6. * Luiana SNR	3 000	Zambezian
7. * Maiombe SNR	400	Guineo-Congolian
8. * Mupa SNR	150	Zambezian
9. * Cuango SNR	100	Guineo-Congolian
10. * Namba SNR	100	Afromontane
11. * Serra de Neve SNR	80	Karoo-Namib/Zambezian
12. * Monte Môco	60	Afromontane
13. * Gabelo SNR	50	Escarpment Zone
14. * Chongoroi SNR	20	Escarpment Zone
15. * Ilha dos Passaros SNR	10	-
16. Namibe RNP	4 684	Karoo-Namib
17. * Cuelei RNP	4 500	Zambezian
18. * Luia RNP	1 500	Guineo-Congolian/Zambezian
19. Carumbo RNP	1 500	Guineo-Congolian/Zambezian
20. Kangandala RNP	600	Zambezian
21. * Cutato RNP	300	Zambezian
22. * Ruacana RNP	200	Zambezian
23. Chimalavera RNP	160	Karoo-Namib
24. * Tundavala RNP	40	Afromontane/Zambezian
25. * Luachimo RNP	20	Guineo-Congolian/Zambezian
26. * Tala Mungongo NM	30	Guineo-Congolian/Zambezian
27. * Quedas do Calandula NM	10	Guineo-Congolian/Zambezian
28. * Dala NM	10	Zambezian
29. * Salto do Cavalo NM	10	Zambezian
30. * Cutato NM	10	Zambezian
31. * Luando NM	10	Zambezian
32. * Binga NM	10	Zambezian
33. * Pungo Andongo NM	20	Zambezian
34. * Alto Hama NM	20	Zambezian
35. * Monte Belo NM	10	Zambezian

NP = National Park
SNR = Strict Nature Reserve
RNP = Regional Nature Park
NM = Natural Monument

* indicates a proposed new conservation area.

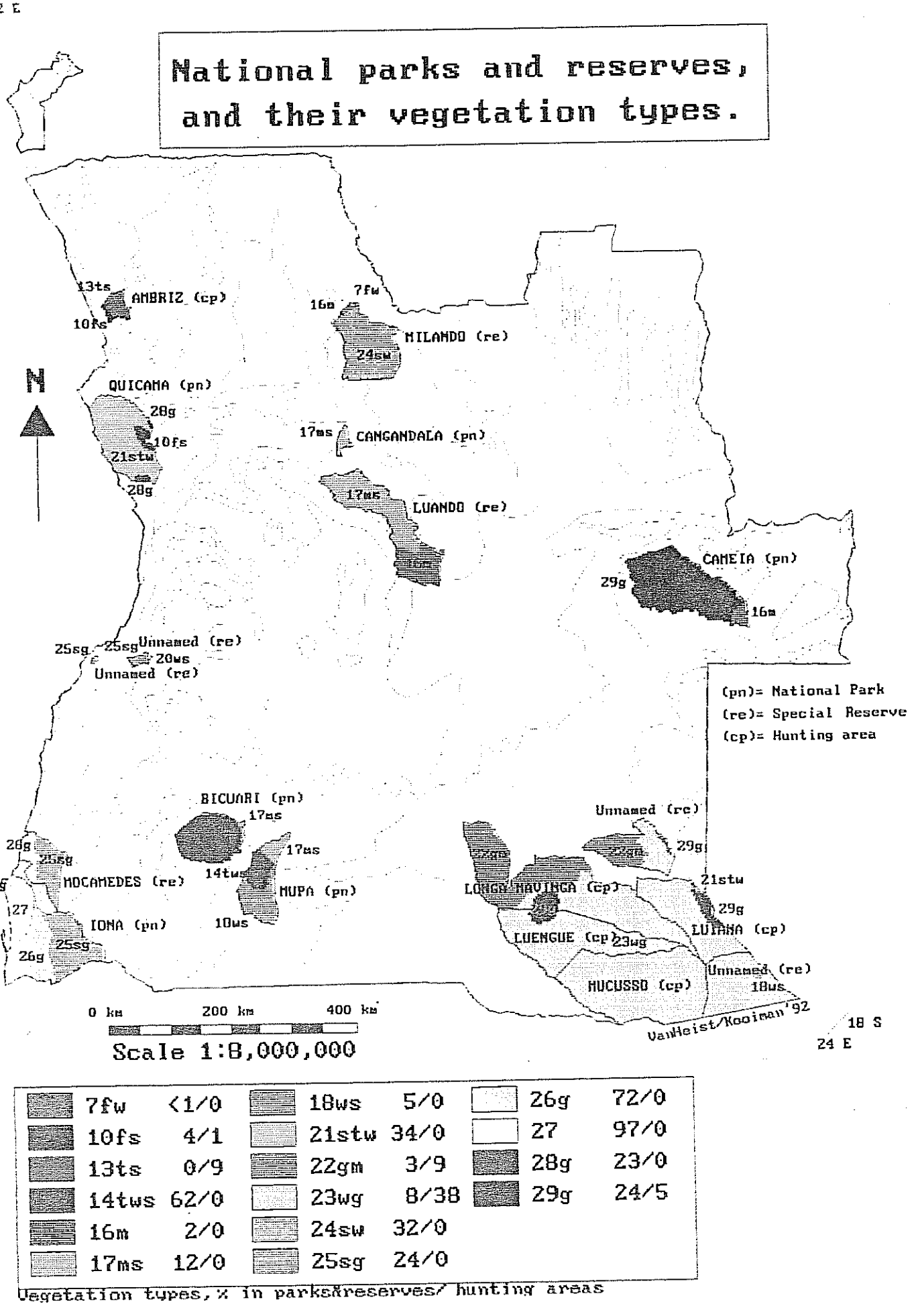

Figure 4.2 A Synthesis Map of Existing Conservation Areas and Biomes in Angola

Figure 4.3

Vegetation types of Angola, after Barbosa (1970), indicating the present area of each type falling within protected areas.

Type No	Physiognomic type & moisture regime	Typical genera	Phytogeographic affinities	Total area km²	Protected Area km²	% of total area	Protected Areas
1.	Forest, humid, evergreen	*Gilbertiodendron, Tetraberlinia*	Guineo-Congo	481	0	0	-
2.	Forest, humid, semi-deciduous	*Gossweilerodendron, Oxystigma*	Guineo-Congo	3 765	0	0	-
3.	Forest, humid, semi-deciduous	*Celtis, Albizia*	Guineo-Congo/Zam	20 989	0	0	-
4.	Forest, dry, semi-deciduous	*Cryptosepalum*	Zambezian	2 163	0	0	-
5.	Forest, humid, semi-deciduous	*Newtonia, Parianari*	Zambezian/G-C	160	0	0	-
6.	Forest, humid, semi-deciduous	*Podocarpus*	Afromontane	10	0	0	-
7.	Forest/savanna mosaic, humid	*Piptadeniastrum, Bosqueia*	Guineo-Congo	13 699	0	0	-
8.	Forest/savanna mosaic, humid	*Marquesia, Berlinia*	Guineo-Congo	79 631	0	0	-
9.	Forest/savanna mosaic, humid	*Celtis, Hyparrhenia*	Guineo-Congo/Zam	27 798	0	0	-
10.	Forest/savanna mosaic, mesic	*Allanblackia, Entandrophragma*	G-C/Zambezian	11 456	0	0	-
11.	Forest/savanna mosaic, mesic	*Pteleopsis, Adansonia*	Zambezian	14 900	745	5	Kisama
12.	Thicket/savanna mosaic, humid	*Landolphia*	Zambezian	46 705	0	0	-
13.	Thicket/savanna mosaic, humid	*Annona, Piliostigma*	Zambezian	27 798	0	0	-
14.	Thicket/savanna mosaic, mesic	*Crossopteryx, Heteropogon*	Zambezian/G-C	12 497	0	0	-
15.	Woodland/thicket mosaic, mesic	*Baikiaea, Ricinodendron*	Zambezian	16 422	9 497	72	Bikuar, Mupa
16.	Woodland, humid	*Julbernardia, Brachystegia*	Zambezian	138 754	0	0	-
17.	Woodland, humid	*Brachystegia, Marquesia*	Zambezian	224 393	1 882	3	Luando, Kameia
18.	Woodland, humid	*Brachystegia, Julbernardia*	Zambezian	74 333	7 693	26	L. B, Kangandala
19.	Woodland, mesic	*Brachystegia*	Zambezian	5 367	0	0	-
20.	Woodland, mesic	*Colophospermum*	Zambezian	69 777	3 551	5	Iona, Mupa
21.	Woodland, mesic	*Colophospermum, Acacia*	Zambezian	8 332	0	0	-
22.	Savanna-woodland, humid	*Cochlospermum, Combretum*	Zambezian	27 718	0	0	-
23.	Thicket/savanna mosaic, arid	*Adansonia, Sterculia*	Zambezian	21 951	9 028	41	Kisama
24.	Woodland/savanna mosaic, mesic	*Brachystegia, Burkea*	Zambezian	114 560	0	0	-
25.	Savanna-woodland, mesic	*Baikiaea, Guibourtia*	Zambezian	60 324	0	0	-
26.	Savanna-woodland, mesic	*Adansonia, Peucedanum*	Zambezian	108 231	0	0	Namibe
27.	Savanna/grassland mosaic, arid	*Acacia, Commiphora*	Zamb/Kar-Nam	35 570	9 056	27	Iona, Namibe, Chim.
28.	Grassland/shrubland, sub-desert	*Aristida, Welwitschia*	Karoo-Namib	9 934	7 311	74	Iona, Namibe
29.	Desert	*Odyssea, Acanthosicyos*	Karoo-Namib	4 406	4 406	100	Iona
30.	Swamp	*Cyperus, Typha*	Zambezian	1 362	186	14	Kisama
31.	Grassland, floodplain	*Loudetia*	Zambezian	49 990	14 024	31	Kameia
32.	Grassland, montane	*Protea, Stoebe*	Zam/Afromont	12 898	0	0	-

Managing and Conserving Biodiversity: Recommendations

The principal recommendation arising from this study is to urge the Angolan Government, the Angolan people and donor agencies to implement the existing recommendations documented in the proceedings of numerous symposia convened in Angola on this topic Most important of these are the results of the Primeira Jornadas de Reflexao Sobre Parques Nacionais e Reservas which was convened in Luanda from 25-28 March 1992. The recommendations resulting from this meeting provide a highly appropriate set of guidelines for immediate action.

To facilitate such a programme, it is a prerequisite that MINADER establish a clear focal point for protected areas management issues. The establishment of a donor assisted coordination unit for National Parks and protected areas proposed in this report would provide an urgently needed institutional framework to manage the rehabilitation process. It would also provide Government with a capacity to review its overall policy on protected areas management.

Given the current limited staff and management capacity in Angola's protected areas it seems advisable to search for innovative and decentralized approaches to protected areas management. Effective policing options do not represent a viable approach for Angola. Southern Africa's experience in involving communities in sustainable natural resource management is considered among the most successful in the world today. This experience in technical, legislative and policy development terms needs to be studied and adapted for the Angolan context. Zimbabwe, Namibia, Botswana and South Africa represent an excellent resource base for Angola to evaluate its own options in terms of national parks management, communal area management of wild flora and fauna, private game ranching etc. Donors and institutions such as IUCN and SADC should act as catalysts to promote collaborative exchanges and regional networks. (A specific project proposal for communal management of wildlife is presented in Annex 5 'Portfolio of Draft Project Proposal')

It is recommended that appropriate legislation be promulgated whereby the existing conservation areas may be reclassified and the creation of new areas following the scheme presented in Table 6 can be established. The total area occupied by all conservation areas in Angola, following these proposals, will increase from 68,100 km² to approximately 78,644 km², an increase of 15,5% bringing the total conservation area network of Angola to only 6.3% of the country, but offering protection to possibly as much as 90% of its biodiversity. This small increase in area will result, however, in the conservation of three biomes and 26 ecosystems not previously included within Angola's national parks and reserves. As such Angola would be provided with conservation areas in all its major biomes and ecosystems, a situation that

would be unique anywhere in Africa, if not the world.

More specific recommendations that relate to the conservation and utilization of the biodiversity of Angola include the following.

a. A field survey of the existing and new conservation areas listed earlier in this section. Such surveys would need to be conducted by appropriately trained and experienced teams of Angolan and foreign biologists, supported by appropriate satellite imagery and aerial photographic coverage. A programme over a five year period should be developed to combine field surveys with training exercises and the collection and appropriate archiving of field material. Such a programme of surveys would contribute substantially to the inventorization and monitoring of the biodiversity of Angola and provide a mechanism whereby young Angolan students can be incorporated into the survey and monitoring teams.

b. International agencies should be encouraged to support extensive field surveys of the current status of large mammals and their utilisation. IUCN is currently implementing a survey of elephant status which could serve as a model for other studies. This project has evolved a wider collaborative programme with MINADER, University of A'. Neto, AAA and other national and international NGOs called "A Survey of the Wildlife Resources of Angola" which is based on the recording of all observations of wildlife or wildlife products (meat, skins, ivory) to develop a resource database on wildlife status and its utilization. This Angolan programme could serve as an umbrella for future more specific species status surveys. Key, species include; Gorilla, Chimpanzee, Wild Dog, Brown Hyaena, Spotted Hyaena, Lion, Cheetah, Manatee, Black Rhinoceros, White Rhinoceros, Hartmann's Zebra, Hippotamus, Giraffe, Giant Sable, Puku Red Hartebeast, Lichtensteins Hartebeast, Tsessebe and Black-face Impala. The current status of marine turtles and the three species of crocodile that occur in Angola also need assessment. An assessment of key bird species and areas is currently being developed by the International Council for Bird Preservation (ICBP).

c. A five year moratorium should be placed on any changes to the boundaries of, or developments not related to biodiversity protection and its sustainable use, in any existing or proposed conservation area. The state of each park and reserve should be evaluated and recommendations made on their rehabilitation. Priority should be given to Kisama, Iona, Luando, Luiana and Bikuar, but urgent attention should also be devoted to the many proposed conservation areas that should be demarcated and promulgated before they are occupied by human populations.

d. The documentation and identification of Angola's biodiversity is still mainly done by North American and European universities, herbaria and museums. Infrastructural support is urgently needed for Angola's existing herbaria, museums and botanic gardens and related research facilities which must form the foundation of any long term biological survey and conservation action in Angola. These include the herbarium at Huambo, the biological museums and collections at Dundo, Lubango, Huambo and Luanda and the botanical garden and research centres at N'Dalatando and Huambo. The reinforcement of these centres should be combined with the training of Angolan museum curators, herbarium assistants, taxonomists and other scientists and technicians and the placing of collaborators from donor countries on a short term basis at these centres to provide additional support in the initial years.

e. Additional support is urgently needed for the **National Plant Genetic Resources Committee** (NPGRC) and for the deployment of field teams to accelerate the collection of the wild relatives of important food crops, and to sample the genetic diversity within traditional crops in the rural areas of Angola. A special collecting mission, due to Angola's unusual historical and post-war circumstances, for immediate deployment, would need to include a training workshop for NPGRC members and collaborators in collecting and conserving local vaireties *in situ*.

f. The **re-publication of key ecological literature** that has become out of print in Angola is essential for the training of Angolan scientists. Important publications such as those of Gossweiler and Mendonça (1939), Gossweiler (1953), Barbosa (1970), Diniz (1973) and others should be supported by donor agencies while the translation into Portuguese of appropriate documentation and handbooks on environmental education, published by organizations such as IUCN and WWF, should be encouraged. In particular, copies of unpublished reports and official documents from the colonial era should be obtained through the assistance of the Portuguese government and universities.

g. Active collaboration with international conservation organizations, such as IUCN, WWF, ICBP etc should be encouraged to plan and implement pilot programmes and projects that will provide the learning ground for Angola to develop a new philosophy and management approach to protected areas and multiple land-use management.

Annex 4.2.a contains information on the Distribution and status of the larger mammals of Angola

4.3 FORESTRY AND WOODLANDS

There is very little information on the status of forest and woodlands in Angola. The existing phytogeographic maps are based on studies carried out in the early and late sixties and the information on growing stock, mean annual increments, is based on similar environmental conditions in the SADCC countries. There is no data on growing stock and MAI for six of the twelve woody biomass classes.

It has not been possible to quantify the extent of forest/woodland degradation (i.e. with the aid of satellite imagery), however the assessment carried out by team members (on the ground and by low aerial reconnaisance) indicates that large areas of the country [in the central planal to regions, (Huambo, Huila, Bie), Malange and the coastal littoral provinces (Zaire, Bengo, Cuanza Sul, Benguela, Namibe)] are being seriously degraded.

In most other African countries, forest land degradation is caused by human and animal population concentration. Given the generally low human and livestock population in Angola, this is only true around major urban areas and especially as a result of population concentration in towns and cities for security reasons during the war.

Thus, population pressure induced deforestation prevails in the narrow coastal plain extending from Zaire to Namibe as the majority of the population inhabit these areas. There are other **forest product deficit areas** or rather areas of very low woody-biomass supply particularly in the southern part of the country. The areas of low woody-biomass supply in an estimated order of severity are:

i) Most of the province of Namibe
ii) The costal plain of Bengo including all of Luanda Province
iii) The coastal plain of Benguela and inland as far as Bocoio and Catengue
iv) The coastal plain of Kwanza-Sul and inland as far as Gabela and Quibala
v) The western half of Kwanza-Norte and in the coffee plantations
vi) The coastal plain of Zaire
vii) The coastal plain of Cabinda
viii) Most of the south of Cunene and especially around N'Giva
ix) The Cuando Valley of Cuando-Cubango
x) The Luena Valley and parts of Moxico bordering Zambia
xi) The Luena Valley of Lunda Sul

The **annual rate of deforestation** is estimated at 40,000 ha/year

(Lanley 1981) and the major factor in the degradation of the forest/woodland is believed to be shifting cultivation, expansion of the agricultural frontier and forest/woodland clearing for the production of fuelwood and charcoal. Shifting cultivation in the coffee zones of Bengo, Kwanza-Sul and Kwanza-Norte with attendant setting of fires have resulted not only in the clearing of forests but also in the degradation of steep slopes causing serious erosion.

Critical Issues with Regard to Forest/Woodland Management

Land Use Policy

Although extensive areas of Angola's natural forests are state-owned and their exploitation regulated by the government, their designation as state forests is not based on a deliberate land use policy. Furthermore, the areal limits of the "state forests" with the exception of those indicated in Annex 4.3.b are not delimited, demarcated and gazetted which is an essential prerequisite of forest ownership.

Land Tenure Policy

During the colonial period, there were three types of rural land ownerships: government, private and communal. After independence, rural land was under government ownership and farmers being guaranteed use right and in some cases leasehold. The war combined with limited capacity of the government to provide the rural people with the needed technical and material services to increase agricultural productivity has resulted in increased forest clearing. Thus, state-owned natural forests and woodlands have become open access lands. This is particularly the case of the "state forests" in the immediate vicinity of communally owned lands. It is very unlikely that the government will have the capacity to prevent further encroachment by the peasants.

Settlement Policy

The displacement of the people to the littoral and sub-littoral zones has created considerable pressure in the area. These zones which are characterized by savanna woodlands with low woody biomass growing stock and mean annual increment are the source of income for charcoal producers for own consumption and for sale to the urban centers. The settlement of displaced people to their areas of origin could reduce the pressure on these woodlands. However, demand driven clearing of such areas as Luanda, Bengo, Benguela, and the coastal plains of Cabinda and Zaire provinces is likely to continue unless action is taken that encourages alternative fuels.

Forest/Woodland Management

Forests and woodland serve productive and protective functions as well as reserves of germplasm for fauna and flora. These forests and woodlands have been subjected to selective cutting over several years. In some parts of Bengo, Kwanza Norte and Huambo, the clearing of these forests and woodlands has lead to soil erosion and endangered sensitive watersheds.

The remnants of **transitional rain forest** and are restricted to small areas in Bengo, Cabinda, Melanje, the gallery forests between the rivers in Lunda Norte and Zaire. The average merchantable growing of the transitional rain forests are estimated at 10-15 cu.m and the mean annual increment is less than 0.5 cu.m/ha. These figures seem to be very low but these may be due to the limited number of commercially valuable species that the market accepts at present.

Given the lack of reliable data on the status of these forests/woodlands, there is a need to carry out an inventory to:

a) determine the **area of productive natural forest/woodlands** to be reserved to meet the wood products of the country,

b) determine the **area of protective forests** to protect major watersheds and sensitive ecosystems, and

c) determine and designate **areas for ecosystem conservation.**

Forest/woodland management is almost non-existent in Angola and is an issue that needs to be addressed as a matter of urgency. The current management practices with regard to the natural forests consists of issuing of cutting licenses to forestry industry operators and fuelwood and charcoal producers. The licenses specify or should fulfill the following conditions:

a) a **localization map** of the area,

b) a **description of the vegetation cover** of the area which should be verified by relevant local institutions,

c) an **assessment of the growing stock** and the annual allowable cut,

d) the **financial and technical resources** of the applicant including the **number of employees** and their educational levels, and

e) the **transport capacity** of the applicant and the market outlets of finished or semi-finished products.

The requirements mentioned above constitute current attempts to streamline the licensing of cutting. At present, the issuance of licenses to concessionaires is not centralized. In fact, there are indications that several institutions both at central, provincial and local levels are involved in the process. The legislation in force requires that MINADER is empowered to issue licenses and control the adherence to the conditions stipulated in the contract. There is, therefore, little or no control on the area logged, the volume extracted and/or the species cut. The lack of control may be attributed to:

a) the **inadequate technical basis** for the issuance of a permit which is due to the lack of forest inventory data,

b) the **shortage of qualified forest inspectors** or guards and the lack of financial resources and means of transport,

c) the **multiplicity of license issuing organs** of the government without due authorization of IDF, and

d) the problem of controlling thousands of **illegal fuelwood and charcoal producers**, particularly to those that have been forced to take the activity because of war induced displacement and lack of alternative employment opportunities.

In the absence of adequate means of transport, forest inspectors have been using transport facilities of license holders as in the case of Cabinda. Such a practice could lead to collusion between the inspector and license holder.

The entire **licensing of concessions** needs to be reviewed as soon as possible in order to introduce rational use of the forest and woodland resources of the country. The review should lead to the streamlining of the process of licensing and control, the setting of royalties or license fees to such levels that will cover reforestation of logged areas or parts thereof.

The licensing process has, however, to be based on the availability of adequate data on the extent of the productive forests and woodlands, the growing stock and annual allowable extraction. This will require a **satellite imagery based inventory of the natural forests and woodland** with the requisite ground-truthing. The current estimate of the growing stock for the whole country is based on the 1970 vegetation map. At present, only an inventory data of commercial timber of the northern part of the country for the purpose granting concessions is available. An inventory of the exploitable timber of four northern provinces is proposed. The planned three-year SADCC Forest Inventory Project the feasibility study of which was financed by CIDA may provide

the requisite country-wide inventory data. However, management plans of the various productive forests and woodlands need to be prepared.

At present, there is **no management plan** for the sustainable development and utilization of the natural forests and woodlands. There is no program of silvicultural treatment for the natural and man-made forests due to the lack of trained manpower and lack of other resources coupled with the long war that prevailed in the country.

There is **very little tree planting** in the country. For example, Cabinda which has three nurseries (one run by IDF, one run by the Forest Experimental Station and another by a private firm) produces less than 20,000 tree seedlings in the two nurseries. However, the three nurseries do produce ornamental planting stock to the communities. The species produced in the nurseries of Cabinda as well as in Huambo, Benguela and Kwanza Norte are *Eucalyptus saligna*, *E. tereticornis* and *Cassuarina equisetifolia*. Although there are several promising exotic and indigenous tree species, there is no species screening, provenance trials and growth performance trials to guide their introduction on a large scale. The annual planting of the IDF does not exceed 20 ha. The underlying reasons for narrow species base for the national afforestation program are:

i) **Lack of research policy** in general and in species screening, provenance and growth performance trials.

ii) **Lack of a systematic assessment** of likely promising species on the bases of documented results in countries with similar agro-ecological zones. Thus, in the case of indigenous species such as *Terminalia superba* growth performance information could be obtained from Zaire.

iii) The **low priority** assigned to the sector in terms of allocation of financial resources and means of transport. **Limited availability of seeds** of tree species presently used in the afforestation program.

Management and Establishment of Man-made Forests

The various estimates of the size of plantations in Angola varies from 150,000 ha to 180,000 ha and with the exception of about 6,000 ha of *Pinus patula* and 1,500 ha of *Cupressus lusitanica* they consist of *Eucalyptus saligna*. The plantations were established between 1946 and 1972. They have not been managed and are over mature. It is, therefore, essential that an inventory of these plantations and a management plan for their utilization is carried out.

The establishment of new man-made forests should be given a high priority particularly in areas suitable for fast growing indigenous and exotic species. However, establishment of new man-made forests will have to be gradual due to (a) the lack of proven species for which there are growth perforamnce information, and (b) the lack of experience on the establishment and management of man-made forests. The planned afforestation programme in Cunene, Huambo and Malanje involving demobilized soldiers will have to be staggered over several years primarily due to the lack of experience in afforestation and unavailability of seedlings.

Integration of Trees into Farming Systems

The shortage of fuelwood and construction timber that faces some of the wood deficit areas can only be solved by the active and sustained participation of the local people. There is very limited experience in Angola in tree planting in general and farm forestry in particular. Although there is a need for agroforestry initiative, such an initiative will have to be preceeded by strengthening of the Institute of Forest Development at all levels and promotion of tree planting activity by local people.

Fuelwood and Energy

The energy problem is alarming in spite of the fact that Angola is an exporter of petroleum. Almost the entire rural population and the population established in the immediate neighborhood of the major population concentration centers use firewood and charcoal for household energy. The consumption of fuelwood and charcoal is estimated at 1.0 cu.m/caput/year. Although there is no global shortage of fuelwood in Angola, there are certain areas in the southern part of the country where there is serious scarcity and people have to travel long distances to fetch firewood.

Organizationally, the source of fuelwood is controlled by the MINADER and the formulation of strategies for energy development is carried out by the Ministry of Energy. Although there is a unit for the development of woody biomass in the Ministry of Energy, the unit has little or no development activity. There is, therefore, a need to coordinate the activities of the two organizations involved in woody biomass development and production.

Charcoal is used extensively as fuel in the urban, semi-urban and around the cities. The quality of charcoal is very poor which results in considerable waste of raw material and energy. The national consumption of wood for charcoal and production of forest products is presented in Figure 4.4.

Figure 4.4: Production of Forest Products (1971-89)

Year	1	2	3	4	5	6	7	8
1971	7 586	6 025	910	33	1 561		6	481
1972	7 402	6 160	580	32	1 242		18	492
1973	7502	6 303	556	41	1 199		27	503
1974	7 663	6 452	556	35	1 211		27	515
1975	7 830	6 607	556	35	1 223		27	527
1976	8 002	6 766	556	35	1 236		27	540
1977	8 182	6 933	556	35	1 249		27	553
1978	8 367	7 104	556	35	1 263		27	567
1979	8 559	7 282	556	35	1 277		27	581
1980	8 759	7 468	556	35	1 291		27	595
1981	8 969	7 663	556	35	1 306		27	610
1982	8 986	7 663	556	35	1 323		27	627
1983	4 150	3 750	57	140	905		4	708
1984	4 273	3 833	116	140	980		5	724
1985	4 399	3 900	113	140	990		5	737
1986	4 537	3 997	108	140	1 003		4	755
1987	4 690	4 102	108	140	1 023		4	775
1988	4 845	4 214	108	140	1 044		4	796

Notes: 1 = Round wood; 2 = Fuelwood/charcoal; 3 = Sawlogs/veneer logs; 4 = Chemical wood pulp; 5 = Industrial round wood; 6 = Sawnwood; 7 = Plywood; 8 = Other forest products.

Thus, three major remedial measures for countering deforestation include:

i) Improve the supply of domestic petroleum-based fuel sources.

ii) Support small-scale agriculture to give rural people a source of income other than charcoal production.

iii) Improve conditions for livestock production.

In order to remedy damage already done and provide for a continued demand for fuelwood, forest plantations should receive a high priority. The ability to implement measures in this area is, however, constrained by the following factors:

a) planning and supervisory capacity at the Ministry of Agriculture, and specifically the IDF,

b) limited nursery capacity to produce seedlings, and

c) the absence of community-based approaches to forest and woodland management, including the lack of methods and organizations to promote community-based tree-planting activities.

For further information on Forest production, please refer to Annex 2.2.b

Institutions

The forest institutions are weak in terms of responding to the national and provincial forestry development needs. The Institute of Forest Development (IDF) is responsible for the planning, implementation and monitoring and evaluation of all forestry development programs. However, the Directorate of Forestry of the Ministry of Agriculture and Rural Development has also a planning function. Both institutions are so inadequately staffed that the organization has to be streamlined as soon as possible. The research capacity is almost non-existent and the Cabinda Forest Experimental Station has neither the skilled manpower nor the funds to even carry out limited species screening and provenance trials. All the foresters and middle level technicians have trained in Eastern Europe and Cuba and have little or no exposure to field work. This is due in part to the security induced travel restrictions and the low budgetary allocation for forestry programs. The provincial branches are inadequately staffed and have neither the funds nor the means of transport needed for field activities. Discussions with the provincial staff of

Cabinda revealed that they have one vehicle and some motor cycles. In addition to this the per diem as so low as to discourage field trips (NKW 3,000 as compared to 90,000 per day in Luanda).

Forest Fires

One of the main causes of deforestation is the use of fire for hunting and in the preparation of land for cultivation. By far the most destructive is fire as a hunting tool. Although the use of fire as a hunting tool is traditional, there are indications that this has increased considerably in the last two decades. This is due to the lack of control by the IDF and its predecessor institutions and the shortage of meat that prevails in the rural and urban areas. In order to compensate for the meat shortage, illegal hunting using fire and fire arms has increased considerably. A visit to the market in Cabinda showed that there is more wild game meat in the market than from domestic animals.

There is a need for intensive campaign against the use of fire all over the country. The forest fires prevention campaign should be organized by IDF in collaboration with the Ministry of Information. This should make use of radio programs and be supplemented with information dissemination at local level using schools and other local institutions as focal points.

Priority Issues in Forestry

The priority issues for the development of the forestry sector are:

i) Training of middle level technicians and in-service training of the existing staff of IDF at all levels.

ii) Inventory of the natural forests and woodlands as well as the major supply sources of fuelwood and charcoal for the major consumption centers and of fuelwood deficit areas.

iii) Assessment of the potentials and relevant approaches for community based forestry management/utilization programmes (legislation, land use, extension service, etc.).

iv) Delimitation, demarcation and gazetting of the forest areas that will constitute the forest estate.

v) Streamlining and strengthening to carry out requisite research and experimentation as well as to implement field activities.

A Proposed Forestry Development Strategy

The main objectives of the forestry development strategy for Angola are as follows:

a) the management of natural forests and woodlands on a sustained basis in order to meet the national requirement for forest goods and services,

b) the management of existing plantations on a sustained basis to meet wood and product requirement of the country,

c) the management of natural woodlands and forests as well as established man-made forests should develop a much stronger focus on strengthening community mangement approaches and systems,

d) the generation of foreign exchange through the export of finished forest products,

e) the protection of catchments and sensitive ecosystems, and

f) the maintenance and conservation of indigenous forest germplasm.

The point of departure for the proposed strategy is the lack of **trained** and **skilled manpower** and the **dearth** of **reliable information** for planning, monitoring and managing the forest and woodland resources of the country as well as the implementation of forestry programs. Although the strategy includes a number of elements, human resource development, institutional strengthening and the elaboration of community oriented forestry development, support programmes are fundamental to the strategy. The elements of the proposed strategy are presented below.

Human Resource Development

As has been mentioned earlier, there are only six foresters and 60 middle level technicians at the disposal of the whole sector. Due to the shortage of trained and skilled manpower, IDF has been forced to regionalize its activities with a region being responsible for two or three provinces. Most of the staff of IDF have little or no field exposure due to the limits set by the war and also because of the lack of funds and means of transport to monitor and evaluate field activities. The staff of the provincial branches have at most one car and no motor cycles, and the per diem which is NKW 3,000/day as compared to NKZ 90,000 for Luanda does not provide the necessary working environment for field work. The development of the forestry sector and the

sustainable development of the forest/woodland resources of the country is dependent upon the availability of an adequate number of trained and skilled forestry professionals, technicians and extension workers. There is, thus, a need to launch the following activities:

a. Middle Level Technical Forestry Education

The technical forestry training program at Pirri, Bengo province, to be financed by FINNIDA is expected to enter into function towards the end of 1993. This Forestry College is envisaged to have an intake of 20 third year students per year. The idea is to have the first two year training at a middle level agricultural school in Huambo or Malanje. This would reduce the need of teaching staff for the first two years where the students will have their basic education and the last two years will be dedicated to theoretical and practical forestry training. [This should include curriculum elements addresssing community based forest managment issues.] In addition to this, the recruitment of students who have completed two years at the agricultural training centers will shorten the time needed for the first group of graduates.

b. In-service Training and Short Courses

In order to improve the skills of the existing staff of IDF in general and its field staff in particular, there is a need for in-service training at Pirri when the college is not in session. In addition to this, study tours and short courses should be arranged in neighboring countries. These should have practical orientation.

c. Professional Level Forestry Training

In the short term, there is a need for an accelerated scholarship program for the training of foresters. The choice of venue is limited to Spanish and Portuguese speaking countries due to the language skills of scholarship candidates. In order to use existing faculties in the neighboring countries with similar forest type, the staff of IDF need to undergo English language training. More effort should be made to have the training at the Faculty of Forestry of Eduardo Mondalene University of Mozambique. At a latter stage, the viability of establishing a Faculty of Forestry in Angola should be assessed.

Some of the scholarships both at the senior and field personnel level should be for courses which include a strong social forestry orientation to introduce to Angola the wide range of experiences made in this field elsewere.

Inventory of Forest/Woodland Resources

There is a need to improve the data base of the forest and woodland resources of the country. It is, therefore, proposed as part of the strategy to carry out a satellite imagery based inventory of the land-based resources of the country. This would serve as a basis for land classification for the various competing uses and serve in particular as bases for delimitation, demarcation and eventual gazetting of the forest estate including those forests most suited to developing communal management systems. This should be followed by the preparation of management plans for the various forest areas. The preparation of forest management plans is time and resource consuming and should be initiated in the remaining dense transitional rain forests and miombo woodlands (i.e. Cabinda, Uige, Lunda Norte and Lunda Sul and possibly Zaire).

Another area that should merit immediate attention is the inventory of major supply sources of fuelwood and charcoal in order to serve as a basis for the sustainable management of these woodlands. Furthermore, this would serve as basis for the preparation of forestry support programs including tree planting and woodland management by communities and individuals.

Management of Existing Plantations

The large tracts of plantation forests have not benefitted from management input. Although most of the plantations do belong to IDF, there is a need to provide technical assistance to prepare plans for the optimal management of the existing plantations. This would also provide an adequate basis for development of management techniques for plantations to be established in future.

Strengthening of Research and Experimentation Capabilities

a. Management of Natural Forests

There is very little management technique developed of relevance to the transitional rain forests and miombo woodlands and there are no established management techniques under Angolan conditions. It is, therefore, proposed that regeneration trials should be initiated in order to conserve the natural forests and woodlands. This should be spearheaded by IDF but with the active participation of the Institute of Agricultural Research (IIA) in Huambo. This programme should also include an assessment of traditional patterns of forest product utilization by local communities as this could be used as a basis for community based commercial exploration schemes.

b. Establishment of National Seed Center

The limited species base of the afforestation programs has to be expanded. This will require the establishment of a seed centre which has the capacity to choose mother trees in the natural forests and woodlands, establish seed orchards in different ecological areas of the country; process and test seeds of indigenous and exotic species and supply seeds of high quality to the tree planting activities.

c. Screening, Provenance and Growth Performance Trials

Future tree planting initiatives will be dependent on the availability of the proven growth performance of species for the different end uses. At present, there is very little or no information on species that could be recommended for those interested to be involved in afforestation programs. It is, therefore, essential to initiate screening, provenance and growth performances of timber and multi-purpose species by establishing a network of experimental stations in the various agro-climatic zones.

d. Study of Wood Properties of Less Known Tree Species

The species base for the mechanical wood-working industries need to be broadened aiming at reducing the pressure on the limited number of commercial timber. This will require the study of chemical, mechanical and physical characteristics of wood of different species. The need of adequate laboratory equipment for wood utilization is essential.

Improvement of the Mechanical Wood-working Industry

There are two issues in connection with the improvement of existing mechanical wood working industries. Firstly, there is a need to assess the recovery rate of these industries for the purpose of designing a program for the rehabilitation of these industries. Secondly, there is a need to assess the viability of the existing industrial location in order to decrease the cost of production and transport as well as to reduce the cost of the finished products to the consumer.

4.4 AGRICULTURAL PRODUCTION SYSTEMS

The Status-quo

The past 16 years of civil strife has resulted in a nearly complete collapse of Angola's agricultural sector. Commercial farms disappeared and the output from subsistence-oriented production systems is but a trickle of pre-independence levels. The reasons for this undesirable development are many. Chief

among them is the prevalent insecurity in the rural areas. This has forced people from the rural areas to urban areas or other countries, and disrupted the commercialization of agricultural products. Today an estimated 37% of Angola's population lives in urban centres and total agricultural output stands at less than 25% of pre-independence levels. Exceptions to this generalization include the agropastoral and pastoral systems of arid and semi-arid regions. These societies remained in their traditional areas and managed to at least maintain the size of their herds.

In peri-urban areas, large numbers of urban dwellers without meaningful employment eke an existence from the **extraction and sale of natural resources**. Thus, the forest cover around most urban centres is depleted due to the felling of trees and shrubs for firewood and charcoal making, and large palm stands have been devastated by wine makers. In the areas of infertile sandy soils, agriculture in peri-urban areas is no longer viable due to the exhaustion of soil nutrients, and in some cases gully erosion threaten important access roads. **The wildlife populations in national parks near urban centres have been severely reduced as game is a source of meat protein and money.**

The **abandonment of rural areas** and **cultivation** was accompanied by the regeneration of soil and vegetation resources. Areas that were once cultivated now support dense stands of secondary forests, woodlands, and grasslands. With the exception of diamond mining areas, the river banks seem to be stable and the water sediment free.

In **pastoral and agropastoral areas**, European operated ranches that were located within communal grazing areas have been reclaimed by their traditional owners and access to key resources re-established. The deterioration of water points are a cause of hardship but the population has somehow learned to cope with this problem. Range degradation appears to be restricted to the vicinity of key resources, such as permanent water points, where livestock and people tend to congregate for protracted periods of time. The collapse of the livestock marketing network has resulted in a drop of off-take rates and scarcity of household and certain food items.

Trends and Issues

With the return of peace, at least a portion of the urban population and refugees are returning to the rural areas and are attempting to resume subsistence agricultural activities. At the same time, the government is attempting to resuscitate the commercial farming sector. These trends will gain momentum as the peace process is consolidated. The **repopulation of the countryside** and the **reactivation of commercial agriculture** have important environmental and socio- economic implications.

One of the biggest problems facing the rural population throughout Angola is the difficulty they have to resume meaningful agricultural activity due to a **lack of production inputs**. Furthermore, the limited quantities that are produced cannot be marketed in a timely fashion due to a **lack of commercial links** with the urban centres. This situation forces the population to seek sustenance through other means. Two of these are hunting and the sale of firewood and charcoal.

Hunting in Angola is associated with the use of fire to improve visibility and force the wild animals into small areas where they can be killed. It is clear that this activity is responsible for the incineration of vast areas of woodlands and savannas. Observations from aircraft over the 10 week consultancy period indicates that over 50% of savanna-covered areas were already burned by mid-July, 1992. Hunting related fire together with tree and shrub felling for fuelwood and charcoal making, is placing Angola's woodlands and forests under pressure. As the number of destitute people in the rural areas increase so will the incidence of grass fires and rate of deforestation.

It follows from the above that one way to curtail the rate of deforestation and conversion of forests and woodlands to savannas is to provide the local population with an alternative source of income to firewood and charcoal, and an alternative source of meat protein to game meat. This can come about by re-establishing the commercial network for agricultural products and the provision of production inputs.

