

**Report submitted to the United States Agency for
International Development**

Mozambique

**Environmental
Threats and
Opportunities**

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Table of Contents

Acknowledgements	i
Abbreviations and Acronyms	iv
Executive Summary	vii
1.0 Introduction.....	1
1.1 Purpose.....	1
1.2 Methods	2
1.3 Overview of this Report.....	3
2.0 Overview of the Ecological Context	4
2.1 Physical Environment.....	4
2.2 Ecology	5
2.3 Human Ecology, Land Use, and Agriculture.....	6
3.0 Overview of the Socioeconomic Context.....	9
4.0 Country Strategic Plan (2004-2010): Environmental Threats and Opportunities	12
4.1 Introduction.....	12
4.2 SO 1: Rural Income Growth Accelerated	12
4.2.1 <i>IR 1.1: Transport infrastructure in areas of high agricultural potential improved</i>	12
4.2.2 <i>IR 1.2: Expansion of rural private-sector commercial trading networks and financial services</i>	13
4.2.3 <i>IR 1.3: Land tenure security and other agricultural policies promote investment in agricultural production</i>	14
4.2.4 <i>IR 1.4: Use of sustainable agricultural technology increased</i>	15
4.3 SO 2: Labor-Intensive Exports Increased.....	15
4.3.1 <i>Cashews</i>	16
4.3.2 <i>Coconut Oil</i>	17
4.3.3 <i>Fresh Fruit: bananas, citrus, fruit juice</i>	17
4.3.4 <i>Textiles: use of locally produced cotton for weaving cloth for domestic garment making or export</i>	17
4.3.5 <i>Wood Products: manufacture of furniture and other products with wood from domestic sources for domestic and international markets</i>	18
4.3.6 <i>Tourism: tourism in coastal areas; and in the interior associated with protected areas (including sport/trophy hunting)</i>	18
4.3.7 <i>Fresh Cut Flowers</i>	18
4.3.8 <i>Tea</i>	19
4.3.9 <i>Sesame Oil: cultivating sesame and extracting oil for domestic and international markets; sale of seed cake for livestock</i>	19
4.3.10 <i>Paprika: cultivating pepper and processing it into paprika for domestic and international markets</i>	19
4.4 SO 3: Improved Health and HIV/AIDS Prevention	20
4.5 SO 4: Improved Governance	20
5.0 Analysis of Key Environmental Threats and Opportunities	22
5.1 Agriculture in the Mozambican Context.....	22
5.2 Agricultural Potential.....	22
5.2.1 <i>Agricultural Potential</i>	22
5.2.2 <i>Land Area Used for Agriculture</i>	23

Table of Contents

5.2.3	<i>Expanding Agriculture</i>	24
5.3	Integrating Environmental Conservation into Economic Development Planning.....	25
5.4	Regional Scale of Environmental Issues.....	25
5.5	Regional and Global Climate Change.....	26
5.6	Forest Concessions, Sustainable Commercial Forestry, and Forest Certification.....	27
5.7	Fire Ecology and Management.....	28
5.8	Coastal Zone Planning and Management.....	29
6.0	Institutional Analysis	30
6.1	Mozambican Policies, Laws, and Regulations.....	30
6.1.1	<i>Environmental Policy</i>	30
6.1.2	<i>Land Policy</i>	30
6.1.3	<i>The Land Law and Regulations (1997)</i>	31
6.1.4	<i>Agrarian Policy</i>	31
6.1.5	<i>National Program for Agricultural Development (PROAGRI)</i>	31
6.1.6	<i>Forestry Law and Regulations</i>	32
6.1.7	<i>Water Law (1991)</i>	33
6.1.8	<i>The National Water Policy (1995)</i>	34
6.1.9	<i>National Tourism Strategy and Policy (1995)</i>	34
6.1.10	<i>The Municipalities Law</i>	34
6.2	SADC Protocols and Programs.....	34
6.2.1	<i>Protocol on Shared Watercourses (1995)</i>	34
6.2.2	<i>Protocol on Wildlife Conservation (1999)</i>	35
6.3	International Conventions.....	35
6.3.1	<i>Convention on Biological Diversity (CBD)</i>	35
6.3.2	<i>UN Convention to Combat Desertification</i>	36
6.3.3	<i>Convention on International Trade in Endangered Species (CITES)</i>	36
6.3.4	<i>Convention on Wetlands of International Importance (Ramsar Convention)</i>	36
7.0	Conclusions and Recommendations	37
7.1	Conclusions.....	37
7.2	Recommendations.....	38
7.2.1	<i>Natural Resource Information Needs</i>	38
7.2.2	<i>Capacity Building in Government Agencies</i>	38
7.2.3	<i>Support to Communities</i>	39
7.2.4	<i>Other Key Linkages to Support</i>	40
7.2.5	<i>Other Suggestions for Relatively Low Cost, Targeted Support</i>	41

Appendix 1: Scope of Work

Appendix 2: Persons and Institutions Consulted

Appendix 3: Documents and Sources Consulted

Appendix 4: Topography Map

Appendix 5: Potential Natural Vegetation of Mozambique

Appendix 6: Coastal Priority Areas

Appendix 7: Forest Cover Map

Appendix 8: Cropland Use Intensity

Appendix 9: Classification of Commercial Timber Tree Species in Mozambique According to Article 11, No. 1, Forest Law

Appendix 10: Population Density

Appendix 11: Agro-Ecological Regions of Mozambique (INIA, 2002)

Appendix 12: Descriptions of Agro-Ecological Regions of Mozambique (Source: INIA, 2002)

Appendix 13: Forest Concessions in Mozambique

Appendix 14: List of Protected, Threatened, and Endangered Species, with Fines

Abbreviations and Acronyms

ADS	Automated Directives System
AEZ	Agro-Ecological Zone
AIDS	Acquired Immune Deficiency Syndrome
ANE	National Roads Agency
ASB	Alternatives to Slash and Burn Program (ICRAF)
CBNRM	Community-Based Natural Resource Management
CBD	Convention on Biodiversity (UN)
CITES	Convention on International Trade in Endangered Species
CSP	Country Strategic Plan (USAID)
CTA	Confederation of Business Associations of Mozambique
DEA	Directorate of Agrarian Economics (<i>Direcção de Economia Agrária</i>)
DG	Democracy and Governance (USAID)
DINAGECA	National Directorate of Geography and Mapping
DNFFB	National Directorate for Forestry and Wildlife
EFI	European Forest Institute
EIA	Environmental Impact Assessment
ETOA	Environmental Threats and Opportunities Assessment
FAA	(US) Foreign Assistance Act
FAO	Food and Agriculture Organization of the UN
FEWS	Famine Early Warning System (USAID)
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GRM	Government of Mozambique
GTA	Environmental Working Group
HIV	Human Immunodeficiency Virus
ICRAF	International Center for Research in Agroforestry
IEE	Initial Environmental Examination
IFFN	International Forest Fire News
IIASA	International Institute for Applied Systems Analysis
INE	National Statistics Institute (<i>Instituto Nacional de Estatística</i>)
INIA	National Institute of Agronomic Research (<i>Instituto Nacional de Investigação Agronómica</i>)
IPM	Integrated Pest Management
IR	Intermediate Result
IUCN	World Conservation Union
MADER	Ministry of Agriculture and Rural Development
MICOA	Ministry for the Coordination of Environmental Affairs
MITUR	Ministry of Tourism
NEPA	National Environmental Policy Act
NGO	Nongovernmental Organization
NRM	Natural Resource Management
PA	Protected Area
PARPA	Action Plan for the Reduction of Absolute Poverty
PRB	Population Reference Bureau

PROAGRI	National Program for Agrarian Development
PVO	Private Voluntary Organization
RCSA	Regional Center for Southern Africa (USAID)
SADC	Southern Africa Development Community
SO	Strategic Objective (USAID)
SOW	Scope of Work
SpO	Special Objective (USAID)
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Education and Science Organization
USAID	United States Agency for International Development
USGS	United States Geological Survey
WCMC	World Conservation Monitoring Center
WWF	World Wildlife Fund International

Executive Summary

The purpose of the Environmental Threats and Opportunities Assessment (ETOA), the findings of which are presented in this report, was to review the new Country Strategic Plan (CSP) for USAID/Mozambique (2004-2010) using an environmental “lens.” One objective was to assure that the proposed plan complies with all USAID environmental requirements—in particular Sections 117 (environmental sustainability), 118 (conservation of tropical forests) and 119 (conservation of biological diversity) of the Foreign Assistance Act (FAA), and with “Reg 216” (environmental impacts). USAID/Mozambique has not had a Strategic Objective (SO) focused on the environment or natural resource management in the past, and is not proposing one in the new CSP. In order to make this report as directly useful and Mission-friendly as possible, this report emphasizes *opportunities* for USAID/Mozambique to improve environmental management and the conservation of biological diversity and tropical forests within its proposed results framework. USAID/Mozambique recognizes that protection of the environment and wise management of the natural resource base are absolute requirements of any successful development program, and seeks to make environmental conservation a fundamental, crosscutting theme in its proposed program.

An assessment team of three environmental professionals worked in Mozambique from October 14 to November 1, 2002. The team met with USAID staff to gain a better understanding of the Mission’s past activities and the results framework proposed in the new CSP. The team met with a wide range of stakeholders and USAID partners and implementing agencies, including government agencies, nongovernmental organizations (NGOs), and private commercial sector representatives. Site visits to Nampula Province in northern Mozambique, and the area bordering Kruger National Park in South Africa, provided on-the-ground examples and details that improved the teams’ understanding of the challenges for sustainable NRM in the country. The team reviewed all of the available reports, documents, maps, and other materials available on the biological diversity, tropical forests, coastal and marine resources, and other environmental issues in Mozambique.