Unfortunately, the **incineration of the natural vegetation** has other causes apart from hunting. For example, in areas of *Hyparrhenia*-dominated savannas, burning is causing coarse, unpalatable grass to resprout. The new growth is consumed by livestock. Fire is also used to clear land for planting and is set accidentally by honey collectors and simple carelessness. In the long-term, the combustion-triggered release of nitrogen and sulphur into the atmosphere and the leaching of cations to the ground water table will lead to an overall dystrophication of these ecosystems.

The *hyparrhenia spp*. savannas in Angola represent a fire-maintained vegetation state. The species composition and physiognomy may be modified through the judicious management of this ecological factor. In other words, through vegetation management techniques, woodlands can replace these Hyparrhenia dominated savannas. Furthermore, preliminary observations of abandoned fields indicate that the coarse grass may be replaced by palatable ones through manipulation of the soil surface.

Therefore, the potential to improve the socio-economic situation of the savanna area inhabitants through **vegetation management** is significant. This calls for a research programme aimed at

elucidating the general dynamics of Angola's savannas. Two objectives could be: (1) to integrate crop cultivation with livestock production; and (2) to increase fuelwood production through the management of the natural vegetation. The Planalto de Malange and Baixa do Cassangue are logical starting points for this kind of research.

Angola's climate is characterized by distinct wet and dry seasons. This means that even well watered regions of the country experience a 3 to 4 month dry spell. Moreover, nearly 80% of its soils are infertile. Therefore, subsistence oriented production systems are forced to exploit pockets of fertility and moisture to meet household needs. This results in a distribution of production activities over different kinds of terrain. In other words, the **production systems are spatially fragmented.** Invariably one of these fragments is of key importance to the viability of the production system. A case in point is that of riparian areas.

This environmentally induced fragmentation of the production systems carries with it implications to land-use legislation and the reactivation of commercial farms. First, it would be dangerous to establish legal limits in property size based on a contiguous property model because production activities are often distributed over a large radius around the homestead. Second, the configuration of large privately controlled properties must be conceived in a way that it does not deny small scale farmers access to key resources.

The importance of key resources and the need to exploit **environmental heterogeneity** becomes more acute with increasing environmental constraints to production. In the semi-arid and arid pastoral areas of western and southern Angola, this entails large displacements of livestock herds to key resource patches. This essential mobility is incompatible with private land ownership. It requires large tracts of communally controlled grazing land that includes the necessary temporal and spatial environmental heterogeneity. Thus, future land-use legislation must accommodate the needs of production systems that are compatible with communal property rights.

In spite of the 16 years that have elapsed since independence some aspects of the colonial legacy continue to permeate the approach to agricultural development. This is evident in the **reactivation of commercial farms** and the resurrection of pre-independence agricultural development projects.

The **rehabilitation of boreholes and chimpacas** within pastoral and agropastoral areas is one feature of pre-independence development that merits renewed attention. In these areas water is in short supply. Nonetheless, the development of water points cannot be viewed as an engineering problem. The socio-cultural and

ecological role that water plays in these systems must be taken into account. The local population must be recruited to assist with the efforts from the outset and local organizations created to maintain the infrastructures. These must be as maintenance free as possible.

In the pastoral and agropastoral areas many commercial ranches that were abandoned after independence have been reclaimed by the indigenous population. More often than not, these properties occupied or hampered the access to areas of vital importance to the functioning of the traditional production systems. This was particularly true in the zone of influence of the Cunene and Caculuvar rivers.

The re-appearance of commercial farms in the semi-arid and arid regions of Angola is unavoidable. However, to prevent conflicts and safeguard the viability of the existing production systems, **land concessions** must follow detailed studies of **traditional resource utilisation schemes**. Many areas previously exploited as commercial farms can no longer play that role.

A very real and imminent threat to the viability of existing production systems in the area of influence of the Cunene river lies in the resurrection of an ambitious development plan for the area. The implementation of this plan involves the **regulation of the Cunene's flood regime** and the harvesting of its hydroelectric potential through the construction of a series of dams. Area that are now annually flooded would be used for irrigated agriculture. River access corridors or the construction of water troughs would guarantee the provision of water for livestock herds. Because the Cunene is the only perennial river in the region and of utmost importance to the economic growth of both Angola and Namibia, the pressure to change its ecology is great.

The **Cunene's flood plain** (evanda) is a critical source of dry season forage to the existing livestock production systems. It is erroneous to believe that the provision of water would compensate for the loss of this key resource. In fact, by enabling the indigenous livestock herds to bridge the dry season, the Cunene's flood plain permits the economic utilisation of an enormous arid and semi-arid region of the country. Thus, estimations of the opportunity cost of changing the agricultural use of this riparian area must be made in the context of its regional role.

The above notwithstanding, one cannot expect the existing pastoral and agropastoral production systems to remain as museum pieces or subjects of anthropological and ecological research. On the other hand, it is of utmost importance to realize that these systems are rational, viable, efficient, resilient and complex. They have proven their worth by surviving 16 years of instability. To induce changes prior to a thorough understanding of their nature and a carefully elaborated set of mitigative

steps is a recipe for disaster. To this effect, anthropological and ecological studies are essential.

For further information on Agricultural Production Systems, please refer to Annex 4.4.a.

4.5 NON-RENEWABLE RESOURCES: MINERALS AND PETROLEUM

While this study focuses on renewable resource use, the central role that petroleum and mineral resources play in the Angolan economy, and the serious environmental implications that their extraction can have, make it necessary that they be included in the discussion, albeit in a superficial manner.

Given the profitability and importance of these resources, it is very likely that they will be the primary source of economic growth and government income in the next 10-20 years. While estimates vary and the proportion varies between years, petroleum revenues account for 75-90% of total export earnings and 60-90% of government revenues. Diamonds and petroleum are the two sectors of the economy which have shown a positive growth rate over the past decade. Much of the diamond sector is uncontrolled private trade, or under the nominal control of large multinational companies and thus does not yield government revenues (or statistics!) in the way the more controlled petroleum sector does. Diamond mining is nonetheless an important economic activity (the illegal sale of Angolan diamonds on the World market has recently increased).

Given the uncertain political climate, whoever is in power will most likely exploit these resources as quickly as possible, with little consideration given to potential negative impact on the environment.

Indeed, in a debriefing after **aerial reconnaisance over an area of Lunda Norte** which has suffered serious ecological damage from diamond prospecting, senior government officials expressed surprise at the very idea that Environmental effects should be taken into consideration. However they agreed that there was a pressing need for the general public to be aware of these factors.

Minerals

Several of the river systems in the Zaire Basin, Lunda North Province, have been mined for diamonds since before Independence. Most of the diamond mining operations are presently located on

the Cuango River, up-and down-stream from Cunfunfo (8°42'S 18°E), the headquarters of the state diamond company ENDIAMA. Diamond mining operations are mainly carried out by two companies: Roan Selection Trust (British) and OBRECHT (Brazilian). Both the river bed and the banks of the river are mined. In the former case, the entire course of the river is altered to expose the river bed which may have deposits of diamonds. Once the bed is exposed the gravel and associated alluvium is removed, the alluvium is washed out, usually directly back to the river, and the gravel is sorted for diamonds. In the latter case, the vegetation and alluvial deposits on the banks of the river are removed to expose the gravel, the alluvium again being discharged into the river. The gravel is then removed for sorting of diamonds exposing the underlying bedrock.

A further disturbing trend in recent years is the influx of several thousand illegal miners ('garimpeiros') from Angola and neighbouring countries who are now mining extensive areas along the banks of the Cuango River, approximately 30 km north of Cunfunfo. In these areas the banks of the river have been denuded of vegetation for a distance of up to 1 km from the river and the alluvial and gravel deposits have been removed to bedrock.

As a consequence of the industrial and non-industrial mining operations the course of the river system has been altered, the river bank vegetation and associated alluvial deposits have been devastated and the river flowing northwards shows obvious signs of **extremely high sediment load.** In addition to these environmental impacts, fishing in the area is practically non-existent and the hippopotamus is now reported to be locally extinct whilst the crocodile is routinely hunted as a pest.

Although the present mining operations are located mainly along the Cuango River, other river systems in Lunda North Province are known to be diamond bearing. It is to be expected, therefore, that industrial and non-industrial diamond mining operations will increase in the region negatively affecting other river systems in the Province.

Although these riverine habitats are being modified dramatically through the activities of the industrial and non-industrial mining sectors, no measures are being taken to minimize degradation or to reverse detrimental trends. At present, **no legislative framework** exists obliging mining companies to rehabilitate devastated areas following mining operations. Legistation is required, therefore, to regulate the activities of the industrial sector, possibly with a clause obliging rehabilitation of mined areas. The rapidly expanding activities of the illegal 'garimpeiros' are also cause for great concern. Control and enforcement of these illegal activities must be taken soon before the situation gets out of hand. Obviously, diamonds are a major source of income for Angola, and the challenge will

be to maintain that income as well as preserving these riverine habitats for future use.

There will neither be any enforcement of environmental regulations without a degree of order and control by the companies with concessions to exploit the resources. The concessions should be granted on the conditionality of obtaining EIA monitoring at regular intervals.

In view of the Angolan Governments' limited capacity to enforce stringent controls, a strategy of cooperation with the private sector should be pursued, whereby a voluntary code of conduct (e.g. for mining techniques, rehabilitation etc) should be jointly developed and monitored.

Petroleum

Visual observations were made by team members of oil spill damages in Kissama National Park and in the bay of Benguela. The effects of off-shore drilling have not been studied in a systematic manner. This is an urgent research priority, especially in view of of the licensing this year of the first deepwater blocks outside Cabinda, which are expected to contribute to a surge in exploration. It is unclear what restrictions the Law on Mineral Resources places on this kind of activity. In general, the law is weak in its environmental provisions.

Soyo, a small town at the mouth of the Zaire River, has a landing strip and port facilities which are used by the Angolan state oil company (SONANGOL) and international oil companies to import and mount equipment for the oil drilling operations in the area (both land off-shore). These operations do not appear to have had any noticeable impact on the surrounding mangrove vegetation. However, off-shore drilling operations are having a negative impact on the artisanal fisheries in the area due to oil spills and/or subsurface leaks and seaps from the off-shore platforms. Reports of oil slicks along the coast north of Cabinda need to be examined as to their origin, size and potential impact. It is not known to what extent, if any, these oil spills are affecting the pelagic and benthic fauna in the estuarine and adjacent littoral waters. The possible impact on marine resources needs, therefore, to be more fully investigated. This could be most effectively done in a joint project conducted by a reputable scientific institution and the oil companies.

4.6 COASTAL ZONES/WETLANDS

Many of the environmental problems discussed below could just as easily be classified as urban environmental problems, as most are the result of population pressure around urban areas. The environmental problems associated with the bays and restingas in and around Luanda discussed below are probably representative of the situation in similar ecosystems along the coast, albeit to a lesser extent. The environmental situation in the Baia Forta-Benguela-Lobito urban complex is also discussed.

The environmental problems related to coastal urban conurbations in Angola are so great that major policy and planning measures will have to be implemented. The scale of the undertaking will require a major financial commitment.

Sheltered Bays and Lagoons

Sheltered bays and lagoons occur at more or less regular intervals along the entire Angolan coast (Figure 4.5). Several of these lagoons are formed by northward-running spits of sand formed in association with river mouths or through sedimentation processes under influence of the northward-flowing Benguela Current. These spits of sand, known locally as 'restingas,' may vary in width from several metres to several kilometers and hav a vegetation cover of greater or lesser extent characterized by typical coastal herbs, bushes and trees.

The restingas are constantly subject to natural processes such as wave action, currents, sedimentation and sand removal which may affect their configuration. As such, these formations are some of the most fragile along the Angolan coast. Unfortunately, large urban conurbations or human settlements are built on, or adjacent to, a number of these restingas and lagoons placing additional pressure on these fragile ecosystems. In the last 15 years, pressure on these systems has increased due to the large influx of people from the interior of the country to the coastal zones because of the war situation. Negative impacts on these ecosystems include reduced vegetation cover and associated erosion, pollution from industrial and human waste and overfishing due to artisanal and semi-industrial fisheries. The main restingas, north to south are: at the mouth of the Zaire River; Luanda; das Palmeirinhas; at the mouths of the Cuanza and Longa Rivers (the latter at 10° 15'S); da Ponta de S. José (12° 35'S); Tombwa/Ponta Brava (15° 50'S); das Tigres (between 16° 28'S and 16° 44'S) and at the mouth of the Cunene River (Figure 4.5).

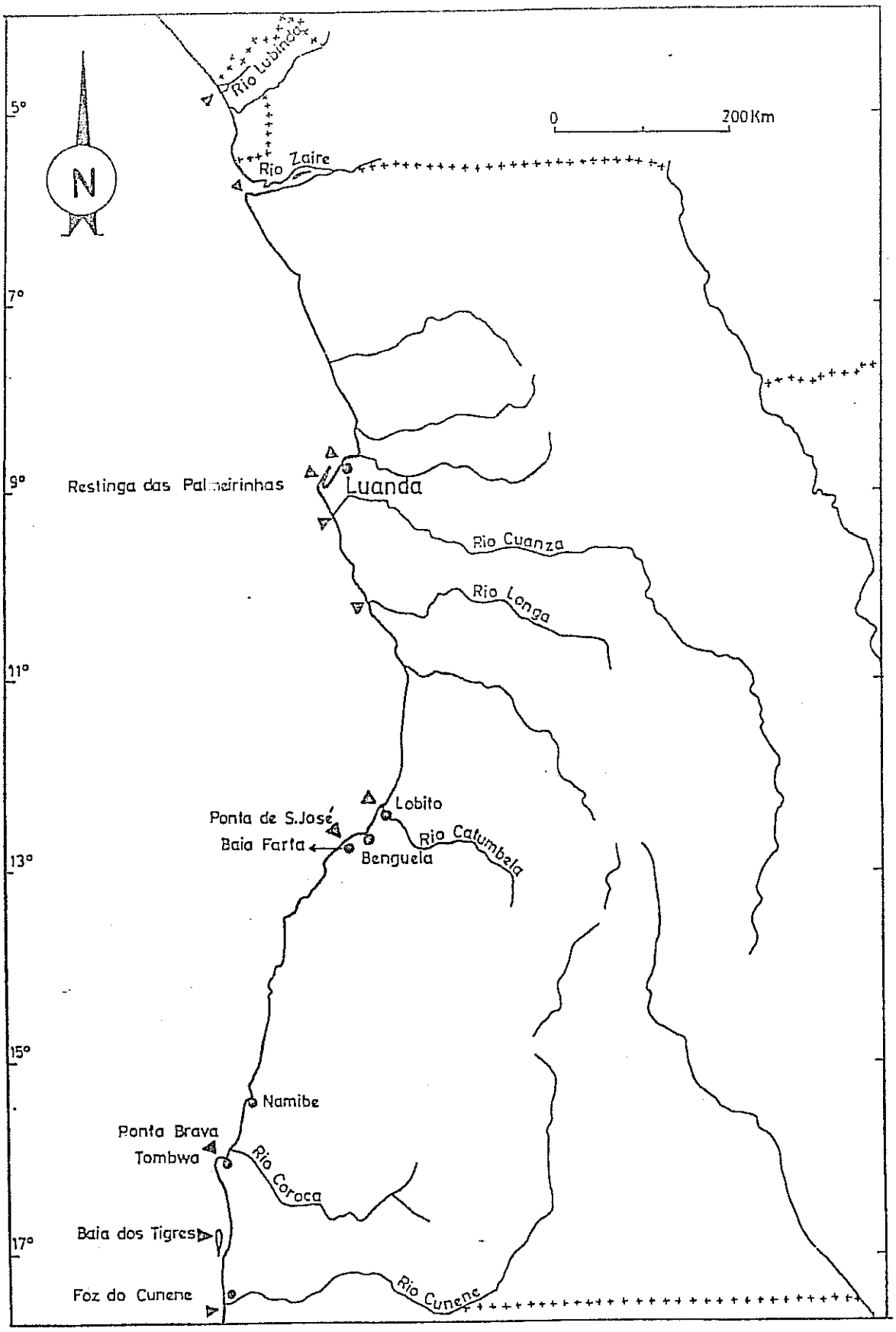

Figure 4.5 Location of Restingas and Bays along the Angolan Coast.

Environmental Problems of Bays and Restingas Adjacent to Luanda

a. Baia do Cacuaco

This Bay is located approximately 15 km north of Luanda. The area between Luanda and the Bay is one of the main industrial complexes in Angola. Low-income residential areas and squatter camps are interspersed within the complex. Angola's biggest cement factory (CIMANGOL) is located at the head of the Bay and industrial effluent from the factory is discharged directly into the Bay. Cement dust is constantly released into the atmosphere which is blown into the Bay by prevailing winds. Other industrial plants in area include an oil refinery (FINA), a battery plant (TUDOR); an oil and soap factory (INDUVE) and a factory producing asbestos tubing and sheets (Cimianto).

Most of the houses around the Bay lack sewage facilities and human waste is often discharged into the Bay. Bengo River, which has numerous human settlements along to the River, enters the sea just north of the Bay (Figure 4.6).

As a consequence of industrial and human pollution the artisanal fishing industry is practically non-existant in the Baia do Cacauco.

b. Baia and Restinga de Luanda

Luanda Bay is formed by a thin restinga, 7 km in length, running in a north-easterly direction known as the Ilha de Luanda (Figure 4.6). The bay provides a habitat for several aquatic bird species including herons (*Ardea cinerea*); Yellow-billed egrets (*Egretta intermedia*); cormorants (*Phalacrocarax carbo lucidus*); seagulls (*Larus cirrocephalus*) and, occasionally, pelicans (*Pelecarnus onocratalus*), although the number of birds of these species has declined markedly in recent years. Grey plovers (*Pluvialis squatarola*) and the bar-tailed godwit (*Limosa lapponica*) are found along the margins of the bay.

The Bay of Luanda is Angola's principal port and shipyard and ships using the bay are major polluters of the waters of the bay. Ships regularly wash out bilges in or close to the bay and maintenance work, such as the painting of hulls with anti-corrosive and molluscidal paints, is carried out apparently without control. These activities are undoubtedly increasing the levels of hydrocarbons, heavy metals and molluscidal compounds to extremely dangerous levels. Industries located around the bay further contribute to pollution of the waters of the bay.

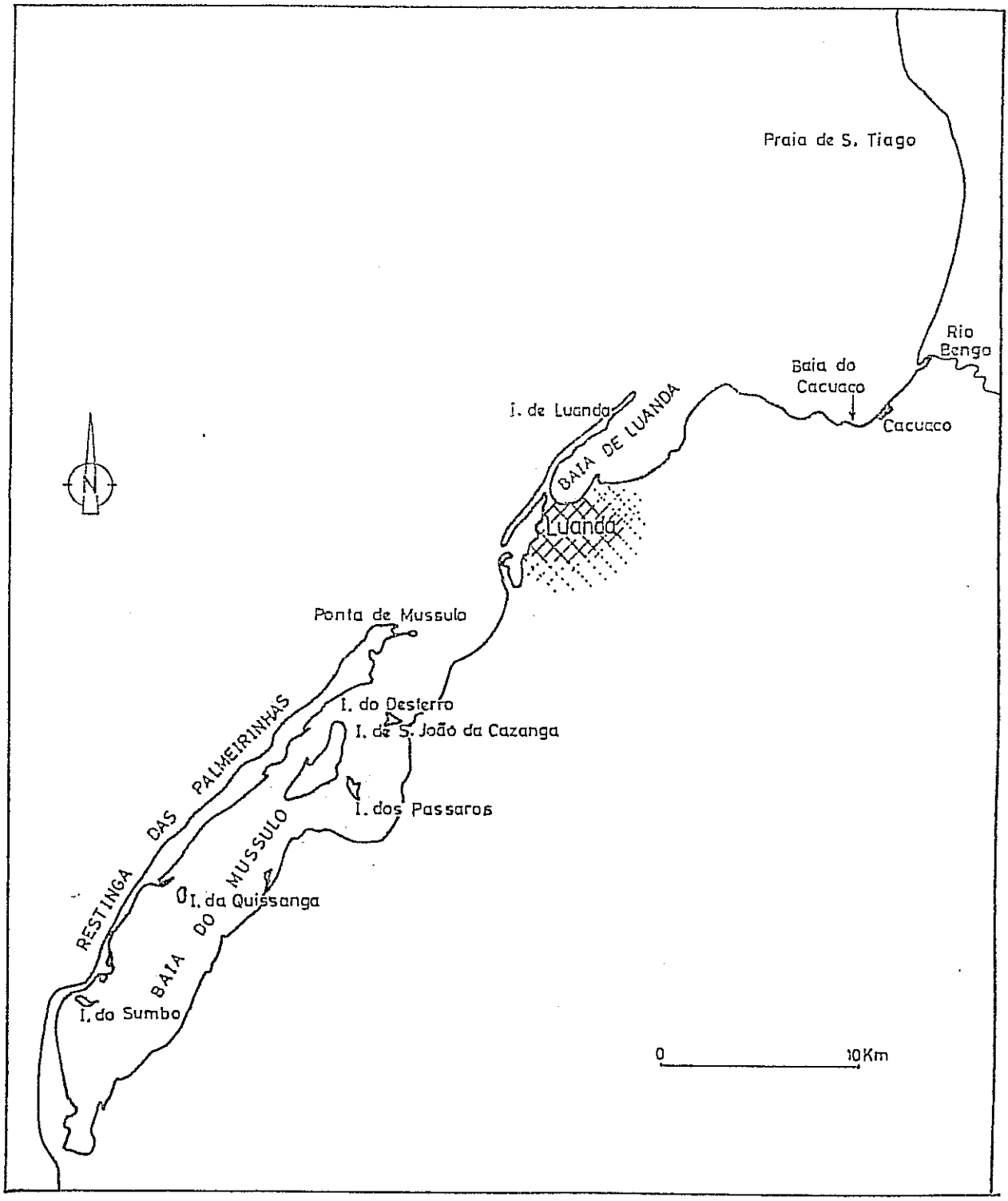

Figure 4.6 Location of Bays and Restingas of Luanda and environs

Storm water drains discharge directly into the bay often contaminated with human waste from broken sewage pipes and overflowing septic tanks in Luanda. Displaced persons camp around the bay and human faeces and garbage accumulate openly on the water's edge as no ablution facilities are available for these people. Preliminary studies have shown that the waters of the bay are highly contaminated by harmful bacteria.

Although the bay is obviously highly polluted, artisanal fishing and collection of shell fish ('mabanga'; *Arca senilis*) still continues in the bay albeit at low levels, even though these activities are prohibited by the authorities.

The restinga (Ilha de Luanda), is an extremely fragile formation, highly susceptible to erosion which is connected to the mainland via an artificially constructed bridge of land; the restinga having separated from the mainland at some time in the past. Groynes have been constructed on the seaward side of the restinga to control erosion. The Ilha has long been a popular tourist resort with many restaurants located along the length of the restinga. However, spontaneous settlements have sprung up in the last 15 year placing further pressure on the Ilha. In 1989, an attempt was made to re-vegetate the restinga by planting 15,000 *Casuarina* trees. However, most of these trees have been removed by the local inhabitants, presumably for domestic use, and only a few trees remain today.

The pressure on the restinga is now extremely high due due to tourism and human settlements. This pressure will probably increase in coming years. Effective measures are required to alleviate pressure on the restinga and to control waste that enters the bay and sea from tourist activities and human settlements.

c. Baia and Restinga do Mussulo

Mussulo Bay (Figure 4.6), located 16 km south of Luanda, is protected from the open sea by a 30 km long north-easterly restinga (Restinga das Palmeirinhas). The bay (152 km^2) is generally shallow throughout and is characterized by sand banks, canals and several small islands (from north to south: Ilhas do Desterro; de S. José Cazanga; dos Pássaros; de Quissango and do Sumbo). Ilha dos Pássaros (10 km^2) is an Integral Natural Reserve covered mainly by mangrove. Bird species resting on the island include herons (*Ardea cinerea*); egrets (*Egretta garzetta* and *E. intermedia*) and ibis (*Threskiornis aethiopicus*). Flamingoes (*Phoenicopterus ruber*) are common visitors to the southern-most part of the bay.

Where conditions permit, dwarf mangrove (mainly *Rhizophora* mangle and but also *R. racemosa* and *Avicennia germinans*)

occurs on the margins and islands of the bay. Common faunal associates of the mangrove are fiddler crabs (*Uca tangeri*), grapsid crabs (*Goniopsis pelii*), oysters (*Ostra tulipa*) and various gastropods (*Siphonaria grisea*, *Littorina angulifera* and *Thais callifera*).

Where the substrate conditions are more saline halophytic herbs such as *Sesuvium portulacastrum*, *Arthrocnenum spp.* and *Sporobolus virginicus* predominate (Correia 1985). Hypersaline soils, characterized by a salt crust, are usually bare. Occasional visitors to the bay are the Atlantic ridley and green turtles (see Annex 4.5.a).

Although few industrial complexes are located adjacent to Mussulo Bay, the restinga and bay are under pressure from increased artisanal fisheries and from tourism. The impact of artisanal fisheries on the turtle population in the bay has already been highlighted (Annex 4.5.a). Artisanal fisheries have increased in recent years and several new fishing villages have been set up around the bay. Fish stocks in the bay appear to be over-exploited. Local fishermen report declining catches and the use of nets of small mesh (sizes 1 and 2) further indicates that fish stocks are being depleted (see Chapter 2.2 and Annex 2.2.a for a more detailed account).

The increase in the number of human settlements, which lack basic sewage disposal facilities, may be leading to bacterial contamination of the waters and fauna of the Bay. No quantitative data of pollution levels in Mussulo Bay are available.

The Mussulo Restinga has several human settlements, tourist homes and small-scale farms along its length although the population pressure is far less than on the Ilha de Luanda. However, the construction of several tourist complexes on the Restinga is presently being considered. Vegetation cover on the Restinga is being reduced thereby increasing the potential for erosion. Re-vegetation programs have been suggested but to date these have not been implemented. A further problem on the Restinga is the possible over-abstraction of ground water. Inhabitants on the Restinga are wholly dependent on ground water for domestic use and irrigation. Lowering of the freshwater head and incursion of saline water will have a negative effect on the hydro-geological balance of the Restinga if alternative sources of water are not forthcoming.

<u>The Luanda - Cuanza River Coastal Strip</u>

The coastal strip between Luanda and the Cuanza River has a long history of arthropogenic land use such as grazing of livestock, small-scale farming, collection of firewood, quarrying of sand

and tourism. Associated environmental problems related to these activities include the over-exploitation of the *Hyphaene* palm, the removal of vegetation cover and erosion.

The soils of the coastal strip vary between dry sandy regosols and ferralic arenosals, known locally as 'musseque' soils. The soils are deep and coarse-textured ranging in colour from pale to soils with a bright chromic hue. The ferralic arenosals may have a relatively high kaolinitic clay content.

The vegetation comprises open dry woodland in which *Adansonia digitata* (baobab), *Sterculia setigera* and *Euphorbia conspicua* dominate. On lowlying soils the palm *Hyphaene gossweilerii* is common.

Fuelwood collection and charcoal production has led to the almost complete removal of suitable woody individuals leaving only tree species not suited for these purposes (e.g. those referred to above). Goat grazing has resulted in reduced herbaceous vegetation cover along the entire strip. Closer to Luanda, spontaneous settlements have been set-up, often on the slopes of hills. The areas surrounding these settlements are almost completely devoid of vegetation. These activities have consequently resulted in severe erosion problems especially on scarps and slopes along the coastal strip and in Luanda itself.

Erosion control measures such as revegetation programs and/or mechanical stabilization need to be implemented urgently in some areas. Certain spontaneous settlements are located in high-risk areas and with increasing human activity and heavy rains, these settlements are in danger of being eroded away in landslips.

In the lowlying areas, closer to the Cuanza River, the *Hyphaene* palm is heavily exploited for the production of local wine ('muruva'). Trees are 'decapitated' and the exuding sap is collected in containers attached to the tree. The wine is used both for domestic consumption and for sale locally. Mortality levels of the *Hyphaene* palm is extremely high, between 95 and 100% in some areas. The regeneration status of the species appears to be low. If the harvesting of the *Hyphaene* palm continues at the present rate there is a danger that the species may become locally extinct. Effective control measures need to implemented to ensure that the palms are harvested on a sustainable basis. Continued survival of the species in the region will be dependent on successful seedling establishment either through natural regeneration or planting of seedlings. Programs to encourage seedling establishment should be carried out in participation with the local community.

The Lobito - Benguela - Baia Farta Urban Complex

The major economic activities and highest population densities in Benguela Province are located within three closely connected coastal towns viz. Lobito, Benguela and Baia Farta. The principal economic activities are fisheries, agriculture, industry, and port and railroad transport. Lobito and Benguela are connected by a railroad which links up with Huambo, Bie and Moxico Provinces in the interior of the country (the Benguela Railroad, presently undergoing rehabilitation). The area is thus of strategic importance and Lobito is the second biggest port, after Luanda, along the Angolan coast.

Although economic activities are presently below potential levels they contribute significantly to the Angolan economy. Lobito-Benguela-Baia Farta register the highest percentage fish catch along the Angolan coast (39% of the total catch) whilst the area is responsible for 35% of the country's total industrial output.

Tourism in the region is not important economically although the potential for tourism certainly exists. The coastline between Benguela and Baia Farta has several clear water bays bounded by sandy beaches and rocky shores which could be developed touristically. Two localities close to Baia Farta (Caotinha and Caota) already have tourist complexes but they are not developed to their full potential. In addition a small game reserve (Parque Natural Regional de Chimalavera) is located 24 km south of Benguela although the reserve, similar to other conservation areas in Angola, lacks infrastructure or the capacity to protect wildlife.

The Lobito-Benguela-Baia Farta area experiences a tropical, dry, semi-desert climate. The annual average precipitation is low (100-300 mm) with a high average evaporation rate (1,300 mm/yr.). The period 1989 to 1992 has experienced below average rainfall exacerbating the trend towards desertification in the region. The soils in the areas surrounding Lobito-Benguela-Baia Farta are calcareous clays ('solos calcários pardos') with a sparse covering of trees and bushes, mainly *Acacia mellifera* subsp. *detineas, A. nilotica* and *Terminalia pruniodes*. Two major rivers flow into the sea between Lobito and Benguela (the Catumbela and Cavaco Rivers) and the area between the two cities (33 km apart) comprises a continuous expanse of rich alluvial deposits which is under intensive agriculture.

Lobito, Benguela and Baia Farta have suffered a massive increase in population in recent years resulting in severe, localized environmental degradation. Population increase in the three municipalities is given in Figure 4.7.

The major environmental problems associated with the increase in population are:

a) land degradation due to the removal of the woody component for fuel and construction - resulting in erosion and desertification,

b) pollution of water resources,

c) degradation of coastal wetlands,

d) possible over-exploitation of the rich alluvial deposit between Benguela and Lobito due to agricultural practices, and

e) possible over-exploitation of fish stocks both by the artisanal and industrial fishing sectors. [This is discussed in detail in Chapter 2.2 and Annex 2.2.a, thus it will not be further addressed in this chapter.]

Figure 4.7. Population increases between 1970 and 1990 in Lobito, Benguela and Baia Farta.

Municipality	1970	1985	1989	1990	2000[1]
Lobito	135640	338300	409000	426400	642600
Benguela	88006	219500	265300	276000	416900
Baia Farta	17811	44420	53700	55990	84380

[1] Projected increases in population until 2000 are given.
Note: Data supplied by Gabinete Provincial dos Planos, Benguela.

a. Land Degradation

Most households and many commercial enterprises in Lobito-Benguela-Baia Farta are dependent on fuelwood and charcoal for their energy requirements. It is estimated that wood consumption in the Lobito-Benguela area alone is 24-28,000 m^3/yr which is far in excess of the estimated wood production for the entire Province (750m^3/yr.)

If these figures are to be accepted, then depletion of the woody biomass is proceeding at an alarming rate. The impact in the urban and peri-urban areas is apparent where an increasing zone of depletion has resulted in the landscape assuming a desert-like appearance with associated patterns of erosion.

b. Water Pollution

Lobito-Benguela-Baia Farta suffer from a lack of adequate water supply for both urban use and irrigation. Only the urban core areas have a water supply system and disposal system and they are generally in a state of deterioration. The only water supply in the surrounding squatter camps is via standpipes ('fontenários' or 'chafarizes') or that brought in by water tankers by the local councils. This supply falls well short of demand.

Sewage and drainage channels are often open where as the closed systems are sometimes broken with sewage and wastewater seeping into the streets which may contaminate nearby wells. The Cavaco River and the irrigation channel parallel to the Lobito-Benguela road are used for washing and bathing. In areas lacking any water supply wastewater and storm water are sometimes used for household purposes (but not for drinking). The health hazards due to contaminated water are further exacerbated by the occasional flooding of the Cavaco and Catumbela Rivers when the floodwaters become contaminated by the open sewage systems and other human waste. The water table is often close to surface and it may be expected that, in addition to surface water contaminating ground water may be subject to bacterial contamination. Consequently, diseases related to contaminated water are common in the Lobito-Benguela-Baia Farta urban complex (Figure 4.8).

Figure 4.8. Diseases related to contaminated water and their ranking in Benguela Province.

Disease	RELATIONSHIP TO WATER: Polluted	Inadequate Supply	Inappropriate Storage	Ranking
Diarrhoea	x	x		1
Malaria			x	3
Cholera	x	x		5
Hepatitis	x			7
Bilharzia	x			11
Typhoid	x			12

Note: Adapted from Campos and Ramos (1990), A situação Saúde em Angola.

Besides water pollution due to bacterial contamination, water pollution due to industrial effluents pose an additional threat. The industrial complex in Lobito-Benguela includes both heavy and light industry, and food and fish processing. No control of discharge of effluents from these factories is exercised. The textile factory (Afrotextil), the biggest in Angola, discharges waste directly into the Cavaco River. Similarly, other light and cottage industries discharge waste into open areas or adjacent water courses.

To date, no data on the level or type of pollutants and the risk industries pose are available. It should be noted that the present levels of industrial output are below potential levels and some factories are temporarily closed. It is to be expected, therefore, that industrial pollution will increase as industries increase output and resume operation.

c. Degradation of Coastal Wetlands

The coastline between Lobito and Benguela comprises beaches, estuaries, shallow bays and salt flats. The beaches, estuaries and shallow bays are polluted by human and industrial waste, especially those areas in close proximity to sqatter camps and residential areas. Lobito Bay appears to be especially affected where pollution by human and industrial effluent is made worse by ships discharging waste in the bay. Small patches of mangroves, representing one of the southern-most mangrove communities along the Angolan coast, occur in sheltered bays north of Lobito. However, these mangroves are under threat from both fuelwood collection and pollution. The area is also an important feeding ground for large colonies of the Greater, Lesser and White Flamingo.

d. Degradation of the Alluvium Floodplains

The area between the Cavaco River in the south (close to Benguela) and the Catumbela River in the north (adjacent to Lobito) comprises a continuous low-lying plain with deposits of nutrient-rich alluvium. The plain is of varying width (2-6 km) bounded by the Atlantic Ocean in the west and an escarpment in the east. The water table is close to the surfaces (0.5 - 4 m depth).

Almost the entire area is under some form of cultivation. Since 1989, farms of varying sizes have been distributed to private farmers for cultivation; crops include tomatoes, onions, cabbages, green peppers, potatoes, maize and sugar cane. The majority of the horticultural produce is sold in Luanda. In addition to the private farms, the sugar company owns large tracts of land for cultivation of sugar cane, although these areas are not fully utilized as the sugar refinery is not presently operational. Water for irrigation is obtained from the Cavaco or Catumbela Rivers by pump or traditional irrigation techniques (channels) as well as from underground reserves (by pump). The latter form of irrigation is causing concern as recent reports indicate that localized salinization of soils is occurring.

In view of the intensity of agriculture and associated irrigation practices, salinization may be accompanied by soil nutrient depletion and/or erosion. These impacts will need to be monitored by MINADER in the future.

The Namibe - Tombwa Coastal Zone System

Namibe (15° 14'S), the capital of Namibe Province, and Tombwa (15° 50'S) are the two principal towns along the arid, southern coast of Angola. Both towns are important fishing ports. Approximately 65% of the population of Namibe Province (57,901 km^2) reside in the municipalities of Namibe and Tombwa. Similar to the situation in other cities along the coast, the population of Namibe and Tombwa has increased substantially in recent years (Figure 4.9).

Figure 4.9. Population Data for Namibe and Tombwa.

Municipality	1984 Population	Estimated 1991 Population[1]
Namibe	41,213	101,200
Tombwa	10,142	20,000

[1] Estimates made by the Gabinete Provincial do Plano, Namibe

Concomitant with the population increases, the two urban centres are experiencing similar environmental problems to those encountered in the Lobito-Benguela-Baia Farta Urban Complex *viz.* local environmental degradation and pollution of aquatic resources. Malaria and cholera, both related to poor water quality, are the two main diseases in the province.

The soils of the region are almost entirely quartz sands. The vegetation comprises a sparse covering of herbs and occasionally trees adapted to the harsh desert conditions. Most notable is *Welwitschia mirabilis*, although graminaceous species such as *Aristida spp.*, *Stipagrostis subacaulis* and *Eragrostis porosa* occur together with herbs such as *Aloe littoralis* and *Sarcocaulon mossamedensis*. Where conditions permit, usually along drainage lines and seasonal river beds, trees and bushes such *Acacia tortilis*, *A. reficiens* and *Tamarix usneoides* are found (Diniz 1973; Barbosa 1970).

Due to the sparse vegetation cover and prevailing winds (mainly from the south) the dunes of the desert are highly mobile. Sediments of sand, arising from the major river mouths (e.g. the Cunene River), together with existing deposits, encroach up the coast. The town of Tombwa is especially threatened by sand

encroachment. The local offices of the IDF/MINADER, with technical help from FAO, are carrying out a reforestation program in an attempt to stabilize the dunes. A secondary objective of the program is to provide firewood for the local population. Several indigenous and exotic tree species are being propagated in nurseries close to Tombwa before transplanting on the dunes. Species include *Tamarix usneoides* (*'T. angolensis'*?), which is collected from the nearby Caroca River and propagated by shoot, *Acacia cyanaphylla*, *A. cyclops*, *Eucalyptus spp.* and *Delonix regia*.

The program, initiated in 1990, is still in the preliminary phase. To date 45 ha. of dune have been revegetated with limited sucess. Due to the lack of available firewood in the region, established trees are harvested for domestic use thereby prejudicing the dune stabilization program.

The major limitation in the Namib-Tombwa is, undoubtedly, the lack of available water resources. Small-scale agriculture is practiced ajacent to and, in the dry season, in the river beds (e.g. along the Caroca River a few kilometers north of Tombwa). Traditional irrigation techniques and abstraction of ground water are used to irrigate crops. With the increase in population the river banks and river beds are now being intensively cultivated. Over-abstraction of water and deterioration in soil quality may pose environmental problems in the future, especially if the trend of increasing aridity continues in the region.

Priorities in the region, therefore, are related to stabilization of dunes, fuelwood supply and the rational use of available water.

Recommendations

This review of Angolas wetland ecosystems has assessed as far as possible their current condition and highlighted various issues and problems surrounding the wetlands of the country. Considering the endemicity and richness of Angolas wetlands and its associated endemic species, the dearth of wetlands information, limited wetlands awareness, the current institutional and policy vacuum concerning wetlands and the general absence of effort and interest to link wetlands conservation and mangement to Angolas development efforts, it is apparent that there is an urgent need for the development and implemenmtation of wetland projects to ensure and promote the sustainable existence and utilization of wetlands.

The development and implementation of an Angola Wetlands Programme should be elaborated with the following objectives/outputs in mind:

a. To more precisely determine the location, biotic and physical characteristics of the major wetland systems of Angola.

b. To identify the services, products and attributes provided by wetlands as well as current uses and the potential for further utilization.

c. To quantify the current and potential threats to Angola's wetlands.

d. Build popular awareness and understanding of the importance of wetland ecosystems.

e. To strengthen and provide the relevant institutions with technical capacity to conserve, manage and monitor wetland systems, including the establishment of focal point(s) within Angola's Government for wetlands management issues.

f. To specifically initiate, develop and implement conservation and management plans for mangrove ecosystems and flood plains.

g. Initiate and encourage Angolas participation in the Ramsar and Biological Biversity Conventions.

The following is a brief summary of more specific priority actions which should be considered during the early phases of programme formulation:

a) Recent trends indicate that over-exploitation of fishing stocks both in the industrial and in the artisanal fishing sectors is occurring. An assessment of fish stocks and catches in both sectors is required to define realistic production targets. More information is required on artisanal fisheries although assistance can be offered to this sector.

b) Measures to control fishing by international fleets are required. The artisanal fishing sector must be protected from unfair competition from industrial fleets. Policing of Angolan waters is urgently required to control illegal fishing.

c) The interior wetlands ('dambos') traditionally used by smale-scale famers were generally abandoned during the war. Since the peace accord these wetlands are again being farmed. The challenge in Angola is to implement ecologically sound farming practices to ensure their long-term sustainablity and to minimize the impact on associated systems (e.g. rivers and lakes).

d) The lower course of the Cuanza River is structurally intact although the manatee and hippopotamus have been heavily exploited. The conservation status of the manatee needs to be determined and conservation measured implemented.

e) The Cuango River (Lunda North) is being transformed by industrial and non-industrial diamond mining. Legislative measures should be considered to rehabilitate mined areas. Control of illegal mining activities is required.

f) The mortality of mangroves along estuaries between the Zaire and Bengo Rivers needs to be investigated.

g) The conservation status of the turtles and their habitats needs to be assessed. Conservation measures may include participation with the local population.

h) Restingas and bays in close proximity to urban areas are suffering environmental impacts such pollution, decrease in vegetation cover, erosion and over-abstraction of water.

i) Linked to (8) above, the major coastal zone problems are those associated with increasing population in urban/peri urban centres resulting in pollution, deforestation, erosion and over-fishing.

j) Sand encroachment is a specific problem in the Tombwa region.

k) Action must be taken to reduce the impact of oil on the livelihood of artisanal fishers in northe

A general description of wetlands is presented in Annex 3.2.a. The specific problems of sandy beaches and marine turtles are presented in Annex 4.5.a.

4.7 INSTITUTIONAL/LEGAL/POLITICAL FRAMEWORK

The prospects for promoting a "sustainable development" approach in Angola are, unfortunately, limited. The population, in general, is unaware of environmental problems. In addition, the major political parties place environment very low on the list of priorities.

The primary concern of both the population and politicians at this moment in time is economic improvement. People are tired of the insecurity and sacrifices of a wartime economy.

There is no quick and easy way to raise the environmental awareness level of the population at large, especially in light

of an illiteracy rate estimated at 80%, the relative youth of the population (45% under 15, which means a lifetime spent in the exigencies of wartime) and the general lack of social organization which characterizes Angolan society. What is necessary is a massive and long-term educational effort, using everyday problems at the grass-roots level (i.e. the connection between disease and lack of urban sanitation management) as an entry point. For example, there is little or no awareness of the connection between environmental problems and public health.

The only way to make environmental concerns an immediate political concern is to highlight their economic importance. In its simplest form this entails presenting the nitty-gritty survival issues for the majority of the population (access to land, water and forest resources) as environmental issues to decision-makers. This can be done indirectly by making decision-makers aware of the economic costs of resource degradation and the long-term economic benefits of sustainable resource use. While the costs in terms of fishing losses of the pollution of the bay in Luanda are well-recognized, the potential financial gains from biodiversity conservation, to give one example, are not obvious to many.

The Role of Foreign Actors

Foreign actors, including foreign private capital and foreign public and private aid, are going to play a major role in Angola's development (at least in the near future). They bear a special responsibility for the direction in which Angola will develop and for the impact this development will have on the country's environment. Paradoxically, they constitute possibly the greatest danger to, as well as the most important support for a sustainable development approach.

Another danger is **private foreign capital investors** eager to exploit Angola's rich natural resources. Their interests coincide with those of an emerging local business and entrepreneur class and with those of the government which badly needs foreign exchange and foreign expertise. In order to attract foreign capital the Angolan authorities are now ready to offer the most advantageous conditions to foreign investors, on the one hand brushing aside social and environmental safeguards and conditions. On the other hand, they offer a generous range of fiscal benefits and privileges. While this latter may be good policy, the former is definitely a mistake. If sustainable development is to be an option, then foreign investment has to be subject to strict environmental (and social) legislation, and foreign private capital has to be made co-responsible for the environmental impact of this investment.

Foreign donors - multilateral, bilateral and private - constitute a potentially strong support for sustainable development in Angola. It is through these channels, and lately more specifically through the spin-offs of the Rio Conference, that environmental consciousness has been stimulated and nurtured in Angola. These donors are the first to initiate environmental impact studies as a precondition for funding future development projects. Some of the principal donors have recently formed an internal working group to discuss these issues and coordinate their actions in this field. As a result of the Rio Conference, considerable international funds will become available for development and support work in the environmental field. Much can be done with these resources in the many fields where change and reform is necessary. The foreign aid community should carefully focus this support and it should give strong support to those few groups in Angola - some NGOs, part of the scientific community and a few government officers and technicians - who try to promote a new, sustainable development approach but who, at present, are spread thin and do not have much influence.

Institutional Framework

The General Framework for a Sustainable Development Approach

It is obvious that responsibility for the definition and implementation of such a policy cannot be entrusted simply to one of the ministries, as is the case at present (the MINADER). It should rather be institutionalized in a separate body, possibly as a ministry or secretariat of state. The appropriate form, function and location of such a new body will probably depend on the ideological interpretation which will be given to the concept of sustainable development. If "sustainable development" is given a much broader interpretation, one that corresponds to its original meaning and goes far beyond environmentally sound management, then it may be advisable to create a new body, of a more political nature and attached to the highest level of government with sufficient power to impose a coherent sustainable development approach on all other sectorial ministries and on administrative and technical units.

Government Institutions

At the top level, the proposals of the inter-ministerial commission to transfer responsibility for environmental matters from IDF and MINADER to a new ministry or state secretariat for environmental affaires makes sense. A state secretariat would probably be preferable as it would be more flexible and able to respond more rapidly to new demands. Such a state secretariat should preferably be situated at the highest level of government and be attached to the Head of State. Its tasks would be to define an overall national environmental policy, develop short

and long term strategies to implement it, support and oversee their translation into sectoral policies, support the elaboration of new legislation in all relevant fields, assist in the creation of environmental focal points (or cabinets or other administrative units) within all ministries and other state secretariats, and to screen action plans of government ministries. The latter task would ensure that they correspond to the overall sustainable approach. The proposal to transform the present informal commission into a formal national commission, whose task would be to do this preparatory work, seems sound. It is crucial that representatives from civil society - political parties, NGOs, interest groups etc - can participate as full members in this commission.

It is important to de-politicize key functions and positions and to promote the emergence of a body of technicians, ensure fair competition for positions, provide security of employment at greatly up-graded salaries, and to aim for stability and continuity of leading cadres. The small group of government officers that are committed to, and knowledgeable about, a sustainable development approach (possibly those who have been involved in the Rio preparation and follow-up commissions) should be supported and placed into strategic positions where they can both influence policy making and raise the awareness of their staff and colleagues. These management and personnel reforms will probably require the help of specialized management consultants.

Non-governmental Organizations

The strengthening and support of the NGO sector is of utmost importance. Great care must be taken by government and foreign donors to give the emerging NGOs time to grow, to gather experience and to mature. Flooding fledgling NGOs with heavy assignments and large funds will turn them simply into local delivery mechanisms of aid. It is tempting for government, for mentors of economic policy like the World Bank, and for foreign donors to use NGOs as relatively efficient and cheap replacements for a badly-functioning, or in many areas absent, state administration.

This is indeed an important role that NGOs can play, but their principal contribution should not lie here but in their function as intermediaries between the state and the people, as facilitators of participatory processes and of effective cooperation between the state and civil society. To fulfil such a role, they must be close to the people, know them and be trusted by them. This pre-supposes field experience. Angolan NGOs must be encouraged to go into this direction. Practical field work in slums, among refugees or among peasant communities is more important at this stage for Angolan NGOs than courting foreign donors and sitting in on high-level commissions. Rather than offering NGOs token representation in new governmental

commissions or bodies, they should be entrusted with real responsibility and the means for participatory projects. Contacts and exchanges with other NGOs outside Angola should be strongly encouraged and would contribute to the maturing of local NGOs. There are several regional NGO groupings in Africa in which Angolan NGOs could participate (ADRA has started to do this). The Africa 2000 project of UNDP could be an excellent tool for this.

Changes in the Legal Framework

The elaboration of a national environmental policy must be accompanied by corresponding legislation, both in the form of a general law on the environment, its use and conservation, and in the form of appropriate additions to sectoral legislation (for example in the fields of mining, forestry, fishery and scientific research). Of special urgency is that appropriate land and forestry laws be adopted to clarify property relations. Such property relations must take into account and legitimize not only individual and state ownership, but also the **traditional custom** of collective village or **community ownership** and **management** of **natural resources**. The concept of "appropriate authority" developed in Zimbabwe (e.g. CAMPFIRE Programme) should be examined for its relevance in Angola.

The new laws should be widely diffused, publicized and commented on in the media. Publications containing information about these laws should be easily available to the public. Appropriate enforcement mechanisms must be created simultaneously with the new legislation. Law enforcement will depend in part on the availability of administrative and repressive means - it will however have to be based largely on people's participation in the control and respect of such environmental legislation. There is no prospect in the near future of government authorities effecting controlling resource utilisation patterms. The best option for promoting sustainable resource use therefore lies in the adoption of a twin strategy of decentralizing/devolving ownership/management authority coupled with corrective incentives or fines to guide decision-making.

Of particular importance and urgency is **legislation in the field of foreign investment**. Present foreign investment laws, both those presently in vigor and those planned by UNITA, are vague and leave almost everything open for negotiation (in order to be as attractive as possible to foreign capital). Foreign investment, interested in the rapid exploitation of Angola's natural resources, constitutes certainly one of the biggest immediate dangers for the country's resource base. At the same time, given the magnitude of the capital gains to be made, there is a great potential here for "managing" foreign investment.

It is therefore important that foreign investment laws contain

strict environmental clauses and safeguards and that environmental impact studies, carried out by qualified multi-disciplinary teams, become compulsory. Environmental impact studies must be carried out by an independent and qualified group and must consider both the impacts on the natural-physical environment and the impact on the socioeconomic, political and human environment.

Scientific Research and Information Sharing

Important and focused efforts are necessary to bring the scientific infrastructure of Angola up to date and make it ready to contribute to a sustainable development strategy. First, it is necessary to regroup the few qualified scientists that are around in a few institutions where, with focused efforts, basic infrastructural facilities and equipment can be restored.

A **training** programme has to be devised for all those scientists and technicians who lack practical field experience and general knowledge of the specific Angolan realities. Such scientists could be associated with the above mentioned participatory planning and development projects. The scientists could gain field experience and confront their theoretical, but often unadapted, knowledge with the traditional knowledge of the local people.

Efforts must be made to develop **multi-disciplinary research and analysis** and to develop the **social science sector** which, at present, is practically nonexistent. Initial research in the social science field should try to take stock of and collect existing data and knowledge about Angola's different social and production systems and start analyzing it. ADRA has an interesting project which proposes to analyze unused data from the last (and possibly unique) nation-wide socioeconomic survey that was carried out at the end of the colonial period. Research should also be carried out on traditional production techniques and traditional ways of managing natural resources, many of which are better adapted to the local ecosystems than modern techniques and are environmentally sound. Research should finally monitor and evaluate ongoing exercises of participatory local resource management.

A **central documentation unit** should be set up where all this information, data, analysis etc, and more generally all information relating to sustainable and ecologically sound development approaches in Angola (thus including relevant legal texts, governmental plans, international agencies' reports, NGO project reports, etc), should be assembled. Such a center could possibly be combined with the UNDP sponsored Sustainable Development Network (SDN). The center would have to be open and accessible to everyone: government bodies, NGOs, individual

researchers, political parties, international donors etc. A communications strategy should be worked out to assure that optimal use be made of this center's information and documentation for formal and informal education and for the preparation of future development projects and plans.

Connected to this central documentation unit (or environmental focal point) a multidisciplinary Development Policy Institute should finally be set up as a semi-public initiative, together with universities and NGOs, that would group together Angolan and possibly foreign resident scientists, and that could carry out environmental impact assessment studies, etc. This would strengthen local capacity and professional involvement in development planning.

Foreign assistance and technical cooperation can play a particularly important role in the development of **Angola's scientific potential,** but such scientific cooperation should be carefully planned, coordinated and subject to precise rules. Generally, the present interest of the international scientific community to study a country that has been for so long inaccessible should be put to good use. **A code of conduct for scientific collaboration should be worked out that obliges all foreign scientists and scientific institutes which want to carry out research in Angola to train Angolan counterparts and to contribute to the rehabilitation and development of the national science sector.** Foreign scientific assistance, provided as part of foreign aid, should be continuous and focused on specific areas - as has been the case in fishery research. Regional scientific cooperation, scholarships and training (for example, in the framework of SADCC) should be given a high priority. Regional collaboration should in any case play an important role in this field as it would be unreasonable to expect each country in the area to build up its own specialized scientific expertise. SADCC already has a number of training programmes in this field. Social Sciences and multidisciplinary approaches are also on the regional level the two areas where most urgent investments must be made.

5. FRAMEWORK FOR ENVIRONMENTAL ACTION

5. A FRAMEWORK FOR ENVIRONMENTAL ACTION

As Angola emerges from decades of war and turmoil it is faced with daunting problems and pressures in almost every respect. Recovery and rehabilitation of the country's economy, infrastructure and productive sectors are of utmost importance. The notion of sustainability and sound environmental management will inevitably be perceived by some as being a hindrance to rapid economic development.

Throughout this report an attempt has been made to highlight the potentials and choices before the Angolan people in relation to their natural resource base. Angola's development is inextricably linked to it's natural resource base - be it oil, land, diamonds or wildlife and forests. The former will last for some years/decades **(non renewable)**, the latter for generations and beyond **if** utilised and managed sustainably **(renewable resouces)**. Economic development throughout Africa and the world has shown the disastrous consequences of failing to understand and appreciate the fragility of ecosystems.

Angola today is privileged to be in a position to make choices. It is rich in mineral resources, biodiversity, land, forests, wetlands, marine resources etc. Angola's natural resource base shows few signs of **irreversible** damage although the costs of pollution, degradation and widespread hunting of wildlife resources observed by the team already amount to millions of dollars. While urban environments have experienced serious pollution problems and wildlife populations have been seriously decimated (some to the point of extinction) most areas of Angola have not been subjected to serious overexploitation over the past 2 decades.

As Angola embarks upon a process of rebuilding the nation it is thus in a position to guide and plan development with many options and choices, the most obvious being **"short-term exploitation vs long-term sustainable development."**

5.1 OPPORTUNITIES AND CONSTRAINTS

The previous chapters provided a first assessment of the current state of the environment with respect to both physical and institutional/human resources.

The constraints highlighted in the report are complex and daunting - the most important of which can be summarised as follows:

a) war torn economy/society,

b) low institutional capacity within Government,

c) lacking policy/legal frameworks,

d) lack of human resources,

e) non-existant land/resource management planning,

f) lack of information/research data,

g) over-exploited wildlife populations,

h) collapsed protected areas administration,

i) no environmental impact assessment process/capacity,

j) a weak NGO structure,

k) low environmental awareness throughout society,

l) destroyed infrastucture, input supply and marketing systems (resulting in a rural survival economy), and

m) high levels of urban pollution throughout the major urban centres (waste; sanitation etc).

Nevertheless the economic stagnation and the virtual collapse of the modern productive economy has resulted in a low level intensity of economic activity over the country as a whole. Thus, while the effects of armed conflict, oil exploitation, diamond mining and urban pollution have created points of environmental damage and/or stress, the resource base as a whole still provides enormous potential for development and conservation.

Angola therefore also faces many **opportunities**, the most of important of which are:

i) A large country with a low population density.

ii) Substantial oil and diamond reserves.

iii) Land resources and climatic condition suitable for intensive agriculture.

iv) A 1,600 km coastline with high potential for artisanal and industrial fisheries, mangrove utilisation, tourism etc.

v) Forest reserves and commercial forestry plantations.

vi) A wide range of wetlands/riverine systems of potential use for fisheries, irrigation, hydroelectric power generation etc.

vii) A relatively high potential for foreign capital investment.

viii) A wide range of biomes providing a unique biodiversity resource for the country's tourism, wildlife and rural development programmes, pharmaceutical and other industries.

Given these opportunities and constraints the greatest danger today appears to be a process of unplanned and uncontrolled development (i.e. **an open access economy** where short term interests and pressures effectively undermine the development of sustainable resource utilisation patterns and systems). This danger is primarily due to the institutional/policy vaccum prevalent in Angola today.

5.2 INITIATING A NATIONAL ENVIRONMENTAL STRATEGY PROCESS (NES)

The need for moving towards a sustainable development strategy for Angola is therefore of utmost importance and urgency as it begins to address the above issues through a process of dialogue, consultations, assessments and planning with the key actors. These include Government institutions at all levels, NGOs, the scientific community, interest groups (e.g. farmer cooperatives), private sector enterprises, foreign corporations and the donor community.

Such a strategy must realistically reflect and address the options for action in Angola today, noteably:

i) **Sustainable utilisation considerations** must be seen to enhance development rather than constrain it.

ii) **Environmental guidelines** must be jointly elaborated rather than imposed (i.e. policing options to control resource utilisation are unrealistic).

iii) Conservation of biodiversity and protected areas management needs to **involve local communities**, and where possible, **transcend preservationist approaches** to enable local communities to benefit from the resource base.

iv) Conservation of resources must be seen to **create new investment opportunities** (e.g. consumptive and non-consumtive tourism).

The underlying theme must reflect the dual policies of "building the positive links between development and the environment while at the same time breaking the negative links" (World Development Report 1992). The most powerful argument in favour of developing such a strategy is that environmental conservation strengthens the long-term options for development in Angola, rather than detracts

from them.

More immediate environmental concerns must be seen to address the **everyday survival issues** for the majority of the population (land, water, health, forests/firewood resources etc). The links between pollution and declining fish stocks, urban waste and deteriorating health, deforestion and land degradation need to be made explicit and subjected to economic analyses of long-term costs and benefits. Similarly private investors should be liable to bear the environmental costs of their mining, exploration and production activities rather than the state and thereby the people of Angola.

Finally, a strategy provides a means to highlight and prioritise feasible actions through a **structured and participatory planning process** (e.g. the early re-establishment of an administrative presence in the national parks to avoid major encroachments now rather than having to remove people at a late stage is an urgent priority in view of the expected more than 1 million refugees returning to the rural areas).

The NES Process

The **NES** provides an umbrella for environment and sustainable development policy debate and formulation. It is process-oriented, consensus building, and ultimately, action oriented.

It is envisaged that the Angola **NES** programme be divided into phases of two years (Phase I) and five years (Phase II). Phase I would focus on consensus building and strategy formulation while Phase II would provide a framework for the implementation of the NES Action Plan.

Phase I

Given Angola's current constraints in institutional and human resource terms as well as the lack of existing data and information on environmental issues, **the NES** should begin by running a series of **national** and **regional workshops** involving all sections and interest groups of society. At the same time a series of **technical/research reports** should be commissioned to provide the NES with an indepth analysis of specific issues and options for action. The feed back, data and information gathered and analysed will provide the basis upon which to elaborate a draft **NES** and **action plan.** The draft version would again be widely circulated and discussed across the country, thereby ensuring not only popular participation but also providing a major focus for environmental awareness building. The final document would then be submitted to Cabinet and the legislature for approval to become Angola's National Environmental Strategy.

While the institutional framework for the coordination of the **NES**

process needs to be examined in the context of post-election changes in Government structures, it is proposed that a NES Secretariat/Commission is establised under the auspices of the President or Prime Minister's office. The NES Secretariat would plan and coordinate the implementation of Phase I guided by a consultative council representing a cross section of all major interest groups in Angola.

The NES Secretariat would also act as a focal point for major initiatives in the environment field (e.g. review of environmental legislation; environmental impact assessment procedures; major research programmes etc) until such time that a final decision has been reached as to how and where in Government responsibility for environmental issues should be institutionalised.

The current situation whereby a line Ministry (i.e. MINADER) holds cross sectoral responsibility for environmental issues does not provide an adequate framework and should be reviewed in the light of the above proposals.

Phase II

Once Cabinet and the legislature have approached the NES, Phase II (5 years) would provide the basis for implementing and where necessary, further elaborating the action plan.

Whatever institution may be given the responsibility for the task, it would primarily act as a catalyst for environmental programmes.

The NES process will have to address a complex agenda including:

a) the need for **a national institution/focal point** for environmental issues,

b) the review of resource management related **legislation**,

c) the provision of **Environmental Impact Assessment** (EIA) procedures and regulation,

d) the introduction of **pollution control standards**,

e) the promotion of **decentralised/community based natural resource management concepts**,

f) the elaboration of a **medium term research agenda**, and

g) the production of **action plans for species conservation and management** (protection, captive breeding, sustainable utilisation, germaplasm etc).

Throughout both Phase I and Phase II, it is envisaged that donor/technical assistance will be required to strengthen and support the Secretariat in its task. A joint and coordinated effort between UNDP, FAO, The World Bank and IUCN (as the major agencies engaged in supporting environmental plans/strategies) to assist the Angolan Government would seem a very desirable and appropriate response to the current conditions in Angola where human resources and institutional capacities are severely constrained. A joint support programme would not only provide a well coordinated and enhanced donor involvement but also avoid parallel processes diluting the available human and institutional resources across too many initiatives.

5.3 SHORT TERM ACTION PROGRAMME

The NES process has been described as an umbrella for environmental issues, therefore not precluding other more specific or sectoral initiatives (the need for which is urgent).

The Government of Angola has already initiated programmes and projects plans with IUCN, (National Report; Demobilisation and Retraining of Soldiers for Protected Areas Management; Kunene Dam EIA; Elephant and Giant Black Sable Conservation Surveys), FAO (Afforestation Programmes; Tropical Forestry Action Plan), the Italian and Spanish Governments (National Parks assistance), the Portuguese Government (National Parks Training Programmes), the EEC (National Report; National Parks; Elephant Conservation Action Plan; Elephant Status Survey) and UNDP (Sustainable Development Network; UNCED 92) to mention but a few examples of planned environmental initiatives.

At present, and no doubt for the coming 2-3 years, Angola is faced with a lack of communication and coordination channels to guide and manage the planning process. Donors and technical assistance agencies have further contributed to the problem by **failing to coordinate their programmes** and at times, allowing **specific national interests to outweigh rational planning** choices. Unfortunately this situation is bound to continue as mission after mission will be arriving in Luanda over the coming 12 months to develop programme options and project proposals, usually with time constraints and few opportunities to move beyond Luanda and an uncoordinated Government planning process.

This report aims to provide both Government and donors with a broad framework for project/programme identification and planning. It is neither comprehensive nor conclusive but represents an interpretation of current conditions, problems and priorities based on extensive field visits, aerial surveys and on-site assessments of important natural resources throughout Angola. Detailed analyses and specific recommendations have been elaborated in Chapter 4 and the list of draft project proposals in Annex 5a.

Key Issues and Thematic Priorities

The following can be regarded as priority issues requiring short-term interventions (for further details, please refer to Chapter 4):

i) **Training of qualified manpower** in planning, research and extension fields (e.g. forestry, protected areas, fisheries, agricultural extension).

ii) **Research, data collection and inventories** on forest resources, wildlife resources, conservation status of protected areas/national parks, major species and specific natural resources such as mangroves, wetlands etc.

iii) Strengthening **national research capacity** by providing the university and research centres with additional staff, finance, equipment and technical assistance.

iv) Increasing levels of **public awareness** concerning the whole spectrum of environmental issues (from public health to marine pollution) through initiating national programmes.

v) A **NGO capacity building programme** - so far NGO's have little or no technical know-how, field experience nor active grassroots constituencies.

vi) Review and adjustment of the most important **policy provisions and laws** affecting resource utilisation decisions (e.g. law on foreign investment, land use, community-based resource management authority, pollution control etc.).

vii) Initiate programmes to **stregthen urban waste and pollution management/control systems.**

viii) **Assess environmental impact** of oil exploration and diamond mining operations with a view to elaborating a joint programme and policy with the respective explorers/ corporations.

ix) **Establish an EIA unit** and programme with funds for environmental impact assessments drawing upon both local and international expertise. The unit should elaborate a short-term policy proposal for Government as to how and when EIAs should be mandatory in the planning and investment approval processes until such time that a fully fledged EIA law is promulgated.

x) Initiate **field based pilot projects** to develop appropriate conceptual framework for natural resource management

policies (eg. wildlife utilisation and rural development; integrated coastal zone management etc)

These 10 issues have emerged as priorities for action during the environmental status quo assessment study. They are inevitably selective, some with short-term results and others with long-term outputs. The common factor, however, is that these represent feasible and urgently needed intiatives and inputs which will largely depend on active donor support to succeed. In Annex 5, a list of **10 draft project proposals** can be found. They have been prepared as a **short-term plan of action.**

The Government of Angola has repeatedly indicated its interest in, and commitment to, developing an environmental agenda for action. To suceed, it requires both technical/policy support and financial assistance to initiate a **critical momentum.** At present this momentum does not exist as ideas, concepts and individuals conversant with environmental issues are dispersed and few. As discussed in Chapters 4-6, **foreign donor organisations** have a special role to play in this respect by facilitating a local process of environmental debate and capacity building that will in due course establish "the environment" as a political and economic issue in national development planning and policy debate.

Without this support from the international community, the immediate future for Angola's environment and natural resource base is bleak. Urban and industrial pollution, oil exploration related pollution, mining-related degradation of vast tracts of land and the resulting siltation of rivers, extinction of species as a result of poaching, loss of biodiversity as encroachments on protected areas destroy the remaining reserves, unsustainable utilisation of forestry/woodland/mangrove reserves, infrastructural developments in sensitive ecosystems (dams, roads, paper mills etc) and destructive agricultural production systems resulting from inadequate extension services and distorting incentive systems and land use laws represent strong forces of destruction.

The report has clearly identified and described instances for all of these. The sheer amount of foreign capital and related industrial and infrastructural developments about to be introduced into the Angolan economy as well as the general resumption of economic activity, has the potential to inflict **more environmental damage in the next 5 years** than the cummulative levels of resource depletion, loss of habitat and species as well as pollution caused during the past 30 years.

The options and choices have been clearly laid out in this report. The Angolan Government, the NGOs, the private sector and the donor community need to jointly evaluate these options and determine the respective policies and actions they are willing to commit themselves to.

Annex 2.1.a

Population: Limitations of Data

Annex 2.1.a Population: Limitations of the Data

The last countrywide population census in Angola was conducted in 1970. In 1984, a partial census was conducted in selected parts of the country. Since then, with the exception of some very localized efforts, no concerted attempts have been made to accurately determine the number and distribution of Angola's inhabitants. The figures that are available are based on extrapolation from the last census, estimates made by the provincial governments, and in a few cases, data gathered by international organizations. The data from these three sources may differ significantly and deliberate choices had to be made between them.

The data produced by extrapolation of the pre-independence census result is of doubtful value as it does not account for the impacts of the war on population distribution. Therefore, a decision was made to use the same figures that the provincial governments use in their planning exercises. It is important, however, to realise that these figures tend to be inflated as the level of assistance any one province or municipality receives is a function of its population. In some cases it was possible to cross-check the provincial government estimates with those of a third party. Estimates of a clearly dubious nature are identified in the text.

Annex 2.2.a

Oceanography, Fish Species Distribution and Abundancy

Annex 2.2.a Oceanography, Fish Species Distribution and Abundance

The composition and abundance of fish stocks along the Angolan coast are determined mainly by the Angolan Current flowing southwards between 9°S and 16°S and, to a lesser extent, by the colder Benguela Current flowing northwards. The influence of the Benguela Current is detected as far north as 13° or 14°S where it diverges away from the coast due to the interaction with the Angolan Current. A full description of the oceanography along the Angolan coast, in relation to fish species composition and abundance, has recently been published (Centro de Investigação Pesqueria 1991) from data gathered during several research voyages made jointly by the Centro de Investigação Pesqueira, Luanda, and the Institute of Marine Research, Bergen, Norway, between 1985 and 1989.

Sardines are found along the entire Angolan coast. Very dense shoals of sardines are encountered (Figure 1) between Cunene (17° 17'S) and Baia dos Tigres (approximately 16° 30'S), Namibe (15° 10'S), between Benguela and Lobito (12° 35'S and 12° 10'S, respectively), near to Luanda (8° 50'S), Ambriz (7° 45'S) and Cabinda (5° 30'S). Three species of sardine (pelagic fish, type 1) are found: the round sardine/'sardinella-lombuda' (*Sardinella aurita*), the flat sardine/'sardinella-da-Madeira' (*Sardinella maderensis*) and the sardine/'sardinopa-da-Africa-do-Sul' (*Sardinops ocellata*), although the latter species is only found south of the Baia dos Tigres due to influence of the Benguela Current.

Very dense shoals of mackerel (pelagic fish, type 2) are found between Cunene and Baia dos Tigres on the edge of the continental shelf. There shoals are comprised of two species: the Cape horse mackerel/'carapau-do-Cabo' (*Trachurus capensis*) and the Cunene horse mackerel/'carapau-do-Cunene' (*Trachurus trecae*). Between Benguela and Cabinda, very dense shoals of pelagic fish type 2 comprising several species are encountered (but not the Cape horse mackerel which is found only in colder waters south of Baia dos Tigres). Species include the Cunene mackerel, the Largehead hairtail/'lirio' (*Trichiurus tepturus*), bumber/'proto-de-aluminio' (*Chloroscombrus chrysurus*), lookdown/'corcovado-africano' (*Silene dorsalvi*) and barracudas/'bicudas' (*Sphyraena spp.*).

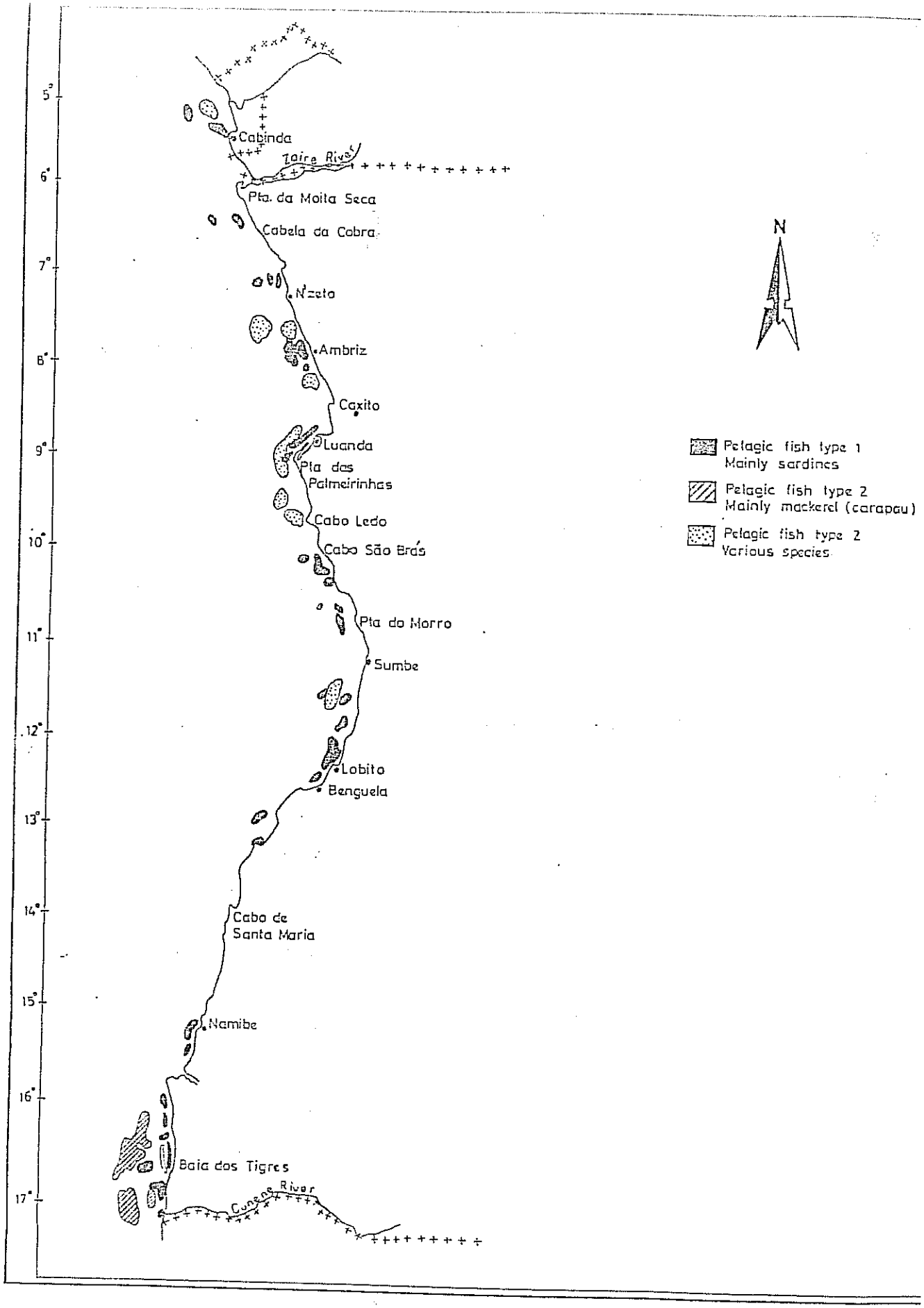

Figure 1. Distribution of very dense pelagic fish stocks (>100 mm) along the Angolan coast. Data obtained during research cruises undertaken by "R/V Fridtjof Nansen" between 1985 and 1989 (adapted from Centro de Investigacao Pesqueira 1991).

Annex 2.2.b The Productive Forests, Their Distribution and Yield

The total area considered as "forest" amounts to 53 million ha or 35% of the total surface area of the country. However, the area considered as productive forest is estimated at only 2,373,000 ha or 2% of the total surface area of the country with an annual allowable cut of 326,000 cu.m. The difference in total "forest" area and the area of productive forests is due to the inclusion of protective forests that have to protected for the protection of major watersheds. Almost all the dense productive forests have been subjected to selective cutting and there are no forests that have not been affected by some sort of human intervention.

After the colonial period forest inventories of small areas have been carried out. However, these inventories do not indicate the actual status of the national forests or their potential. As a result of this situation it is deemed necessary to carry out a forest inventory which includes the natural high forests and savannas for the purpose of obtaining concrete and reliable information on the forest and woodland resources.

The lack of recent and of good quality aerial photographs makes it necessary to use satellite imagery in order to rapidly assess the status of the forests in those areas where the major utilizable natural forests are concentrated.

The estimates of the growing stock and annual increments are unreliable in both the Analysis of Current Situation, Forestry Sector (Horsten 1983) and the Woody Biomass Study (Millington & Townsend 1990). However, the estimates of the former are used because of its commercial timber bias as opposed to the latter which has a woody biomass energy bias. Millington & Townsend (1990) believe that the mean annual increments and the growing stock are underestimated in both reports. In the arid and semi-arid regions of East Africa and the **Combretum** woodlands of Niger in West Africa, the mean annual increments are about 5.0 cu.m/ha. It is, therefore, appropriate to use mean annual increments of 5.0 cu.m/ha in savannahs and about 10.0 cu.m/ha in the case of transitional rain forests/woodland vegetation class. In order to indicate the order of magnitude of the availability of forest resources in the country, the extent of the provincial forest area and allowable cut is presented in Table 1.

Production of Forest Products

In accordance to the existing laws and legislation of the country, there is no private ownership of natural forests with the exception of the small areas designated for crop and

livestock production. Forest exploitation to date is based on t issuance of concessions for a time defined period.

Table 1: Estimated forest area in ha and potential annual cut i cu.m.

Province	Area of productive in ha	Allowable annual cut in cu.m
Cabinda	245,000	112,000
Zaire	36,000	12,000
Uige	224,000	70,000
Kwanza Norte	90,000	27,000
Bengo	35,000	10,000
Malange	157,000	12,000
Lunda Norte	210,000	32,000
Lunda Sul	161,000	10,000
Moxico	383,000	16,000
Bie	91,000	3,000
Kwando Kubango	232,000	5,000
Huila	160,000	3,000
Cunene	168,000	4,000
Namibe	21,000	0
Benguela	42,000	1,000
Huambo	32,000	1,000
Kwanza Sul	86,000	8,000
Luanda	0	0
TOTAL	2,373,000	326,000

A major part of the concession holders are private companies th majority of which operate under installed capacity. The production of sawlogs for the period 1982- 1986 is presented Table 2 in order to give an order of magnitude of forest resou use.

Plantation Forests

According to the inventory of plantation forests of 1975, Ango had a total of 148.000 Ha, the majority of which ie Eucalyptus sap followed by **Pinus** ssp and small areas of **Cupressus lusitan** plantations. However, almost all these plantations are in a st of abandonment and most probably degraded due to lack of silvicultural treatment, burning and phytosanitary problems th it is urgent to assess their status as soon as possible.

The major part of these plantations -- 133 000 ha -- belonged to private companies which include the Railway Authority in which the State is a minority share holder. A partial assessment of the plantations by the Ministry classifies 17 268 ha as excellent, 26 178 ha good, 28 002 ha as normal, 25 986 ha as poor and 1 385 ha as very poor.

Table 2: Production of Sawlogs in cu.m (1982 - 1986).

Enterprise	1982	1983	1984	1985	1986
1. MoA	38,433	31,191	115,731	113,151	91,474
1.1 Cabinda	8,120	7,190	101,475	102,785	76,244
1.2 Zaire	87	66	290	743	472
1.3 Uige	6,263	4,437	2,696	2,133	5,852
1.4 Kwanza Norte	3,037	3,268	1,457	2,569	2,721
1.5 Bengo	12,012	12,349	6,871	3,301	5,314
1.6 Malange	4,578	2,217	1,958	1,069	85
1.7 Lunda Norte	2,400	1,237	609	161	616
1.8 Moxico	1,404	364	-	103	64
1.9 Kwando Kubango	532	63	375	202	106
1.10 Huambo	-	-	-	85	-
2. MoI	-	-	-	**20,778**	**16,900**
2.1 Panga-Panga (4)	s.i	s.i	s.i	20,778	16,900
Grand TOTAL	38,433	31,191	115,731	133,929	108370

The national afforestation programme has virtually ceased due to the war situation that prevailed for a long time and the shortage of trained manpower and financial and other resources. The annual rates of afforestation are insignificant with the existence of nurseries in all provinces with little or no production due to the lack of nursery infrastructure and means of nursery production. At the beginning of the eighties, there were plants to launch a program of afforestation with the massive participation of the population, students, members of the armed forces etc. The national afforestation program envisages the planting of 1 000 seedlings per year. But, even this modest target has never achieved. The policy of the Institute of Forest Development is to continue with the same plan with private and community participation where the government provides technical assistance. The plan did not materialize due to lack of financial

resources to raise seedlings as well as the lack of funds to plant the small amount of seedlings that were produced.

In 1989, a 250 000 tree planting program was planed in the littoral zone with the objective of providing shade and protect the soils from water and wind erosion. This program was, however, not implemented for reasons that are not clear.

In February of 1991, a project identification mission was launched financed by the Canadian government. The recommendation of the mission included: technical assistance in forestry and training, assistance to promote community participation in tree planting and provision of funds for the purchase of transport vehicles and equipment. The implementation of the program of assistance is being awaited.

Although not confirmed, the Railway Authority plans to export to Portugal 1 000 cu.m from its plantation forests around Benguela.

Annex 2.2.b

The Productive Forests, Their Distribution and Yield

Annex 2.3.a Government Institutions with Environmental Activities

1. MINISTRY OF PETROLEUM

Has recently created the **DIRECCAO NACIONAL DOS PETROLEOS** (National Petroleum Department) within which functions the **GABINETE DE PROTECCAO AMBIENTAL** (Office for the Protection of the Environment), which is part of the National Contingency Plan **"COMBATE A POLUICAO"** (Fight Against Pollution).
HUMAN RESOURCES: 12 people, 5 of whom have higher studies and the rest, intermediate-level studies.
The **GABINETE DE PROTECCAO AMBIENTAL** reports to the NATIONAL DIRECTOR and he, in turn is directly answerable to the MINISTER

FUNDING: General State Budget.

LINKS: with the Ministry of Agriculture and Rural Development - Instituto de Desenvolvimento Florestal (Institute of Plant Development) and petroleum companies.