Mozambique is one of the poorest countries in the world. More than 80% of the population of nearly 20 million people is engaged in rural agriculture, mainly at the subsistence level. Soils in Mozambique are generally old and nutrient-poor, and precipitation is strongly seasonal, with high variability from year to year. These factors pose many challenges to agriculture. Information on the “agricultural potential” of Mozambique is contradictory and confusing, and it is not possible to provide convincing statistics on the amount of land with “agricultural potential,” nor on how much land is currently being used for agriculture.

The natural vegetation of Mozambique is mainly miombo woodland of various types. Woodlands and forests are thought to cover approximately 78% of the country, but these are largely inhabited and farmed using shifting cultivation. Natural resources supplied by forests and woodlands make a major contribution to the Mozambican economy. Wood supplies more than 80% of Mozambique’s energy demands, and 80% of the population area are estimated to use “bushmeat” as a source of protein. Use and management of natural resources such as forests and wildlife makes a major contribution to rural livelihoods in Mozambique, and so natural resource management (NRM) should be treated as an integral part of rural agriculture. Mozambique’s

institutional structure recognizes this by placing management responsibilities for forests and wildlife within the National Directorate for Forestry and Wildlife (DNFFB) of the Ministry of Agriculture and Rural Development (MADER). Coastal and marine habitats likewise provide livelihoods and food security for much of the coastal population.

The assessment team examined the results framework proposed in the CSP Concept Paper, and discussed ongoing revisions of that framework with Mission staff. We recognize that subsequent analysis and internal discussions by USAID/Mozambique may have led to substantial revisions in the SOs and IRs discussed in this report. We examined the results framework through an environmental, tropical forestry, and biodiversity conservation “lens,” and identified some environmental threats and opportunities on a SO-by-SO, IR-by-IR basis.

Strategic Objective (SO) 1, “rural income growth accelerated,” proposes that improving the enabling environment for rural agriculture will help bring this about. The ETOA team agrees, but emphasizes that NRM must be viewed as an important and integral part of “agriculture” in the Mozambican context. One piece of the enabling environment proposed for USAID support under SO 1, Intermediate Result (IR) 1.1 is roads and transportation infrastructure. While road building and rehabilitation pose some threat to biological diversity and tropical forests if planned or executed without an adequate Environmental Impact Assessment (EIA), USAID/Mozambique can mitigate this threat by continuing to conduct EIAs for this IR, and in the process build EIA capacity within appropriate government agencies and private consulting firms. USAID and its partners can take advantage of opportunities under IR 1.1 to use transportation planning mechanisms to avoid increasing access to areas of low agricultural potential or habitats of special concern, and to improve conditions for sustainable NRM (e.g., community forestry, game ranching, or nature tourism) at the community level through improved access.

IR 1.2 under SO 1 proposes to support the expansion of rural private-sector commercial trading networks and financial services. Like IR 1.1, this IR could pose some threat to forests and biodiversity, but these can be avoided relatively easily through environmentally sensitive national, provincial, and district-level development planning. On the other hand, this IR also provides opportunities to intensify agriculture and improve yields in areas of truly high agricultural potential; this in turn could reduce the extension of marginal, shifting cultivation into forest and woodland areas, and enable stabilization of the agricultural frontier. The expansion of such networks and services could increase opportunities for sustainable natural resource-based enterprises in rural communities (e.g., crafts, carpentry, bee-keeping, nature tourism, and non-timber forest products such as wild fruits, medicinal plants, and mushrooms).

IR 1.3 under SO 1 proposes to support land tenure security and other agricultural policies promote investment in agricultural production. This IR affords many opportunities for USAID to support the further development and implementation of the progressive, new natural resource governance structures being created through the Land Law, the National Program for Agrarian Development (PROAGRI), and the Forest Law and Regulations. Activities in support of this IR have the potential to improve some of the most critical aspects of the enabling environment for sustainable NRM in Mozambique. Insecure tenure over land, forests, wildlife and other natural resources often contributes to ecologically unsustainable exploitation of those resources, and environmentally insensitive policies related to land and agriculture may lead to agricultural

expansion into ecologically sensitive areas. Excellent opportunities exist to support communities to obtain rights to land (land titles) and natural resources (community forest concessions, for example). USAID can also support policy reform and capacity building within appropriate government agencies at national, provincial, and district levels in order to promote community-based natural resource management (CBNRM).

Intermediate Result (IR) 1.4 proposes the increased use of sustainable agricultural technology. Since NRM in Mozambique is so important, this IR also provides many opportunities, such as supporting technical training, institutional development, and technical assistance in forestry and wildlife management research and extension. It could include activities to develop public-private partnerships that increase the use of sustainable forestry methods in the commercial forestry sector (e.g., forest certification). Support of the development and spread of agroforestry systems would also be appropriate under this IR.

Strategic Objective (SO) 2 proposes support to increase labor-intensive exports. The ETOA team was provided with an illustrative list of labor-intensive industries currently being considered for support under SO 2. The majority of these proposed export categories are agricultural (fresh fruit, flowers, cashews, coconut oil, sesame oil, paprika, and tea), or are a blend of agricultural and industrial (textiles and wood products). All of the export categories on the list could be potential sources of air or water pollution if poorly designed or managed, but these threats can be avoided through EIAs. In general, for all annual and perennial export crops, the generic threat is that if cultivation is expanded into areas currently supporting natural forests or woodlands, valuable natural resources could decrease. The corresponding opportunity, however, is to promote the production of those crops on agricultural land that has been used but is currently idle, and/or to intensify production and increase yields of those crops on lands where they are already grown.

Tourism is also being considered as a labor-intensive “export,” because of its potential to generate rural jobs and income. The extensive coastal zone in Mozambique is seen to offer a competitive advantage in the tourism sector. Insensitive development of tourism infrastructure in the coastal zone (e.g., roads, hotels, harbors) could threaten beaches, coral reefs, estuaries, coastal forests, habitats of threatened marine species, as well as the aesthetic or recreational values that attract tourists. On the other hand ecologically sensitive planning and development of tourism facilities in the coastal zone could potentially provide jobs and improve rural incomes while protecting biodiversity, forests, and other resources.

Important linkages exist between the “health” of Mozambique’s environment and the **human health objectives** proposed in the Concept Paper. If it chooses to do so, USAID/Mozambique could take advantage of a number of opportunities for linking improvements in health for the people of Mozambique with the conservation of forests, wildlife, and other natural resources. The following three opportunities are examples.

- Because the nutritional needs of many rural poor people in Mozambique are met in part by fish and shellfish, wild foods such as fruits and mushrooms, and wild game meat, conserving natural resources will help maintain this aspect of food security, and therefore, nutritional health.

- About 10% of the 5,700 plant species found in Mozambique are used in traditional medicine, and conservation of forests, woodlands, and other natural habitats will allow local people to continue to benefit from this traditional pharmacopoeia.
- Air pollution from the use of wood and charcoal as cooking fuel is a respiratory health hazard for women in Mozambique, and supporting a switch from woodfuels to electricity or kerosene for cooking would improve health and also reduce pressure on forests, especially those near urban areas.

Improved governance is a proposed SO in the new CSP. The new Land Law, Forest Law, and Forest Regulations envision significant changes in the relationship between the government and its citizens regarding NRM, in particular the decentralization of management responsibility to more local levels. These laws and regulations provide a key opportunity to increase citizen inclusion and trust in local-level governance institutions. Sustainable environmental management in Mozambique will require improvements in governance, and conversely, NRM initiatives provide excellent opportunities for improving overall governance in the country. USAID has a number of good opportunities to contribute to improved natural resource governance through its Democracy and Governance (DG) program.

In analyzing the proposed USAID/Mozambique CSP 2004-2010 through an environmental lens, the assessment team concluded that the Mission has many opportunities to positively influence the conservation of tropical forests and biodiversity, and improve the sustainable management of natural resources in the country through its proposed strategy if it chooses to do so.

The team concluded that priority needs fall into three main categories:

- natural resource information needs,
- capacity building in government agencies, and
- support to communities.

USAID/Mozambique is well poised within its proposed new strategy to contribute to meeting these critical needs, especially through SO 1, and in particular through its support to PROAGRI.

The ETOA team recommends that USAID/Mozambique:

- Work with appropriate agencies in the Government of Mozambique (GRM) and with other donors to define “agricultural potential,” and to develop the nationwide data and mapping information needed to use this concept in planning sustainable agricultural development for Mozambique.
- Support progress on the national forest inventory, and use this to delimit lands to be included in a permanent national forest estate, where commercial forestry concessions make sense.
- Support human resource development and capacity building within MADER, especially DNFFB, to work with communities in forest inventory, sustainable natural forest management, management plans, and CBNRM; improve extension skills among mid-

level technical staff through curriculum changes at national training institutions; and improve training and research capacity at the university level. Within the National Directory of Geography and Mapping (DINAGECA), improve capacity for working with communities in land demarcation and titling, and in intercommunity dispute resolution.

- Support the local communities to obtain land titles, negotiate concessions, and participate in the development of management plans with the private sector. In order to provide demand-driven support to communities, the assessment team recommends that USAID consider developing a small grants mechanism or fund to support community land titling, participation with the private sector in developing forest concessions, and the development of joint management plans.
- Support environmentally sensitive coastal zone planning and the development of integrated coastal zone management plans for areas of priority for conservation, for all coastal protected areas, and for areas of tourism development.
- Contribute to and support regional ecological and environmental planning and integration, especially in the areas of transboundary water management and international rivers, transboundary conservation areas, and regional climate change. The Mission should coordinate these regional interests through Regional Center for Southern Africa (RCSA).

1.0 Introduction

1.1 Purpose

The purpose of this assessment as described in the Scope of Work (Appendix 1) is to:

- Review the environmental and social (economic, political, and institutional) context of USAID’s program in Mozambique.
- Review the results framework proposed in the new Country Strategic Plan (CSP) and assure compliance with all environmental requirements.
- Identify potential threats to biodiversity, tropical forests, or the environment that may result from activities proposed in the new CSP.
- Identify opportunities and entry points under the new CSP that will positively influence the conservation and sustainable management of biodiversity, tropical forests, marine and freshwater resources, and the Mozambican environment in general.

USAID environmental requirements include an assessment of any proposed new strategic plan with regard to Sections 117, 118 and 119 of the Foreign Assistance Act (FAA), and with “Reg 216” (USAID 2002; Russo 1994). FAA Section 117 requires that:

“Special efforts shall be made to maintain, and where possible, restore the land, vegetation, water, wildlife, and other resources upon which depend economic growth and human well-being, especially of the poor.”

FAA Section 118 deals with tropical forests, and requires that every CSP include an analysis of:

“The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and the extent to which the actions proposed for support by the Agency meet the needs thus identified.”

FAA Section 119 concerns the conservation of biological diversity, and requires that every CSP include an analysis of:

“The actions necessary in that country to conserve biological diversity, and the extent to which the actions proposed for support by the Agency meet the needs thus identified.”

Reg 216 (22 CFR 216):

- requires that environmental factors and values are integrated into the USAID decision-making process,
- assigns responsibility for assessing the environmental effects of USAID’s actions, and
- implements the requirements of the National Environmental Policy Act (NEPA) as they affect USAID programs.

Reg 216 basically mandates an Environmental Impact Assessment (EIA) process for all USAID activities, beginning with an Initial Environmental Examination (IEE). This initial examination may come up with a “negative determination,” so a full EIA is not always required for new activities.

Because of the interrelated character of environmental issues and the fundamental importance of environmental conservation to sustainable development, USAID’s Automated Directives System (ADS) states that missions can often save time and be more efficient by conducting a broader “environmental threats and opportunities” assessment when undertaking the mandatory tropical forestry and biological diversity (FAA 118 and 119) assessments. USAID/Mozambique chose to apply this broader approach; hence this assessment of environmental threats and opportunities related to the new USAID/Mozambique CSP.

1.2 Methods

The environmental threats and opportunities assessment team consisted of Bruce Byers, Team Leader, Dennis Johnson, and Cesar Tique. The two US-based team members arrived in Mozambique and began work on October 14, 2002. The team met with relevant staff of USAID several times in the first few days, developed a work plan, which was approved by USAID on October 18. The team met with and interviewed a wide range of knowledgeable people (see Appendix 2, Persons and Institutions Consulted) and reviewed relevant documents and other sources (see Appendix 3, Documents and Sources Consulted).

The team traveled to Nampula Province from October 23-26 for field site visits to two pilot community forest management project areas in Mecuburi and Monapu Districts. These sites were recommended by senior staff within the DNFFB as among the best places in the country to see and understand the challenges of moving toward joint forest management with communities, and as potential models for replication elsewhere. The team met with community leaders and members at these sites (see Appendix 2) On November 1, the day before US-based team members departed, the ETOA team presented a summary of preliminary findings to a small group of USAID/Mozambique staff (see Appendix 2).

USAID/Mozambique prepared a Concept Paper describing their new strategic plan in February 2002 (USAID/Mozambique, 2002). The Concept Paper was reviewed by USAID Washington and an Issues Paper was prepared. A parameters cable of April 9, 2002 communicated guidance about modifications to and requirements for the proposed CSP. The environmental analysis reported on here is one of the requirements listed in the parameters cable. At the time of the ETOA team’s visit, the Mission was in the process of revising the results framework described in that Concept Paper. Because the concept paper represents the only available “official” written description of the results framework for the proposed 2004-2010 CSP, this assessment is based primarily on the Strategic Objectives (SOs) and Intermediate Results (IRs) given in that Concept Paper. The team did discuss ongoing revisions of that framework with Mission staff, and we recognize that subsequent analysis and internal discussions by USAID/Mozambique may have led to substantial revisions in the SOs and IRs discussed in this report.

1.3 Overview of this Report

USAID/Mozambique has not had an environment SO in its current strategy and has not proposed one in its new CSP. In the review of the Concept Paper, the Issues Paper raised the issue of whether there should be a separate environmental SO. According to the parameters cable (of April 9, 2002), a “consensus was reached that a rural-based SOW [sic] which incorporates environmental issues and funds is acceptable.” According to team interviews with Mission staff, the Mission sees environmental issues as a fundamental, “crosscutting” theme, underpinning each of their other proposed SOs. Given these facts, the goal in this report is to emphasize crosscutting linkages and “entry points” for USAID. In other words, this report will emphasize ways in which USAID/Mozambique can avoid creating environmental threats through undertaking activities under their proposed SOs and IRs—especially ways in which they can take advantage of opportunities to support improved environmental management and conservation through those activities.

In order to make this report as directly useful and Mission-friendly as possible, only a brief overview of the ecological and social context for sustainable development in Mozambique is presented at the beginning of the report, in Chapters 2 and 3. Then in Chapter 4 the results framework proposed in the CSP Concept Paper through an environmental, tropical forestry, and biodiversity conservation “lens” is examined, identifying some environmental threats and opportunities on an SO-by-SO, IR-by-IR basis. Chapter 5 analyzes key environmental threats and opportunities in more detail, discussing issues such as the ecological basis for agricultural potential, environmental accounting and biodiversity, forest concessions and sustainable commercial forestry, environmental issues related to coastal zone planning and management, and regional and global climate change. Chapter 6 analyzes the institutional context of NRM and conservation in Mozambique, and summarizes issues such as institutional capacity, CBNRM, and private-sector partnerships. Finally, Chapter 7 presents some conclusions and recommendations that flow from this environmental threats and opportunities assessment.

2.0 Overview of the Ecological Context

2.1 Physical Environment

Mozambique is located in southeastern Africa, between 10° 27' and 26° 52' south latitude and 30° 12' and 40° 51' east longitude. Most of the country is tropical, lying north of the Tropic of Capricorn. Mozambique has a total area of about 784,000 square kilometers (Central Intelligence Agency [CIA], 2002; Hogue, 2000a), about twice as large as the US state of California.

Figure 2.1: General Map of Mozambique



About 25 main rivers flow through the country to the Indian Ocean, and most are transnational, having their catchment basins in other countries. The Zambezi River is the largest of these, cutting across central Mozambique. Other important rivers north of the Zambezi are the Rovuma, Liganha, Lúrio, and Lugenda Rivers, and south of the Zambezi, the Pungue, Buzi, Limpopo, Save, and Komati Rivers. Lake Niassa (also called Lake Malawi) forms the northwestern border of the country

with Malawi. Mozambique has a coastline approximately 2,470 kilometers long (International Institute for Applied Systems Analysis [IIASA], 2002).

The country is generally low-lying, with coastal plains below 200 meters covering about 42% of the land, especially in the south and in a belt along the coast. Plateau areas, with average elevations between 200 and 500 meters, cover about 29% of the country. Highlands ranging from 500 to 1000 meters cover about 25% of the land surface, with a large proportion occurring in the north and west. Mountain areas, with elevations above 1000 meters occupy about 4% of Mozambique, and are located along the border with Malawi and Zimbabwe (see Appendix 4, Topography Map).

The climate of Mozambique is strongly influenced by altitude, proximity to the sea and latitude. It is semi-arid and subtropical in the south and tropical in the north, with strongly seasonal rainfall. There are two distinct seasons, a warm, wet season from November to March, and a cooler, dry season from April to October. Rainfall varies between about 1,400 millimeters a year near the Zambezi Delta to about 300 millimeters a year in the lowlands of the southern interior. The driest areas of the country lie in the interior of Gaza Province. Mountainous areas in the north and west have around 2,000 millimeters of rainfall a year (IIASA, 2002). Precipitation can vary dramatically from year to year. The coefficient of variation in precipitation ranges from 20 to 40%, with higher values occurring in the south (Reddy, 1984). Thus, droughts are common and natural. Severe droughts occurred in 1974, 1983 and 1984, and 1992. Years of severe floods also occur, and the last were in early 2000, and again in late 2000 and early 2001 (IIASA, 2002).

Soils in Mozambique are generally old and nutrient-poor. There are seven major soil groups in Mozambique according to the National Soils Map (National Institute of Agronomic Research [INIA], 1995). In general, all (except for fluvisols, which are found in river floodplains) are chemically poor and have low to medium fertility. The fertile fluvisols make up only about 6% of the soils of the country. In high altitude and rainfall areas, acidic ferralsols and acrisols are found; these soils have a low relative fertility. Arenosols, with very low fertility and a low water storage capacity, occur principally in the southern part of the country (Geurts, 1997).