OBJECTIVES: Creation of mechanisms and instruments (legal and administrative) within the Sistema de Proteccao Ambiental (Environment Protection System) to control activities in the petroleum industry.

ACTIVITIES: At present, they are at the stage of:
Creating a **LAW FOR THE PROTECTION OF THE ENVIRONMENT IN ANGOLA WITHIN THE PETROLEUM INDUSTRY**, with the objective of:
carrying out the prevention, combat and control of pollution within this industry.
With topics:
1. Combatting potential sources of spillage.
2. Controlling and combatting discharges.
3. Economic/financial analysis of leaks.

In this area, it is working in collaboration with all the oil companies; MINADER/IDF; the legal office of the Ministry of Petroleum.

Other activities carried out are:
- observation and contacts;
- programme formulated in 1991 for drafting the Law for the Protection of the Environment within the petroleum industries;
- preliminary studies - this is done with all the oil companies; interested institutions through meetings and collective work.

With this Department still at an EMBRYONIC phase, the difficulties are primarily to do with the question of organizing

Annex 2.3.a

Government Institutions with Environmental Activities

its structure, approving legal and administrative documents; inadequacy of equipment required for measuring, controlling, monitoring and recycling water.

2. MINISTRY OF INDUSTRY

At present, this Ministry has neither a structure nor officer responsible for environmental issues and above all, more seriously - **TO DATE, PRACTICALLY NO ANALYSES HAVE BEEN MADE ON ENVIRONMENTAL IMPACT AND THE PROJECTS AND PROGRAMMES BEING IMPLEMENTED ARE APPROVED WITHOUT CONSIDERING ENVIRONMENTAL REQUIREMENTS.**
Within the Ministry, there is one person who is a member of the Inter-ministerial Technical Commission charged with drafting the National Report for the World Conference on the Environment and Development; s/he has only participated in the Commission's meetings and at his/her initiative, a letter has been sent to MINADER - asking for **DIRECTIVES**, addressed to the DIRECCAO NACIONAL DE DESENVOLVIMENTO RURAL (National Rural Development Department).

3. MINISTRY OF HEALTH

Has a structure, called the **SECTOR NACIONAL DE HIGIENE E SANEAMENTO** (National Hygiene and Sanitation Sector), reporting to the Deputy Minister and Minister.
This Sector has a National Director and 2 technicians (1 with higher training in medicine and 1 intermediate-level technician with a course in hygiene and epidemiology.

FINANCIAL RESOURCES. General State Budget, which is very limited

OBJECTIVES: To improve the quality of life of the people and to promote and sensitize the population on sanitation.

ACTIVITIES: Seminars on water and sanitation have been held in the Provinces;
Vaccination programmes applied;
Sanitation programmes implemented;
Training courses for intermediate and basic-level staff through intensive/crash courses.

LINKS: With all governmental and non-governmental institutions.

INITIATIVES: There is a Proposal for the creation of a **GABINETE AMBIENTAL** (Environmental Office), reporting to the Deputy Minister.

DIFFICULTIES: Lack of support, funds, materials, qualified staff.

4. MINISTRY OF COMMERCE

At institutional level, there is a Departamento de NORMACAO E QUALIDADE" (Standards and Quality Department), which is currently not operational, owing to a change in location.
[- The Direccao Nacional do Turismo e Hoteleria (National Department of Tourism and the Hotel Industry) has created a project to draft legislation demanding environmental studies]

5. MINISTRY OF FISHERIES

This Ministry has a **INSTITUTO DE INVESTIGACAO PESQUEIRA** (Fishing Investigation Institute), which is currently working on a new structure and which is meant to have a Department of "OCEANOGRAPHY" with an "Environmental" Sector and 3 high-ranking technicians.

OBJECTIVES: The effect of oil exploration on aquatic life.

FUNDING: General State Budget.

ACTIVITIES: Currently, the New Structure is being worked on, and it is intended to have an Oceanography department with an "Environmental" Sector, which will investigate sea pollution and aquatic fauna.

LINKS: With the *"Associacao Angolana do Ambiente"* (Angolan Environmental Association); University of Angola.

DIFFICULTIES: Inadequate financial resources.
Lack of trained, specialized staff.
Lack of material support.
Lack of information.
[All investigations on industrial and traditional fishing carried out with the support of SIDA and NORAD]

6. MINISTRY OF PLANNING

Currently, environmental issues are attended by the Ministry's **DIRECCAO DA PLANIFICACAO REGIONAL** (Regional Planning Department), reporting to the Deputy Minister.

HUMAN RESOURCES: 11 people (5 with higher training; 2 with Bachelor degrees; 3 with intermediate-level studies and 1 with basic education).

FINANCIAL RESOURCES: General State Budget.

OBJECTIVES: To coordinate and plan the activities of the Regional Plan.

ACTIVITIES: Coordination and evaluation of Provincial Plans.
Drafting of the Part connected with the Development of the Regional Plan.
Evaluation of economy-related Projects at provincial level.

LINKS: With all governmental institutions; the Institute of Physical Planning and others indirectly.

DIFFICULTIES: Lack of specialized staff.
Lack of sensitization on environmental issues.
At present, there is a technician working in the Ministry of Planning - an economist in the "Direccao da Planificacao Regional" (Regional Planning Department), who took part in drafting the National Report for the United Nations Conference on the Environment and Development and who has had practically no other tasks of this nature.

Subordinate to the Ministry of Planning is the **INSTITUTO NACIONAL DE PLANIFICACAO** (National Planning Institute), which has 22 specialized staff with higher studies, 44 staff with intermediate studies and 20 with basic instruction.
This Institute has the following departments:
Regional Planning Department at national level; Urban Planning Department; Territorial Information Department; Finance Sector; Regulations and Methodology Sector.

FINANCIAL RESOURCES: General State Budget.

LINKS: multi-sectoral; UNDP; Development Workshop.

OBJECTIVE: Drafting of physical plans for national, regional and urban development.

ACTIVITIES: Preparation of PRELIMINARY STUDIES ON:
Location of the Airport and recommendations to move it to another area.

Urban development plan for Luanda and other cities.
Analysis of physical/geographical aspects and identification of environmental problems such as (erosion, industrial waste in the water, soil, air).

The Institute only drafts the Projects and it is up to other authorities to implement them.
Another characteristic is that it is not always the Institute which is sought to carry out Preliminary Studies and give its approval. Very often, they come already completed and no recognition or approval is sought for the Project or Programme.

INITIATIVES: [- to create its own special fund]
To create funds through project budgets and other work. This proposal has been submitted to the Ministry of Finance, after

which it will go for approval by the Council of Ministers. Currently, there is a practice of imposing a charge for Dispatches by the Deputy Minister of Planning.

DIFFICULTIES: Lack of specialized staff.
Lack of work facilities, computerized equipment.
Inadequate funding.
Lack of facilities/buildings.

7. STATE SECRETARIAT OF GEOLOGY AND MINES and its subordinate body, the **INSTITUTO NACIONAL DA GEOLOGIA E MINAS** (National Institute of Geology and Mines); it has practically no environmental departments or sectors.

8. STATE SECRETARIAT FOR THE PROMOTION AND DEVELOPMENT OF WOMEN

This is a recent institution and has practically no structure yet established.

OBJECTIVES: To define, propose, promote and execute the State's policy in the field of the promotion of women in all areas of national life.

FINANCIAL RESOURCES: General State Budget.

LINKS: with all sectors of governmental activity, women's organizations; religious organizations; other non-governmental organizations; Institutions from the United Nations Systems; Women's Groups.

ACTIVITIES: This State Secretariat is still at an initial phase of its work and all its activities are geared towards its internal organization, establishing contacts and selling the SEPDM image.
A Seminar on GENDER was held; Meetings with women from various sectors; Interviews, visits to the provinces, etc.

INITIATIVES: To study the situation of women in the country.

DIFFICULTIES: Those specific to a new structure.

9. STATE SECRETARIAT OF ENERGY AND WATER

This Secretariat supervises the **INSTITUTO NACIONAL DAS AGUAS** (National Water Institute), which has the following departments: Hydrological Department; Water Resources Management Department; Development Department; Sanitation Department.
Within this Institute is a Sector on new and renewable sources of energy, reporting to the **DIRECCAO NACIONAL DE ENERGIA** (National

Energy Department).
The Institute is the executing body.

HUMAN RESOURCES:
about 54 people, of whom 13 have higher education, 10 intermediate and the rest, basic education.
One person in Huila province (southern region), one research Centre in Cacuaco on reforestation.

FINANCIAL RESOURCES: General State Budget.

OBJECTIVES:
The rational management of water resources, with different policies for underground water, surface water and limited coastal waters. The coastal waters are still under the control of the Ministry of Fisheries.

ACTIVITIES:
At present, all activities are of an EMERGENCY nature, owing to the country's current situation of lack of or inadequacy of potable water.
The rehabilitation and installation of water systems is being carried out in rural areas. There is already a Programme in the south of the country which has a certain financial autonomy with its own budget allocations. It is a pilot Programme, which may be replicated throughout the whole of the country.
Included within this Project are:
Rural water supply Projects in HUILA, MALANGE, BENGO and CUNENE. In these projects, drilling takes place, pumps are installed and the people supplied with water. At the same time as this work is carried out, the population is sensitized by staff (social workers), trained by UNICEF and they provide technical assistance. These employees are trained through crash courses of 1 to 3 months duration within the country and abroad.
The NEW AND RENEWABLE SOURCES OF ENERGY Sector has a research Centre ONGAZANGA, which has the following objectives: creation of solar pumps; aeolic pumps; supply of energy to rural areas; Production of BIOGAS; supply of power for refrigerators to keep vaccines: for human beings and cattle.
These objectives have been realized in the south of the country where there are villagers supplied by new and renewable sources of energy.
There is an "Improved Stoves" Project in Onga-Zanga; this project is at the testing and research phase in the area where it will be implemented. There is a small Rural Laboratory in Onga-Zanga.

DIFFICULTIES: Lack of specialized staff. Scant funding.

10. MINISTRY OF EDUCATION

There is no "Environmental" department or sector. Subordinate to the Ministry is the **INSTITUTO NACIONAL DE INVESTIGACAO E DESENVOLVIMENTO DE EDUCACAO** (National Investigation and Education Development Institute), which has a Project "Educacao e materia da populacao e para vida familiar" [sic] in the FORMAL sector. The Project is multi-sectoral and has this objective: sexual, moral and civic education and sensitization. It is being applied in the natural and social sciences; in the Portuguese language there are experimental programmes from Grades 5 to 8 and then they will return to 5th to 1st grades.
There are no other environmental sensitization and education projects within this Ministry and its subordinate bodies.

11. UNIVERSITY OF ANGOLA "A. NETO"

On the basis of the contact made, it was established that in the area of higher education, environmental education only exists within the Faculty of Science: THEORETICAL ECOLOGY AND APPLIED ECOLOGY, and up to a certain point, environmental knowledge is taught in the Faculty of Architecture. It was clarified that, given the difficulties which the country was experiencing, the war situation, lack of qualified staff and the great need for cadres in all socio-economic sectors of the country, it was not possible to incorporate the Environment as an integral part of the other sciences, and for this reason, it has not been introduced as a subject in its own right nor integrated into the other sciences.
In conclusion: **there are no projects which address the environmental issue.**

12. MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

Within this Ministry, there are different institutes and departments which, to a greater or lesser degree, take environmental issues into account, in general, under the components: land, flora and fauna. The **DIRECCAO NACIONAL DA AGRICULTURA E FLORESTAS** (DNAF: National Agriculture and Forestry Department), reports to the Deputy Minister and is part of the central bodies. It has the following structures:

Department of Vegetable Production;
-"- of Plant Conservation;
-"- Seeds and Vegetable matter;
-"- Agro-chemistry and laboratory support;
-"- of Agro-industrial Technology;
-"- Hunting, Apiculture and Aquaculture;

-"- of Parks and Reserves;
-"- of Agricultural and Forestry Dissemination and Training;
and 2 sectors;
National Agro-meteorological Sector;
National Administrative Sector.

This Department is a recent structure, which has practically no Projects or Programmes yet formulated. It is a structure which is still at its organizational phase, recruiting staff and collating information. The Department defines strategies and is the policy-making body whilst the executing body is the **INSTITUTO DE DESENVOLVIMENTO FLORESTAL** (Forestry Development Institute) and has the following structure:

Studies and Planning Office;
Flora/Plant life Department;
Fauna/Animal life Department;
Surveillance Department;
Regional Centres;
Administration and Budget Management Department;
Physical Protection Sector;
Human Resources Sector.

The objectives of the **Direccao Nacional da Agricultura e Florestas** (DNAF) are: **policy-making body on forestry, apiculture and aquaculture** and it is a part of the Sustainable Development System Network whilst the objective of the **Instituto de Desenvolvimento Florestal** (IDF) is: the execution and promotion, through the design and implementation of projects and programmes aimed at: the development of forests and wildlife; Parks and reserves.

Both institutes have NATIONAL DIRECTORS.

ACTIVITIES of the Instituto de Desenvolvimento Florestal: All Projects address environment issues.
A number of projects are under way, such as:
Tombwa "Anti-desertification" Project
"Rehabilitation of parks and reserves" Project
Regional SADCC Projects "Establishment of and training in Pisciculture"; "Plant life Investigation" Project;
"Integration of demobilized soldiers" Project, etc.
This institute has a total of 132 employees, of whom 17 have higher training, 28 intermediate studies and the rest, basic education.

It has representatives at provincial and municipality level and even grassroots employees at community level.

FINANCIAL RESOURCES: autonomous, within the General State Budget.

LINKS: with all MINADER structures; National Parks and Reserves; plant life/ forestry companies.

INITIATIVES: On 2 occasions, it was proposed that the country have an Environmental Policy, taking into account that there is an "Environmental" Sector within the "Fauna" Department, which, at that time, was the only State structure with such a responsibility; although this sector is part of the productive sphere of the national economy, a proposal was submitted for the country to have an Environmental Policy.
[proposals submitted by Liliana de Rohas]

The first proposal was put forward at the beginning of 1990 and the second in early 1992. This latter is a document of which the main objective is: Maintaining an environmental balance within a sustainable development process for the country. It depicts environmental problems within the country, the motivation for creating and promoting an environmental strategy, the need for establishing a governmental environmental institution and its function, means and ways of funding, the need for planning in socio-economic activities; the need for establishing Environmental Legislation, ways and means of implementing Environmental Policies in all sectors within the socio-economic development process with characteristics of environmental components; the need for cooperation, environmental research and the training of specialized staff and the extreme importance of sensitizing and educating the whole population so as to create a widespread environmental awareness amongst all people.
This document is still at the stage of being evaluated by the IDF and for organizational and technical reasons, it has already been with the institute's director for 6 months, pending a response.
The *Estrategia Ambiental de Angola (Environmental Strategy for Angola)* is a document which sets out problems and solutions (means and ways) for them, and includes all sectors of the national economy.

In addition to these initiatives, the IDF has submitted 2 experts to draft the National Report for the United Nations World Conference on the Environment and Development; it participated in the Conference itself and is currently part of the National Commission for the promotion of an Environmental Policy in the country. This Commission is working more on a voluntary basis than as a body executing a State responsibility.
The ideas, forms and content of the Environmental Strategy are reflected in the National Report by the Angolan delegation which participated at the Summit in Brazil.
Along the same lines, a Project on environmental sensitization and education has been formulated for the country, comprising 6 formal and informal sensitization and education sub-projects, namely:

Environmental sensitization and education sub-project at pre-school level;
-"- for Grades 1 to 3;
-"- at university and qualification level; for women; for the mass media; for young people.

The general objective of this project is:

To inform all people on the environment and to create in them a widespread environmental awareness of the characteristics, phenomena, processes, interrelations and interactions of the components comprising the environment, so that harmony is maintained between the components of this dynamic "Nature-Society-Human Being" system in all forms of interrelationship in this system's progressive development process,
in other words,

To allow values to be recognized and concepts clarified; to develop "Know-How" and the attitudes required for an understanding and appreciation of the reciprocal relationship between the human being, his culture and his biophysical environment; to train people to take decisions and to formulate for themselves, a code of personal conduct in respect of problems and issues which affect the quality of the Environment.

This project will be implemented in close collaboration with governmental institutions and NGOs interested in the above objectives. The sub-projects are backed up by various educational Programmes with the following basic principle: the integration of environmental issues into all sciences and the establishment of a specialized staff.

Another institute within MINADER is the **INSTITUTO DE DESENVOLVIMENTO AGRARIO** (Agrarian Development Institute) and it has the following structure:
Coordination and Supervision Department;
Organization and Management Department; Communication and Training Department; Studies and Evaluation Office;
Human Resources Sector and Finance and Administration Sector.
It has a total of about 60 employees, of whom 5 have higher training.

FINANCIAL RESOURCES: Autonomous funding through the General State Budget.

OBJECTIVES: Extension work, technical assistance and aid in rural development.

ACTIVITIES: There are a number of projects which address environmental issues. In general terms, all the projects and programmes have an Environmental Impact, such as the following projects: Porto Ambuim, in Kwanza North to increase the number of

trees, where work with the peasants is supplemented by technical assistance; aid with training staff in the context of the project's activities. The IDA supervisor is always with the peasants, keeping abreast with the different phases of the project and all its activities, including the task of sensitization and correctly educating [the people] in the treatment and use of land in rural environments.

The Ministry has a Programme for the Reintegration of Demobilized Soldiers, in which the IDA participates by holding Agricultural Refresher Courses for these soldiers. These are intensive 1 to 4 month long courses.

LINKS: With all structures within the Ministry and with NGOs; Ministry of Planning, Ministry of Commerce and the Ministry of Industry.

The **DIRECCAO NACIONAL DE PEQUARIA** (National Cattle-Rearing Department) is another body within MINADER, reporting to the Minister; it has the following:
Studies and Planning Office; Veterinary Training and Dissemination Department; Animal Health and Veterinary Public Health Department
with about 27 employees in all, of whom 10 have higher studies and 5 intermediate studies.

OBJECTIVES: To coordinate and formulate Agrarian policies in the area of animal health and production; veterinary public health, animal trade and traffic and products and derivatives of animal origin.

ACTIVITIES: This is a new structure, but it already promotes certain activities, such as: Epidemiological studies in the south of the country, together with the FAO; and health activities - also in the south of the country, which is awaiting funding.

INITIATIVES: Through the Provincial Departments, funds may be created by starting to impose fines, taxes, etc.
The IDF scouts (fiscais) could be the same scouts as those for cattle-rearing.

OBSERVATION: No control of products - there is a lack of logistical support.

13. MINISTRY OF LABOUR, PUBLIC ADMINISTRATION AND SOCIAL SECURITY

At present, this Ministry has the following:
Departamento Nacional de Seguranca e Higiene do trabalho (National Department for Safety and Hygiene in the Workplace) and the **Direccao Nacional do Emprego e a Forca de Trabalho** (National Employment and Manpower Department).

The objective of both structures is, directly or indirectly, to combat environmental problems such as: creating better working conditions and safety in the workplace and the supply and distribution of jobs.
The DIRECCAO NACIONAL DE SEGURANCA E HIGIENE DO TRABALHO has a total of 21 employees, of whom 2 have higher training, 8 have bachelor degrees, 6 intermediate studies and the rest, basic education.

FINANCIAL RESOURCES - General State Budget.

OBJECTIVE : Prevention of accidents in the workplace and work-related diseases.

ACTIVITIES: Some have already been defined, but have not yet been approved for lack of personnel; the following documents need to be improved:
Draft Decree creating the *Conselho de Prevencao (Prevention Council)*,
Draft Edict on the *Conselho de Prevencao*,
Draft Decree on the *Sistema de Seguranca do Trabalho* (Job Security System),
Directives on the *Politica de Seguranca e Higiene do Trabalho* (Safety and Hygiene in the Workplace Policy).
The General Labour Law is currently being revised and a Decree drafted establishing methodology and collating information and statistics on accidents in the workplace. The staff training Project is under implentation, through bilateral cooperation with Spain, Portugal and Brazil, in the form of intensive 1 to 6 month long courses and higher training within the country.
Other activities under way are:
Projections of work-related hazards in companies. These forecasts are always accompanied by Recommendations addressed to the companies to improve working conditions ovr and above the Regulations, made by the same institution.

DIFFICULTIES: Lack of transport for inspection and analytical field visits; lack of technical facilities, equipment and instruments (those existing are very outdated and obsolete); lack of individualized protection for employees and

Specialized shop selling these articles.
Lack of a LAW ON HYGIENE AND SAFETY IN THE WORKPLACE.

The **Direccao Nacional do Emprego e Forca de Trabalho** has the following structure:
Employment Department.
Employment Promotion and Vocational Training Department.
Job market studies planning Department.
It has a total of 40 people, of whom 6 have higher education, about 30 intermediate studies and the rest, basic education.

OBJECTIVES: Supply and demand of jobs, job distribution and vocational training.

ACTIVITIES; Taking account of the unemployment situation, this is one of the country's main problems and particularly in respect of the demobilization of soldiers, the Ministry has close links with all governmental and non-governmental sectors to resolve this problem through the implementation of a number of projects.

DIFFICULTIES: Lack of specialized staff. Lack of material facilities, transport, equipment and communications.

Annex 2.3.b

Overview of NGO's with Environmental Activities

Annex 2.3.b Overview of NGOs with Environmental Activities

1. GENERAL CHARACTERIZATION

In a country with Angola's characteristics, one cannot speak of the existence of a civilian society as such. The political systems prior to and following independence have never allowed for its emergence and true consolidation. An exception would be the churches, which, by their special nature, have always played an important role, both in terms of popular participation and also by their involvement in areas such as education and health and even into the realm of politics. Indeed, we cannot forget the role which some churches have played in the education of young people and the development of nationalism (primarily the Protestant churches), and, later, in the movement for peace and democracy (particularly the Catholic church). The churches have also made their presence felt with respect to the treatment of injuries sustained during the war, mainly through emergency relief programmes to combat hunger and disease.

It was with the political glastnost of recent years that associations of various kinds have gradually begun to emerge on all fronts: professional, economic, social and aid associations, and finally, there has been the legalization of political parties.

It was against this background that the first Angolan NGOs emerged, some geared towards development, in spite of their imperfect knowledge and the inappropriate practices of similar previous processes; for the most part, these NGOs have been linked with churches and relief programmes. The organization of the NGO movement is, today, an established fact, which implies an active contribution towards the emergence of a minimally structured civilian society. However, their diversity of interests, objectives, principles, philosophies and methodologies makes it difficult for them to undertake joint ventures and to coordinate their ideas.

In 1991, in line with events in other countries and in the spirit of the recommendations of the meeting of NGOs in the PALOP (African countries having Portuguese as the official language) countries, held in Bissau in March, the Forum of Angolan NGOs (FONGA) was created, aspiring to a platform of coordination, deliberation and debate amongst NGOs.

If the objectives professed at its creation cannot fail to be considered as noble, the manner in which the NGO movement has matured in Angola - a consequence of the very fragility of initiatives by civilian society in the country; a society not yet sufficiently strong and structured -has given rise to an inverted

top-down type structuring. FONGA is no more than a "Steering Committee", bringing together associations of all kinds, be they NGOs or other organizations, all with very different interests and objectives, fragile in nature, lacking institutional and bargaining capacities and, even more seriously, lacking basic tasks which would allow them to strengthen these capacities.

A mere reading of the "Directory of NGOs", published by UCTA, leads us to conclude a priori on the lack of substance of the majority of these NGOs, based on the definition of their object (in their constitution); an object which, more often than not, encompasses such a wide range of areas of action that it would be impossible it to achieve from the outset, compounded by the fact that these organizations are known not to be backed by Government funding or any other kinds of donations by the population or by philanthropic or other associations. It was the individual frailty of NGOs which led to the quest for strength collectively, through FONGA.

The abstract nature of the task of coordinating interests amongst roughly homogeneous groups according to their constitutional or statutory objects, in an informal, that is, non-institutionalized way, cannot yet be realized within a society marked by a one-party system, burdened by its habitual chain of authoritarian and vertical decisions, with an all-powerful State hampering the initiative of society and limiting it to a replication of its own image.

Even before the establishment of FONGA, the foreign and national NGOs formed a Committee of NGOs in Angola (CONGA), which never really asserted itself in a decisive manner, through its activities so as to achieve its fundamental objective, which was that of coordinating the NGOs and this again was a consequence of the heterogeneity of interests and objectives involved. Further, given the frailty of the national NGOs, a process of unequal "partnership" was verified, insofar as they sought very little diversified support and, in most cases, were absorbed by the foreign NGOs, which, in turn, did nothing to achieve a real partnership, translated into a reinforcement of their own institutional and bargaining capacities.

The political party system continues to be dominated by traditional political forces. Many of the new parties arose from dissidences amongst the traditional parties, either during the civil war, or even, in some cases, before it; dissidences which rarely represented ideological connotations. The population, in turn, has shown itself increasingly more reticent in respect of politicians and one could say that attitudes of indifference or fear towards such or such a party are much more common than stances of militancy or alignment.

2. THE PROBLEM OF DEVELOPMENT

Angola has remained on the margin of the development processes which were begun in most of the former colonies following the Second World War. Already at the end of the colonial era and in the context of the so-called "reformist colonialism", some experiences were promoted, purporting to be different from the authoritarian or paternalist models which had prevailed until then. Limited to certain regions, they did not have the necessary follow-up, either as a result of the consequences of the war or because of the bureaucratic, centralized development model in force after independence.

Angola was thus isolated from the debates and deliberations around this problem, with significant consequences on government policies and in the life of the people. The political parties and churches, in their turn, did not come up with alternative programmes and practices, nor produce arguments which could have led to more appropriate solutions and models which were more in touch with the real situation prevailing in the country and with modern theories of participation and sustainable development. The use of a developmentalist and environmentalist discourse - when it occurs - does not go beyond mere rhetoric, for it is not based on concepts which have been reflected on or assumed and sectarian practices are not uncommon, negating the universalism of the ideas professed. The only exception may, perhaps, be found in the Frente para a Democracia (FpD - Front for Democracy) which has expressed some ecological concerns since its foundation, but which, to date, has not carried out any practical activities in this direction.

Ecological awareness at the level of high-ranking politicians and the people in general is practically non existent. After independence, there is record of only a few environmental programmes carried out by the (social communications) media, but without any linkage made to the problem of development and lacking the necessary follow-up. With regard to environmental education programmes, whether formal, at school or University level, or informal, they were also practically non existent. When they did take place, they were completely out of touch with reality.

Inevitably, this backdrop is reflected in a negative manner at the level of grassroots communities. Accustomed to command and authoritarian or paternalistic and dependency-creating schemes, the population rarely takes on initiatives which go beyond the mere defence of self-subsistence or of resolving the most burning and immediate problems affecting their respective communities. This fact, however, does not imply an attitude of resistence to innovation on their part. Quite the reverse: specific experiences and studies recently carried out indicate that, in general terms, rural communities are neither traditionalist nor

Annex 2.4.a

Environmental Protection Legislation Enforced during the Colonial Period

closed, but on the contrary, reveal themselves as capable of absorbing, adopting and adapting innovations, provided that the latter may be integrated into the systems to which they belong.

3. SOME INITIATIVES

Faced with this situation, the odd NGO - mainly foreign ones - has tried to begin projects or programmes which would contribute towards shaking us out of this lethargy, particularly in the field of reforestation; these NGOs have state institutions as their main partners, in an attempt to overcome one of the most serious problems confronting the people in recent years: the need for fuels of vegetable origin. Of note in this area is the organization "Ajuda Dinamarquesa de Povo para Povo" (ADPP - Danish People to People Aid), with initiatives in the provinces of Bengo, Luanda and Huambo; "Accao Agraria Alema" (German Agro Action), in collaboration with the Angolan NGO AAD (Accao Angolana para o Desenvolvimento - Angolan Development Action), working in the provinces of Kwanza South and Benguela and in addition, the Angola-Canada Programme, also in Benguela.

The attempt to create green spaces in Luanda has also merited the attention of the young people belonging to the "Juventude Ecologica de Angola" (Angola's ecologically-oriented youth). In an initiative worthy of praise on all fronts and which was neither understood nor supported, this group has made great efforts to alter the present situation. Also at urban level, we should highlight the initiative by the Canadian NGO Development Workshop, which has been implementing water and sanitation projects in the shanty towns of Luanda, thus contributing to the emergence and development of Angolan NGOs such as the *"Associacao de Amigos do Ambiente N'gola Kiluanje" (Friends of the Environment Association)* and the *"Associacao Crista da Mocidade" (Young People's Christian Association)*; and finally, special mention must be made of ACORD, an international NGO, which has under way, a support project to displaced people in the municipality of Viana, and identified a land planning and tree planting initiative.

The *"Associacao Angolana do Ambiente"*, formed about 10 years ago, has gone through a long period of inactivity, without any actions worthy of mention apart from the mere heralding of significant dates on the national and international ecological calendar. More recently, when they held a seminar on the environment in January 1991, they expressed the intention of initiating some activities of greater importance, most notably an environmental education programme, but which, in the meantime, have not yet materialized. The AAA has also been collaborating with the UNDP in activating a Sustainable Development Network.

ADRA, *"Accao para o Desenvolvimento Rural e Ambiente"* (Rural Development Action and the Environment), has emerged with an

innovative look in Angola, seeking not to dissociate the problem of the environment from that of development, in an integrated, endogenous, participative and sustainable approach. Based along these lines of thinking, it is implementing a research-development project in the Kaluquembe region, Huila province, in collaboration with ACORD, which will serve to construct a methodology which may then be duplicated in other regions of the country. Concerned by the paucity of debates and deliberations and the lack of a development culture in Angola, ADRA has been responsible for the appearance of a page in the weekly **Correio da Semana** dedicated to the dissemination of ideas and experiences on environmental and development topics. Together with the programme Canal 7, broadcast weekly by TPA (Angolan People's Television), this page represents the only regular vehicle for disseminating this genre of ideas by an organization emanating from civilian society, albeit circumscribed to a very limited layer of the population.

Very recently, the "*Centro Angolano de Tecnologias Apropriadas*" (CATA - Angolan Appropriate Technologies Centre)) was established, which, as the name indicates, seeks to develop appropriate technologies in the field of construction, water and energy. Still not very active as yet, we do not know enough about it to draw conclusions, but from the potential revealed, it merits close attention and following up.

By way of further reinforcing an issue mentioned earlier, the churches are not carrying out any development projects worthy of such a name. Some experiments, the fruit of isolated initiatives and usually not very well identified, end up by becoming negative examples of dependency-creating or sectarian projects, resulting, in many cases, to the benefit of the religious institutions themselves and relegating to second place, the interests and needs of the people. Merely by way of example, we may cite the projects implemented by the Congregational Church in Huambo (funded by the ICCO) or the rural development project in Kaluquembe by the Evangelical Church of South-western Angola (IESA - funded by World Vision, Canada), where the objective is a reforestation initiative, but only aimed at members of the church.

4. WHAT FUTURE?

The background described above is in no way encouraging and this situation is aggravated by the institutional and operational frailty of the majority of organizations emanating from civilian society.

In spite of this, there is a gap which NGOs, political parties, churches, associations and other social players can and should fill. The political moment is favourable to the organization and consolidation of civilian society and its active involvement in

the democratization process and take off towards sustainable development, which are, after all, two sides of the same coin.

However, we must be realistic. Such organizations need, above all, to consolidate themselves and to find their own proper direction. To achieve this, they need support for their own institutional reinforcement and this cannot be achieved without external supports, given the economic crisis which Angola is experiencing. Deliberations and debates, exchanges of experiences, staging of workshops, training courses, are some of the most pressing needs of these organizations and ones which they are not capable of fulfilling on their own. Having addressed this issue, then yes, it will be possible to contemplate a more active involvement by society.

Some specific initiatives and projects may be identified and, in some cases, they are only waiting for the necessary funds and methodological supports. This is the case of the environmental education programmes, reforestation projects and rehabilitation of nature parks and reserves, within the framework of a participative approach with the people residing therein; it is also the case of a study to be held on the environmental impact on and land planning of the region affected by the Kapanda Dam, which some NGOs and institutions hope to implement.

Annex 2.4.a Environmental Legislation Enforced During the Colonial Period

Source: Instituto de Investigacao Cientifica de Angola (Scientific Research Institute of Angola) / Centro de Documentacao Cientifica (Science Documentation Centre): "Bibliografias Tematicas No. 19 - Ambiente e Poluicao" (The Environment and Pollution), Pp 48-49 Luanda, 1973

1. Decree of 1 December 1892: prohibits ships from jettisoning any ballast which they may have on board, into rivers, ports and inlets

2. Decree No. 33613 of 17 April 1944 and Government Directive ("Portaria") No. 10671 of 25 May 1944: order the promotion of the necessary studies to set aside areas for the protection of wildlife in general and unique species.

3. Decree Law No. 35395 of 26 December 1945: stipulates that the Junta de Investigacao do Ultramar (Overseas Investigation Council) direct and coordinate scientific activities on Nature conservation.

4. Decree Law No. 36446 of 31 June 1947: makes reference to the studies to be carried out by botanical and zoological missions of the Junta de Investigacao do Ultramar on plant ecology and the protection of animal life.

5. Decree Law No. 37188 of 24 November 1948: approves the International Convention on the Protection of African flora and fauna, signed in London on 8 November 1933.

6. Decree Law No. 39193 of 2 May 1953: approves the International Health Ruling in which it is established that health authorities may take any practical steps to prevent a ship from discharging any water or waste substances into ports, rivers or canal which may cause the pollution of the latter.

7. Decree Law No. 40040 of 20 January 1955: establishes the general principles to be observed for the cnsevation ofland, flora and fauna Overseas; sets up the Nature Conservation Councils; regulates hunting and fishing activities; publishes the list of protected animal species.

8. Decree Law No. 41363 of 15 November 1957: creates a technical department for the protection of fauna in the Veterinary services Overseas.

9. Legislative Edict ("Diploma") No. 2873 of 11 December 1957: approves Hunting Regulations in Angola.

10. Governmental Order No. 10375 of 15 October 1958: approves the Control of National Parks in Angola.

11. Legislative Edict No. 3187 of 6 December 1961: orders that the Hunting Regulations in Angola be incorporated into the rules established in Decree Nos. 40040 and 41365.

12. Decree No. 44398 of 14 June 1962: approves the Regulations on the Control of drag-net fishing in Angola.

13. Decree No. 44531 of 21 August 1962: approves the Regulation of Plant life in Guinea, Angola and Mozambique.

14. Decree No. 45082 of 21 June 1963: stipulates that national ships should have a fuel register book.

15. Decree Law No. 46186 of 11 February 1965: approves accession to the 1954 International Convention on the Prevention of Pollution of the Sea by Hydrocarbonates, with the amendments approved on 13 April 1962.

16. Legislative Edict No. 3574 of 28 August 1965: regulates the use of pesticides in Angola.

17. Legislative Edict No. 3885 of 15 February 1969: regulates and controls the cutting of natural grazing so as to bring it into line with the provisions of the regulations on plant life and on the protection of land, flora and fauna in Angola.

Annex 3.2.a

Wetlands in Angola:Description

Annex 3.2.a Wetlands in Angola: Description

INTERIOR WETLANDS

The interior wetlands of the country comprise a complex group of interlinked and inter-dependent wetland systems and, where appropriate, these systems are considered as a functional ecological unit rather than independent systems.

Also, a special note should be made regarding the terminology used with regards to palustrine systems in the interior of Angola. 'Chanas' are the equivalent of seasonally inundated edaphic grasslands which may occur in valley bottoms (=dambos), in areas of impeded drainage (dambos or swamps dependent on the scale) or along the margins of the headwater rivers. 'Anhara' is an Umbundu term which refers to seasonally flooded grassland of large extent and may be considered to be the equivalent of 'chanas'. Small-scale farms ('lavras') on these seasonally inundated wetlands are termed 'olonakas'.

The Riverine - Palustrine - Lacustrine Systems of the Zambezi Hydrographic Basin

The riverine, palustrine and lacustrine systems of the headwaters of the Zambezi hydrographic basin are considered together as the three systems are interlinked underlining the complexity of the wetland system in this area.

The Angolan watershed of the basin extends some 400 km in a W.S.W. - E.N.E. direction from Munhango passing just north of Luena, the capital of Moxico Province, to Luacano where it veers eastwards running along the Zaire - Angola border to the frontier with Zambia (see Fig. 1., Hydrographic Basins of Angola). The watershed is drained by numerous rivers, the waters of which eventually flow into the Zambezi River including the Lungue-Bengo, Luena, Chonga, Lumeje and Chefumage Rivers.

Lakes in the region are formed where the river flows into a wide depression before continuing its course e.g. Lake Cameia (11° 36'S/20° 45'E; 10 km²; max. depth 2.5m) on the Chonga River, a tributary of the Lumeje River, or by rainwater runoff from the surrounding areas e.g. Lake Dilolo (11° 30'S/22° 04'E; 40 km²; max. depth 2.2 m). Much of the area between the river systems is lowlying and vast areas are transformed into floodplains during the wet season (the 'anharas' of Moxico). Cameia National Park (14,450 km²) is located between Luena and Chifumage Rivers comprising seasonally inundated floodplains and three lake systems (Lakes Cuamba, Calundo and Chaluvanda). Numerous dambos ('chanas') on hydromorphic soils not associated with the river

systems occur in the headwater region. Grasses dominate the moderately well-drained hydromorphic soils of the floodplains and dambos; *Loudetia simplex* is dominant but other species include *Tristachia* sp, *Monocymbium Aristida* sp. and *Ctenium newtonii*. Reeds (*Phragmites mauritianus*) and cyperaceous species occur on the margins of lakes.

Gallery forests are dominated by *Ficus* sp. *Syzygium guineense*, *Pandanus* sp and *Phoenix* sp at the source and on margins of river systems. The hippopotamus (*Hippopotamus amphibius*) and crocodiles (*Crocodilus niloticus*) are found in the river and lake systems. Large mammals associated with the floodplains include the red lechwe/'songue' (*Kobus leche*); bushpig/'potomachero' (*Potomochaerus porcus*); the roan antelope /'palanca vermelha' (*Hippotrogus equinuus*); reedbuck/'unce' (*Redunca arundinum*) and sitatunga (*Tragelephus spekei*).

Traditionally, the seasonally-inundated headwater wetlands (*chanas*) of the Zambezi Basin are used for the dry season cultivation of crops ('*nakas*'). The principal crop is cassava although rice, potatoes and groundnut are also grown. Crops are irrigated by traditional irrigation methods viz. recession irrigation or channels leading from the river. Where drainage is impeded soils are raised above the water table for cultivation of cassava and rice may be grown in the adjacent channels.

Fishing is an important practice in rivers, permanent lakes and, during the wet season, inundated flood plains. Species include 'mugumba' (*Alestes laterales*); 'bagre' or 'buli' (*Clarias gariepinus*); 'missoge' (*Clarias* spp.juv.); 'missuta' (*Cteropamo multispinnus*); 'ndembe' (*Gnathonemus macrolepidotus*); 'pungo' (*Hydrocyon lineatus*); 'mukongo' (*Mastacembellus ansongei*); 'zeza (*Schilbe mystus*); 'kele' (*Serranochromis* spp.) and 'katua' (*Serranochromis longimannus*). Fish are caught by net ('*lioge*') usually from boats; by conical fish traps ('*muvua*') strategicall located at man-made or natural narrow points in streams and canals; by basket (*liango*) handled by two women on the margins o lakes and streams or by line fishing.

Fishing villages are located throughout the region e.g. on the banks of Lumeje River in Cameia National Park and around lakes Cameia and Dilolo. During the dry season fishing is restricted t permanent lakes and streams but during the wet season (December to May) vast areas of the floodplains ('anharas') are inundated and fishing takes place over the entire flooded area. Villages predominantly dependent on fishing may grow crops but usually dried fish is bartered for cassava and other crops. In addition to traditional fishing, aquacultive ponds have been constructed and the banks of several of the headwater rivers with water feeding into the ponds via channels from the rivers.

The headwater systems between the Luena and Chefumage Rivers were surveyed during the present study and the wetland use patterns in relation to demographic changes are probably representative of much of the wetlands in Zambezi Basin headwater region.