2.2 Ecology

The climate and soils of Mozambique create the conditions for the development of its natural vegetation. Miombo woodlands of various types being the predominant ecosystem type (see Appendix 5, Potential Natural Vegetation of Mozambique). A large part of Mozambique has been included in the World Wildlife Fund's (WWF's) Miombo Ecoregion, one of 200 high-priority, focal ecoregions around the globe (Byers, 2001). Miombo woodlands are dry tropical woodlands, dominated by species of broad-leaved trees in the legume subfamily called the *Caesalpinioideae* by botanists. These woodlands occupy a large area of southern Africa and are adapted to the generally poor soils and the strongly seasonal rainfall regime of this region (Byers, 2001; Campbell, 1996). Most miombo trees lose their leaves during the annual dry season. Tree canopy cover in these tropical woodland ranges from 20% to almost closed-canopy forests in wetter areas. A grass understory is almost always present, so in ecological terms miombo ecosystems can also be described as savanna woodland. Coastal forests in Mozambique share many affinities with miombo woodlands. In addition to miombo forests, dense or closed-canopy forests of other types exist in limited areas along rivers, mountain areas, and include coastal

mangrove forests. In the dry areas of the south, tree canopy cover may be less than 20% in some areas, and could be described as savanna grassland or thorn scrub vegetation.

Almost 5,700 plant species have been recorded in the country, and the actual number is certainly much higher. About 250 of these are found only in Mozambique (they are what biologists call “endemic”). The mountain areas of Mozambique are relatively rich in endemic species, with at least 45 unique plants found in the Chimanimani Mountains, for example. Another area of exceptional plant diversity is south of Maputo, straddling the border with South Africa. This area has more than 2,500 species of plants in its coastal forests, wetlands and mangroves.

Mozambique has more than 200 species of mammals and a similar number of reptiles and amphibians. Of approximately 900 bird species found in southern Africa, Mozambique’s diverse habitats support about 600 species (Fitzgerald, 2000).

According to the World Conservation Monitoring Center (WCMC), Mozambique has sixteen endangered mammals, fourteen endangered birds, five endangered reptiles, two endangered fish, and seven endangered invertebrates (WCMC, 2002a; Animal Info, 2002). The World Conservation Union (IUCN) also lists 89 plant species on its Red List of Threatened Species (WCMC, 2002b).

Coastal and marine habitats in Mozambique are especially rich, and include coral reefs, mangrove forests, seagrass beds, coastal swamps, dunes, beaches, and coastal mud flats. The open waters offshore support productive marine ecosystems. The coastal and marine ecosystems of eastern Africa have been designated, like the miombo, a focal ecoregion by WWF (WWF, 2001a; 2001b). Three main ecological zones have been identified here. The northern part of the coast in Cabo Delgado and Nampula Provinces, to just south of the Ilha de Mocambique, has been called the coral coast subregion. From Angoche to the mouth of the Save River is the swamp coast. This area encompasses the delta of the Zambezi River, supports extensive mangrove forests and its offshore banks are a highly productive fisheries area, especially for shrimp. South of the Save River is the dune coast subregion. Four of eight areas identified as “globally outstanding” for biological diversity in this Eastern African Marine Ecoregion are in Mozambique (see Appendix 6, Coastal Priority Areas).

2.3 Human Ecology, Land Use, and Agriculture

The ecological dynamics of miombo woodlands, the dominant type of ecosystem in Mozambique, have been shaped in many ways by humans. These woodlands are largely inhabited, and their structure is dependent in part on human factors such as the use of fire, shifting cultivation, and pastoralism, which have been a part of the ecology of the region for thousands of years (Byers, 2001). Mozambique’s forests, like those elsewhere in southern Africa, should be thought of a “social forest” (Campbell, 1996). For this reason and others, a distinction between NRM and agriculture in Mozambique is an artificial one.

According to the National Program for Environmental Management (MICOA, 1996), “The forests and other native vegetation formations are distributed over... 78% of the total surface of the country.” The Director of DNFFB agreed with this figure, stating that “forests cover 62 million hectares” of Mozambique (Arlito Cuco, personal communication). According to Saket et

al. (1995), and Banze et al. (1993), forests free from shifting cultivation cover approximately 19,350,000 hectares, or roughly 25% of the total land surface of the country.

Deforestation in Mozambique is relatively slow, and in the period 1990-2000 the Food and Agriculture Organization of the United Nations (FAO) estimated that the annual rate of forest loss was about 63,000 hectares per year (FAO, 2000). According to the DNFFB, 7.2 million hectares of forest land are part of the country's protected area system, around 9% of the total land area of Mozambique (A. Cuco, personal communication). A FAO map of forest cover in Mozambique can be found in Appendix 7.

Because of soil and climatic factors, agricultural potential in Mozambique is generally low relative to most other countries. Arable land—defined as land suitable for repeated cropping of annual or semiannual crops such as maize, rice, wheat, etc., is estimated to be about 3,120,000 hectares, or 4% of the country's land area (CIA, 2002; IIASA, 2002a). Mozambique's lack of arable land places it among countries with the least arable land in the world, such as Columbia, Venezuela, Jordan, and Madagascar. For comparison, arable land in the United States is estimated at 19%, Bangladesh at 73%, Denmark at 60%, and India at 56% (Geography IQ, 2002). It should be noted that the most fertile, alluvial soils in the country are found on river floodplains, where agriculture must cope with periodic floods.

Annual or semiannual crops are only one type of agriculture, however, so statistics on arable land do not give a complete picture of a country's agricultural potential. According to the National Program for Environmental Management (MICOA, 1996), "In Mozambique, there are estimated to be 36 million hectares (approximately 45% of the total area of the country) which constitutes the area with recognized agricultural potential." This estimate must include not only arable cropland, but land suitable for tree crops, plantations, and livestock rearing as well. Tree crops such as cashews, mangos, and coconuts are very important in Mozambique, for example. Trypanosomiasis (sleeping sickness) transmitted by tsetse flies is present in about two-thirds of Mozambique (IIASA, 2002a), and this limits cattle keeping in these areas. In non-tsetse areas, cattle keeping, especially to provide agricultural traction in the family farm sector, has unrealized potential. The vulnerability of the agricultural sector, including livestock keeping, to droughts and floods is a significant issue given the high variability of rainfall in the country.

Shifting cultivation is an ancient agricultural production system that is commonly practiced today in Mozambique. It needs to be stated that shifting cultivation *per se* is not destructive and can be sustainable if rotation cycles are sufficiently long so that natural vegetation recovery can take place before clearing is done again. However, under increasing human population pressures, the cycle is shortened, the natural vegetation does not have the chance to recover fully, and as a result, soil fertility declines and crop yields are lower. Viewed in terms of human labor, the same level of labor is required but with diminished production. At that point the system becomes unsustainable.

Fire is an essential and integral part of shifting cultivation. Only through burning at the end of the dry season can the cut trees and slashed brush be converted to ash and incorporated into the soil to sustain crop production. The use of fire in shifting cultivation has only limited

possibilities for reduction. Burning must be done near to or at the end of the dry season because only then has the woody material dried enough to give a good, hot burn.

It is not known how much land in Mozambique is used for agriculture. According to a national vegetation mapping exercise and forest inventory supported by FAO and UNDP (Saket, 1994; Saket et al., 1995), in 1990 about 11,844,000 hectares of land were used for agriculture. This statistic suggests that only about one-third of the land area estimated to have potential for some type of agriculture is being used, and this in turn suggests a considerable potential for agricultural expansion. However, another source estimates that the “agricultural area” of the country in 1998 was 47,350,000 hectares, or 60.4% of the entire country (IIASA, 2002). This statistic suggests that agriculture is taking place in an area larger than that recognized by the Government of Mozambique (GRM) as having agricultural potential, which if true would surely be an economically and ecologically unsustainable situation. The FAO has produced a map of Cropland Use Intensity (see Appendix 8) that suggests a significant, but less than full, use of potential “cropland” over at least half of the country. “Cropland” is not defined, however, and must not be the same as arable land, which is only a small fraction of Mozambique.

Part of the confusion probably stems from the fact that most of Mozambique is miombo woodland, and miombo is traditionally and typically an inhabited forest, settled at low density by farmers practicing shifting cultivation (Byers, 2001; Campbell, 1996; Chidumayo, 1993; 1995). Part of the confusion is because definitions are complex. “Agriculture,” for example, includes activities ranging from the farming of annual crops on arable land, to permanent tree crops, to shifting cultivation within forests and woodlands, to extensive livestock keeping in natural savanna woodlands and grasslands. “Forests” include a range of vegetation types ranging from open miombo woodlands to dense closed canopy riverine and montane forests. Hence, the distinctions between “agricultural land” and “forest land” inevitably become blurred.

In addition to these definitional problems, however, is the fact that accurate information on land cover and land use does not appear to exist for Mozambique (Menete, 2000). This lack of clear and accurate information is a risk to countrywide land use and agricultural planning however, and may lead to unsustainable, environmentally damaging choices. The USAID-funded Mozambique Land Cover Change Monitoring Project may help to rectify this lack of information eventually, but at the time of this assessment the results from this project were not available (www.uneca.org/eca_programmes/it_for_development/geoinfo/special%20mapping%20applications_africa.PDF: website visited November 12, 2002).

Balancing the agricultural and forestry requirements of a nation while maintaining a sustainable natural resource base is a monumental challenge. It is a challenge that requires a combination of reliable natural resource information and the political will to adopt and implement policies that assure sustainable development.

3.0 Overview of the Socioeconomic Context

Mozambique is one of the poorest countries in the world. In 2001 Mozambique ranked 157th in the United Nations Development Program's (UNDP's) Human Development Report, and as the sixth poorest country in the world (UNDP, 2001). Approximately 70% of Mozambicans live in absolute poverty. Household incomes rank in the lowest 10% of countries in the world (CIA, 2002). The GDP per capita was estimated at US\$ 230 in 1999 (IIASA, 2002a). Poverty is common all over the country, but more so in the rural areas and during the past three years either floods or drought have worsened the situation.