The Wetlands of the Upper and Lower Cuanza

The Cuanza River flows nearly 1000 km from the source (13° 40'S/17° 30'E) close to Mumbua, southern Bie Province. The river flows in a predominantly north, north-westerly direction entering the Atlantic Ocean about 60 km south of Luanda. The upper Cuanza wetland system is characterised by a series of springs and medium to large swamps. In its upper reaches, riparian reed swamps are well developed. Immediately above the confluence with the Luando River, large tracts of permanent swamp and many lagoons occur on the floodplain. other notable wetlands occur further upstream along the Luando river system and its tributary, the Jombo. There are extensive swamps and a series of large lakes between the Luando and Jombo rivers.

The flora of the upper Cuanza wetlands consists of flood plain grasses such as *Echinochloa pyramidalis*, *Hyparrhenia spp* and *Vetiveria negritana*. *Cyperus papyrus*, *Phragmites mauritianus* and *Typha domingenis* occupy large swamp depressions and lagoon fringes. Frog and toads are common while the common reptiles include snakes and crocodiles.

Resident mammals are *Kobus lechwe*, *Cercopithecus ascanius*, *Colobus polykomos angolensis* and *Herpestes sanguineus*.

During the last 220 km of its course the River widens as it flows across the coastal plain. During this stretch the swampy depressions on the margin of the River comprise a swathe of papyrus (*Cyperus papyrus*) of varying width (up to 1000 m). On the drier, landward fringes of the floodplain the grass *Echinochloa pyramidalis* dominates. The floating macrophyte *Eichornia crassipes* forms dense mats in sheltered areas of the river. The dende palm (*Elaeis guineensis*) is locally dominant whilst the *Raphia* palm occurs in the lower reaches of the River. The papyrus/*Echinochloa* floodplain association is substituted by tall fringing mangrove (principally *Rhizophora mangle*) about 20 km from the mouth of the Cuanza. The fringing mangrove community is in a remarkably intact state with individuals of up to 20 m tall line the banks of the River. The only cutting of mangrove trees is by local fishermen and farmers who harvest trees for fuelwood and construction. This removal is not, at present, having a major impact on the mangrove community. However, in view of the proximity of Luanda and the increasing need for firewood and charcoal in the capital, it may be expected that the mangrove communities will come under increasing pressures. Steps should, therefore, be taken now to prevent this eventuality.

Shortly before flowing into the sea the river curves and widens and here the sandy shores have a sparse covering of halophytic herbs such as *Scaevola plumeria; Ipomoea pes-caprae* and *Canavalia roseus*.

During the last 80 km of its course the River Cuanza forms the northernmost boundary of Kissama National Park. Hippopotamus and the manatee (*Trichechecus senegalensis*) are reported to inhabit this stretch of the river. Elephants/ *Loxodonto africana*; the red buffalo/'pakasa' (*Syncerus cafer nanus*) and reedbuck/'nunce' (*Redunca arundinum*) were regular visitors to the fringing swamps and floodplains.

The River Systems of the Zaire Basin

The rivers of the Zaire Basin flow in a more or less northerly direction from the common Zaire - Zambezi watershed (see Figure 3.6 and section 3.2) eventually discharging into the Zaire River. The principal rivers (and their tributaries) of the Zaire Basin, from east to west are: the Casai (forming the eastern border with Zaire) Luia, Chiumbe, Chicapa, Lushiko, Cuilo, Lubalo, Cuango, Lui and Cambo Rivers.

The soils of the river valleys are mainly ferrallitic derived from crystalline or sedimentary rocks of the Precambrian and Karoo. The valley bottoms and river banks have fine-to medium-textured hydromorphic alluvial soils. Both soil types are fertile and consequently the valleys and valley bottoms are utilized for small-scale crop production, mainly maize and cassava. The majority of these small-scale farms are located near urban centres along the rivers.

The vegetation along the lower courses of the rivers typically comprises evergreen gallery or riparian forest known locally as 'muxito' (Diniz 1973). These forest formations are especially well-developed along the Casai River where rainfall is higher. Trees may reach 30-40 m in height with climbers and lianes abundant. Common tree species include *Anthocleista vogelii, Bombax reflexum, Canarium schweinfurthii, Carapa procera, Ceiba pentandra, Chlorophora excelsa, Elaeis guineensis, Ficus mucoso, Macrolobium fragans, Parkia filicoidea, Phoenix reclinata, Spondinanthus preusii, Uapaca guineensis* and *Xylopia rubescens* (Diniz 1973; White 1983).

The Palustrine Systems of the Central Plateau

The Central Plateau, centred more or less on Huambo (the capital of Huambo Province) is drained by several river systems flowing towards the coast in the east and towards the Cunene and Cubango Rivers in the South.

The area is characterized by an extensive system of valley bottoms (dambos), referred to locally as 'chanas' or 'anharas'. The soils of these habitats are hydromorphic, usually gleyey-humic. Graminaceous species such as *Loudetia simplex*, *Ctenium*, *Tristachya*, *Digitaria* and *Heteropogon* predominate. In comparison to most of the upland soils, which tend be of low inherent fertility, the hydromorphic soils are more suitable for agricultural purposes. For the uplands as a whole, it is estimated that hydromorphic soils cover some 9.3 million ha. The valley bottoms have long supported small-scale farming activities, especially during the long (6-7 months) dry season. The small-scale farms ('lavras'), known locally as 'olonakas' produce mainly maize but also sweet potatoes, beans and cassava. During the dry season a set of ditches are estabilished within the dambo which act as drains to manipulate the water table. It is estimated that before Independence 320 000 ha. was under small-scale irrigation, mostly in the valley bottoms (Serrano & Carter, 1991). However, the Central Plateau was particularly affected during the civil war and large numbers of rural dwellers migrated to urban areas or other more stable regions. The area under traditional irrigation consequently declined markedly during the war. It is estimated that by mid-1980'S only about 10,000 ha was under traditional irrigation (Moris & Thom 1987). However, since the signing of the peace accord, rural dwellers have been returning to their traditional farming lands. The situation in the Central Plateau region is thus comparable to the headwater areas of the Zambezi Hydrographic Basin in Moxico Province (see Figure 3.6). Over-flights of the area (July 1992) revealed that small-scale farms were already established in the valley bottoms. A disturbing trend, however, is the burning of large areas of the Central Plateau including the herbaceous cover in the valley bottoms.

The wetlands of the valley bottoms of the Central Plateau form the headwater areas of major rivers. Traditionally, these wetlands are believed to regulate streamflons by maintenance of dry season (base) flow and dampening flood peaks although this thesis has been challenged in recent years (Whitlow 1991). Nevertheless, it will be necessary to encourage agricultural practices compatible with the long-term maintenance of these systems. Traditional farming practices on these wetlands are considered to be ecologically sound. Incompatible land-use practices, however, such as ploughing, overgrazing and fire should be restricted. The opportunity now exists in Angola to manage these systems on a sustainable basis. To achieve this goal infrastructure support and training must be given to the local MINADER offices as highlighted in section 4.6.

MARINE WETLANDS

Introduction

The Angolan coast extends some 1650 km between latitudes 5° 00'S and 5° 47'S (Cabinda), and between 6° 05'S and 15° 17'S (the Zaire and Cunene Rivers respectively). The entire coastline is, therefore, tropical although temperatures are moderated, especially in the south, by the cold, northward flowing Benguela Current.

The coastline is characterized by long sandy beaches interrupted by rocky shores and steep cliffs; the latter formations being encountered mainly north of Luanda. Sheltered bays and lagoons, often formed by northward-running spits of sand (known locally as 'restingas') occur at intervals along the coast. Thirty-two rivers enter the Atlantic Ocean between the Cunene and Zaire Rivers. Of these, 24 are considered perennial whilst the remaining 8 are seasonal rivers located in the arid south of the country. Wave action along the coast is strong to moderate except in sheltered bays and lagoons. Tides are semi-diurnal and tidal range is low (< 2m) with little variation throughout the year. The littoral waters are rich in commercially important fish, crustacean and mollusc species. Diverse algal flora and marine angiosperms occur in shallower waters although little in known regarding the taxonomy, distribution and ecology of these species.

Sandy Beaches

Sandy beaches along the Angolan coast are of marine and continental origin. Beach vegetation is typically characterized by rhizomatous and prostrate herbaceous species such as *Canavalia maritima*, *Cyperus maritimus*, *Ipomoea pes-caprae*, *Ipomoea stolonifera* and *Scaevola plumieri*.

Beach formations and the associated fauna and flora have been negatively affected by human interventions such the large-scale removal of sand for construction purposes, over-exploitation of inter-tidal fauna and the decimation of the turtle populations.

Estuarine Systems

Thirty-two rivers flow into the Atlantic Ocean between the Zaire and Cunene Rivers. At least eight of these rivers, located in the arid south of the country are seasonal. Between the Zaire and Cuanza Rivers ten main rivers, draining the interior highlands, discharge into the sea; from north to south: the Luculo, Senge, Lucunga, M'bridge, Sembe, Loge, Uezo, Zifule, Dande and Bengo Rivers. All these rivers are reported to be perennial although,

during an overflight made in mid-July 1992, it was noted that all least three of the rivers had no direct access to the sea (the Luculo, Lucunga and Zifule Rivers) whilst sand bars were forming at the mouth of the Sembe River.

The Zaire River has by far the largest and most complex estuarine system of all the rivers system flowing into the Atlantic Ocean. The estuarine mangrove systems is especially well developed extending at least 20 km up-stream from the mouth of the River. Mangrove tree species include *Rhizophora mangle*, *R. racemosa*, *R. harrisonni*, *Laguncularia racemosa* and *Avicennia germinans*. The halophytic fern *Acrostichum aureum* dominates in disturbed and open areas of the mangrove (Mepham & Mepham 1985). The immediate banks of the River and islands are characterized by tall individuals (up to 25 m in height) grading into mangroves of shorter stature away from the water's edge.

The mangrove communities on the Angolan side of the Zaire River are structurally intact with a few isolated patches having being cleared by local fishermen and/or farmers. Soyo, a small town at the mouth of the Zaire River, has a landing strip and port facilities which are used by the Angolan state oil company (SOMANGOL) and international oil companies to import and mount equipment for the oil drilling operations in the area (both land off-shore). These operations do not appear to have had any noticeable impact on the surrounding mangrove vegetation. However, off-shore drilling operations are having a negative impact on the artisanal fisheries in the area due oil spills from the off-shore platforms. It is not known, to what extent, if any, these oil spills are affecting the pelagic and benthic fauna in the estuarine and adjacent littoral waters. The possible impact on marine resources needs, therefore, to be more fully investigated. Upstream from the mouth of the Zaire River (approximately 20 km) the tidal influence decreases and the mangrove communities are replaced by *Raphia* swamps occasionally in association with riparian forest comprising species such as *Elaeis guineensis*, *Irvingia smithii* and *Xylopia* sp (Diniz 1973). Even further upstrem (approximately 30 km) the latter association grades into extensive areas of papyrus swamp. Both the *Raphia* and papyrus swamps are intact with little human encroachment. The outermost, landward margins of the papyrus swamps are characterized by grasslands with scattered palms. Here, vast areas are burnt and the landscape is dotted with small-scale farms. Isolated fishing camps occur throughout the estuary but do not appear to be having a major impact on the overall structure of the system.

Smaller mangrove communities occur along estuaries and associated lagoons of several of the river systems south of the Zaire River. Mangroves are found at the estuaries of the Lucula, Lucunga, M'bridge, Sembe and Cuanza Rivers. The mangroves of the latter River are relatively large in extent and are discussed in section

4.6. As noted, several of the river systems between the Cuanza and Zaire Rivers do not appear to flow directly to the sea. To what extent this is due to reduced flow, sedimentation processe or an unusually dry period needs to be determined. Mangrove communities at the mouths of the Lucula, Lucunga and M'bridge Rivers show signs of high levels of mortality (up to 30%). Whether this mortality is related to impoundment of fresh water impeded tidal recharge or other factors also needs to be investigated. The importance of mangrove communities as nurseri for fish and crustacean species, shoreline stabilization and nutrient retention is well-documented. If these mangrove communities are suffering above-normal mortality levels then management options may be required to reverse deleterious trend:

Annex 3.3.a

Methodological Note: Geology

Annex 3.3.a Methodological Note: Geology

The section on Angola's geology integrates elements of its topography, landforms and underlying geology.

The geomorphologic subdivision (Figure 3.7) used to structure this discussion was compiled from information provided by Diniz (1992) and Azevedo et al. (1972).

The geologic map (Figure 3.9) was derived from Azevedo et al. (1972), Diniz (1973) and information extracted from the map (1:1,000,000) compiled by Carvalho (1980).

Annex 3.4.a

Methodological Note: Soils

Annex 2.4.a Methodological Note: Soils

Figure 11 is a generalized soils map of Angola.

It was compiled from information derived from Diniz (1973, 1991) and Azevedo et al. (1972).

An attempt was made to present the soils in a manner that is accessible to individuals not familiar with the jargon used by soil scientists. Because of the small map scale used and the purpose of this report, the presentation has to be conducted at a high level of abstraction.

The reader should keep in mind that small scale variations in soils that are crucial to the production systems cannot be properly addressed in a discussion of this character.

Annex 3.5.a

Studies to Classify Vegetation

Annex 3.5.a Studies to Classify Vegetation

Units used to describe the biogeographic divisions of Angola.

a. Chapin 1932: Avifaunal districts
   - Guinea forest
   - Congo savanna
   - Rhodesian highland
   - Eastern montane
   - South-west Arid

b. Barbosa 1970: Phytogeographic formations
   - Closed forest
   - Forest-savanna mosaic
   - Thicket-savanna-woodland mosaic
   - Edaphic formations
   - Woodlands
   - Tree and/or Shrub savanna
   - Steppes
   - Desert
   - Grassland

c. Huntley 1974a: Biomes
   - Guinea forest
   - Congo savanna
   - Brachystegia
   - Montane forest
   - South-west arid
   - Escarpment zone

d. White 1983: Phytochoria
   - Guineo-congolian regional centre of endemism
   - Zambezian regional centre of endemism
   - Karoo-Namib regional centre of endemism
   - Afromontane regional centre of endemism
   - Guineo-congolian/Zambezian regional transition zone
   - Kalahari-Highveld regional transition zone

Angola can be divided into several biomass classes depending on the purpose of the classification. The phytogeographic map of Angola (Barbosa 1970) subdivides the vegetation of the country into 32 formations. This classification of vegetation formations, comprises of vegetation types with little or no woody vegetation. Thus, only 20 vegetation types have growing stocks of more than 0.0 cu.m/ha. The Analysis of the Actual Forest Situation (Horsten 1983) is based on the above mentioned vegetation classification. However, the main focus of the report is the production of timber and fuelwood focus at national and provincial levels.

Another broad classification is that of the Physical Resources

and Agricultural Potential of Angola (Diniz 1991). This generalized phytogeographical classification is similar to that of the Woody Biomass Assessment with two exceptions; (1) it does not group the similar vegetation of the inundated plains of Moxico and Lunda and (2) it does not subclassify the desert formations.

Vegetation classification with a fuelwood focus (as opposed to botantical, agricultural or ecological) is presented in the **Woody biomass assessment** of the SADCC region (Millington and Townsend 1989). Their categories are useful as there is a need to simplify the vegetation classification scheme as well as to bring it in line with vegetation classification of the region. Visits to Kwanza Norte, Bengo, Benguela, Huambo and Cabinda confirmed that the classification is an appropriate one for Angola.

The Transitional Rain Forests/Miombo Woodlands

The vegetation class is related to the transitional vegetation between the northern rain forest and and miombo-woodland belt of north-central and north-western Angola. Much of this vegetation class is found in Malanje, Lunda Norte, Launda Sul and Uige. There are small areas of this class in Cabinda, Kwanza Sul, Moxico and Zaire. Although there is very little left of the miombo woodlands of Bie and Huambo, significant areas of these provinces were classified with the transitional vegetation of the north. The total area covered by this vegetation class is estimated to be about 159,680 square kilometers.

There is very little left of the peripheral rain forests due to extensive clearing in the past with the possible exception in the forest reserves. However, the undisturbed mature secondary forest is said to have similar characteristics with the primary forest.

The floristic composition of this class is variegated and consists of different strata. The upper strata is composed of *Albizzia spp., Celtis spp., Ficus spp., Chlorophora excelsa, Antiaris welwitshii, Piptadenistrum africanum, Spathodia campanulata, Pycnanthus angolansis, Combretodendron balsamiferum* and *Sterculia purpurea*. The dense forests of Maiombe are more richer in their species composition. In addition to the species mentioned earlier they are composed of such species as *Gilbertiodendron ogoonsense, Gosweilerodendron balsamiferum, Librewellea klanei, Oxystigma oxyphllum, Pentadesma leptonema* etc.

The river valleys of the north-south flowing rivers is characterized by fast regenerating riparian vegetation attaining heights of 35 to 40 m. The vegetation of plateaux of the interior of northern Angola is less productive and very sensitive to human intervention. The dominant tree species of the dry evergreen

miombo of this class consist of *Brachystegia speciformis, B. waangermeeama, Isoberlinia giorgii, Lannea antiscorbutica, Marquesia acuminata, M. macroura,* and *Parinari curatellifolia.*

The dominant tree species of the semi-evergreen miombo woodland of the north western part of Lunda Norte are *Marquesia macroura* and *Brachystegia taxifolia* with *Marquesia acuminata* and *Pteleopsis diptera* forming the next important tree species.

In areas of severe deforestation, this vegetation recovers to tall well developed grassland with scattered individual, fire-resistant trees such as *Burkea africana, Cumbretum spp., Dialium englernum, Diplorhynchus condylocarpon, Trythrophloeum africanum, Hymenocardia acida, Protea petiolaris* and *Pterocapus angolensis.*

Dense, High Miombo Woodland

This vegetation class is mainly found in Bie, Huila, Cuando-Cubango, Cunene and Moxico and covers an area of 111,281 square kilometers of the slightly undulating sandy plains associated with the headwaters of Cuito, Cuando, Cubango, Luanginga, Luena and Lungue-Bengo rivers south-east of the Bie plains.

The upper canopy of this vegetation class is dominated by about 25 m high tree species of *Brachystegia bakerana, Cryptosepalum exfoliatum, Dialim englerum, Guibourtia coleosperma subsp. pseudotaxa* and *Julbernardia paniculata.* The lower layer is composed of *Baphia massaiensis, Capaifera baumiana, Diospyros spp., Landolphica spp., Paropsiabrazzeana, Parinari spp., Trichilia quadrivalis* and *Xylopia odoratissima.*

There is no detailed data on the forest/woodland species of this vegetation class. However, in order to give an idea of the species composition of this class a summary of Cuando-Cubango is presented Table 1.

Dense, Medium-Height Miombo Woodland

This class varies from the Dense, High Miombo Woodland in that it has slightly lower seasonal and overall growth rate due to edaphic and climatic factors. It covers an area 221,164 square kilometers which includes large areas of Bie (32.6%), Huila (56.3%), Lunda Sul (61.2%), and Moxico (23.8%). There are also extensive areas of this vegetation class in Cunene, Bengo, Huambo, Cuando-Cubango, Malange, Zaire and the Dembo Cloud Forests of Kwanza Norte which have given way to coffee plantations.

Table 1: Forest composition of the dense, high Miombo Woodland of Cuando-Cubango.

Species	Occurrence as dominant (max = 25)	Trees/ha (dbh greater than 20 cm)	Frequency of occurrence in percentage
Brachystegia longifolia	4	0-10	0-13
B. bakerana	5	n/d	13-32
B. spp. (unknown)	2	4.9-14.6	6-13
Other *Brachystegia*	5	0.5-16	2.19
Isoberlinia baumii	15	3.4-24	1-68
I. spp. (unknown)	1	3.2	5
Other *Isoberlinia*	4	8-49	3-41
Guibourtia coleosperma	15	2-29.4	5-46
Cryptosepalum pseudotaxus	4	n/d	7-35
Pterocarpus angolensis	4	0.3-2.2	3-10
Burkea africana	7	1-3	6-24
Combretum spp.	2	2	6
Diplorhynchus angolensis	1	n/d	6
Erythrophleum africanum	15	2-29.4	0.5-4.46
Ochna spp.	2	n/d	5-7
Monotes africanus	4	n/d	8-17
Ricinodendron sautaneii	1	n/d	13

Data taken from: Millington and Townsend (1990)

The Dense, Medium-Height Miombo Woodland is well-defined and rich in flora with the closed canopy attaining heights of 25 to 30 meters. The upper canopy is dominated by *Brachystegia gosswieleri, B. boehmii, B. speciformis, B. waangermeeana, Cumbretum spp., Cussonia angolensis, Isoberlinia angolensis* and *Julbernardia paniculata*. On the higher grounds of the Bie Plateaux, the canopy is lower and the dominant species include Brachystegia bakerana, B. longifolia, B. speciformis, Capaifera baumiana and *Guibourtia coleosperma*.

The woodlands of eastern Moxico vary considerably in their species composition as a result of variations in depth and quality of soil. On the well-drained soils, there are various miombo types which consist of species such as *Cryptosepalum spp.* and *Marquesia calanersus-Uapaca pilosa* woodland complexes. The shallow soils in which this vegetation class is found are dominated by *Brachystegia microphylla* and *B. autilis* whilst the poorly drained soils are dominated by *B. boehmii, Marquesia katangensis* and *Uapaca spp.*

The main canopy trees of the Dembos Cloud forests consist of species such as *Albizzia spp., Celtis spp., Ficus spp.* and *Morfus spp.* The under-storey trees have been cleared to make way to coffee plantations with some of the main canopy trees being retained as shade for the coffee bushes.

Seasonal Miombo Woodlands and Wooded Savannah

This vegetation class which is found between the rain forests of the north and the dense miombo woodlands of the south includes several closely related vegetation types ranging from miombo woodlands and bushy thickets to relatively dense savannahs on the plateaux. The geographic distribution of this class includes Kwanza Sul, Lunda Sul, Malange and Moxico as well as small patches in Bie, Kwanza Norte, Uige and Zaire. The total area covered by this vegetation class amounts to 306,946 sq.km. The vegetation class over the area varies in growth rates as well as the seasonality of shedding of leaves as well as in species composition. The western part of the vegetation class which is found in Bie, Kwanza Norte and Sul, Malange, Uige and Zaire is dominated by wooded savannah. The dominant species in this area are *Acacia sieberana, Annona spp., Cochlospermum angolense, Diplorhynchus condylocarpon, Pilostigma thonningii* and *Terminalia sericea*. The eastern part is characterized by open-canopied miombo vegetation mostly dominated by *Brachystegia gosswielei, B. speciformis* and *Julbernardia paniculata* especially in the free draining areas.

In northern Bie, the upper canopy consists of 6 to 30 m high *B. tamarindoides, Marquesia laadensis, Syzygium guineense* and *Uapaca spp.* and constituting a canopy cover of 15 to 70%.

Dry Deciduous Savannah

The vegetation class is found in the southern half of the country and is characteristic of the area bordering Namibia and the highest parts of the Bie Plateau which includes the driest variants of the Angolan Miombo Woodland as well as the *Baikaea* and *Mopane* woodlands. This vegetation type has a very low growth rate during the dry season and peak growth rate during the rainy season, and covers an area of about 229,657 sq kms. It is generally found in Cunene, Cuando-Cubanago and Moxico but there are also some tracts in Huambo, Huila and Namibe. This vegetation class is more open with low canopied trees (about 10 m) interspersed with grasses that attain heights of up to 2.0 m. The vegetation structure varies within the area that is covered by this class is summarized below:

- On the Bie Plateau, the dominant species are *Brachystegia boehmii. B. gosswielei, B. spciformis, Julbernardia globiflora* and *J. paniculata.*

- On the higher parts of the Bie Plateau (1,900 to 2,200 m.a.s.l.), the canopy is lower and consists of *B. floribunda, B. speciformis* and *J. paniculata.* Over this altitude the open thicket is replace by *Mopane* grassland.

- In Cuando-Cubango where the rainfall varies between 500 and 1 000 mm, the main dominant species are *Burkea africana, Baikiaea plurijuga, Pterocarpus angolensis, Combretum dinteri* and *Guibourtia coleosperma.*

- On the alluvial soils of Cunene, with rainfall of 400 to 600 mm, occur the *Mopane* woodlands. The dominant heights decline from 15 m in the west to 7 m in the east as a response to lower rainfall regime in the east. The canopy is dominated by *Acacia kirkii, Colophospermun mopane* and *Stericula spp.*

The forest composition of the dry deciduous savannah woodlands showed that tree densities of dominant species ranged from 1.5 to 47% for all trees and 1.4 to 48% for trees of dbh greater than 20 cm (Coelho 1967).

Dry Coastal Savannah and Arid Coastal Thicket

This vegetation class extends from the western escarpment to the Angolan coastal plain, a strip of 20,150 km and with an annual rainfall of no more than 600 mm. This heterogeneous flora with miombo and *Mopane* woodlands is well adapted to long seasonal moisture stress as a result of which the area is dominated by

grass. The vegetation class occupies and area of 48,484 sq km and is mainly found in Bengo, Benguela, Kwanza Sul and Zaire. There are some area specific floristic differences within this class. Thus, the west-central vegetation formation has been called "north Zambezian undifferentiated woodland and wooded grassland" (White 1983) and is dominate by *Adansonia digitata, Dichrostachys spp., Euphorbia conspicua, Setari wlitschii* and *Sterculia setigera*. In some areas, grasslands are dominant and the woody vegetation is limited to small patches of *Acacia spp., Dichrostachys cinera, Euphorbia conspicua* or *Terminalia prunioides* whilst the shallow and stony area are dominated by *Croton spp., Grewia spp.* and *Strychnos henningsii*.

Dry Inland Savannah

This vegetation which has strong similarities with the dry coastal savannah has a total area of 26 263 sq.km, is composed of disturbed forests in the south. It constitutes a transitional zone between the Bushy Arid Shrubland that lies to the west and open Mopane woodland to the east. This is less disturbed than the areas to the north and the canopy is dominated by *Acacia kirkii, Colophoospermum mopane* and *Sterculia spp*.

Degraded Rain Forest and Miombo Woodland

This vegetation class covers a total area of 33,220 sq.km. The degraded rain fores which covers an area of 18,002 sq.km is found along the coastal plain between N'Zeto and the Zaire river; the inland zone of Kwanza Norte, Malange, Uige and Zaire; and the coastal plains of Cabinda. The dominant woody vegetation is composed of fire-resistant *Acacia spp., Adansonia digitata, Euphorbia conspicua, Sterculia africana* and the introduced mango (*Mangifera indica*) and cashew nut (*Anacardium occidentale*).

The degraded miombo woodland which covers an area of 15,218 sq.km is mainly found in Benguela, Cunene, Huila, Kwanza Sul and Uige. The vegetation structure, growing stock and mean annual increments of this sub-class are similar to those of the degraded rain forest. However, with the exception of mango and cashew nuts there is very little floristic similarity. The main dominant woody vegetation is composed of *Brachystegia spp., Isoberlinia spp., Julbernardia spp., Mucronata spp., Montes spp., Uapaca spp.* and *Parinari curatellifolia*.

Bushy Arid Shrubland

This vegetation type covers an area of 15 748 sq.km and extends from the Namibe desert northwards and covers about 23% of the province of Namibe. The vegetation is characterized by thorny

bushes most of which are succulents. The main dominant woody species are *Acacia spp., Commiphora spp., Sterculia spp., Boscia albitruncata, Grewia bicolor, Hoodia currori, Salvadora persica* and *Rhigozum spp.*

Chanas da Borracha Grassland and Degraded Dry Deciduous Savannah

The Chanas de Borracha grassland vegetation sub-class is restricted to the upper Zambezi Valley of the Kalahari sands of Cuando-Cubango, Moxico and Lunda Sul provinces while the degraded Dry Deciduous Savannah are found in the above mentioned areas as well as on the Nambian border and in Cunene. This vegetation class covers an area of about 72,238 sq km.

The Chanas de Borrachas of the upper Zambezi is edaphically controlled by annual burning and the seasonal flooding of the soils and is dominated by short grasses of **Loudetia simplex** and *Monocymbium cereriiforme* and low bushes of *Parinari capensis*.

Mopane Grassland

This is found in the western part of Bie above 2,000 metres where the soils are too shallow to support miombo woodland vegetation types of the lower parts of the plateau.

Coastal and Desert Vegetation

This is the vegetation class of the Namib Desert which extends from the Atlantic Coast to Southern Angola covering extensive areas around Namibe and Tombwa. In the latter case with considerable desertification problems in terms of sand dune movements. The biomass class covers an area of 833 sq.km and is dominated by desert annuals, grasses, succulents and *Welwitschia bainesii* but the riparian bushland is dominated by *Acacia albida, Ficus spp., Hypheaene benguelllensis* and *Tamarix usneoides*. The vegetation of the depressions of the eastern Namibe desert are characterized by *Acacia albida, A. reficiens, A. tortilis, Commiphora spp., Hoodia currori* and *Sterculia setigera*.

Annex 3.6.a A Description of the Major Features of Angolan Biomes

The great range of biomes and ecosystems found in Angola is probably unequalled in any other African state. The term BIOME refers to a major biogeographic division and is defined as much on the genetic composition and origin of its component plant and animal species as it is on physiognomic, climatic or edaphic factors. A biome comprises numerous ECOSYSTEMS. The term ecosystem is used in reference to a particular animal and plant community and its associated physical environment. Ecosystems can be classified according to their physiognomy (forest, woodland, grassland), climate (moist, mesic, arid; temperate, tropical or equatorial) or substrate (marine, freshwater or terrestrial).

A detailed survey of Angolan ecosystems has yet to be undertaken. The preparation of the present preliminary inventory is based on the brief references made to biogeographic features of Angola in the literature (Chapin 1932, Traylor 1963, Barbosa 1970) and on personal experience gained during four years of extensive travels throughout the country during the period 1971/75 (Huntley 1974d).

White's (1983) 'regional centres of endemism' offer the best synthesis of the biological characteristics of Angola within an African context. The major divisions and the percentage area of Angola occupied by them are:

- Guineo-congolian 10,7% (forest, thickets, tall grass savannas)
- Zambezian 86,2% (woodlands, savannas, grasslands and thickets)
- Afromontane 0,5% (forests, savannas and grasslands)
- Karoo-Namib 2,6% (desert, shrubland, savannas, woodlands and thickets)

These divisions correspond closely to the 'biomes' recognised by Huntley (1974a, b, d) and are useful categories for a general account of the biodiversity of Angola. Transitional zones and mosaics occur at the interfaces of each of these major 'centres of endemism'. These transitional zones are of particular interest along the Angolan escarpment and at the interface between the Guineo-congolian and Zambezian systems in northern Angola. In addition to these major divisions, various other biological communities of indefinite or mixed affinities are to be found in specialized environments, such as the coastal, estuarine and riverine ecosystems and in the microclimates of large waterfalls, caves and rock outcrops.

Annex 3.6.a

Major Biomes: A Description

In describing the major features of these biomes, reference will be made to the vegetation types delineated in the Carta Fitogeografica de Angola of Barbosa (1970), the most recent detailed account of the country's vegetation. Barbosa described 32 major vegetation types and over 100 subordinate types. A recent synthesis of Angolan environments and their agricultural potential (Castanheira Diniz 1991) recognises 13 main divisions.

Guineo-Congolian Biome

The **Guineo-congolian biome** comprises the evergreen and semi-deciduous forests of Cabinda, Zaire, Uige, Cuanza Norte and Cuanza Sul provinces. Communities of this biome occupy the escarpment slopes and well dissected regions of the interior plateau, ranging from 200 m to 1 400 m altitude and receiving from 1 200 to 1 800 mm rainfall per annum. These moist forests possess an extremely rich and robust flora, notable especially for the wide range of very tall tree species, often reaching 50 m in height and forming a continuous multi-storeyed canopy.

Evergreen Guineo-Congolian Forest (Barbosa types 1, 2, 3) is found in the interior of Cabinda, where specimens of *Gilletiodendron ogoouense, Tetraberlinia bifoliolata, Julbernardia seretii, Librevillea klainei*, etc, reach from 30 to 50 m height. This forest is surrounded by more extensive areas of partially deciduous communities, with *Gossweileriodendron balsamiferum, Oxystigma oxyphyllum, Pentaclethra eetveldeana, Guibourtia arnoldiana, Terminalia superba*, etc. To the south of the Zaire River in the Zaire, Uige, Cuanza Norte and Cuanza Sul provinces, extensive forests comprising many deciduous species are found. These "coffee forests" receive from 1 000 to 1 800 mm rainfall per annum, with two to three rainless months. The forests occupy the upper slopes of the western escarpment and benefit from an almost continuous stratus cloud cover resulting from the influence of the cold Benguela Current. Dominant trees include *Celtis prantlii, C. milbraedii, Morus mesozygia* and *Albizia glaberrima*; few of these exceed 30 m height.

Very little light penetrates the forest canopy and grasses are rare and grazing antelope absent in the forest floor community. This stratum is occupied by browsers such as Water Chevrotain *Hyemoschus aquaticus*, Yellow-backed Duiker *Cephalophus sylvicultor*, Black-fronted Duiker *C. nigrifrons*. The trees, shrubs and lianes of this biome produce an abundance of flowers and fruit throughout the year and frugivorous mammals and birds are common. The primate fauna of these forests is particularly important, including Gorilla *Gorilla gorilla*, Chimpanzee *Pan troglodytes*, Greater White-nosed Monkey *Cercopithecus nictitans*, Moustached Monkey *C. cephus*, Golden Potto *Arctocebus calabarensis*, Bosman's Potto *Perodicticus potto*, etc. Two well-known birds from these forests are the Grey Parrot *Psittacus*

erithacus and the Great Crested Lourie *Corytheola cristata*.

The conservation of a single example of this biome, such as the Maiombe Forest of Cabinda, would be insufficient to represent its varied forms, and examples of the drier, semi-deciduous forests of Cazenga and Gabela should also be conserved.

Surrounding the extensive Guinea Forests are vast areas of tall grassland interspersed by gallery forests in the valleys and isolated forest patches in favourable situations on the plateaux. This comprises White's (1983) Guineo-Congolia/Zambezia regional transition zone and was recognised as a separate 'Congo-savanna' biome by Huntley (1974a). The gallery forests are particularly well developed in the Cuango, Luachimo and Cassai valleys of the Lunda Norte province.

The forests, (Barbosa types 7, 8, 9, 10) of 20 to 40 m height, include many of the species noted in the previous grouping, with species such as *Piptadeniastrum africanum, Chlorophora excelsa, Ceiba pentandra, Musanga cecropioides, Allanblackia floribunda, Entandrophragma angolensis*, etc. The grasslands, of two to four metres height, include various species of the genera *Hyparrhenia, Andropogon, Pennisetum, Loudetia, Panicum*, etc. Trees and shrubs are sparsely scattered through this grassland as their survival requires considerable capacity to resist the intense fires which pass through the grasslands annually. Typical woody species are *Hymenocardia acida, Erythrina abyssinica, Piliostigma thonningii, Cussonia angolensis*, etc.

The mammalian fauna of the gallery forests is of special interest, including a variety of primates not found elsewhere in Angola. These include the Black-cheeked White-nosed Monkey *Cercopithecus ascanius*, Brazza's Monkey *C. neglectus* and the Angolan Black-and-White Colobus *Colobus angolensis*. Antelope of these forests include Black-fronted Duiker, Yellow-backed Duiker, Blue Duiker, Sitatunga *Tragelaphus spekei* and Bushbuck *T. scriptus*. Birds include Hartlaub's Duck *Pteronetta hartlaubi*, White-crested Hornbill *Tropicranus albocristatus*, Naked-faced Barbet *Gymnobucco calvus* and Chestnut Wattle-eye *Dyaphorophyia castanea*.

The range in ecosystems in the transition zone surrounding the Guineo-Congolian forests varies widely, and at least three conservation areas, in the Zaire, Uige and Lunda Norte provinces would be required. Because of the nature of the ecosystems in question, none of these areas need exceed 200 km².

Afromontane Forests

The **Afromontane Forests** of Angola are of very great biogeographic interest as they are the sole surviving links in our knowledge of past climatic conditions which favoured a much wider distribution of this cool moist forest biome. Today these forests are represented in Angola by a few isolated patches on the protected slopes in the mountains of Huambo, Benguela, Cuanza Sul and Huila provinces. The combined area of these relics is probably less than 200 ha, yet they provide sufficient habitat for the maintenance of faunal and floral communities separated by over 2 000 km from their closest allies.

The best examples of this forest type are to be found in the Luimbale area, in particular on Mount Môco where at least fifteen patches of from one to twenty hectares survive. The forests are found mainly in deep ravines at altitudes from 2 000 to 2 500 m.

Trees recorded from these remnant patches (Barbosa types 6) include *Podocarpus milanjianus* (locally dominant), *Polyscias fulva, Apodytes dimidiata, Pittosporum viridiflorum, Syzygium guineense* subs *afromontanum* and *Halleria lucida*. The forests receive between 1 200 and 1 800 mm rainfall and are not as heavily festooned in epiphytes as are similar communities elsewhere in Africa - few orchids are to be seen and the most prominent cryptophyte noted during a brief reconnaissance survey was *Lycopodium dacrydioides*. The forests seldom exceed 8 m height and the canopies are usually very irregular due to the steep gradients on which the patches are located.

The mammal fauna of these forests has been greatly reduced through hunting, but includes Yellow Baboon *Papio cynocephalus*, Red-footed Squirrel *Funiscuirus pyrrhopus*, Blue Duiker and Bush-pig *Potamochoerus porcus*.

Only the avifauna of these forests has been studied in any detail with extremely interesting results. Of thirty species collected in the montane forests of Mount Môco, seven are restricted entirely to the relic montane forests of Fernando Po, the Cameroons, Ruwenzori, Tanzania, Ethiopia and Malawi, at distances of 2 100 km to 3 400 km from Mount Môco.

The conservation of Angola's montane forests is of the greatest importance, for although they comprise only three ecosystems (montane forest, *Protea* savanna and montane grassland) their biogeographic interest is immense.

Open grassland with widely scattered trees and shrubs (Barbosa Types 32) covers large areas of the Angolan highland plateau at altitudes above 1 600 m in the Huambo, Bié and Cuanza Sul provinces. Included here are the grasslands of seasonally

waterlogged plateaux where *Parinari capensis, Myrsine africana, Protea welwitschii, Dissotis canescens, Cyathea* sp, *Loudetia* spp, *Fimbristylis* spp and *Xyris* spp, number amongst the constituents. Better drained areas include *Phillipia benguellensis, Protea trichophylla, Stoebe vulgaris, Cliffortia* sp, *Themeda triandra, Tristachya inamoena, T. bequertii, Hyparrhenia andogensis, H. quarrei, Monocymbium ceresiforme, Ctenium* sp, etc.

Zambezian Biome

The Zambezian regional centre of endemism (in this account, the term Zambezian Biome will be used)is represented in Angola by a vast area of the interior plateau, in particular the highly leached soils formed by the crystaline rocks of the Ancient Massif and the infertile Kalahari sands.

This biogeographic unit has a physiognomy and floristic composition which varies considerably over the 1 078 000 km² of its extent in Angola. To the west, woodland, interspersed by narrow drainage-line grasslands is most prevalent. This typical *Miombo* woodland (Barbosa types 16, 17, 18) occupies approximately 35% of the country's surface area, of which 437 000 km² comprise this grouping. *Julbernardia paniculosa* and *Brachystegia spiciformis* are widespread throughout, with *B. floribunda, B. boehmi, B. wangermeeana* and *B. gossweilerii* locally dominant. The woodlands range from 4 to 12 m height with a sparse to moderate grass and shrub layer below the continuous canopy. Drainage-line grasslands are typically dominated by *Loudetia simplex* and members of the tribe Andropogoneae.

An edaphic grassland (Barbosa types 12) occupies much of the Lunda Norte province in the extreme north-east of Angola. Called "chanas de borracha" by Gossweiler and Mendonça (1939), these extensive treeless plains are characterized by the abundance of *Landolphia parvifolia* var. *thollonii*, a perennial shrub with robust sub-terranean organs and copious rubbery latex.

Trees such as *Marquesia macroura, Guibourtia coleosperma* and *Cryptosepalum pseudotaxus* are either locally dominant or in some areas form distinctive and extensive communities. Cryptosepalum Dry Forest is found on the eastern border adjoining the Balovale district of Zambia.,

A distinctive vegetation type, Mopane woodland, is well represented in the arid south west of Angola. A wide range of communities is found, from pure stands of *Colophospermum mopane* of up to 10 m height, to mixed associations of this species with *Terminalia prunioides, Spirostachys africanus, Acacia erubescens, Balanites angolensis*, etc. In common with its habit elsewhere in Africa, mopane occurs almost exclusively on clayey and rocky substrates, giving way to *Baikiaea plurijuga* communities on the

sands to the east and to the Brachystegia formation in higher, moister areas.