The struggle against poverty has become the major policy for the Mozambican government and it has prepared, with the help of donors and the World Bank, the Action Plan for the Reduction of Absolute Poverty (PARPA). This five-year plan (for 2001-2005) seeks to reduce the incidence of poverty from its current level, estimated at 70% (CIA, 2002) to 60% by the year 2005 and to less than 50% by 2010.

Economic growth has been strong since 1993 when the peace treaty was signed and the long civil war ended, and is estimated to have been 9.2% in 2001 (CIA, 2002). Economic growth is concentrated mainly in the south, especially in the Maputo and Beira Corridors.

Approximately 81% of the labor force in Mozambique is engaged in rural agriculture (CIA, 2002), and 90% of these people work in the "family farm" sector, or subsistence agriculture (IIASA, 2002a). The subsistence agriculture system is characterized by all family members taking part in farm labor. Levels of inputs such as fertilizers and pesticides, and use of equipment such as tractors or plows are very low—less than 2% of subsistence farmers use fertilizers (other than ash fertilization), and less than 5% use animal traction, for example. Yields are generally low, corresponding to levels of inputs (IIASA, 2002a). Agriculture accounts for about 33% of GDP (CIA, 2002), and 80% of exports.

The National Agricultural Census estimates that about 2.5 million households are involved in the family farming sector, and the average area farmed is 1.82 hectares per household (National Statistics Institute [INE], 2002). These statistics suggest that about 4.5 million hectares of land are farmed by this smallholder, family farming sector. Chief crops are manioc, maize, millets, rice, sweet potato, and beans. Staple food crop cultivation represents about 63% from total household production, followed by cash crops (17%) and vegetables (4%). Until 1994, the family sector was responsible for the production of 95% of cereals, 98% of legumes, 100% of cassava and cashews, 50% of coconuts, and 72% of cotton produced in the country. It also contributes considerably to the production of vegetables, citrus, and other tropical fruits. In 1995, 75% of all livestock belonged to this sector (Menete, 2000).

The "commercial" farming section consists of state and private commercial farms, and is said to account for approximately 15% of all cultivated land during the 1998-1999 farming season (DEA, 2000). It is obvious that the smallholder, family farming sector predominates over the large-scale "commercial" farming sector, which is increasingly being given more attention under the economic reform program.

Recent statistics from the National Agricultural Census suggest that between 3.8 million and 5.3 million hectares (INE, 2002b) of land are now under cultivation in Mozambique. As discussed earlier, estimates of potential agricultural land in the country suffer from problems of definition and data—but range from about 3.12 million hectares of “arable” land (CIA, 2002; IIASA, 2002a) to 36 million hectares with “recognized agricultural potential” of some kind (e.g., for annual crops, tree crops, and grazing) (MICOA, 1996). It is simply not possible to estimate how much of Mozambique’s land potential is being utilized for agriculture at this time, based on the available information.

Natural resources supplied by forests and woodlands make a major contribution to the Mozambican economy, but this contribution is to a large degree overlooked by national economic accounting procedures and statistics, such as those used to estimate GDP and economic growth. Wood supplies more than 80% of Mozambique’s energy demands. (FAO, 2002a; A. Cuco, personal communication), but the majority of this is not sold or traded in the market. An estimated 80% of population uses “bushmeat” as a source of protein. Rural households earn some income from selling firewood and charcoal, medicinal plants, and other wild products. Forests are a source of subsistence and income, especially important in times of: crop failures, floods, droughts, famines, wars, and unemployment. In other words, forest products of all kinds are important to livelihood and food security—which for poor, subsistence farmers is more important than “income” *per se*. According to the National Environmental Plan (MICOA, 1996), even woodlands with “low economic value” can have “enormous social value” because of the free goods and services they provide. In summary, “the sustainability of the [natural] resource base is the basis for the sustainability of all efforts toward poverty reduction in rural areas.” (Cuco and Songane, 2002).

According to the DNFFB, of the 62 million hectares of forests and woodlands in Mozambique, 19 million hectares have the potential for commercial timber production because of sufficient density of valuable timber tree species (see Appendix 9). Approximately 35.8 million hectares of forests and woodlands that do not have commercial timber value and are not incorporated in the national system of protected areas as either national parks or forest reserves nevertheless have the potential for multiple uses by rural people (A. Cuco, personal communication).

Mozambique’s export economy is dominated by agricultural and natural resource products. In 1997, for example, shrimp and wood exports together earned \$85 million of \$230 million in exports, or 37% of export earnings (INE, 2002). Since most shrimp and wood products come from natural wild stocks, it is clear that natural resource conservation and management is extremely important to the economy of the country. In 1998, the value of principle export products ranked as follows: prawns, cashew kernels, cashew nuts, citrus, cotton, maize, wood, copra, tires, sugar, and lobster (INE, 2002a).

The population of Mozambique is about 19.6 million (CIA, 2002), and is growing at around 2% per year (Population Reference Bureau [PRB, 2002]). Mozambique is a large country, so population density is relatively low—25 persons per square kilometer, compared to its neighbors Zimbabwe (32 persons per square kilometer), Tanzania (39 persons per square kilometer), Malawi (92 persons per square kilometer), or South Africa (36 persons per square kilometer). Only Zambia (13 persons per square kilometer) has a less dense population. Relatively low population densities are characteristic of the miombo ecoregion, where human populations were traditionally limited by generally low soil fertility and poor conditions for cattle pastoralism.

Population distribution is not uniform in Mozambique (see Appendix 10, Population Density). More than 50% of the people are concentrated in the north, especially in Nampula and Zambezia Provinces. In the central zone people are concentrated along the Beira Corridor, and in the south along the coast, especially around Maputo. About 80% of Mozambique's population lives in rural areas.

Population dynamics and economic growth are both likely to be affected by Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), for which the adult prevalence rate is estimated to be about 15% (CIA, 2002).

4.0 Country Strategic Plan (2004-2010): Environmental Threats and Opportunities

4.1 Introduction

In order to make this report as directly useful and Mission-friendly as possible, only a brief overview of the Mozambican ecological and socioeconomic context was presented so far. In this chapter, the results framework proposed in the CSP Concept Paper through an environmental, tropical forestry, and biodiversity conservation “lens” will be examined, and some environmental threats and opportunities on an SO-by-SO, IR-by-IR basis will be identified. General issues that arise from this examination are discussed in more detail in Chapters 5 and 6.

4.2 SO 1: Rural Income Growth Accelerated

The development hypothesis underpinning this SO is that “Economic growth which reduces widespread poverty in Mozambique must originate in the agricultural sector, where 80% of Mozambique’s poor live and work” (USAID/Mozambique, 2002). The view of Mozambique through an environmental “lens” supports this hypothesis. Two points should be noted, however:

- First, rural people in Mozambique now depend heavily on wild, unfarmed, natural resources to provide much of their economic livelihood and food security—for cooking fuel, shelter, protein, and medicine, for example. It is unlikely that this dependence will be reduced very much in the period of the proposed CSP. These resources are not bought and sold on the market, for the most part, and are not measured as economic activity or counted as “income” in current national economic statistics. However, ensuring that Mozambique’s natural resources are managed sustainably, so that they continue to provide benefits to rural Mozambicans, is a requirement for poverty reduction. Along with increasing the growth of rural income, good NRM is an essential ingredient of economic development in Mozambique.
- Second, many areas of Mozambique do not have high agricultural potential because of soils and climate. Hence, use and management of natural resources such as forests, savannas, wildlife, and marine resources such as fish and shrimp, become relatively more important than in countries endowed with more fertile soils and more consistent rainfall.

In Mozambique (as elsewhere in southern Africa), NRM should be treated as an inseparable and integral part of rural “agriculture.” In fact, the GRM’s institutional structure does exactly this: it places management responsibility for forests and wildlife within the Ministry of Agriculture and Rural Development (MADER).

4.2.1 IR 1.1: Transport infrastructure in areas of high agricultural potential improved

Threats:

1. Direct negative impacts possible to species or ecosystems of special concern, wetlands, waters, and soils.

Mitigating actions: develop national environmental guidelines and standards for roads, linking the National Roads Authority (ANE) with technical coordination by MICOA; build EIA capacity within the ANE; improve capacity for transportation-related EIAs at the provincial and district levels through training workshops, site visits, and on-the-job training; carry out EIAs for all road building, road rehabilitation, and other transportation infrastructure changes. (USAID has supported capacity building related to EIA for the National Roads Authority (ANE) through training and through the preparation of environmental guidelines for roads. This latter activity involved collaboration between ANE and MICOA.

2. Indirect negative impacts possible due to significant land-use changes or population migrations caused by improved access, especially to previously less accessible areas.

Mitigating actions: environmentally sensitive planning—for example, keep new roads and road improvements away from protected areas (PAs) and their buffer zones, in general, *unless* those roads will allow more financial benefits to flow from the PAs or buffer zones (such as increased ecotourism, CBNRM in buffer zones, etc.); concentrate support for road improvements in areas of truly high agricultural potential, or areas with the potential to substantially improve rural incomes from natural resource enterprises, such as forestry or nature tourism.

Opportunities:

1. Use transportation planning mechanisms to avoid increasing access to areas of low agricultural potential or habitats of special concern.
2. Improve conditions for sustainable NRM (for example, community forestry, game ranching, or nature tourism) at the community level through improved access.