Dry deciduous forest with abundant *Baikiaea plurijuga* occupies a vast area of the extreme south east of Angola (Cuando-Cubango province). The formation is almost entirely restricted to sandy substrates and penetrates the *Colophosphermum mopane* formation to as far west as the Ruacana Falls, at 14 ° 06' E. Pure stands of *Baikiaea plurijuga* are rare. The species is most typically associated with *Guibourtia coleosperma, Pterocarpus angolensis, Burkea africana, Dialium englerianum* with local communities of *Ricinodendron rautanenii*. The woody species range from 5 to 12 m height. Grasses are sparse and wiry, up to 1,5 m tall and include *Aristida stipitata, Triraphis schlecteri, Tristachya rehmannii*, etc.

The **Karoo-namib** regional centre of endemism. Southwards from Luanda the Angolan Coast Belt experiences an arid climate with extended dry seasons. These arid conditions are also found along the entire southern frontier of the country. The vegetation types found within this 'South West Arid' biome (Huntley 1974a) vary considerably according to soil substrate and climatic conditions, but throughout the zone plants share a deciduous habit and the ability to endure long rainless periods.

Conditions of extreme aridity are found in the Namib Desert of south west Angola. Here the vegetationless dunes (Barbosa types 29) are occupied by a highly specialized invertebrate fauna dependent on wind-blown plant detritus for their food and water needs. Precipitation is negligible, Baía dos Tigres and Tombua receiving 15 and 12 mm per annum respectively. Inland from the mobile dunes perennial *Aristida* and *Stipagrostis* grasslands lead to *Acacia-Commiphora* savanna and thicket (Barbosa types 27, 28). Here *Welwitschia mirabilis* is common on gravelly substrates. The arid savanna and thicket communities include several Acacia species - *A. reficiens, A. detinens, A. mellifera, A. tortilis*, plus several Commiphora and Boscia species, and *Terminalia prunioides, Catophractes alexandri, Rhigosum brevispinosum, Sesamothamnus benguellensis, Colophospermum mopane* etc. These woody communities seldom exceed 4 m height; only along the dry river beds - "mulolas" - do trees reach any stature - here *Acacia erioloba, A. albida* and *Combretum imberbe* of 15 m and more are found.

Elements of Karoo-Namib, Zambezian and Guineo-Congolian centres of endemism intermix along the coast in the narrow arid coastal strip as far as the Zaire river. Dense dry thicket and scrub-forest (Barbosa types 11, 14, 22, 23) are the typical physiognomies, with *Sterculia setigera, Adansonia digitata, Euphorbia conspicua, Strychnos* spp, and *Acacia welwitschii* dominant in the woody strata. Grasslands between the closed communities are dominated by *Andropogon gayanus, Heteropogon*

contortus and *Hyparrhenia* spp. Extensive sand plateaux within this formation, especially along the littoral, are occupied by *Hyphaene gossweileri* palm savanna with *Eragrostis superba*, *Schizachyrium semiberbe* and *Digitaria milanjiana*.

A rather remarkable grassland (Barbosa type 23) occurs in a very restricted area to the north and south of Luanda. The community occupies smoothly rounded hills of Miocene and Oligocene marine sediments comprising highly plastic montmorillonite-rich clays and marls. The outstanding feature of this is the complete dominance, virtually to the exclusion of any other species, of *Setaria welwitschii*. This grass forms extremely dense swards of 1 to 1,5 m height, sometimes covering continuous areas of up to 100 000 hectares.

Escarpment Zone

Between the arid Karoo-Namib shrubland and thickets of the Coast Belt and the Zambezian *Brachystegia* woodlands of the interior plateau, a discontinuous series of moister vegetation types extend southwards from the Guineo-Congolian forests and savanna systems following the escarpment as far as Capangombe. This escarpment Zone has affinities with all three adjoining biomes but also acts as a barrier between the two drier biomes allowing sub-speciation to develop within them.

The ecosystems found in this zone include evergreen forest, deciduous forest and dry thicket communities, all with very important biogeographic features.

Annex 4.2.a

Distribution and Status of the Larger Mammals of Angola

Annex 4.2.a Distribution and Status of the Larger Mammals of Angola

The faunal diversity of Angola has been more exhaustively studied than the country's botanical resources, but even in respect of the fauna, most of the studies have related to the vertebrate component. Angola's rich avifauna has been catalogued by Traylor (1963) with extensions to the checklist provided by Dean *et al* (1988). The most comprehensive avifaunal treatment is that of Pinto (1983).

The fishes of Angola's abundant rivers were catalogued by Max Pohl (1967) but have not been more recently surveyed. Reptiles and amphibia both need further field study.

The mammals of Angola have yet to be studied in any detail in the field. The only study of any depth undertaken in Angola was the two year study of the Giant Sable undertaken by Estes in Luando in 1969/70. Taxonomic studies, and a synthesis of the distribution of mammal species, was published by Crawford Cabral (1988).

During the period 1971-1975 an extensive survey of the status of 80 species of mammals was undertaken throughout Angola - although largely focused on protected areas (Huntley 1973e). At the time, few areas of Angola had the abundance of wildlife typical of many East African and southern African states, but in general, the populations in the conservation areas were rapidly increasing. Since 1975, many populations of large mammals have been severely reduced, if not eliminated. Wholesale harvesting of elephant, rhino, eland, roan, oryx, springbok, zebra, bushbuck, reedbuck, lechwe and many other species occurred in all parks and reserves. It is possible that some nucleus herds might still survive, sufficient to recover if given effective protection. The populations of small mammals, especially those of no commercial or food value, might not have been affected - indeed some species might have benefitted from the collapse of agricultural and industrial activities, especially species within the Guineo-Congolian forests.

A detailed survey of the present states of Angolan wildlife - in particular the larger mammals - is needed to compare the current situation with that of 1975. Preliminary extensive surveys are currently evolving through the 'Survey of Wildlife Resources of Angola Programme' - a collaboration between IUCN Elephant Status Survey, MINADER, University A'. Neto and Angolan NGOs.

The following account provides an outline estimate of the 'Red Data' status (E = Endangered; V = Vulnerable; R = Rare; S = Safe; and I = Indeterminate), distribution (within biomes and provinces) and general features of 80 of the 275 species of

mammals known from Angola. The 'Red Data' status for species which have declined since 1975 is indicated as S/E where it is known that they have moved from Safe to Endangered between the years 1975 to 1992. Where the species was listed in Anexo 1 of the **Regulamento de Caça** of 1972, ie species the hunting of which is prohibited by law, this is mentioned. In reality, no protection of any sort has been possible since 1975. It should b noted that the following account emphasises wildlife status in protected areas and is from the perspective of the situation in 1975. Very little data is available on current status and distribution.

ORDER PHILODOTA

Manis gigantea, Giant Pangolin (I). Guineo-Congolian Biome. This species is only known in Angola from Cabinda. At present i is protected, with the other Pangolins, by inclusion in Anexo 1 of the Regulamento de Caça. Further protection is being sought by the creation of a Strict Nature Reserve within its range in the Miaombe Forest of Cabinda.

Manis tricuspis, Tree Pangolin (I). Guineo-Congolian Biome. Widespread in northern Angola. Protected by inclusion in Anexo 1. With *M. gigantea*, will be included in Maiombe Strict Nature Reserve.

Manis temminckii, Cape Pangolin (I). Zambezian and Karoo-Namib Biomes. Widespread in southern Angola. Protected by inclusion in Anexo 1. Found in Bikuar National Park.

ORDER PRIMATES

Perodictious potto, Bosman's Potto (I). Guineo-Congolian Biome. Included in Anexo 1. Occurs in proposed Maiombe Strict Nature Reserve.

Actocebus calabaronsis, Golden Potto (I). Guineo-Congolian Biome. Included in Anexo 1. Occurs in proposed Maiombe Strict Nature Reserve.

Galago crassicaudatus, Thick-tailed Galago (S). Zambezian and Karoo-Namib Biomes. Widespread. Included in Anexo 1. Occurs in Bikuar, Kisama, Kangandala National Parks and Luando Strict Nature Reserve.

Galago senegalensis, Lesser Galago (S). Zambezian and Karoo-Namib Biomes. Included in Anexo 1. Occurs in Luando Strict Nature Reserve and Kangandala National Park.

Galago alleni, Allen's Galago (I). Guineo-Congolian Biome. Forests of Cabinda. Included in Anexo 1. Occurs in proposed Maiombe Strict Nature Reserve.

Galagoides demidovi, Dwarf Galago (I). Guineo-Congolian Biome. Forests of north-east Angola. Included in Anexo 1. Occurs in certain gallery forests of Lunda Norte province which are proposed for proclamation as Regional or Strict Nature Reserves.

Euoticus elegantulus, Needle-clawed Galago (I). Guineo-Congolian Biome. Included in Anexo 1. From the Forests of Cabinda. Occurs within area of proposed Maiombe Strict Nature Reserve.

Papio cynocephalus, Yellow Baboon (I). Zambezian Biome. Widespread in central and north-east Angola. Unprotected and unconfirmed in any existing conservation area. Will possibly be included in reserves in Huambo (Mt Môco) and Lunda provinces.

Papio ursinus, Chacma Baboon (S). Karoo-Namib Biome. Frequent in southwest Angola. Good populations within Iona National Park and Namibe Reserve.

Cercocebus aterrimus, Black Mangabey (I). Guineo-Congolian Biome. Reported from Cuango River, northern Angola, but no recent or original information.

Miopithecus talapoin, Talapoin (S). Guineo-Congolian Biome and Escarpment Zone. North-west Angola. Good populations in Kisama National Park.

Cercopithecus cephus, Moustache Monkey (I). Guineo-Congolian Biome. Common in Cabinda, and found within area of proposed Maiombe Strict Nature Reserve.

Cercopithecus ascanius, Black-cheeked White-nosed Monkey (I). Guineo-Congolian Biome. Gallery Forests of north-east Angola. Unprotected. Occurs in areas proposed for proclamation as Strict Nature Reserve or Regional Reserves, Lunda Norte province.

Cercopithecus nictatans, Greater White-nosed Monkey (I). Guineo-Congolian Biome, Cabinda. Occurrence within area of proposed Maiombe Strict Nature Reserve suspected but not confirmed.

Cercopithecus mitis, Blue Monkey (S). Guineo-Congolian Biome and Escarpment Zone. North-west Angola. Good populations in Kisama National Park.

Cercopithecus neglectus, Brazza's Monkey (I). Guineo-Congolian gallery forests of north-east Angola. Occurs in areas proposed for proclaimation as Strict Nature or Regional Reserves, Lunda Norte province.

Cercopithecus aethiops, Vervet Monkey (S). Guineo-Congolian, Zambezian and Karoo-Namib Biomes and Escarpment Zone. Widespread and common. Good populations in Kisama, Bikuar and Iona National Parks, also in Luando Strict Nature Reserve.

Colobus angolensis, Angolan Black and White Colobus (I). Guineo-Congolian Biome, gallery forests of north-east Angola. Protected by inclusion in Anexo 1. Occurs in areas proposed for proclamation as Strict Nature or Regional Reserves, Lunda Norte province.

Gorilla gorilla, Gorilla (E). Guineo-Congolian Biome, Cabinda rainforests. Protected by inclusion in Anexo 1. Restricted distribution in climax forests of Cabinda. Occurred within proposed Maiombe Strict Nature Reserve in 1975, present status unknown.

Pan troglodytes, Chimpanzee (E). Guineo-Congolian Biome, Cabinda. Protected by inclusion in Anexo 1. More widespread in Cabinda than the Gorilla, but nevertheless rare. Occurred within proposed Maiombe Strict Nature Reserve in 1975, present status unknown.

ORDER CARNIVORA

Canis adustus, Side-striped Jackal (R). Zambezian Biome. Included in Anexo 1. Widespread but nowhere common. Occurs in Bikuar, Luando and Kangandala

Canis mesomelas, Black-backed Jackal (R). Karoo-Namib Biome. Iona National Park, Namibe and Chimalavera Reserves.

Vulpes chama, Cape Fox (S). Karoo-Namib Biome. Iona National Park, Namibe Reserve. Included in Anexo 1.

Otocyon megalotis, Bat-eared Fox (S). Karoo-Namib Biome, Iona, Bikuar and Namibe Reserve. Included in Anexo 1.

Lycaon pictus, Wild Dog (V/E). Zambezian and Karoo-Namib Biomes, Iona, Bikuar, Luando and Kisama. Widespread but nowhere common. Populations within the conservation areas are at a critical level. Total protection required if they are to survive.

Hyaena brunnea, Brown Hyaena (V/E). Karoo-Namib Biome, extreme southwest of Angola. Iona National Park and Namibe Reserve. Included in Anexo 1. Small populations in the two conservation areas mentioned.

Crocuta crocuta, Spotted Hyaena (V/E). Zambezian and Karoo-Namib Biomes, Kisama, Luando, Kangandala, Bikuar. Widespread but nowhere common. Populations within the conservation areas are

very small and require total protection and restocking.

Felis libyca, African Wildcat (R). Zambezian and Karoo-Namib Biomes. Widespread but seldom sighted. Iona National Park.

Felis nigripes, Black-footed Cat (I). Karoo-Namib Biome. Occurrence suspected but not confirmed in Iona National Park.

Felis serval, Serval (S). Zambezian and Karoo-Namib Biomes. Widespread but nowhere common. Kisama, Iona, Bikuar, Luando.

Felis caracal, Caracal (I). Karoo-Namib Biome. Occurrence suspected in Iona and Namibe.

Panthera leo, Lion (E). Zambezian and Karoo-Namib Biomes. Widespread but very rare. Populations in Kisama, Iona, Luando and Bikuar are at a critical level. Restocking is urgently required.

Panthera pardus, Leopard (V/R). Guineo-Congolian, Zambezian and Karoo-Namib Biomes. Widespread but nowhere abundant. Kisama, Iona, Luando and Bikuar all have populations although numbers may be low. Skins openly sold in village markets in 1992.

Acinonyx jubatus, Cheetah (E). Zambezian and Karoo-Namib Biomes. Included in Anexo 1. Populations throughout Angola are at a critical level and effective total protection is required if the species is to survive. Very small populations possibly still occur in Kisama, Luando, Bikuar and Iona, the total for all these conservation areas did not exceed 50 animals in 1975.

ORDER SIRENIA

Trichechus senegalensis, African Manatee (E). Lower reaches of the large rivers of north-west Angola, including Longa, Cuanza, Bengo, Dande, M'Bridge, Congo and Chiluango in 1975. Exact status unknown. Included in Anexo 1. Kisama National Park (Longa and Cuanza rivers).

ORDER PROBOSCIDEA

Loxodonta africana, African Elephant (S/E). Guinco - Congolian, Zambezian and Kroo - Namib biomes. Two sub-species occur - L. a. africana (Bush Elephant) and L. a. cyclotis (Forest Elephant). Widespread but nowhere abundant in 1975, when the total population (though never surveyed) was probably between 5,000 and 10,00; the majority in Cuando Cabango province. Based on a recent report by Anstey and Enock (1992) of the IUCN/MINADER Elephant Survey, the following preliminary assessment of current status can be made. In the northern zone of the country the

Maiombe forest is still believed to hold a population of Forest Elephants with elephants also reported from the forests of Zaire, Uige, Malange and Cuanza Norte provinces. In Kisama National Park the 1975 population of around 800 elephants has been reduced to less than 100 concentrated along the Cuanza River. In the southern zone elephants are reported from the area south of Cazombo town (Moxico province), a herd was recently sighted in Bikuar National Park and there are reports of serious elephant crop raiding problems in Cunene province. Elephants have been sighted in the Coporolo River area (Benguela province) and some desert adapted elephants (a rare ecotype of the Bush Elephant) are believed to exist in south-west Namibe province. The largest distribution is estimated to be in Cuando-Cubango province with reports this year of a significant influx of elephants from Zambia, Namibia and Botswana due to the regional drought. A preliminary aerial reconnaissance in late 1989 by Dr Hall Martin counted around 700 elephants in a single transect, with estimates made that the population in this province could be of the order of 10,000 elephants. The 'best guess' that can now be made is a national population in the high 1,000's or very low 10,000's. The 1975 estimates may have been under-estimates as it is clear that major harvesting of elephants occured in the past 16 years for both meat and ivory with estimates of ivory exported being of the order of tens of tonnes. For example, in 1989 alone 6.8 tonnes of believed Angolan origin ivory was confiscated, while in transhipment through Namibia. Current exploitation continues to put severe pressure on elephant populations (in a single town in Cuango-Cubango 2 elephants per week are being shot to supply meat). Management measures (that recognise that the majority of elephants exist outside protected areas) will have to rapidly evolve.

ORDER PERISSODACTYLA

Diceros bicornis, Black Rhinoceros (E). Karoo-Namib and Zambezian Biomes. Included in Anexo 1. Extremely rare throughout its range in Angola in 1975. A small, apparently stable population of ±30 occurred in Iona National Park. Other very small groups were reported from surrounding areas, and from Tchimporo in the province of Cunene. Another population, reputed to be larger, was reported from the Luengue and Mucusso areas of the Cuando-Cubango province. All these populations may have been eliminated during the war.

Ceratotherium simum, White Rhinoceros. Although reported from the extreme southeast of Angola in the last century, no authentic reports of the species' occurrence in the country have been located since 1890. A group of 10 were introduced to Kisama National Park from Zululand in 1968, and one calf was observed in 1974. The Kisama population has apparently been exterminated. The species is included in Anexo 1.

Tragelaphus spekei, Sitatunga (V). Guineo-Congolian and Zambezian Biomes. Widespread but nowhere common. Small numbers occur in Luando and Kangandala.

Tragelaphus scriptus, Bushbuck (S/V). Guineo-Congolian, Zambezian Biomes and Escarpment Zone. Previously abundant in Kisama. Small numbers in Kangandala and Luando. Very heavily poached in Kisama. A major source of meat in rural areas.

Oryx gazella, Gemsbok (S/E). Karoo-Namib Biome. Abundant in Iona (±3 000) in 1975 with small numbers (±100) in Namibe Reserve. These populations have been severely reduced if not eliminated throughout the former range.

Hippotragus equinus, Roan Antelope (S/E). Zambezian Biome. Widespread and locally common. Numerous in Kisama (±1 500), Bikuar (±200) and Luando in 1975. Now severely reduced, if not eliminated over most of its range.

Hippotragus niger niger, Sable Antelope (V). Zambezian Biome. Small populations scattered in Cuando-Cubango province, also reported from eastern Moxico and Lunda provinces. Not included in any national park or reserve, probably severely reduced today.

Hippotragus niger variani, Giant Sable (V/E). Zambezian Biome. Included in Anexo 1. Healthy, expanding population in Luando (±2 000) with smaller numbers (±100) in Kangandala in 1975. Several herds occurred outside these conservation areas. Current status unknown, although very small numbers have been seen in Kangandala in recent years.

Kobus defassa, Defassa Waterbuck (R/V). Zambezian Biome. Widespread but nowhere common. Very small populations occurred in Kangandala, Luando and Bikuar in 1975.

Kobus ellipsiprymnus, Common Waterbuck (R/V). Zambezian Biome. Included in Anexo 1. A very small population occurred in the extreme south-east of the Mucusso in 1975.

Kobus vardoni, Puku (E). Zambezian Biome. Included in Anexo 1. Very small population in Luando. Larger populations reported in Lunda Norte province, included in area proposed as Regional Reserve.

Kobus lechwe, Lechwe (R/V). Zambezian Biome. Widespread in south-east Angola and locally common. Healthy population (1 000) in Luando in 1975. Severely reduced today.

Redunca arundinum, Reedbuck (S/V). Zambezian Biome. Widespread and locally common in 1975. Numerous in Kisama (1 000), smaller numbers in Kangandala, Luando and Bikuar in 1975. Much reduced today.

Alcelaphus caama, Red Hartebeest (E). Zambezian Biome. Included in Anexo 1. Once abundant in the Cunene province but reduced to small populations in the Mupa and Tchimporo areas in 1975. Possibly extinct in Angola today.

Alcelaphus lichtensteini, Lichenstein's Hartebeest (E). Zambezian Biome. Included in Anexo 1. This species is very poorly known in Angola. It was known only from eastern Lunda Sul and Moxico provinces. Probably extinct.

Damaliscus lunatus, Tsessebe (V/E). Zambezian Biome. This species occurred in reasonable numbers in the Cuando-Cubango province. Probably much reduced today.

Connochaetes taurinus, Blue Wildebeest (R/E). Zambezian Biome. Widespread and locally common in south and south-east Angola in 1975. Healthy population in Bikuar (±500) in 1975. Much reduced today.

Aepyceres melampus melampus, Common Impala (V). Zambezian Biome. Found only along the left margin of the Cubango river below Caiundo. Fair populations occurred here but the sub-species is unprotected in Angola.

Aepyceros melampus petersi, Black-faced Impala (E). Karoo-Namib Biome. Included in Anexo 1. Found along the Cunene river below Matala. Small populations occurred in Bikuar (±100) and Iona (±500) in 1975. Probably extinct in Bikuar and very much reduced in Iona.

Antidorcas marsupialis, Springbok (S). Karoo-Namib Biome. Abundant in Iona (±2 500) with good numbers in Namibe (±500) and Chimalavera (±200) in 1975. Very much reduced today.

Cephalophus silvicultor, Yellow-backed Duiker (I). Guineo-Congolian Biome. Included in Anexo 1. Occurs in proposed Maiombe Strict Nature Reserve and in areas proposed for proclamation as reserves in Lunda Norte province.

Cephalophus dorsalis, Bay Duiker (I). Guineo-Congolian Biome. Occurs in proposed Maiombe Strict Nature Reserve and areas proposed for proclamation as reserves in Lunda Norte province.

Cephalophus nigrifronsk, Black-fronted Duiker (I). Guineo-Congolian Biome. Included in Anexo 1. Occurs in proposed Maiombe Strict Nature Reserve and also in areas proposed as reserves in Lunda Norte province.

Cephalophus monticola, Blue Duiker (S). Guineo-Congolian and Zambezian Biomes and Escarpment Zone. Common in Kisama.

Sylvicapra grimmia, Grimm's Duiker (S). Zambezian and Karoo-Namib Biomes. Common in Kisama, Luando, Kangandala and Bikuar in 1975.

Ourebia ourebi, Oribi (R/F). Zambezian Biome. Widespread and locally common in 1975. Small populations in Luando and Bikuar. Probably much reduced today.

Oreotragus oreotragus, Klipspringer (R). Karoo-Namib Biome. Healthy populations in Iona National Park, with smaller numbers in Namibe and Chimalavera Reserves in 1975.

Raphicerus campestris, Steenbok (S/R). Karoo-Namib and Zambezian Biomes. Good populations in Iona and Bikuar in 1975.

Rhynchotragus kirki, Damara Dik-dik (S/R). Karoo-Namib Biome. Abundant in Iona National Park. Small numbers in Namibe and Chimalavera Reserves and Bikuar National Park in 1975.

Syncerus caffer caffer, Cape Buffalo (R/E). Karoo-Namib and Zambezian Biomes. Locally abundant in extreme south-east Angola in 1975. Very small and vulnerable population (±50) in Bikuar. Much reduced.

Syncerus caffer nanus, Red Buffalo (S/E). Guineo-Congolian and Zambezian Biomes and Escarpment Zone. Widespread and locally common. Abundant in Kisama (±5 000), small numbers (±100) of transitional form in Luando in 1975. Kisama population reduced to probably less than 500 today.

It is clear that the **wildlife population** in Angola has been **dramatically reduced** in its distribution and abundance since 1975. Few viable populations of the larger mammals survive, particularly in the major conservation areas such as Kisama and Iona. **Extensive surveys of wildlife status** in both protected and rural areas are urgently needed. It is probable that the populations of 21 species (gorilla, chimpanzee, wild dog, brown hyeana, spotted hyeana, lion, cheetah, manatee, elephant, black rhinoceros, white rhinoceros, Hartmann's zebra, hippopotamus, giraffe, giant sable, puku, red hartebeest, Lichtenstein's hartebeest, tsessebe and black-faced impala) have been so reduced as to be on the threshold of extinction, or to have already become extinct, in Angola.

Annex 4.2.b

Plant Genetic Resources and Related Studies

Annex 4.2.b Plant Genetic Resources and Related Studies

Plant Diversity Studies

Before independence several valuable studies were made of Angolan plant biodiversity, by Gossweiler and Mendonça (1939), Gossweiler (1953), Grandvaux Barbosa (1970), Castanheira Diniz (1973, 1991) and others. Most of the botanists working in Angola during that period were not Angolans; they left at the time of independence and their work is generally unknown in Angola today, although a good deal of valuable material is available in Portugal. In spite of the efforts made by this small number of dedicated naturalists, they were only able to provide a general survey of Angola's phytogeography and even with the few more detailed studies of selected areas [Azancot de Menezes (1971), Teixeira (1968) and Monteiro (1970)] Angola's plant biodiversity remains much less well known than that of several other countries in the region.

These studies were mainly the responsibility of the Scientific Research Institute of Angola (IICA), the Agricultural Research Institute of Angola (IIAA), and the Universities of Luanda, Nova Lisboa and Sa da Banderia. From 1975 until recently, very few studies of Angolan biodiversity have been possible due to varying combinations of the following three main factors: lack of scientific personnel, lack of financial support and travel restrictions caused by the war.

The principal herbarium in the country is housed in the Agricultural Research Institute (IIA) in Huambo. It holds a unique collection of specimens, and includes the Gossweiler collection. Thanks to the dedicated care of the IIA Director and his staff, the collections and catalogues have been well conserved since 1975, although no new accessions have been added for 16 years. There are also two small herbaria, one in Lubango, Huila province, in a good state of preservation, and one in Luanda, in a very poor state.

The Conservation and Utilization of Crop Plant Genetic Resources

A major concern for Angola is to ensure food security and self-sufficiency in food production. This can only be achieved by raising agricultural productivity, and requires among other inputs, the use of improved varieties of commercial and subsistence crops. Future breeding programmes will need to make use of higher yielding exotic varieties and the disease resistance and adaptive characters of local germplasm. Regional and international recognition of this situation led to the setting up of the SADCC Regional Gene Bank (SRGB) network. While

the first priority for the SRGB are the major crop species and their wild relatives, its programme also includes lesser crop species, medicinal plants, tree species and eventually all endemic species.

Angolan National Plant Genetic Resources Committee (NPGRC)

Angola has been represented at SRGB Board meetings since 1987 and the Angolan NPGRC was set up in 1991. Its members include representatives of the IIA, University, Veterinary Research Institute, Forestry Development Institute (IDF), the Agricultural Development Institute (IDA), National Seeds Programme, and the NGO Angolan Environment Association (AAA). The National Gene Bank is housed in existing buildings at IIA, Huambo, with a smaller satellite bank in the Biology Department in the Science Faculty, Luanda. Inventories have been made of seed collections kept at Huambo and a first seed collection of sorghum and millets was made in 1991. Priorities for collection are indigenous crops, long-time introduced crops, followed by minor crops, medicinal plants and other species. (SRGB is financially and technically supported mainly by the Nordic countries, but further support is needed because of Angola's unusual recent history.)

The country is seen as a particularly urgent case for the emergency collection of crop plant genetic resources for the following reasons:

1. Sixteen years of war have meant that large areas of the country have been isolated economically and commercially. Farming in these areas has been reduced to local subsistence level and farmers have had to rely on local seed varieties. These are low yielding, highly variable, but resistant varieties.

2. After the peace agreement of 1991 all major roads are being opened up and increasing amounts of imported seed are rapidly being distributed countrywide to government and non-government agencies. Local varieties will almost certainly be substituted by higher yielding imported varieties. Abandoned local varieties are likely to become extinct quite fast. In any case, in a few years' time it will be immeasurably more difficult, and perhaps impossible, to find the levels of genetic diversity available at present.

3. Before independence, although working collections were kept of commercially important crops, almost no attention was paid to local indigenous crops, even though crops like sorghum and pearl millet are staples in the semi-arid areas of the country.

4. Crops that have been introduced into Angola were in several cases brought here many years before they were introduced into other countries in the region, and they have suffered longer periods of natural selection and adaptation.

5. The threat to biodiversity is greater now in the post-war period because roads are passable again and previously displaced people are returning to their home areas. With no other immediate source of income, they are cutting the woodland to sell as charcoal or timber. In the southern provinces woodland is being decimated for timber that brings a quick return across the border in Namibia. In the northern provinces, medicinal plants are sold by the truck-load across the border into Zaire.

6. For many years one of the major regional taxonomic studies, the preparation of the *Flora Zambesiaca*, has continued without Angolan participation. There is immediate interest in including Angolan species in the volumes now being prepared on *Acanthaceae*, *Asclepiadaceae*, *Labiatae* and *Scrophulariaceae*.

Biodiversity and Global Warming

The importance of global warming and alterations in climate that come from the 'greenhouse effect' should be considered seriously. These effects may become more important than other immediate, localised problems of desertification and deforestation, and population encroachment into protected areas. The international programme SEPASAL has been set up to search out and evaluate plants that may become economically useful in increasingly warm and dry areas. The SEPASAL inventory already includes 225 potentially useful plants that are certainly or probably present in Angola, with uses ranging from food, beverages, forages, fibres, medicines, chemicals and timber.

Medicinal Plants

One of the longer term benefits of plant biodiversity for Angola should include the development of a pharmaceutical industry, using modern biotechnology techniques, and based on the wealth of medicinal plant material that will become available as surveys are made.

Traditional and herbalist medicines are of great importance, especially in rural areas of Angola, and the collection of the species used and their pharmacological analysis should also have an important place in biodiversity conservation and research.

Annex 4.3.a

Initiatives in Forestry: Ongoing and Planned Programmes

Annex 4.3.a Initiatives in Forestry: Ongoing and Planned Programmes

National Forestry Research Program

The program which is envisaged to benefit from FINNIDA financing estimated at USD 5.6 million of which the Government is envisaged to contribute USD 2.33 million will cover the period 1992-2000. The project covers research in silviculture and forest management, forest resources utilization, wood energy, agroforestry and extension, and the conservation of ecosystems.

The training requirement envisaged includes: a five year scholarship for two BSc students, MSc scholarship for six students and scholarships for two PhD students as well as intensive short in-country courses for personnel involved in the collection and analysis of forest and socio-economic information relevant to the development of the forestry sector. There is no information as to how many will benefit from the latter training program. Given the budgetary constraints that faces FINNIDA, it is unlikely that the project will start as planned.

Protection of Wildlife Resources and Protected Areas

The project which has a duration of seven years in its two phases has an estimated budget of USD 2.92 million and is intended to revise the status of the areas of conservation of the country, the development of the national parks, the development of conservation education and the training of requisite staff for the task. The manpower required for the project at various levels is not available.

Luanda Peri-urban Fuelwood Plantation

The project objectives are:

a) the establishment of 55,000 ha of fuelwood plantations,

b) the increase of food production for the City of Luanda through the introduction of agroforestry practices,

c) reduction in the degradation of the peripheral areas of the city, and

d) the generation of employment generation.

The manpower requirement for the task is not indicated, however, it would seem appropriate to have adequate number of trained

manpower at professional, middle and basic level technicians.

Regional Seed Center

The five year project is in the process of formulation and the trained manpower requirement at all levels has as yet to be determined.

The Tombwa Project for Combating Desertification

The project which has a duration of five years and an estimated budget of USD 944,860 is financed by UNDP with the objectives:

a) dune fixation in the vicinity of Tombwa,

b) a massive afforestation on the embankments of Curoca river, and

c) training of personnel specialized in combating desertification. The trained manpower requirement is not indicated in the project document.

The Forestry Experimental Station of Cabinda

The project which is intended to create the conditions for infrastructural, technical and human development for a sustained program in forestry investigation and experimentation including silviculture, inventory of exploitable standing stock and wood technology.

Development and Revitalization of Bee-keeping

The project which is intended to cover the provinces of Bengo and Moxico is in a study phase. The project is in a preparatory stage and the manpower requirement is not yet known.

Strengthening the Planning Capacity of MINADER

The project which has a budget of USD 370,000 and is financed by UNDP/FAO envisages the reorganization and the strengthening of the Institute of Forestry Development (IDF) in the following areas:

a) the reorganization and strengthening of the Institute, the formulation of institutional development program and the taking of decisions for the rehabilitation of the production of wood and derivatives of wood. The trained manpower requirement has as yet to be determined.

b) diagnosis of the forestry sector including the status of the productive natural forests and a reconnaissance of the existing plantations, and

c) preliminary attempt at formulating an Angolan Tropical Forestry Action Program.

The diagnostic part of the terminal report is based on very scanty information sources. However, the "inventory" of existing plantations and the project profiles could serve as a base for the formulation of an Angolan Tropical Forestry Action Program. The short comings of the draft Tropical Forestry Action Program is a function of the technical expertise constellation than that of lack of vision. Notwithstanding, the Angolan Tropical Forestry Action Program requires an indepth assessment of the current situation and the rate of deforestation as well as the major contributing factors; the prevailing conditions that promote or inhibit sustained natural woodland management and tree planting initiatives by individuals and communities and an assessment of the environmental and forestry/woodland management present knowledge, attitude and practices of local communities. The formulation of the Angolan Tropical Forestry Action Program will require a multi-disciplinary team that will carefully scrutinize the resource base, the competing land use; assess the land use patterns and propose an optimal land use policy; assess the current legal and institutional framework for the sustainable management of natural resources; the rational utilization of forests/woodlands and the define an action program for the development of forests/woodlands and community and individual tree planting initiatives.

The organization for the formulation of the Tropical Forestry Action Program will depend on issues of capacity. Ideally, the Action Program should be based on the national capacity to establish a bench mark study. This could be undertaken by National Task Forces composed of all the relevant land based resource users and other governmental and non-governmental organizations coordinated by a national coordinator supported by an international co-coordinator. However, this will be time consuming. Another alternative is to establish an adequately financed Tropical Forestry Action Program Secretariat which has a freedom of maneuverability in terms of day to day operation. This should be manned by an National Coordinator assisted by an International Co-coordinator, a professional forester and the full complement of secretarial staff, necessary office equipment and means of transport. The tasks of the Secretariat which should be supported by a Steering Committee should include, among others, the elaboration of a desk study covering the current status of the natural resources, the critical issues and courses of action. Further, its functions should include the preparation of Terms of Reference for the various local and national consultant inputs and the coordination of their inputs.

Training in Saw-doctoring

The project involves the training of personnel, although the number of trainees is not indicated. It is envisaged to be financed by UNDP/FAO at an estimated cost of USD 275,000.

Forestry Education

The Angolan Government, with the assistance of the Government of Finland, has prepared a project proposal for the establishment of Technical Forestry College. The first phase of the project covers the period 1993 to 1996 and the second phase from 1997 to the year 2000. FINNIDA's financial and technical support in Phase I will amount to USD 2,215,550. The first phase will have an intake of 20 students who have completed the first two years at the Agricultural Technical Colleges. The start of the college will depend on time it takes to construct and renovate the required facilities.

Afforestation by Demobilized Soldiers

The project, which has a budget of USD 1,000,000 for a period of 12 months, is in the planning stage. The afforestation project will be in the provinces of Huambo, Cunene and Malanje. The project will have to determine the areas to be planted and raise the required seedlings. The capacity of the existing nurseries to raise the needed seedlings is limited. Furthermore, funds should be made available for the protection and management of the plantations.

Annex 4.3.b.

Forestry Legislation

Annex 4.3.b Forestry Legislation

The forest legislation, in vigor, was elaborated by the colonial administration in 1962. This legislation established the norms of forest utilization and forest exploitation but does not address issues related to forest management and silvicultural treatment. The Ministry of Agriculture and Rural Development (MINADER) is in the process of elaborating a forestry legislation.

The draft forestry legislation, which is comprehensive, identifies two types of forests, namely, protective or catchment forests and productive forests. In fact, the protected ecosystems are treated within the protective or catchment forests. There may be a need to treat protected ecosystems as separate since their management requirement may be at variance with the management of protective forest. Nonetheless, the draft forestry legislation covers the basic requirements including penalties associated with infractions.
The draft forestry legislation stipulates the duties and responsibilities of the Council of Ministers, MINADER and the Directorates of Forestry and Agriculture. The duties of MINADER include, among others, the following:

A. Propose a national forest policy and a short term, medium term and long term national forest development plan to the Council of Ministers. The national forest development plan should be based on an assessment of status of the productive and protective forests and clearly stated objectives for the period under consideration. The plan should include (a) the area to be designated as forest based on precise criteria for selection, its geographic limits and a map of the given area, (b) the number of ha to be reforested including specification of the species, (c) estimates of volume of industrial forest production, and (d) the creation of branch offices with qualified staff in order to increase the area planted and manage the forest and woodland resources on a sustained basis.

B. Prepare a forest development strategy.

C. Guarantee the coordination of all enterprises involved in the forestry sector.

D. Fix royalties to be paid by concessionaires in collaboration with the ministries of Planning and Finance.

E. Classify, or reclassify, lands to be designated as productive and protective forests as well as protected

ecosystems.

F. Ensure the rational management of forest and woodland resources.

The draft legislation does not define the relationship between MINADER and the Institute of Physical Planning and the Institute of Cadastral Services. It is particularly important in the classification and reclassification of rural lands for various conflicting uses.

The functions of the Directorates of Forestry and Agriculture has the following duties and responsibilities:

A. Establish the geographical limits of the productive forests and estimate the surface area.

B. Assess and evaluate the implication of designating of the area on the present land users.

C. Describe the soil and vegetation cover.

D. Indicate the activities to be implemented and the estimated cost.

E. Promote tree planting activities by communities, institutions and individuals.

F. Encourage tree planting activities by local people and institutions through the provision of forestry extension services.

G. Introduce new forestry techniques that are well adapted to local conditions and capable of increasing the production of forest goods and services.

H. Undertake research and experimentation for the purpose of rehabilitating, conserving ecosystems and increase the production of forest products

I. Administer and supervise the areas under its custody directly or by entering into a contractual agreement with other entities.

J. Monitor and control logging, processing, marketing, import and export of forest products including seeds and maintain records of all transactions.

K. Organize the control of plant protection and prevention of diseases and pests.

Table 1 Names, Province, area and gazetting year of Angolan "forest reserves."

Forest Reserve	Province	Area (ha)	Gazetting Year
Kakongo	Cabinda	65,000	1930
Beu	Uige	140,000	1958
Kakukala	Kwanza Norte	80,000	1954
Golungo Alto	"	55,000	1949
Kabinda	Bengo	10,000	1929
Kibaxi-Piri	Bengo	20,000	1954
Samba-Lukala	Malange	40,000	1958
Chongoroi	Huila	60,000	1957
Cubal-Catumbela	Benguela	60,000	1954
Cubal da Ganda	Benguela	9,700	1954
Umppulo	Bie	450,000	1927
Kassai	Moxico	190,000	1927
Luena	Moxico	180,000	1958
Lucusse	Moxico	245,000	1927
Luisavo	Moxico	40,000	1927
Makondo	Moxico	75,000	1927
Katupe	Moxico	15,000	1927
TOTAL		1,734,700	

Data taken from Costa & de Almeida (1992)

Annex 4.4.a

Environment and Agricultural Production Systems

CHAPTER IV

ENVIRONMENT AND AGRICULTURAL PRODUCTION SYSTEMS

Introduction

This chapter addresses the interactions between agricultural production systems and the environmental matrix in which they exist. The approach used entailed the subdivision of Angola into regions where the principal features of the dominant agricultural production systems are similar; and the presentation of examples from each of the regions that were visited in the course of this exercise. It is believed that the stratification herein presented provides a valid framework for the extrapolation of general trends and features suggested by the specific examples discussed. It is not, however, suited for the extrapolation of detailed attributes as the production systems regions cover immense and ecologically diverse areas.