4.2.2 IR 1.2: Expansion of rural private-sector commercial trading networks and financial services

Threat:

1. Expansion of such networks and services that could lead to environmentally destructive and unsustainable expansion of certain crops (e.g., tobacco, cotton) into previously unfarmed natural forest and woodland areas.

Mitigating actions: support environmentally sensitive national, provincial, and district-level development planning institutions and build their capacity to help avoid such negative outcomes.

Opportunities:

1. Expansion of such networks and services that could help intensify agriculture and improve yields in areas of truly high agricultural potential; this in turn could reduce the extension of marginal, shifting cultivation into forest and woodland areas, and enable stabilization of the agricultural frontier.

2. Expansion of such networks and services could increase opportunities for sustainable natural resource-based enterprises in rural communities (e.g., crafts, carpentry, bee-keeping, nature tourism, and non-timber forest products such as wild fruits, medicinal plants, and mushrooms).

4.2.3 IR 1.3: Land tenure security and other agricultural policies promote investment in agricultural production

Threats:

1. Insecure tenure over land, forests, wildlife and other natural resources often contributes to ecologically unsustainable exploitation of those resources.
2. Environmentally insensitive policies related to land and agriculture may lead to agricultural extensification and expansion into ecologically sensitive areas, causing damage to fragile soils and watersheds, damage to coastal or freshwater wetlands, and pollution of fresh and marine waters.

Opportunities:

1. Support communities to obtain rights to land (land titles) and natural resources (community forest concessions, for example).
2. Support policy reform and capacity building within appropriate government agencies at national, provincial, and district levels in order to promote CBNRM.
3. Support capacity building within DINAGECA to work with communities in land demarcation and titling and intercommunity dispute resolution (not only technical survey work); train survey agents in new skills at national training institution.
4. Support communities in obtaining certificates of land occupation on a demand-driven basis (small grants program, government facilitation at all levels, NGO assistance).
5. Support capacity building within MADER, especially DNFFB, to work with communities in forest inventory, sustainable natural forest management, management plans, and CBNRM; improve extension skills at mid-technical level through curriculum changes at national training institutions (such as the IAC); improve training and research capacity at university level.
6. Support communities in community forest management and other CBNRM (small grants, government facilitation at all levels, NGO assistance?).
7. Support development of forestry concession regulations that will ensure sustainable forest management (national standards, criteria and indicators).
8. Support development of capacity to monitor concession agreements and enforce compliance with forest management plans.
9. Support regional initiatives to harmonize NRM policies.
10. Support regional initiatives to carry out transboundary NRM in appropriate areas.

In general, support improved environmental and natural resource governance.

4.2.4 IR 1.4: Use of sustainable agricultural technology increased

Threats:

None identified

Opportunities:

1. Support technical training, institutional development, and technical assistance in forestry research and extension.
2. Support technical training, institutional development, and technical assistance in wildlife management research and extension.
3. Support public-private partnerships that increase use of sustainable forestry in the commercial forestry sector (such as forest certification).
4. Support the use of agroforestry systems (e.g., cashew-based agroforestry, coconut-based agroforestry, native trees in agroforestry systems, nitrogen-fixing trees in agroforestry systems) to maintain tree cover and protect soils and watersheds.

4.3 SO 2: Labor-Intensive Exports Increased

The ETOA team was provided with an illustrative list of thirteen potential labor-intensive industries currently being considered for support under SO 2. Seven of these export categories are agricultural (fresh fruit, flowers, cashews, coconut oil, sesame oil, paprika, and tea), two are a blend of agricultural and industrial (textiles and wood products), two are industrial (footwear, and garments), and two are services (data processing and tourism). Each of the three IRs proposed in the Concept Paper (USAID/Mozambique, 2002) contribute to the enabling environment for increasing these potential labor-intensive export categories. Seen through the lens of environmental threats and opportunities, it is these target categories themselves, rather than the activities undertaken in support of the IRs that are important. Therefore, the proposed categories will be discussed, rather than the proposed IRs. If additional, other target export categories are eventually chosen, the environmental threats and opportunities related to each should be carefully analyzed before activities are developed.

Four of the thirteen proposed export products are already among Mozambique's top ten most valuable export products: cashews, citrus, wood products, and copra from coconuts (INE, 2002).

All of the thirteen export categories on the list could be potential sources of air or water pollution if poorly designed or managed, but these threats can be avoided through the required EIAs. It is recognized that USAID cannot necessarily influence national policy in general in terms of how various labor-intensive export activities are carried out, but the conditions of USAID financial support can require that specific activities follow appropriate EIA procedures.

Three of the proposed categories of labor-intensive export industries—garments, footwear, and data processing—do not seem likely to have a direct negative impact on the environment, tropical forests or biological diversity.

The other ten proposed products or activities could affect the environment, tropical forests or biological diversity. In general, for all annual and perennial export crops, the generic threat is that if cultivation is expanded into areas currently supporting natural forests or woodlands, valuable natural resources could decrease. The corresponding, generic opportunity, however, is to promote the production of those crops on agricultural land that has been used but is currently idle, and/or to intensify production and increase yields of those crops on lands where they are already grown.

Cashews and coconuts are already major export products in Mozambique (INE, 2002) and most production (almost all for cashews) is in the family farm sector (Menete, 2000). These are tree crops that can be easily integrated into agroforestry systems, and are much better for watershed protection and soil conservation than annual crops. To the extent that USAID can promote intensification of production and increases in yields on lands where these crops are already produced, the environmental implications should be very positive.

Most cotton production takes place in the family farm sector (Menete, 2000). If textiles are to be produced from Mozambican cotton, expansion of an export textile industry poses some risk of new forest and woodland clearance from smallholder cotton cultivation. The expansion of cotton cultivation in the Zambezi Valley in northern Zimbabwe has led to extensive clearing of miombo woodlands there (Campbell, 1996).

Flowers, tea, sesame, and paprika are specialized crops, and are unlikely to be grown on large areas. Promotion of these crops seems to pose a minor risk to natural habitats.

Potential threats and opportunities for each of these ten proposed products or activities are listed below:

4.3.1 Cashews

(Cashew kernel production and processing for domestic and international markets; cashew nut shell liquid for export; cashew nut shells for domestic fuel.)

Threats:

1. Promotion of perennial cashew growing in new agricultural areas could threaten forests, coastal areas and biological diversity.
2. Large-scale spraying to control powdery mildew could be detrimental to other crops and organisms.

Opportunities:

1. Promote rehabilitation of extensive areas of existing cashew plantations.
2. Promote intensification/increase in yields in current cashew areas.

3. Promote utilization of cashew apples as a juice source (link to export of fruit juices).
4. Promote the most ecologically sensitive spraying practices.

4.3.2 Coconut Oil

(Copra production and extraction of oil for domestic and international markets; coconut shells for fuel or charcoal.)

Threat:

1. Promotion of perennial coconut palm growing in new agricultural areas could threaten forests, coastal areas and biological diversity.

Opportunities:

1. Promote rehabilitation of existing coconut palm plantations.
2. Promote intensification/increase in yields in current coconut palm areas.
3. Promote utilization of coconut timber from senescent palms (link to domestic wood products).

4.3.3 Fresh Fruit: bananas, citrus, fruit juice

(Production of fresh fruits and fruit juices for domestic and international markets.)

Threat:

1. Promotion of perennial fruit crop cultivation in new agricultural areas could threaten intact forests and biological diversity.

Opportunities:

1. Promote cultivation of fruit crops on idle agricultural land or in areas of degraded forests.
2. Promote intensification/increase in yields in current fruit producing areas.

4.3.4 Textiles: use of locally produced cotton for weaving cloth for domestic garment making or export

Threat:

1. Promotion of cotton growing in new agricultural areas could threaten intact forest and biological diversity.

Opportunities:

1. Promote cotton growing on underutilized agricultural land.
2. Promote intensification/increase in yields in current cotton-producing areas.

4.3.5 Wood Products: manufacture of furniture and other products with wood from domestic sources for domestic and international markets

Threat:

1. Production could involve timber from unsustainable sources.

Opportunities:

1. Promote wood product industries with legitimate forest concessions or cutting permits to assure sustainable forest use.
2. Promote national standards and international certification for sustainable forest management.

4.3.6 Tourism: tourism in coastal areas; and in the interior associated with protected areas (including sport/trophy hunting)

Threats:

1. Insensitive siting or development of tourism infrastructure in the coastal zone (e.g., roads, hotels, harbors) could threaten beaches, coral reefs, estuaries, coastal forests, habitats of threatened marine species, and aesthetic or recreational values that attract tourists.
2. Insensitive siting or development of tourism infrastructure inland or on the coast (e.g., roads, hotels, harbors) could threaten protected areas or their buffer zones.

Opportunities:

1. Promote ecologically sensitive planning and development of tourism facilities in the coastal zone that could potentially provide jobs and improve rural incomes while protecting biodiversity, forests, and other resources.
2. Support or conduct appropriate feasibility studies and environmental analyses for coastal tourism.
3. Support careful planning and development of nature tourism facilities near protected areas that could potentially provide jobs and improve rural incomes, and also provide funding for protected area management.

4.3.7 Fresh Cut Flowers

(Production of cut flowers for domestic and international markets.)

Threat:

1. Promotion of annual or perennial flower growing in new agricultural areas could threaten forests and biological diversity.

Opportunity:

1. Promote flower growing on existing idle agricultural land or areas of degraded forests.

4.3.8 Tea

(Cultivating tea plants and processing tea for domestic and international markets.)