A Preliminary Stratification: Sources of Information and Criteria

The stratification of Angola presented below was based on the principal features of the dominant subsistence oriented production systems. Its confection was derived from four sources of information. First, the publication by Diniz (1973) in which he describes 32 agricultural zones (Figure 14) as delimited by the now defunct Missao de Inquéritos Agricolas de Angola; (2) protracted interviews with individuals from the different regions of the country; (3) first hand observation; and (4) information provided by Dr. Julio Morais based on his detailed knowledge of Angola's environment and cultures acquired over 28 years of environment-related work in the country. In all, thirteen production systems regions were defined and delineated (Figure 15). The discussion of the regions is necessarily unbalanced as the amount and reliability of the information gathered differed between them. It is also imprecise in virtue of the high level of abstraction at which a discussion of this nature has to be conducted.

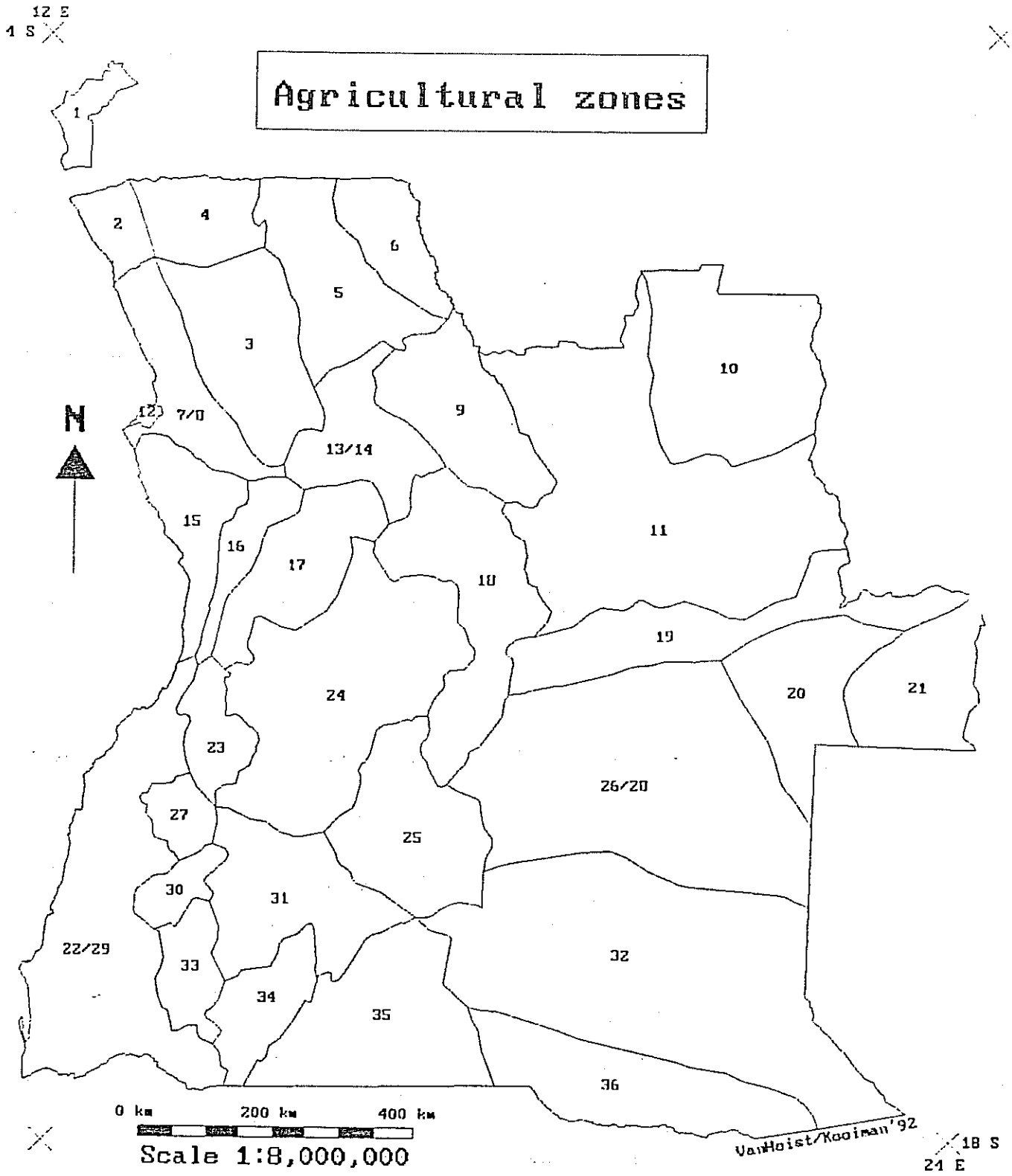

Figure 14. Angola's Agricultural zones (after Diniz 1973).

LEGEND

AGRICULTURAL ZONES (After Diniz 1973)

1. Cabinda
2. Litoral Norte
3. Cafeicols Dembos-Uige
4. Subplanalto do Congo
5. Planalto de Congo
6. Cuango
7/8. Litoral de Luanda
9. Baixa do Casssangue
10. Nordeste da Lunda
11. Lunda
12. Suburbana de Luanda
13/14. Planalto de Malange
15. Litoral Sul do Cuanza
16. Libolo-Amboim
17. Transição Centro-Oeste
18. Alto Cuanza
19. Influencia do CFB
20. Anharas do Moxico
21. Alto Zambeze
22/29. Litoral Sul
23. Transição Centro-Oest
24. Planalto Central
25. Ganguelas
26/28. Bundas e Luchazes
27. Quilengues
30. Terras Altas da Huila
31. Transição Centro-Sul
32. Cuando-Cubango
33. Gambos
34. Baixo Cunene
35. Cuanhama
36. Baixo Cubango

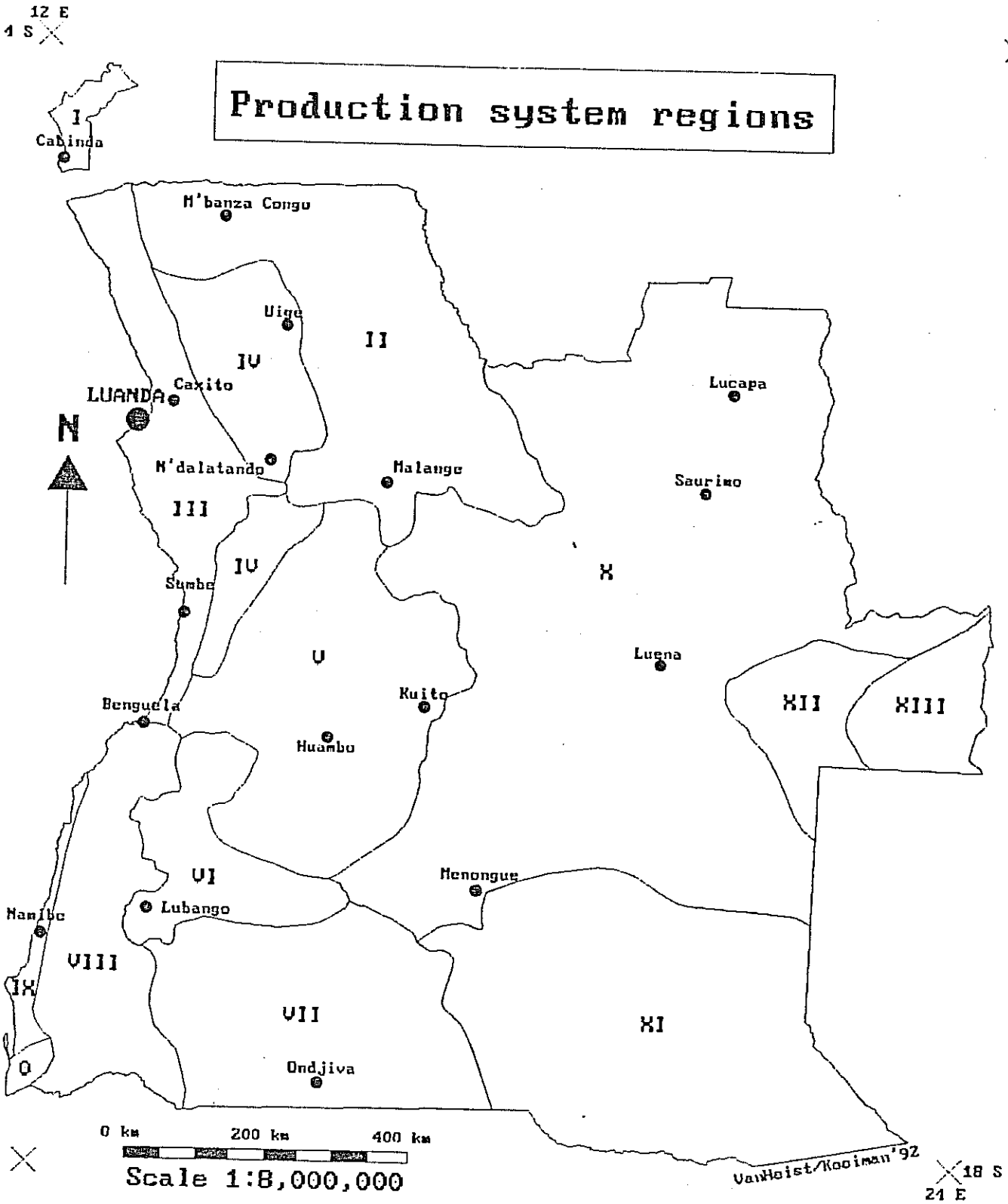

Figure 15. Production systems regions (see text for discussion)

The Production Systems Regions

Region I Highly diversified systems of humid (1000-1500mm) tropical areas (Cabinda).

Land-Use

The production systems in this area are characterized by the cultivation of a broad spectrum of crops in several different plots. Manioc is cultivated in topographically elevated well-drained positions often in association with other crops such as pigeon peas (*Cajanus cajan)* and beans. The low lying areas (*baixas*) are planted with annual and biennial crops such as maize manioc and beans the first season after clearing. This group is replaced by perennial crops such as coffee, oil palm (*Elaeis guineensis)* and banana from the second year onwards.

Land clearing in the upland areas is a collective exercise and the manioc fields belonging to different households are situated adjacent to each other. The pooling of resources facilitates land clearing in this forested area, and the agglomeration of cultivated plots reduces the negative effects of the surrounding vegetation on crop performance by increasing the area:perimeter ratio of cultivated areas. Upland areas are abandoned once crop production declines. According to Barbosa (1970), the secondary forest is rich in good timber species such as *Terminalia superba* and *Piptadeniastrum africanum*. On the average, each production system utilises four different plots (MIAA 1971) to achieve its production objectives

Issues.

Agricultural production in Cabinda is complex. Little is known about its long-term impact on the forest resources and the opportunities to combine agricultural production with sustainable forest utilisation. The fact that the secondary forest includes valuable tree species indicates that these two activities can be successfully integrated. A principal stumbling block to insuring the sustainability and enhancing the economic performance of the production systems lie in the lack of knowledge about the local social-cultural and ecological systems. Therefore, interdisciplinary studies are necessary to increase the knowledge base about agricultural production in the Cabinda area before direct attempts are made to change the status-quo.

The spatially fragmented nature of agricultural production and the strong element of collective participation in agricultural activities indicate that any future land-use legislation must

accommodate some degree of communal property rights. Furthermore, the distribution of cultivated patches with different objectives among environmentally distinct areas casts doubt on the viability of legally defining a maximum size for individual properties as suggested in the proposed land-law.

REGION II. Manioc based agricultural systems of humid and sub-humid (800-1400mm) areas.

Land-Use

Manioc is cultivated in the upland areas in the wet season often in association with beans and groundnuts. Maize fields in upland areas are also common but of less importance. Low lying areas are sown in the beginning of the dry season with maize, beans, sugar cane, banana, and other crops once the excessive soil moisture has drained. These moist and fertile topographic depressions insure a supply of agricultural products throughout the year as soil moisture content remains high during the dry season.

In some areas of the region (Planalto de Malange; Figure 14) cattle and goat rearing by small-scale farmers used to be common. During the war the local livestock population was decimated. Cattle were used by subsistence farmers primarily as a savings account and little use was made of their by-products. Furthermore, in spite of the importance of goats, livestock rearing was of less importance than crop production. Thus, although the people in this region keep livestock, they are not *bona-fide* agro-pastoralists.

Generally speaking, in the beginning of the rainy season, the livestock graze the young foliage of the otherwise unpalatable *Hyparrhenia* spp.. As the rainy season progresses and this dominant grass matures and becomes excessively fibrous, the animals graze in old fields that support a suite of palatable grasses such as *Cenchrus ciliaris*. In time, this limited source of palatable forage is exhausted and grass fires are set to promote a second flush of young grass leaves. Late in the dry season the livestock is allowed to consume crop residues and graze patches of palatable grasses within low lying areas.

In addition to using fire to promote the emergence of palatable foliage for grazing by livestock, the local farmers utilize it as the first step in the preparation of land for cultivation. Furthermore, given the present unavailability of meat protein in the region large areas are burnt to facilitate the hunt of small animals. Thus, the bulk of this region is burnt during the dry season and there is a strong

likelihood that the savannas that cover the area are fire-dependent.

Issues

The favourable climate, the occurrence of fertile soil patches, the well-developed road network, and proximity to important urban centres renders the southern portion of region II attractive to the development of large scale commercial agriculture. Thus, at the time of independence there were 5000 farms in the Province of Malange, and the Planalto de Camabatela (Planalto do Congo *sensu* Diniz (1973)) was a very important cattle producing area.

Within the Baixa do Cassange (Figure 14), large concessions for the production of cotton on Vertisols were granted in the early 1900's. The indigenous population was coerced into producing this multi-purpose crop until 1961. At that juncture the agricultural policy changed, the enforcement was dropped and the peasants ceased to cultivate the crop. Commercial operators moved in with machinery to fill the void but had to abandon the area and transfer their operations to the lighter soils of the Planalto de Malange due to the difficulties associated with the mechanized tillage of cracking clay soils. Because of the commercial value of cotton and their familiarity with the crop, the peasant population resumed its cultivation in the late 60's. Thus, when Angola became independent, the Province of Malange contained both: large scale commercial farms situated primarily in the Planalto de Malange, and small-scale systems with manioc as their primary food crop and cotton as their primary cash crop.

The high agricultural potential and history of the areas mentioned above indicate that the re-introduction of large scale commercial farms to the region is a strong likelihood. In fact, the repopulation of the Planalto de Camabatela with beef cattle is a priority of the Direçao Nacional da Pecuaria.

As described above, the production strategies followed by the small-scale farmers utilise the natural (depressions) and anthropogenic (old fields) environmental heterogeneity to realize production goals. If the re-occupation of the Planalto de Malange and Planalto de Camabatela by large scale production systems is insensitive to this relationship, the viability of small-scale subsistence-oriented production systems may be compromised.

History provides us with an example to lend credence to the point made in the previous paragraph. In 1980, in an attempt to repopulate the Camabatela Plateau with livestock, the Government of the R.P.A. imported 10,000 head of cattle from Botswana. By 1983, the herd numbered 22,000 head. With the

increased pressure on palatable grazing resources, the cattle began to seek low lying areas where the local population produced their food crops and the availability of palatable grasses was greater. The agriculturists' response was to erect fences to exclude the government herd. This resulted in a visible loss in weight of the cattle herd. The government reacted by cutting the fences creating a conflict between the local population and the government staff.

From an ecological point of view, the principal impediment to livestock production in the southern portions of Region II lies in the low forage value of the *Hyparrhenia* species that dominate the savannas in the area. This is one of the main reasons for the widespread use of fire in the area. During colonial times this problem was tackled by maintaining the grass layer closely cropped by a combination of heavy grazing pressure, mowing, and the judicious use of fire. These techniques can be effective but require large outlays of capital for fencing and equipment.

Observations made in abandoned fields within the Planalto de Malange and by Diniz (1966) in the Planalto de Camabatela indicate that the composition of the grass layer can be drastically altered in favour of palatable species by manipulation of the soil surface . Indeed, it is possible that the low lying areas tend to be richer in palatable grass species because they are more intensively cultivated. Unfortunately, the shift in composition in the small patches is short lived.

The observation made above indicate that the cattle producing potential of the *Hyparrhenia* spp. dominated savannas of region II can be increased through the development of range management techniques that promote the replacement of these grasses by palatable species such as *Cenchrus ciliaris* and *Melinis minutiflora*. This would preempt one of the reasons for grass fires. The fact that cultivation entails the manipulation of the soil surface and subsequent shift in botanical composition, suggests that cropping and livestock rearing activities can be better integrated to augment the overall productivity of the agricultural production systems in the area. To accomplish this, interdisciplinary research including range ecologists, animal scientists, sociologists, economists and agronomists is necessary. In some parts of the savanna areas the lack of fuelwood is acute. This entails the expenditure of time, labour and money, on the part of the rural population and results in the over utilisation of woodlands elsewhere.

The relatively high rainfall values within the area indicate that the *Hyparrhenia* spp. dominated savanna is maintained by fire. This suggests that control of this factor may result in an increase of the woody component. If this hypothesis is

valid, management of the natural vegetation through the judicious use of fire may go a long way towards alleviating local fuelwood shortages. Furthermore, patches of woodlands within an otherwise homogeneous savanna would raise the browse and wildlife habitat value of the area. Once again, a research programme directed at the ecology of the *Hyparrhenia* spp. dominated savannas may provide a solution to some pressing social problems.

As stated in the section on population the Province of Zaire is expected to receive an influx of 56,000 and the Province of Uige 73,000 returned refugees. Because of the fast and anarchic rate of repatriation, the relief operations mounted by the United Nations and other organizations are unable to provide this population with the means to re-initiate their agricultural activities. Without and alternative source of survival, the returnees will be left with little option but to exploit the regional resources in a manner that may prove to be unsustainable. As in other parts of Angola, an increase in charcoal making and firewood harvesting may be predicted, together with an increase in hunting pressure and grass fires. Therefore, it is necessary to give the returnees the means to resume agricultural production once they arrive at their place of residence. In the absence of adequate support, the remaining wildlife and forests will face a growing threat.

REGION III Manioc-based river-dependent agricultural production systems of semi-arid (350-800mm) coastal zones (coastal strip from the Zayre to the Balombo River).

Land-Use

Manioc is sown in upland areas whereas the production of annual crops such as maize, beans, and sweet potatoes takes place in the floodplain of major rivers and along the receding water lines of small lakes. The cultivated patches are inundated annually and the soil fertility restored by the deposition of fine sediments. Good soil fertility and favourable soil moisture in this otherwise dry region render these low lying riparian areas of crucial importance to the persistence of the local production systems. Fishing is an important complement to the agricultural activities.

In addition to annual crops, the dendem palm (*Elaeis guineensis*) is also cultivated along the waterways. In some areas of alluvial soils, naturally occurring patches of *Hyphaene* spp. palms are used for the production of palm wine (muruvo). In the vicinity of Luanda, these stands have been tapped to the edge of extinction as the beverage they yield is an important source of income to people displaced by the war and now settled along this coastal strip.

Issues

By virtue of the dry climate in which they operate, the agricultural production systems in this region depend on river and lake margins in order to produce the suite of crops necessary to support household economies. Three factors may affect this relationship: (1) the regulation of river flood regimes; (2) the enclosure of river margins by large scale commercial operations; and (3) pollution of rivers with heavy metals or other toxic substances. For the time being the likelihood of either of these taking place in a large scale is unlikely, however, the possibility should not be discounted.

Within this region there are large areas near the coastline that are underlain by poorly consolidated sedimentary formations. These areas are extremely susceptible to gully erosion. Observations made south of Luanda indicate that surface features that concentrate runoff water are particularly effective in triggering the development of large gullies. Thus, the eventual resumption of cattle ranching and concomitant formation of cattle tracks may pose a threat to the stability of these areas, especially in zones of undulating relief and livestock concentration such as watering points. The same results may be produced by an increase in the area placed under rainfed manioc cultivation or the development of large scale irrigated agriculture in areas of undulating relief.

The presence of Luanda and neighbouring population centres have a significant impact on the ecology of the mid-portion of this region. The city provides a market for several woodland products and a source of income to the surrounding rural population. This influence has a visible effect over a radius of 50-100km.

For example, the high demand for fuelwood and charcoal within the city and peri-urban areas causes the deforestation of a large radius around the city. This process is accentuated because the population in the surrounding rural areas has no alternative source of income to the sale of fuelwood and charcoal. Furthermore, a significant portion of the urban population, especially displaced persons and refugees, derive their livelihood from the fabrication of wooden utensils and carvings. This trade creates a demand for larger trees. Finally, the existing urban demand for palm wine is having a catastrophic impact on *Hyphaene* spp. palm stands situated within alluvial depressions. This is evident in the nearly complete mortality of palms in stands near Palmeirinhas located 50 km south of the capital.

Finally, it should be noted that the spatial fragmentation of agricultural production systems is incompatible with land-

use legislation that views the production units as a contiguous patch of land. The same observations made for region I (Cabinda) applies in this case.

REGION IV Manioc or maize based systems of high potential coffee producing areas with an accentuated relief. (Highlands of Uige, Cuanza Norte, Cuanza Sul).

Land-Use

Manioc or maize often in association with beans and sweet potatoes is planted in well-drained areas. Maize, beans, bananas sugarcane, and vegetable crops are planted in low lying areas. In some areas the exploitation of oil palm is an important activity. As in other areas, the distribution of cropping activities among ecologically distinct patches of land insures the supply of agricultural products throughout the year. The exploration of coffee, once the most important economic activity in this region, has been drastically curtailed.

Issues

During the colonial period, this region was the most important Robusta Coffee (*Coffea canephora*) producing area in Angola. Its soils are fertile and its climate ideal for the cultivation of this perennial crop. Accordingly, many commercial coffee farms were established in the area at the expense of the indigenous population. This was a source of conflict between the commercial farmers and the peasant community.

In the wake of independence; the exodus of the commercial farmers, the ensuing civil war, and a sequence of ineffective agricultural policies, contributed to the nearly complete collapse of the coffee industry and the abandonment of many plantations. Today some of these located in the vicinity of populations centres are being converted into manioc and maize fields. Others are losing their tree cover in response to the strong demand for charcoal and fuelwood.

Coffee is a crop imminently suited for areas of accentuated relief. The fact that it grows below a tree layer insures that soil erosion is held to a minimum. The devastation of the tree cover and replacement of coffee with short-lived sun loving crops is likely to have ecologically undesirable effects. To stem this trend, it is necessary to re-activate the coffee industry. This process should involve the peasant communities from the outset in order to avoid conflicts over land.

REGION V Maize-based agricultural production systems of sub-humid (900-1300mm) (interior plateau).

Land-Use

Agricultural production in this undulating region is characterized by a very close link between production strategy and topography. In September the mid-slopes (ombanda) are sown with maize beans and other annual crops. The upland areas (ongango) are sown in October with a similar suite of crops. In August after the excess water has drained, the topographic lows (onaka) are planted with maize, beans, potatoes and vegetables. Bananas and sugar cane are also cultivated in transitional and low lying areas. This sequence allows for a continuous supply of products throughout the year. For example, the upland maize is harvested in April whereas the products from the low lying areas are harvested from December through January. Animal draught power was widely used but the livestock population was annihilated during the war. The upland areas are abandoned after 4-6 years of cultivation and allowed to rest for similar period. The low lying areas are utilised continuously.

Issues

The war had a profound effect in this region. The rural population either moved to other provinces or to the vicinity of the larger urban centres such as Huambo. The natural vegetation had 16 years to regenerate and in the Planalto Central (Figure 14) a low secondary miombo shrubland covers a good portion of the land surface.

At the time of writing there is a flux of people back to the rural areas. As they have had insufficient time to resume planting activities at a meaningful scale they rely on the sale of fuelwood and the production of charcoal to derive an income. In the densely populated Planalto Central, this trend coupled with the clearing of land for cultivation is certain to result in a severe shortage of wood once the 16 years of regrowth has been consumed.

In contrast with the bulk of Angola land scarcity in the Planalto Central is an important issue. Rest periods of upland areas prior to the outbreak of hostilities in the early seventies had decreased from an average of 16-20 years to 4-6 years (Morais 1973). This trend is worrying as the dominant soils (Ferralsols) are acid and infertile. In the absence of fertilizer additions or long fallow periods, large patches of land are bound to become sterile. The land shortage problem is particularly acute with respect to the fertile and highly prized low lying areas (onakas) as access to these patches

helps to isolate the production systems from climatic fluctuations. Therefore, increases in production cannot be realized by enlarging the area under cultivation. This will have to come from improved agricultural practices.

The shortage of land in the Planalto Central has created a situation whereby traditional rights of an individual over the land is tantamount to private land ownership. Land-use rights are inheritable and the land may lay idle without reverting to the pool of communal resources. This strong control of individuals over land resources facilitates the introduction of innovations such as soil conservation measures and the introduction of perennial species such as fruit and multi-purpose tree species. In fact, the low density of domestic ungulates, the mesic climate, and the control of individuals over the land they cultivate render this region ideal for the introduction of agroforestry practices.

Finally, it is worth noting that the resumption of agricultural activities in this area will be hampered by a severe shortage of virtually every production input. Of particular importance is the lack of draught animals.

REGION VI Agropastoral systems of semi-arid and sub-humid (600-1000mm) areas (southeastern Benguela and eastern Huila).

Land-Use

The production systems are characterized by a tight interaction between livestock rearing, crops production and the environment. These interactions have been described in detail by Thomas (1989). Herein a brief synopsis and gross generalization of his account.

The dominant crops are maize, millet and sorghum. The first primarily in the wetter portions of the region. These cereals are combined with a broad spectrum of crops such as beans, sweet potatoes, manioc, groundnuts, and vegetables. The livestock component includes cattle, goat, sheep, chickens, and pigs. Wild fruits are collected and dried for household consumption.

Crop production takes place in 5 different patches of land: (1) low lying areas with alluvial soils (tyitaka); (2) abandoned residential sites (tyilume unda); (3) abandoned livestock corrals; and (4) house gardens where domestic wastes are disposed of; (5) enclosed upland areas. The corrals are rotated along the perimeter of cultivated areas in order to spread the benefits of manuring. As in other areas, the low lying alluvial areas permit a flow of agricultural products throughout the year. The use of animal traction is widespread

and crop rotation is intercalated with fallow periods.

The livestock graze primarily in communal rangelands but some dry season forage reserve is usually enclosed with areas dedicated to crops. In the dry season the animals are allowed to graze the cultivated enclosures. Short-lived and comparatively small displacements of livestock herds in search of forage or water in the dry season are common but not ubiquitous. Hand dug wells (cacimbas) along ephemeral water courses (mulolas) and fossil valleys such as the chimbolelo are critical for the survival of these systems.

Each class of livestock is used for different purposes. Cattle is considered the most important animal. Apart from being a strong determinant in establishing social relations and principal means of capitalization, these animals provide milk, draught power, hides, manure, and meat. Goats are consumed by the household and are treated as a current account for the purchase of relatively inexpensive items.

Issues

The preceding section only begins to describe the complexity of these agropastoral systems. They are very resilient and weathered 16 years of war relatively unscathed. In contrast to other regions, the bulk of the population remained in the rural areas and continued with their productive activities. There are few modifications that can be done to improve their performance. On the other hand, there are many opportunities to break the dynamic balance that exists and destroy what has proven to be a highly efficient system of land-use.

Perhaps the greatest impact of the war on these agropastoral production systems has been the disruption of the marketing network. The agropastoralists are unable to market their products or secure household and certain food items such as blankets, sugar, soap, and ploughs among many others. This is a cause of hardship and may have resulted on a decrease in off-take rates as the producers had no reason to sell or trade livestock.

One threat to the viability of the agropastoral systems from the semi-arid areas lie in the reactivation of commercial ranches within communal grazing areas, without proper consideration of the impact of fences in the spatial dynamics of indigenous livestock production or communal land-use rights. This problem was identified in the 1960's by the now extinct Instituto de Investigação Cientifica de Angola (IICA 1967). Their recommendations should be followed and the allocation of land in areas that are known to be used by the indigenous population should be preceded by detailed studies of communal rangeland utilisation and the necessary changes

made in the configuration and size of concessions. This issue is applicable to all areas where livestock rearing takes place in communally owned grazing lands and is expanded in the following two sections.

Another danger confronting the agropastoral systems is the erroneous and superseded notion that exists within relevant institutions that these systems are inefficient and that traditional pastoralists are recalcitrant. This set of ideas should be erased and replaced by others that concur more closely with the situation on the ground. A set of short-courses with extended field trips within the agropastoral zones would suffice to modify the thinking of well meaning but inexperienced civil servants.

Prior to independence, the colonial government had an ambitious programme to increase the number of livestock watering points and several hundred were developed in the arid and semi-arid regions of the country. These consisted primarily of two types: (1) boreholes; and (2) excavated reservoirs with a water harvesting system referred to as "chimpacas". In the past 16 years, 90% of the 1200 existing boreholes became unoperational and the chimpacas deteriorated due to lack of maintenance. Thus, a recent study (SATEC/SOGREA 1990) of water availability in the semi-arid and arid portions of Huila, Cunene, and Namibe concluded that the region faces serious problems of water shortage. Many boreholes are beyond repair and the cost involved in the recuperation of chimpacas exceeds that of constructing new structures. Nonetheless, the recuperation of the regions water points is a government priority.

The provision of water for livestock in semi-arid areas is a delicate and complex issue. The construction of chimpacas and the drilling of boreholes at no cost to the community may undermine a complex set of rules regulating the access to water and grazing resources. The lack of investment by the indigenous population would leave nobody responsible for the maintenance of the structures or control over their use. Finally, the haphazard location of permanent watering points may lead to degradation of the forage resources.

The foregoing observations indicate that the recuperation of pre-existing water points and creation of additional ones involve much more than engineering prowess. First, the local communities must be consulted in assisting the collaborating agency in locating water point sites. Second, the development of new water points must be undertaken in conjunction with the organization of community based water and grazing management associations that would be held accountable for the maintenance of the structures. Third, the community must bear a small proportion of the cost involved in the construction of the facilities. Fourth, because the maintenance of motor

driven water pumps in these remote areas is difficult and costly, the emphasis should be placed in the development of surface water resources (chimpacas) and, where the water table is not excessively deep, boreholes with windmill or hand-driven pumps. Moreover, it will be necessary to reconcile the availability of water with grazing resources lest the amelioration of one deficiency lead to the emergence of another. To this effect it may be preferable to create ephemeral watering points that preclude the long-term permanence of livestock in any particular area.

One final point that is closely linked with the development of water resources and increased forage availability, concerns the propensity of the indigenous pastoralists to commercialize. Some maintain that the greater availability of grazing and water resources will result in an increase in the size of the herds without a commensurate increase in the absolute off-take. That is, pastoralists will only sell or trade the number of animals they need to, in order to obtain the goods they desire. Consequently, the development of water points without a concomitant increase in livestock sales will lead to an increase in the area that is subjected to heavy grazing pressure, without yielding tangible benefits to the nation.

Generally speaking, pastoralists in semi-arid and arid areas tend to be reluctant sellers of livestock. This attitude has been shown to be logically consistent with their objectives and environmental setting (Behnke and Scoones 1991; Behnke 1992). Presently in the agropastoral and pastoral regions of Angola there is a relatively strong propensity to trade livestock for consumption items. This might be a temporary response to the re-apparition of essential articles such as blankets, cloth, sugar, salt, and soap, after 16 lean years. It is likely that once the unfulfilled needs are satisfied, off-take will settle down to a constant rate.

It is unreasonable to expect drastic changes in the livestock marketing behaviour of pastoralists in the near future, especially in the absence of a better alternative investment. Nonetheless, like all socio-cultural systems pastoral societies do change. Given enough time, alternative investment options, and the rise of a different consumption pattern, the pastoral societies may make a significant contribution to the formal economic sector. Programmes designed to encourage an increase in off-take rates from pastoral herds must be rooted on an in-depth understanding of their decision making process and needs assessment.

Finally, it is important to emphasize that communally owned resources are essential for the functioning of the agropastoral systems and any land-use legislation must accommodate this fact. The traditional land-use rights are

well developed and complex. No set of laws elaborated without careful study of the situation on the ground can possibly do justice to the indigenous population or the national economy. This topic is expanded below.

REGION VII Transhumant agropastoral systems of arid and semi-arid (400-800) areas. (Cunene, southern portion of Huila)

Land-Use

The agropastoral production systems within this semi-arid region share many features with the ones described in the preceding section. The dwellings are semi-permanent structures, the cultivated fields are fenced, and sorghum and millet are common crops. They differ in the temporal and spatial scale of herd displacement, the reduced importance of crops in favour of livestock, more pronounced fishing and gathering activities.

The ethnic make-up of the region is complex and includes several different ethnic groups. Important among them are the Humbes, Mudimbas, Cuanhamas, Ombadja, Kafima, Evale, and Mugambos. This brief discussion is restricted to the areas used by the Humbes, Mudimbas and Cuanhamas.

In general terms, the area may stratified into two broad systems; one linked with the Cunene and Caculuvar flood plains (evanda) and the other more dependent on intermittently flooded grassy plains (chanas). The first system supports Humbe and Mudimba; the second the Cuanhama populations.

In terms of cropping activities all three ethnic groups behave similarly. Sorghum and millet are the predominant crops and draught power is widely used. Cultivation is performed within thorn bush enclosures that may reach 15 hectares in size. These also contain significant areas that are left fallow and serve as forage reserves. Wild fruits from *Dyospirus mespiliformis* (munhande) and *Sclerocarya Caffra* (mungongo) form an important component of the local diet and provide raw material for the production of traditional alcoholic beverages.

The cropping activity in the context of the Cunene-Caculuvar system is concentrated in the transition zone between the active flood plain and the sandy uplands. It is in this area where the more productive soils are found and wild fruit trees are concentrated. No cultivation or fences were observed within the annually flooded areas.

Although very variable from year to year and household to household, the people from the Cunene-Caculuvar system

undertake two treks per year (IICA 1967). One in the wet season (March-July) that may cover up to 150 kilometres and another from September to December --the second half of the dry season-- to the evanda of the Cunene river. This second displacement is short and may be interspersed with returns to the fixed home base (eumbo). The ability to move and the dry season forage produced in the Cunene's evanda are crucial to the survival of the local herds and agropastoralists (IICA 1967).

The spatial displacement of cattle herds by the chana-dependent Cuanhamas is facultative and limited in terms of distance and time. This relative sedentarism is made possible by the local environmental heterogeneity of the area they have chosen to inhabit.

The chana-dependent Cuanhamas live in an area of subdued relief. Small changes in elevation are associated with significant differences in soil drainage and vegetation. The lowest depressions are occupied by intermittently flooded grasslands (chanas). These merge into a transitional woodland (mufito) of which *Colophospermum mopane, Diospyrus mespiliformis* and *Sclerocarya caffra* are common components. In places where the interfluve is large and the soils well-drained and coarse-textured (etundas), *Baikiaea plurijuga* woodlands materialize.

In this area the Cuanhamas residential nucleus and surrounding cultivated land is situated in the mufitos, between the imperfectly drained chanas and infertile etundas. It is on these topographic positions where the best soils and greatest concentrations of fruit trees (*Diospyrus spp., Sclerocaria spp.*) are found.

In the rainy season the chanas are flooded and abound with a land fish (*Protopterus spp.*) that is caught --at first with baskets and traps (February through March) and later with spears (May)-- and dried by the local population. In the wet period the cattle graze in the uplands and transitional areas. Sorghum and millet are cultivated around the homestead in rather large enclosures, together with other drought resistant crops (*Vigna spp., Lagenaria vulgaris*). After the wet season, the wild fruits are harvested and dried, and the cattle herd is moved to the chanas.

Issues

Some issues relevant to the agropastoral production systems of region VI are applicable to the ones discussed here and will not be discussed a second time. First, there is a tendency to resurrect pre-existing commercial ranches without considering the role that the areas they occupied play in the existing

production strategies. Second, there is a need to develop water resources. Third, the bulk of the grazing area is communally owned. Fourth, the marketing network collapsed during the war hampering the sale of livestock and acquisition of household and food items. Fifth, there is insufficient knowledge concerning the livestock marketing strategies utilised by the agropastoralists. Finally, it is possible that increases in herd size resulting from the greater availability of water and forage would not be accompanied by an increase in total off-take

The above notwithstanding, the point must be made that herd movements are more pronounced and communally grazed areas larger in this drier region than in region VI, suggesting that conflicts over private fences will be more common. This is especially true of ranches that are situated along the margins of the Cunene and Caculuvar rivers. Furthermore, the co-existence of privately and communally owned grazing lands invariably denies the subsistence herd access to the privately controlled areas whereas the commercial herd has access to both; communal and private grazing areas. This inequitable situation existed in the 1960's (IICA 1967) and is certain to re-emerge with the reactivation of commercial ranches. Thus, the continued existence of these highly efficient production systems hinges on the elaboration of a land-law that accommodates communally owned grazing resources and preserves the potential for herd mobility.

The Cunene basin has a tremendous agricultural potential that did not go unnoticed by the colonial government. In 1969 an ambitious plan for the development of the Cunene basin was devised and endorsed by the colonial government of Angola and the administration of the Namibian territory. The project envisioned the control of the river's flow regime through the construction of a series of dams, and the development of irrigated agriculture on the alluvial soils. Watering points were to be provided for the pastoralist's herds. The project lay dormant until 1990. In November of that year it was revived and its overall objectives endorsed by the Government's of Angola and Namibia. The plan involves the regulation of the Cunene's flood regime and the harvesting of its hydroelectric potential through the construction of a series of dams. Areas that are now annually flooded would be used for irrigated agriculture. River access corridors or the construction of water troughs would guarantee the provision of water for livestock herds.

In january of 1991, a technical commission (Comissão Técnica Conjunta Angola-Namibia para o Desenvolvimento e Utilização da Bacia Hidrográfica do Cunene) was formed. In November of the same year, an office (Gabinete para a Administração da Bacia Hidrografica do Cunene) was created to administer and coordinate the development of the basin. The Namibian

government is pressing for the speedy construction of a dam (Epupa dam) in the lower quarter of the river.

The sequence of events outlined above indicates that there are very strong pressures for a quick and severe modification of the Cunene river basin. When juxtaposed with the complexity and efficiency of the existing agricultural production systems the virtue of such a hasty approach must be placed in doubt. The potential for the complete breakdown of what is otherwise a functional agroecological system is great. A case in point concerns the Cunene's flood plain.

The Cunene's flood plain is a critical source of dry season forage to the existing livestock production systems. It is erroneous to believe that the provision of water would compensate for the loss of this key resource. In fact, by enabling the indigenous livestock herds to bridge the dry season, the Cunene's flood plain permits the economic utilisation of an enormous arid and semi-arid region of the country. Thus, estimations of the opportunity cost of changing the agricultural use of this riparian area must not be made in isolation but in the context of its regional social, economic, and ecological role.

The above notwithstanding, one cannot expect the existing pastoral and agropastoral production systems to remain as museum pieces or subjects of anthropological and ecological research. On the other hand, it is of utmost importance to realize that these systems are rational, viable, efficient, resilient and complex. They have proven their worth by surviving 16 years of instability. To induce changes prior to a thorough understanding of their nature and a carefully elaborated set of mitigative steps is a recipe for disaster. To this effect, anthropological and ecological studies are essential.

Lastly, many individuals within the MINADER expressed fears that the range in the semi-arid and arid portions of Angola is degraded. More often than not this notion was not derived from first hand information but from the simplistic paradigm that links communal land ownership, heavy grazing pressure and range degradation. Recent long-term studies of transhumant pastoral systems in arid areas of Africa (Ellis and Swift 1988; Behnke and Scoones 1991) have shown that in these non-equilibrium drought prone regions, periodic events depress livestock numbers to the point where their impact on the vegetation and soils is reduced. In other words, communal grazing does not necessarily lead to land degradation.

Field observations indicate that portions of the rangelands of Angola show signs of reversible and irreversible degradation. These are found primarily in the vicinity of permanent water sources such as the Cunene and Caculuvar rivers, and encompass

a relatively small proportion of the total area. The most common undesirable change observed consisted of an increase in thorn shrubs (*Acacia kirkii; A. mellifera; A. arenaria; A. tortilis; Dychrostachys cinerea)* to the point where the penetration of grazing animals became hampered. On the other hand, the bulk of the area appears to be in relatively good condition. More definitive statements need to await in-depth ecological studies. These observations also apply to the transhumant systems discussed below.

REGION XIII Transhumant pastoral systems of arid (100-400mm) areas. (Western Cunene, Namibe).

Land-Use

These productions systems are characterized by a great degree of mobility of livestock and people. The annual movements take place over several months and may cover hundreds of kilometres. Livestock rearing is clearly the most important agricultural activity with crop cultivation playing a subsidiary role of relatively minor importance.