Threat:

1. Promotion of perennial tea cultivation in new agricultural areas could threaten intact forests and biological diversity in mountain habitats that are already limited in extent in Mozambique.

Opportunity:

1. Promote tea cultivation on land formerly used for that crop, on other idle agricultural land or in areas of degraded forests.
2. Promote agroforestry systems that include tea cultivation.

4.3.9 Sesame Oil: cultivating sesame and extracting oil for domestic and international markets; sale of seed cake for livestock

Threat:

1. Promotion of annual sesame cultivation in new agricultural areas could threaten intact forest and biological diversity.

Opportunity:

1. Promote sesame cultivation on land formerly used for that crop, or on other idle agricultural land.

4.3.10 Paprika: cultivating pepper and processing it into paprika for domestic and international markets

Threats:

1. Promotion of annual pepper cultivation in new agricultural areas could threaten intact forest and biological diversity.

Opportunities:

1. Promote pepper cultivation on land formerly used for that crop, or on other idle agricultural land.

4.4 SO 3: Improved Health and HIV/AIDS Prevention

Important linkages exist between the “health” of Mozambique’s environment and the human health objectives proposed in the Concept Paper (USAID/Mozambique, 2002). The Concept Paper proposes “use of quality health services increased” as a SO, and “behavior changes enhance HIV/AIDS prevention and care” as a Special Objective (SpO) in the new CSP. In discussions with USAID/Mozambique staff, the team was told that it was likely that these two objectives would be merged into one, and therefore they have been combined in this discussion. Presented below are several *opportunities* for linking improvements in health for the people of Mozambique with the conservation of forests, wildlife, and other natural resources.

Opportunities:

1. Nutritional needs of many rural poor people in Mozambique are met in part by fish and shellfish, wild foods such as fruits and mushrooms, and wild game meat. It is estimated that 80% of rural Mozambicans eat “bushmeat” (Cuco and Songane, 2002). Conserving natural resources will help maintain this aspect of food security, and therefore nutritional health.
2. Use of medicinal plants by local people may account for 70% or more of basic healthcare treatment in Africa (WCMC, 1992). Medicinal plants play an important role in basic healthcare in Mozambique, particularly in rural areas (e.g., Verzar and Petri, 1987; Jansen and Mendes, 1990, 1991). About 10% of the 5,700 plant species found in Mozambique are used in traditional medicine (Bandeira et al., 2000; WCMC, 1992). Conservation of forests, woodlands, and other natural habitats in Mozambique will allow local people to continue to benefit from this traditional pharmacopoeia.
3. Bio-prospecting—seeking to identify drugs from wild plants and traditional medicines with commercial potential in the pharmaceutical industry (USAID, 2002)—has the potential to provide jobs and improve rural incomes in Mozambique, given the high levels of use of wild plants in traditional medicine.
4. Air pollution from the use of wood and charcoal as cooking fuel is a respiratory health hazard for women in Mozambique. A recent study (Ellegard, 2002) showed that even in Maputo wood is the main household cooking fuel, followed by charcoal. Only about one-third of households in Maputo have electricity, and of those only one-third use it for cooking because it is too costly. About 80% of Mozambique’s energy needs are derived from wood from its forests. Supporting a switch from woodfuels to electricity or kerosene for cooking would improve health and reduce pressure on forests, especially those near urban areas.

4.5 SO 4: Improved Governance

In the Concept Paper (USAID/Mozambique, 2002), a SpO related to democracy and governance is stated as, “potential for conflict reduced through improved citizen government interaction.” In Mozambique the ETOA team met with the team leader for this objective, and was given new draft language as follows: “citizen inclusion and trust in local governance increased.” The team was also told that this objective was likely to become a SO.

The new Land Law, Forest Law, and Forest Regulations envision significant changes in the relationship between the government and its citizens regarding NRM, in particular the decentralization of management responsibility to more local levels. These laws and regulations provide a key opportunity to increase citizen inclusion and trust in local-level governance institutions. Sustainable environmental management in Mozambique will require improvements in governance, and, conversely, NRM initiatives provide excellent opportunities for improving overall governance in the country.

Some “generic” threats and opportunities that link NRM and conservation with governance are given below. Natural resource governance is a large part of the land and agricultural sector reforms (including forestry and wildlife) that have already been discussed under SO 1, and specific suggestions have been discussed regarding such issues as land titling, the community consultation process for forestry concessions, and CBNRM.

Threats:

1. Without improved governance (citizen inclusion, trust in government, and participation in decision making), the new environmental and natural resource policies, laws, and regulations cannot be successfully implemented; this could lead to increased environmental degradation and the waste of resources that are badly needed for economic development.
2. Without an increased ability of environmental and conservation NGOs to make environmental information available to the public and to advocate environmental positions, environmental and conservation concerns may be ignored in Mozambique’s push for rapid economic growth.

Opportunities:

1. Promote community participation in land and natural resource decision making through technical and financial support.
2. Empower communities to manage their land and natural resources to reduce conflicts.

5.0 Analysis of Key Environmental Threats and Opportunities

The ETOA team identified a number of key issues that emerge from a review of the new results framework proposed by USAID/Mozambique from an environmental standpoint. These are discussed here to set the stage for drawing conclusions and making recommendations about how USAID/Mozambique can make environmental sustainability an underlying, crosscutting theme of its entire portfolio.

5.1 Agriculture in the Mozambican Context

Use and management of natural resources such as forests and wildlife makes a major contribution to rural livelihoods in Mozambique, and so NRM should be treated as an integral part of rural agriculture. Forests, woodlands, and savannas provide poles and construction materials, firewood, grazing for livestock, bushmeat, wild fruits, honey, mushrooms, edible insects, and medicinal plants. Mozambique's institutional structure recognizes this by placing management responsibilities for forests and wildlife within the DNFFB of the Ministry of Agriculture and Rural Development (MADER). Coastal and marine habitats provide a wide range of high protein fish, shellfish, and crustaceans to fishers in the "family fishing," or artisanal fisheries sector.

By always keeping in mind the broad definition of "agriculture" above—a definition that is appropriate to the Mozambican environment—USAID/Mozambique will improve its opportunities for success in activities under SO 1 and SO 2 which have anything to do with "agriculture."

5.2 Agricultural Potential

5.2.1 Agricultural Potential

The Scope of Work (SOW) for this Environmental Threats and Opportunities Assessment (see Appendix 1, SOW) asked the assessment team to "identify and analyze gaps in the existing knowledge base, both within and outside the purview of PROAGRI..." One such gap is the lack of clear definitions, data, and maps of the "agricultural potential" of land in Mozambique. For example, although the National Program for Environmental Management (MICOA, 1996) stated that approximately 45% of the total area of the country has "recognized agricultural potential," the ETOA team has not been able to locate the definitions, data, or maps on which that statement is based. Likewise, the team has been unable to confirm the statistic that 4% of Mozambique is "arable" land (CIA, 2002).

Agricultural potential must be defined with respect to certain crops or activities. In the case of Mozambique, it was earlier argued that NRM should be considered part of agriculture. Clearly, the areas of Mozambique with "high agricultural potential" for tea cultivation are different than those with high potential for coconut growing, which are in turn quite different from those areas with high potential for game ranching. Areas with high potential for game ranching are not always the same as those with high potential for cattle grazing, for example. "Potential" is not only a matter of the natural situation, but can be altered by agricultural inputs such as irrigation

and application of fertilizer to crops, or provision of water points for livestock, in order to overcome natural limiting factors.

MADER has a map of “Agro-Ecological Regions” in Mozambique (see Appendix 11). This map gives a general picture of which crops can be grown in which parts of the country (see Appendix 12, Descriptions of Agro-Ecological Regions of Mozambique). The FAO is engaged in a process that may be heading in the right direction for closing the gap in information about agricultural potential in Mozambique. The FAO has developed an AEZ methodology over the past 25 years, which provides a standardized framework for characterizing climate, soil and terrain conditions relevant to agricultural production. AEZ has been used in several countries—including Bangladesh and Canada—to evaluate crop production potentials. The AEZ framework contains three basic elements. The first are called Land Utilization Types—selected agricultural production systems with defined input and management relationships, and crop-specific environmental requirements and adaptability characteristics. The second is geo-referenced climate, soil and terrain data, which are combined into a land resource database. The third element is the procedure for calculating potential yields by matching crop environmental requirements with the environmental characteristics captured in the database (FAO, 2002b).

The FAO is planning specific AEZ studies on the effect of climatic variability on food security in southern Africa, and the results of this study should be very useful to the GRM, USAID, and other donors involved in support to the agricultural sector in Mozambique (FAO, 2002b).

The GRM website (Mozambique, 2002) states that “Mozambique has immense agricultural potential.” This is partly a matter of definition and interpretation. If it does have such potential, the data to estimate what that potential is do not seem to exist. On the other hand, it seems safe to say that a large part of Mozambique’s agricultural potential (whatever that may be) remains underutilized.

It does not appear to this assessment team that sufficient information on agricultural potential is available to conduct long-term national planning for sustainable agricultural development. Unless such information is widely available to the government, civil society, and donors, it is difficult to see how policies, laws, and regulations can be successfully implemented.