The land-use system in this region does not fall under the banner of nomadism because the families return regularly to areas along ephemeral river courses where they cultivate maize and other drought tolerant crops. These rely on short-lived pulses of soil moisture associated with periodic floods. In contrast with the agropastoral systems of the previous section, the human shelters are of a temporary nature and cultivated fields are not permanently fenced. It is common for the entire family to accompany the livestock herd in search of water and forage. Hand dug wells excavated along ephemral river channels (mulolas) are key to the surival of these systems.

Issues

To an even greater extent than the agropastoral systems in region VII, the key to the survival of the pastoral systems considered here is mobility. This feature allows the family unit to take advantage of pulses of resources that occur dispersed in space and time. We are once again faced with a situation where livestock production in the arid regions of southwestern Angola must rely on large tracts of land. Any trend that endangers this strategy will compromise the viability of these production systems. Other livestock production alternatives would entail significant inputs in terms of livestock feed and water developments. In a world where meat is an abundant -albeit poorly distributed-

commodity, and the returns on investment in marginal areas is low, this option is impractical. Furthermore, Behnke (1985) has shown that in dry areas, traditional subsistence-oriented pastoral systems are more efficient than commercial ranching enterprises.

The situation arises once again whereby the viability of livestock production systems entails communal ownership of large land areas. These must encompass the necessary environmental heterogeneity and permit the free movement of livestock. In this case, hand-dug wells (cacimbas) within the channels of ephemeral watercourses and the Cunene river must be viwed as tkey reoseurces. As previously discussed (regions VI and VII), the re-activation of commercial farms may pose a threat to the survival of the transhumant pastoral systems in southwestern Angola. The same recommendation holds; the re-activation of commercial farms in this arid region must follow studies of the dynamics of the existing systems, and any future land law must accommodate communal land utilisation.

REGION IX Ground-water dependent intensive river valley agriculture of arid (100-400) coastal areas.

Land-Use

Agricultural land-use in this zone is restricted to irrigated crop production along valley bottoms. The spectrum of crops is broad and includes plants typical of mediterranean and tropical climates. Some of the more important ones are: olives, mangoes, tomatoes, vegetables, papayas, potatoes, maize, melons, bananas, grapes, and cucumbers amongst others. Apart from food crops, alfalfa and other forage crops are planted to support re-emerging dairy operations. All this is made possible because of shallow water tables and the periodic replenishment of fine soil particles deposited by the rivers in flood periods. These valleys are true oasis in an otherwise barren landscape.

Issues

The shallow water tables on which these highly productive systems are based consist of subsurface rivers. The difference in height between these layers of water and the high tide is minimal. This poses two dangers. First, excessive extraction of water for irrigation or culinary use during the dry season may result in the subsurface penetration of sea water up the river valleys. For the time being this does not appear to be an imminent threat, however, with the increase of irrigation and the likelihood of dry years this possibility cannot be discarded. Second, the erection of dams in the upper reaches

of these rivers may drastically alter the subsurface flow regime. Once again the threat of sea water incursion is real. Thus, it is necessary that studies be undertaken to enhance the understanding of the underground hydrology of these systems in order to avoid unwanted side effects resulting from over utilisation of water resources or the alteration of subsurface flow regimes by engineering works.

Within some river valleys (Bero River) the colonial government built an ingenious system of dikes that directed the flow of flood waters. This same system allowed the diversion of silt-laden waters (nateiro) to arable fields. This periodic addition of fine particles assisted in maintaining the fertility of the cultivated soils at an acceptable level. These dikes and gates are in dire need of maintenance and rehabilitation. Their conservation and proper operation would reduce the need for fertilizer addition and increase the area available for cultivation.

The production of cash crops with the potential for high economic returns is usually associated with the addition of fertilizers, herbicides and pesticides. Since the underground water is situated relatively close to the surface and the sandy layer that overlies it is an ineffective filter, the probability of contamination of the ground water table is high. This is especially true if the application of irrigation water is excessive and the farmers are inadequately trained in the application of agricultural chemicals. The fact that this same source of water is utilised for culinary use means that the introduction of pesticides and other chemicals must be closely monitored.

REGIONS X. Manioc-based agriculture complemented by apiculture, fishing, hunting and gathering. (Moxico, Lunda Norte, upper Cuanza)

Land-Use

The systems in this region combine a variety of activities to meet household needs. Manioc cultivation takes place in sandy upland areas that are very infertile. Each cycle is limited to a maximum of 6 years because of soil exhaustion and weed problems. The first four years are dedicated to Manioc. This crop may be followed by groundnuts or maize. After this period a new area has to cleared. Since soil fertility is higher under old stands of miombo woodlands, these vegetation patches are selected for clearing over younger ones.

Within low lying areas (onakas) where the soils are more fertile and remain moist throughout the dry season, a suite of complementary crops are sown. These include bananas, maize,

rice, and vegetables amongst others. Fore historical reasons and because the onakas are a key resource to the economy of the production systems, the the population is invariably concentrated near rivers, streams, or riparian depressions. In the upper Cuanza region (Figure 14) rice cultivation used to be an important activity.

Prior to the civil war apiculture was a well-developed activity over the bulk of this region. Traditional beehives are built from tree bark and placed in trees within old stands of miombo woodland. There are two periods of honey production that are related to two flowering periods: one from June through August; and the other form September to January. The honey produced in the later is deemed to be of better quality. The actual extraction of wax and honey is fraught with inefficiencies due to the design of the traditional hives and honey collection techniques.

The upper Cuanza area is infested by the tse-tse fly (*Glossina Morsitans)* and includes the Giant Sable Game Reserve, a subject of a companion report (Huntley 1992).

Issues

This region covers the bulk of what is perhaps the most important watershed in sub-saharan africa. The rivers that originate within it flow to the Zaire and Zambezi rivers. Thus, mismanagement of this area will affect a large portion of the African continent.

From the point of view of soils, vegetation, and water resources, it is safe to say that the region is in excellent condition. Areas that were once cultivated are now covered by natural vegetation. This is particularly true of riparian areas that were intensively cultivated prior to 1975. However, there are factors that may contribute to change this ecologically favourable situation.

First, a large portion of this region was an important theatre of guerrilla warfare in the fight against the Portuguese regime in the early 1960's. In an effort to reduce the contact between peasants and guerrillas, the colonial government through a combination of coercion and the provision of services concentrated the previously dispersed population into population nuclei. The subsequent 16 years of war tended to consolidate this agglomerative process. Thus, today the population in some areas within Moxico Province are accustomed and prefer to live in large groups called "bairros". Therefore, with the resumption of agricultural activities the impact of agricultural land-use that once was dispersed will be concentrated and the areas of contiguously cultivated land larger than prior to independence.

The above coupled with the general infertility of the region augments the importance of the fertile riparian areas to the local inhabitants. A probable consequence is the over utilisation of these low lying areas and degradation of stream banks, a crucial habitat for fish reproduction. The eventual introduction of pesticides may result in the contamination of the fluvial network. A research and development project aimed at the judicious utilisation of these key resource patches might help to avoid unwanted side-effects.

Second, as stated above soil fertility is clearly a limiting factor to the output of the local production systems and a principal reason for slash-and-burn agriculture. Because greater soil fertility is associated with old stands of Miombo woodland these are selectively cleared. In contrast with the original vegetation cover, the young replacement communities that occupy the site after abandonment support a thinner woody component and a relatively dense herbaceous strata. This combination renders the vegetation more susceptible to the incursion of fires than the original dense Miombo woodland.

Because of a shortage of red meat and income generating options the intensity of hunting is at present very high. This activity is greatly facilitated by burning the vegetation. Thus, the alliance of slash-and-burn cultivation and fire-aided hunting will translate into an increase of savanna-covered areas at the expense of the old Miombo woodlands. This will have a profound and negative effect on the honey producing potential producing of the area. The effects on the overall hydrology are difficult to assess. Over the long-term one may expect a decline in the overall fertility of the area as nitrogen, sulphur and other nutrients are volatilized into the atmosphere or leached into the ground water and removed by the river system.

Apiculture is an important component of the production systems within this region. Its viability is directly linked to the conservation of the miombo woodlands. Therefore, an increase in the value of honey and wax is tantamount to augmenting the value of conserving this vegetation type. At present, the network for the commercialization of honey and wax is non-existent. There is a valiant attempt by the provincial staff of the MINADER in Moxico Province to support honey production but it falls short of what is necessary. A small and well designed project to develop the bee industry in the eastern Provinces of Angola would contribute to the conservation of the miombo woodlands and regional watershed. This would have to be combined with research efforts to augment the productive life of soils and reduce the rate of conversion of mature to immature miombo. The options are many but cannot be discussed herein.

REGION XI Millet and Manioc based agriculture complemented by fishing, apiculture, hunting and gathering.

Land-Use

This region was not visited in the course of this study, however, the available literature indicates that its production systems resemble the ones in region X with the exception that the cultivation of millet and sorghum is more widespread. The preference for these drought resistant crops is justified by low rainfall values (600-1000mm).

The area used to support an agropastoral population along the margins of the Cubango river. This society has since disintegrated as a result of the protracted war.

Diniz (1968) describes a trend by the population away from a dispersed and largely hunter gatherer existence towards concentration and increased dependence on agriculture. This change was propelled by instability in the area during the struggle for independence. In an analysis of population nuclei, he found that villages without access to fertile riparian areas were unable to meet subsistence needs due to the general infertility of the soils. Thus, the bulk of the population tended to be situated near watercourses. Fishing, apiculture, hunting and gathering were important activities.

Issues

Since region XI was not visited, it is difficult to make definitive statements about the situation of the environment and the subsistence oriented production systems it harbours. However, the similarities with the Moxico area indicates that the same set of issues raised above hold here. Namely, the importance of pockets of fertility, the importance of hunting and gathering, the infertility of the sandy soils, and concentration of population along watercourses.

Apart from the drier climate, there are a two other features of this region that makes it distinct from region X. First, is its strategic location with respect to areas of wildlife concentration in Botswana, Zambia, and Namibia. Second, the easternmost corner of the region is within the range of the tse-tse fly (*Glossina morsitans*). Third, although the present situation is not known, this portion of Angola used to be very sparsely populated.

The above indicates that the eastern portion of region XI, namely, the triangle formed by the Cuando river and the border with Namibia, should be considered for inclusion in a supranational natural reserve area. The continuity with areas of high wildlife concentration would insure that this area

would be repopulated within a relatively short period of time. The low human density suggests that conflicts over land-use would be minimal.

REGION XII Inland fish-based production systems. (eastern Moxico).

Land-use

This region falls entirely within a vast (200X200Km) palustrine grassland. Since this kind of ecosystem is the subject of a companion to this report, the land-use is not discussed. It is, however, important to note that the inhabitants of this area rely on trading fish for agricultural products from the surrounding regions. Other points worthy of mention is the fact that the region used to produce significant amounts of rice and livestock. These two activities have been reduced to negligible levels.

Issues

Large areas within the palustrine grassland that covers region XII has good rice growing and livestock rearing potential. If conducted carelessly and in large scale, these two activities may compromise the fish producing potential of the area, and the health of the local population.

The danger associated with large scale rice plantations lie in the application of pesticides that is frequently associated with this crop when grown in tropical areas. Large herds of livestock may result in the organic pollution of lakes and rivers. Thus, legislation and its enforcement is necessary to regulate the kind and application methods of pesticides if these chemicals are to be used. As for the problem caused by livestock, the identification of a solution requires careful study, however, an environmental monitoring programme would go a long way in detecting unwanted trends.

REGION XIII Combination of regions II and X. (Alto Zambeze).

Land-Use

This region was not visited but the literature indicates that the production systems include features of those in region II and region X. That is, manioc based agriculture with access to relatively fertile patches of soils supplemented by apiculture, hunting and gathering.

Issues

The major environmental issue facing this region is the influx of refugees returning from Zambia. The UNHCR estimates that around 80,000 refugees will make their way to the Cazombo area. If left without an option, this population will resort to hunting a wildlife population that is rumoured to be among the healthiest in Angola. In fact, illegal hunting with automatic weapons is reportedly widespread in the alto Zambeze and surrounding areas.

Annex 4.5.a

Environmental Problems of Sandy Beaches and Marine Turtles

Annex 4.5.a Environmental Problems of Sandy Beaches/Marine Turtles

Sandy beaches along the Angolan coast are of marine and continental origin. Beach vegetation is typically characterized by rhizomatous and prostrate herbaceous species such as *Canavalia maritima*, *Cyperus maritimus*, *Ipomoea pes-caprae*, *Ipomoea stolonifera* and *Scaevola plumieri*.

Beach formations and the associated fauna and flora have been negatively affected by human interventions such the large-scale removal of sand for construction purposes, over-exploitation of inter-tidal fauna and the decimation of the turtle populations.

Sand Removal from Beaches

Large-scale removal of sand from beaches for construction purposes is common near urban centres. Large areas of the beach near Ponta das Palmeiras (approximately 40 km south of Luanda) have been transformed though the removal of sand affecting both the ecology of the area and natural coastline processes such as beach formation and sediment transport. Presently there is no effective legislation to control these activities.

Exploitation of Inter-tidal Fauna

Diverse bivalves, several of which are exploited commercially, inhabit the sub-tidal and inter-tidal zones (e.g. *Arca senilis* ('mabanga'), *Donax rugosus*, ('quitela'), *Dosinia sp*, *Solen guinensis*, *Tagelus adansoni*, *Tellina madagascariensis* and *Tivela tripla*. *A. senilis* has been heavily exploited since prehistoric times as indicated by the presence of mounds of shells (at least 2,000 years old) of this species, south of Luanda. The decline in shell and population sizes over time strongly suggests that this species is being severely over-exploited. *D. rugosus*, inhabiting the inter-tidal zone of open beaches (e.g. along the Mussulo Restinga, Benguela, Cacuaco and São Tiago beaches), also appear to be suffering over-exploitation. Furthermore, the inter-tidal habitats in these areas are often polluted by human waste resulting in bacterial contamination of substrate feeders, with consequent health risks for consumers.

Impact on Turtles

Aerial surveys of the Angolan coastline carried out in 1983 and 1985 (Department of Biology, Agostinho Neto University) between the northern border of Cabinda (5°S) and Quiçombo (11° 19'S)

indicate that 54% of the coastline (Figure 1) is suitable for turtle nesting (i.e. open sandy beaches with gentle slope and moderate wave action under normal conditions). Little information is available regarding turtle grounds south of Quiçombo, although prolific nesting has been reported along the so-called Praia das Tartarugas ('Turtle Beach') north of Baia de Lucinda (13° 50'S). Little is known regarding the present status of the turtle nestings along this stretch of beach.

During the 1983/85 surveys, three species of turtle were recorded inhabiting coastal waters and nesting along the coast viz. the leather back turtle, *Dermochelys coriacea* (known locally as 'kitabanga' or 'ya dikota'); the Atlantic ridley turtle, *Lepidochelys olivacea* ('yofele') and the green turtle, *Chelonia mydas* ('mbaxi'). No evidence was found of the hawks-bill turtle, *Eretmochelys imbricata* or the logger-head turtle, *Caretta carreta*, both of which are reported in the literature as inhabiting Angolan coastal waters. The most abundant species was found to be the leather back turtle followed by the Atlantic ridley and the green turtle. Nesting occurs between October and March with a peak in January. The distribution of turtle nests between the northern border and Quiçombo located during the 1983/85 survey is shown is Figure 1. Important breeding grounds are located along the Cabinda coast, between Ponta do Mussulo (8° 59'S) and the mouth of the Cuanza River (9° 22'S) and the beaches of Kissama National park between Cabo Ledo (9° 40'S) and Cabo de S. Braz (9° 58'S).

Turtles are subject to heavy human predation along the entire Angolan coast even though all three species of turtle are protected under Angolan law. In 1978 under Decree 64/78, the three species were included in the list of highly endangered species. Shells, meat, eggs and hatchlings are exploited and turtle shells, and even live individuals, are sold openly in local markets. A survey carried by the Department of Biology (ANU) in 1984/85 along a 30 km stretch of beach south of Luanda (between Ponta do Mussulo and Barra do Cuanza) found an average nesting density of 74 nests per kilometer of beach. However, regular monitoring of a 3 km section of this beach has shown a dramatic decline in the number of nests of the leather-back and Atlantic ridley turtles (Figure 2). Indeed, by 1990 no nests of the Atlantic ridley turtle were recorded.

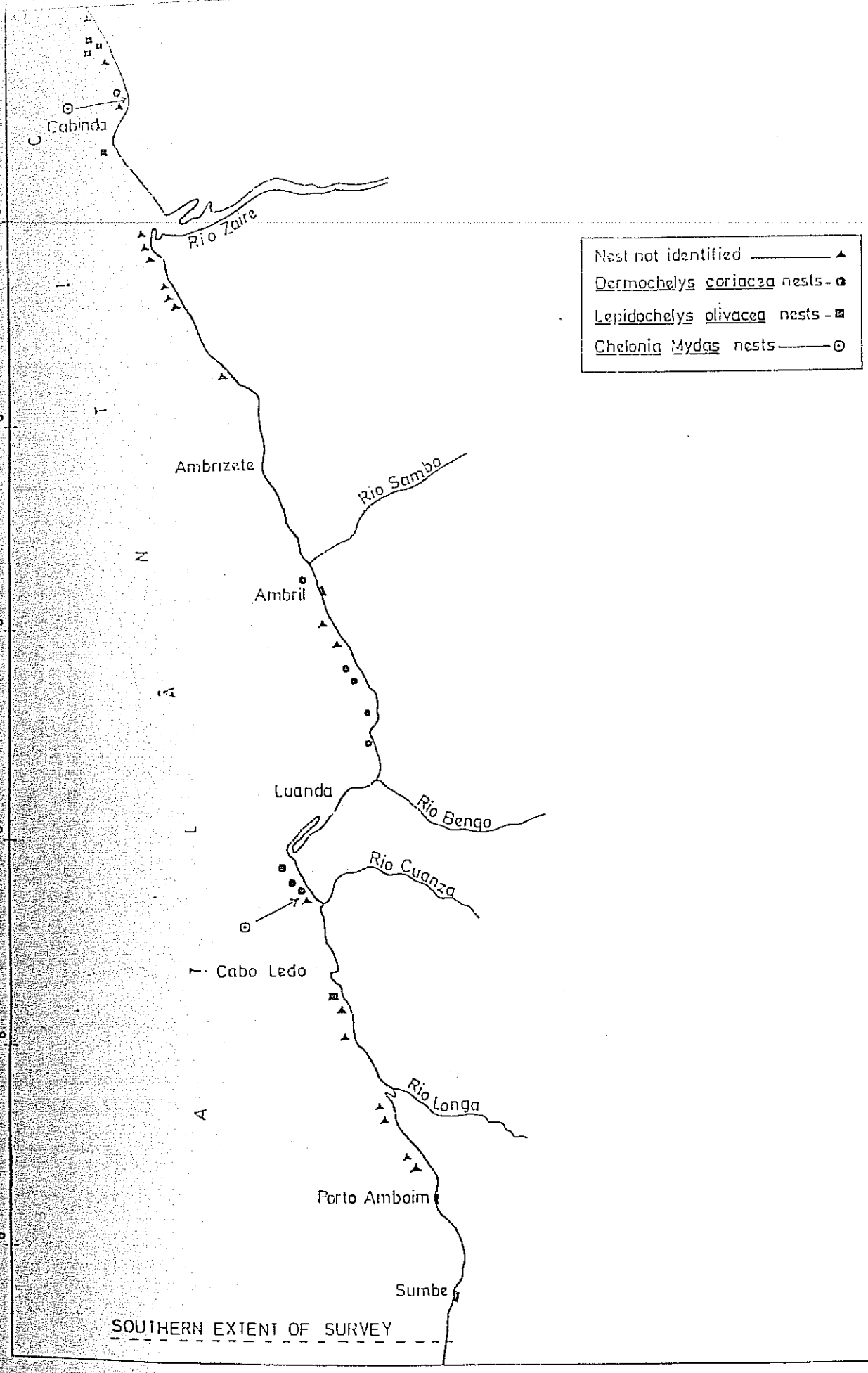

Fig. 1. Distribution of turtle nests between 5°S and 11°25'S along the Angolan coast.

Annex 5.1.

Portfolio of Draft Project Proposals

Annex 5

THE ANGOLAN ENVIRONMENT

A PORTFOLIO OF DRAFT PROJECT PROPOSALS

CONTENTS

The following portfolio contains 10 strategic but action oriented projects considered as priority initiatives with regard to environmental issues in Angola. They are project concepts which require further elaboration. The projects cover a range of Government institutions/NGOs, initiatives, international NGOs and bilateral/multilateral donors as key implementors and funding sources. Project Budgets are estimates based on IUCN scales for staff management etc - these may vary according to different implementing agencies.

PROPOSAL No 1

PROJECT TITLE:	National Environmental Strategy Phase I
IMPLEMENTATION AGENCY:	MINADER or Environmental Secretariat in the Prime Minister's office
SCOPE/AREA:	National
DURATION:	Phase I - 2 years (starting date: July 1993)
BUDGET:	US$2,0 Million
INPUTS:	Technical Assistance; Vehicle; Consultancy + Activities Fund;
DONOR/TECHNICAL SUPPORT:	IUCN/Bilateral Funds The World Bank, UNDP, FAO

BACKGROUND:

As Angola embarks on a process of economic rehabilitation and recovery it is faced with a policy vacuum in most areas of environmental management/sustainable development policy. There exists an urgent need to elaborate a national environmental strategy (NES) which addresses the key environmental and conservation issues thereby providing a basis for guiding development programmes, infrastructural rehabilitation and private sector investment. These include land use planning, legal framework, protected areas management, pollution central political/administrative policies for country based resource management as well as environmental impact assessment procedures and human resource development to mention but a few.

Objectives/Outputs

The underlying objective of an NES process is to involve all the key actors (Government institutions, NGOs, private sector, scientific/research institutions) to address issues

of concerns, policy options and realistic action plans (e.g consensus building).

The NES Phase I would thus have the following objectives:

- national, provincial and issue specific workshops held to elaborate environmental agendas

- information assembly and analysis carried out to compile a data base to identify options and strategies for action

- draft national policy framework prepared to build consensus as priority actions and strategies for Government, NGOs, private sector etc.

The final output the NES Phase I would thus be a national environmental strategy to be submitted to Cabinet and the legislature for final approval.

IMPLEMENTATION APPROACH

The project would be guided by the NES Secretariat/Commission to be established under the responsible Ministry for environmental issues or the Prime Minister's office. It would be staffed with senior Government staff, 2 technical advisors and include a consultative council representing the country's major interest groups.

The Secretariat would be responsible for preparing an 'environmental agenda' through a series of wide ranging workshops and consultations in the country, the commissioning of technical reports on specific environmental aspects and the preparation of a draft NES report. While Phase I would already include specific implementation initiatives (e.g environmental impact assessments; elaboration of pilot projects) the thrust of phase II (5 years) would consist of action planning and a wideranging implementation programme incorporating pilot projects, legislative reforms, human/institutional resource development etc.

Given Angola's current situation it would seem advisable that donors (i.e World Bank, UNDP, FAO and IUCN as the principal agencies engaged in environmental strategy support) examine options for a joint and coordinated initiative in the environment field.

PROPOSAL No 2

PROJECT TITLE:	Wildlife Resources and Rural Development Project
IMPLEMENTING AGENCY:	MINADER/ Angola and international NGOs (to be identified)
SCOPE/AREA:	National
DURATION:	Phase I: 2 years (starting date: early 1993)
BUDGET:	US$ 850,000
INPUTS:	Technical Assistance, Consultancy/Research Fund, Vehicles, Operational Equipment
DONOR/TECHNICAL SUPPORT:	IUCN-ROSA/CASS Social Science Programme; International and National NGOs; Bilateral/Multilateral Donors

BACKGROUND:

In Angola there is a high dependence on the harvesting of wild fauna/flora products (meat, skins, ivory and medicinal plants) throughout the country. Preliminary studies indicate that wildlife forms the main source of protein in many of the rural provinces of Angola (especially Moxico and Cuando-Cubango) and that this dependence may indeed increase in the short-term. However this level of wildlife harvesting, with respect to certain species, is unsustainable and the resource is already serious depleted. From the biodiversity perspective, justifications for the setting aside of large areas of land required for the conservation of wildlife (such as large mammals) will depend on the return of tangible benefits to the rural people from such land-use.

There is a considerable potential for the integration of wildlife resource use with rural development in both the established protected areas and in over 300,00 km^2 of communal lands where the options for wildlife utilisation as part of multiple rural land-use are more viable than conventional agricultural systems. The highest potential areas are likely to be the provinces in the south of Angola, where human populations are low (less than 5 people/km^2) and agriculture is marginal.

Objectives/Outputs

The objectives of the project are to develop the sustainable use of wildlife resources in Angola through the integration of conservation concepts and rural development approaches. Outputs include tangible and sustained benefits to rural communities from wildlife resources and declines in threats to Angola's biodiversity.

Implementation Approach

Phase I will focus on a research and development phase to assess the potential and options for sustainable wildlife use.

- assessment of options and potential undertaken by a team of regional specialist (e.g from Zimbabwe, Namibia, Zambia, Malawi) coordinated by IUCN-ROSA/CASS Social Science Programme and IUCN Angola office. Timeframe - early 1993.

- clarification and coordination with MINADER, national NGOs and donor community/international NGOs (e.g World Food Programme, FAO, Africare, Care International, UNDP, EEC etc) to identify programme implementation needs and integration within existing rural development initiatives.

- implementation of pilot programmes with the above agencies.

- monitoring and evaluation of progress.

The emphasis of Phase I is to provide technical guidance and back-stopping to the development of a programme of integrated rural use of wildlife resources as a partnership with Angolan GOs and NGOs and the wider international development community.

Phase I will also provide technical advice to the development of community involvement aspects of Proposal 3 (National Parks and Protected Areas Management Coordination Unit) and be coodinated with Proposal 6 (Wetlands Conservation and Management Programme) and Proposal 9 (Biodiversity Research Capacity Building Programme).

Phase II is planned to involve a longer-term programme of technical assistance and evaluation capacity to implemented programmes.

PROPOSAL No 3

PROJECT TITLE:	National Parks and Protected Areas Management Coordination Unit
IMPLEMENTING AGENCY:	Instituto de Desenvolvimento Florestal (MINADER)
SCOPE/AREA:	National
DURATION:	Phase I - 3 years (starting date: March 1993)
BUDGET:	US$1,3 Million
INPUTS:	Technical Advisers; Consultancy/Research Fund; Vehicles; Operational Equipment
DONOR/TECHNICAL ASSISTANCE:	Bilateral/Multilateral Funds IUCN/Technical Corporation Agencies

BACKGROUND:

Over the past 20 years Angola's protected areas management and administration has virtually ceased to exist. Many of the national parks and reserves have no staff presence, have been subject to severe encroachments and poaching and loss of most, if not all, of their infrastructure. As the IUCN Report (1992) illustrates both historically and in terms of biodiversity consideration the current delimitations and management concepts need to be reviewed and reformed.

Of particular importance in this context is the elaboration of a new approach to conservation and management of wildlife resources and protected species which provides new legal and administrative mechanisms for community based management/involvement in Angola.

Objectives/Outputs

The three major issues to be addressed are research, management concepts and administrative structure. The project will thus have the following objectives:

- preparation and commissioning of research programmes to establish a scientific data base for management
- review of legal and policy framework for protected areas management to elaborate a reform programme

- review of organisational/administrative structures to develop an institutional framework for protected areas management.

The overall objective of Phase I would then be the elaboration of an institutional, administrative and scientifically based framework for the management of Angola's protected areas.

IMPLEMENTATION APPROACH

The project envisages the creation of a coordination unit to be staffed by 3 senior IDF staff, 2 technical support staff with associated researchers from the University of Agostinho Neto.

The unit would prepare a research programme to address delimitation/biodiversity issues and urgent conservation issues/action plans. It would also initiate a legal/policy framework review including an assessment of approaches adopted in neighbouring countries (e.g Zimbabwe, Namibia). An organisational development study would be commissioned to develop a new institutional administrative structure for the management of Angola's protected areas estate. The unit would also engage in developing and coordinating donor assistance projects and programmes for various national parks.

Phase II of the project (5 years) could then focus on a consolidated programme of pilot project implementation, research coordination and organisational development of the responsible institution(s) for protected areas management.

PROPOSAL No 4

PROJECT TITLE:	Environmental Awareness and Education Support Programme
IMPLEMENTING AGENCY:	Non-Governmental Organisation (possibly Environmental Liaison and Information Centre) - see project proposal No 5)
SCOPE/AREA:	National (initial focus on urban areas)
DURATION:	4 years (starting date: July 1993)
BUDGET:	US$1,7 Million
INPUTS:	Technical Assistance; Educational Materials; Audio-Visual Equipment; Publication Fund; Consultancy Fund; International Volunteers
DONOR/TECHNICAL SUPPORT:	International NGOs; International Volunteer Agencies; Bilateral/Multilateral Donors

BACKGROUND:

With over 80% of Angola's population having been born and grown up in a war torn society, it is no surprise that environmental concerns and concepts are almost unknown. Daily survival consideration did not leave any room for concern about natural resources, pollution, sustainable utilisation etc. The need for public awareness and education programmes ranging from basic hygiene issues to the impact of the widely practised burning of agricultural/shrub land is immense.

So far no programmes and projects beyond a few isolated but interesting initiatives (e.g Juventud Ecologica de Angola) exist in Angola. The media, NGOs and Government extension services are in need of the most basic support (materials) and sources of information (reports; data; films) to begin addressing environmental awareness issues.

Objectives/Outputs

This programme should aim to fulfil the following objectives during Phase I:

- production and supply of some basic, essential educational materials (pamphlets, posters, films etc).

- elaboration and implementation of specific target group oriented awareness programmes (e.g schools; hospitals; women's organisations; extension services etc).

- implementation of a media support programme (TV and radio programmes; journalist training workshops; production of films etc).

- promotion of high profile popular events (e.g tree planting days; environment/public health music festivals; competitions).

Implementation Approach

Given the lack of experience and institutional capacity both within Government and among existing NGOs in this sphere it is recommended that this programme be funded in conjunction with the establishment of an environmental information and research centre (project proposal No 5) as an independent entity (e.g foundation). The awareness programme would function as a subproject of the centre with 6 professional Angolan education/communications professionals, 1 Technical Advisor, a technical unit for the design and production of educational materials staffed with 2 international volunteers and 2 Angolan staff and equipped with Desk Top Publishing Unit, Video production equipment etc. The programme would act as an advisory/resource and production centre for campaigns and educational programmes ideally through collaborating ministries and NGOs.

PROJECT No 5

PROJECT TITLE: Environmental Information and Resource Centre

IMPLEMENTING AGENCY: to be established as an independent foundation/institution

SCOPE/AREA: Location: Luanda but operational on a national basis

DURATION: Phase I - 5 years (starting date: April 1994)

BUDGET: US$1,0 Million

INPUTS: Operational Funds; Publications Fund; Equipment; International Volunteer

DONOR/TECHNICAL SUPPORT: Bilateral/Multilateral Funds/International Foundations/UNDP Sustainable Development Network - IUCN/International Volunteer Agencies

BACKGROUND:

Any organisation, consultants mission or researcher working in Angola has encountered the almost complete absence of historical records, reports, publications and materials from public access. While up to date research and publications are few and far between the problem is also one of materials being dispersed, not recorded, stored in unknown archives etc.

As Angola embarks on the rehabilitation of its economy it faces the twin problems of lacking data (scientific and socio-economic) as well as the non accessability of existing historical records and technical reports (most consultancy reports for instance are not accessible to Angolan professionals not to mention other missions examining relate issues).

The establishment of an information and resource centre als addresses the need for a wide range of literature and information on sustainable development/environment issues which are not available in Angola. The centre would thus also act as a resource centre for NGOs and researchers in need of particular information and network contacts, while

the same time offering seminars/training workshops on a wide range of sustainable development related issues.

Objectives/Outputs

The overall objective of establishing an environmental information and resource centre is thus to provide Angolan officials, professionals, NGOs and researchers with an accessible resource centre that can provide an information base on Angola as well as international materials on sustainable development related subjects.

More specifically the objectives would be as follows:

- establish a documentation centre for existing literatur data on Angola
- provide Angolans with state of the art international literature/reports through accessing publications, data bases, E-Mail networks
- act as a networking resource centre whereby specific information requests are serviced through collaborative arrangements (e.g GATE-ITDG-CGIAR etc)
- establish a data base on national resources relevant to sustainable development (projects; research programmes; national resource persons etc)
- provide a forum for workshops and training seminars on critical environmental/development issues to stimulate national debate.

Implementation Approach

This project will require a relatively small staff contingen (1 coordinator; 1 international volunteer; 1 librarian; 1 assistant) while capital fund requirements will be somewhat higher. The centre could be run as a separate entity (e.g established as a foundation) although it is recommended that during the initial 2-3 years it may be preferable to manage it under the auspices of either a local or international NGO (one possibility being the IUCN country office in Luanda). In the medium term it should become self financing through either a foundation capital fund or local sponsorship (e.g oil companies) or indeed a combination of both.

PROJECT No 6

PROJECT TITLE:	Wetlands Conservation and Management Programme
IMPLEMENTING AGENCY:	Ministry of Agriculture and Rural Development/Ministry of Water Affairs/Provincial Administration Benguela/ University of Agostinho Neto
SCOPE/AREA:	National and Regional (Benguela)
DURATION:	3 years (Phase I)
BUDGET:	US$2,2 Million
INPUTS:	Technical Assistance, Activities Fund, Consultancy Fund, Research Fund, Vehicles, Equipment
DONOR/TECHNICAL SUPPORT:	Bilateral Funds, IUCN Southern Africa Wetlands Programme and/or other technical cooperation agency

BACKGROUND:

Two issues justify prioritising wetlands issues in Angola: (a) critical urban pollution levels near major settlements along the coastline (b) major wetland resources inland which need to be conserved/managed sustainably which are threatened as major agricultural production programmes resume.

Coastal and inland wetlands represent critical elements of Angola's ecosystem both in terms of productive resources (fisheries) as well as catchment areas for the nation's water reserves. For the past few years Southern Africa has been experiencing a water crisis which is in part due to mismanagement of its wetland resources. There is thus a critical need for Angola to assess its wetland resources and their potential for sustainable utilisation in the long-term including field/demonstration projects (particularly as Angola represents Southern Africa's major watershed/catchment area).

- develop human and institutional capacity for EIAs in Angola.

- provide financial and technical expertise for conducting independent EIAs for a period of 3 years.

The overall objective of the project would be to ensure that all major projects will be subject to an EIA providing both Government and industry with appropriate guidelines and recommendations for environmentally sound investments.

IMPLEMENTATION APPROACH

The project envisages the establishment of an EIA unit the exact institutional location of which needs to be determined. It should however from the outset operate as a consensus building institution involving Government ministries, NGOs and the private sector through a consultative council. It is essential that the unit be given an advisory not a regulatory role providing relevant Government departments with scientifically based guidance for decision making - which remains the prerogative of the respective licensing/ concession awarding authority.

The unit should be staffed with scientific (both natural and social sciences) professionals, 2 Technical EIA Advisors, provided with basic equipment (e.g small laboratory for pollution assessments) and vehicles to ensure independent mobility and access to EIA sites.

In addition a training fund (training seminars, workshops, scholarships) and a consultancy fund for commissioning international and local experts should be included in the project.

include:

- a strengthening of the middle level technical forestry education.
- the provision of in-service training and short courses for mid-term professionals.
- a scholarship programme for professional foresters to undertake MSc/PhD courses abroad.
- a social community/forestry training programme for extension staff and senior IDF staff.

IMPLEMENTATION APPROACH

The programme should aim to service and assist the IDF by closely coordinating its activities with other forestry related projects and programmes (eg FAO, FINNIDA, SADC). Its key inputs would be in terms of providing technical advisors/trainers, financial support for training courses and curriculum development, funds for scholarships and a pilot project fund for developing appropriate tools and approaches for social/community forestry through field based activities (ie in dialogue with local communities/organisations).

The precise nature of these inputs is dependent upon the activities and objectivies of other forestry sector related programmes and on donor support.

PROPOSAL No 9

PROJECT TITLE:	Biodiversity Research Capacity Building Programme
IMPLEMENTING AGENCY:	National Research Centres/University of Agostinho Neto
SCOPE/AREA:	National
DURATION:	5 years
BUDGET:	US$2,2 Million
INPUTS	Research Fund; Training/Fund; Vehicles; Equipment
DONOR/TECHNICAL SUPPORT:	Bilateral Aid - Collaborative Research Programmes with international universities, IUCN, WWF etc

BACKGROUND:

Angola's universities and research centres have been severely constrained in their ability to conduct scientific field based research during the past 2 decades. There exists hardly any systematic scientifically based research data on biodiversity/national resources published after 1978. Given Angola's unique range of biodiversity and the need for management oriented data to conserve and utilise this wealth, there exists a need to initiate research programmes coupled with training and scholarship programmes to build up the scientific capacity of Angolan scholars and institutions; be it wildlife, conservation, germaplasm collections or species trials for agriculture, forestry etc.

Objectives/Outputs

The programme should aim to fulfil the following objectives:

- identification and **prioritisations** of biodiversity related research projects
- **coordination** of a national research programme including international research projects on biodiversity issues
- establish a **biodiversity resources database** and library to collate baseline biodiversity data (wildlife and plant status/use) for management and policy development.

- conduct training workshops/seminars for scientific staff (technicians; researchers; students) to upgrade skills (eg. for germaplasm collections; field trials)

- supervise a scholarship programme for promising academics to pursue MSc and PhD programmes through collaborative programmes with international universities.

The overall objectives of the programme would be the development of Angola's capacity to better analyse, conserve and utilise its rich biodiversity resources.

IMPLEMENTATION APPROACH

The programme foresees the selection of a university department or national research centre to coordinate the programme guided by a scientific advisory panel involving other relevant institutions.

The unit would elaborate a research working programme, establish collaborative agreements with other international universities, coordinate international research programmes in Angola, establish a central database, facilitate training workshops and award scholarships.

PROPOSAL No 10

PROJECT TITLE:	NGO Development Support Programme
IMPLEMENTING AGENCY:	IUCN - The World Conservation Union
SCOPE\AREA:	National
DURATION:	3 years (starting date: April 1993)
BUDGET:	US$1,4 Million
INPUTS:	Small Projects Fund; Training/Workshop Fund; Consultancy/Backstopping Fund; Exchange Programmes
DONOR/TECHNICAL SUPPORT:	Bilateral/Multilateral Agencies; Regional, International NGOs; IUCN Angola Country Office; International NGOs with Angola Country programmes.

BACKGROUND:

Given Angola's recent political history NGOs did not feature prominently. Until recently the institutional spectrum consisted mostly of church/welfare/emergency relief organisations usually as national chapters of international NGOs.

The past two years have seen the establishment of a limited but nevertheless important number of NGOs some of which specifically address the link of environment/development issues.

Given the immense task of rehabilitation and Government's institutional/capacity constraints Angolan NGOs stand to become an important and essential complementory force in the future development of the country. For local NGOs to play this role it is a pre-condition that they first build up their own constituencies as well as human and institutional capacities. The danger for local NGOs to merely become extended implementing agencies for international donor funds is great and needs to be addressed.

Objectives/Outputs

The primary objective of this programme is to strengthen the institutional and human capacity of Angolan NGOs to

address the broad spectrum of environment/sustainable development issues. The NGO programmes aims to contribute to such a process by:

- providing NGOs with training workshops and seminars on a wide range of issues including administrative/ organisational development
- establishing a small projects fund to assist NGOs in accessing financial assistance for relevant initiatives
- making available institutional/organisational development expertise and backstopping services to assist NGOs in developing their managerial/ administrative and planning capacities
- arranging for exchange and dialogue programmes to develop links and networking between Angola's NGO community and other NGOs active in the Southern Africa region.

IMPLEMENTATION APPROACH

In view of the current institutional vacuum in Angola (i.e NGO umbrella organisation) it is proposed that IUCN facilitate this programme for an initial phase of 3 years. The programme envisages the employment of a local coordina and the establishment of funds (i.e for small projects; training workshops and seminars; consultancy/ backstopping exchange and networking) which IUCN would administer as a trust fund agency. IUCN would utilise its regional networ of members/partners and resource persons register to assis Angolan NGOs in developing collaborative links throughout region.