5.2.2 Land Area Used for Agriculture

The Concept Paper (USAID/Mozambique, 2002) states that a key constraint to success with SO 1, increasing rural incomes, is that “Over 80% of Mozambique’s arable, non-forest land is lying fallow.” The source for this statistic was not cited in the Concept Paper, and the team was unable to confirm it. USAID, through its Famine Early Warning System (FEWS) program, has funded a US Geological Survey (USGS) project to map cropland use intensity in southern Africa, including Mozambique, using remote sensing technology (USGS, 2002). A map of cropland use intensity prepared by this project (IIASA, 2002; USGS, 2002) (see Appendix 8, Cropland Use Intensity) does NOT show that more than 80% of the arable land in Mozambique is unused. Another study by the FAO and UNDP suggests that at minimum, about one-third of the land with agricultural potential in the country has been used in recent years (Saket et al., 1995). As discussed in Chapter 2, definitions and statistics vary widely with respect to three of the concepts embedded in the statement above: “arable” land, “non-forest” land, and “fallow” land. Given this

level of uncertainty in both definitions and data, the ETOA team believes that the statement listed as a key constraint above should not be used for rationalizing or planning SO 1 activities until better data are available.

5.2.3 Expanding Agriculture

Seen through an environmental lens, the statement in the Concept Paper under SO 1 (page 8) that “The first order of business is to expand the agricultural frontier” seems to pose some risk to tropical forests and biological diversity. The term “frontier” could suggest carving new croplands from natural vegetation. However, the ETOA team understands that USAID/Mozambique does not intend to support activities that would expand agriculture into areas of marginal potential or environmental sensitivity. We agree that expanding agricultural *production* is a high priority in Mozambique, but the team believes that from an environmental viewpoint the best opportunities lie not in expanding agriculture into new lands and natural habitats, but rather in:

- reoccupying lands that were formerly used for agriculture,
- rehabilitating and/or replanting areas with tree crops such as cashews and coconuts, and
- improving inputs to increase yields of crops grown on currently cultivated lands.

Rather than extensifying agriculture, what is needed is to intensify agriculture in those relatively limited areas of the country with good soils, access to water and inputs, to transportation, to population centers and markets, and with competitive advantages for certain high-value and/or labor intensive crops and other products. USAID/Mozambique should promote agricultural improvements through intensification—using greater inputs (mechanization, fertilization, integrated pest management [IPM], irrigation) to obtain higher yields—while minimizing clearance of forests and woodlands.

The recent study of global agricultural potential by the FAO (FAO, 2002b) encourages this view, and is worth quoting here:

“A recent global study using this AEZ methodology concluded that a little more than one-quarter of the global land surface can be regarded as “sufficiently suitable” for crop cultivation. For the developed countries this amounts to about 20% and for developing countries about 30% of their respective land surfaces. However, we don’t expect the area of cultivated land—at global scale—to increase very much. Most of the increase in future food production will come through improvements in input use and technology, especially in developing regions where the gap between actual and potential yields is still very wide. In fact, a major expansion of cultivated land would be undesirable for environmental reasons, because of important implications for biodiversity and global biogeochemical cycles.” (FAO, 2002b)

On the other hand, if livestock grazing on natural rangelands, and NRM based on forestry or wildlife are also included under the broad heading of “agriculture,” then perhaps the “agricultural frontier” could be “expanded” in an environmentally sustainable manner.

5.3 Integrating Environmental Conservation into Economic Development Planning

The Concept Paper (USAID/Mozambique, 2002) proposes that the goal of the new CSP is to sustain “broad-based double-digit growth” through expanded capacities and opportunities for the country and its people. Given the importance of the agriculture sector in the Mozambican economy, ensuring the long-term sustainability of the environmental and natural resource base upon which agriculture depends, should be a key component of the new CSP (as well as being a key component of other donor and GRM development plans).

The ability of any agriculture initiative to yield economic gains over the long term, depends directly on the environmental sustainability of that initiative. For example, if the adoption of practices to increase crop yields in the short term result in soil erosion or a decrease in soil fertility, the long-term economic potential of the farming system is decreased. While simplistic, this example demonstrates a direct cause and effect relationship between agriculture and environment. In this day and age, it is quite easy to address direct causes and effects, given proper planning. What remains more difficult is to mitigate the upstream (or downstream) causes of environmental degradation—especially those affecting ecological services—that may fall outside the geographic jurisdiction or technical scope of a given initiative.

One example of an economically important ecological service is provided by the annual cycle of freshwater flows in the Zambezi, Pungue, Buzi, Save and other transnational rivers that enter the Indian Ocean along the “swamp coast” subregion of Mozambique. In this cycle, a certain quantity and flow (as well as quantity) of water is required annually, to flush shrimp larvae from the mangrove ecosystems lining this low-lying coast into the open ocean where they feed and develop to harvestable size (Helena Motta, personal communication). Shrimp harvested in these fisheries are vital to the Mozambican economy: throughout the late 1990s, shrimp contributed between 50 and 75% of the total value of agricultural export products (INE, 2002a). However, the use of water for hydroelectric power generation changes the natural flow regime of these rivers. Couple this with diversions from neighboring states (such as the recent diversion from the Pungue River in Zimbabwe) and decreases in water quality, and the issue becomes further complicated. These environmental issues, if not adequately addressed, could have significant economic implications for the shrimp industry in Mozambique (Hoguané, 2000b). The notion of “mainstreaming” environmental and natural resources conservation into economic development planning acknowledges the upstream and downstream linkages between environmental and economic sustainability, and the need to integrate these concerns into the policy, program and activity planning processes.

5.4 Regional Scale of Environmental Issues

Viewing Mozambique’s development prospects through an ecological and environmental lens, it can be clearly seen that Mozambique is environmentally connected and linked to its neighbors in the region. Ecological boundaries and national political boundaries seldom coincide, and that is certainly true for Mozambique and its neighbors in southern Africa. Mozambique is situated within the miombo ecological region, or “ecoregion,” of southern Africa (Byers, 2001; Campbell, 1996). This region is ecologically connected through its biophysical features, in

particular its geology, hydrology, and climate. It shares many other ecological and social characteristics as well. The most important of these regional linkages may be the hydrological connections, followed by climatic ones (which are less well understood—see below).

Hydrological connections have important implications for international rivers, a large number of which flow through Mozambique from their watersheds in neighboring countries. The generally flat topography and slow drainage that are characteristic of the miombo ecoregion mean that the flow of Mozambique's rivers is, in many cases, determined by forest cover and land use in neighboring countries. Forest cover is important in maintaining soil structure and water holding capacity (Lawson, 2000). Depending on what happens in Zambia and Zimbabwe, for example, floods may become more common on the Zambezi, Pungwe, or Save Rivers.

The coast of Mozambique is also ecologically connected with other parts of eastern Africa. Currents move water down the coast from Tanzania, affecting the distribution of marine organisms, for example (WWF, 2001a).

5.5 Regional and Global Climate Change

Global climate change is likely to have a serious impact in Africa. Increased intensity of droughts, floods and changes to growing seasons may have significant implications for soil productivity, water supply, food security, and in turn human welfare and poverty, as well as deleterious and, in many cases, irreversible impacts on biological diversity. Climate change may affect development directly through changes in precipitation, evaporation and hydrology, sea level rise, and changes in the occurrence of extreme weather events (floods, droughts, storms) that would impact on primary production, ecological systems, public health, and poverty (World Bank, 1998). Coastal and marine ecosystems are vulnerable to sea level rise caused by global warming. Ecologically sensitive coastal zone planning and management can help reduce vulnerability to climate change.

The nations of southern Africa are among the most vulnerable regions of the world in terms of sensitivity to the climate system (Hulme, 1996; Magadza, 1994; Makadho, 1996; Workshop, 2001). Characterized by a strong dependence on primary production, the region is also subject to a high degree of inter-annual climate variability, including sporadic flood and drought events. In one modeling exercise, 18% of the total area of southern Africa will shift from tropical dry forest (such as miombo woodland) to very dry scrub as the Earth's climate warms up. Forage for rangeland animals will be reduced (Lawson, 2000).

One way to help cope with the effects of global climate change is to conserve natural ecosystems with high biodiversity, because these are more resilient to drought than agricultural systems. Maintaining community access to natural resources would help reduce the vulnerability of poor rural people to global climate change.

Miombo woodlands in southern Africa are thought to regulate regional climate (Lawson, 2000). Land use and climate interact significantly. Loss of forest reduces rainfall in residual areas and areas downwind. Clearance of woodland or forest may cause warming and drying of regional climate, increasing vulnerability to global climate warming (Gornitz, 1985; 1987).

This regional climate regulation provided by miombo woodland cover is a valuable ecological service. There is likely to be a cost in vulnerability to global climate change if miombo clearance is widespread. Throughout southern Africa the goal of national agricultural and forestry policies should be to maintain tree cover in natural woodlands and forests whenever possible.

5.6 Forest Concessions, Sustainable Commercial Forestry, and Forest Certification

PROAGRI is the government and donor supported reform process within MADER. Forestry and wildlife management is the responsibility of the DNFFB, one directorate within MADER, and production forest management was one of the four main areas of PROAGRI support to the forestry subsector. The goal of this support was to realize the full potential of forest resources to contribute to economic growth, create new employment opportunities, and at the same time satisfy the needs of local communities for forest and wildlife products.

According to the Initial Environmental Assessment of PROAGRI (IUCN, 1998), the potential environmental impacts arising from the forestry component of PROAGRI include:

- improved biological diversity conservation through the involvement of local communities in CBNRM, which was viewed as a means to reduce forest fires, the incidence of illegal grazing, and a reduction in illegal hunting and plant harvesting;
- sustainable use of forests, resulting from a new concession management program under which the private sector and communities can acquire concessions of up to 50 years, with the possibility of renewal for up to an additional 50 years;
- increased exports of value-added forest products, to be achieved through the restriction of log exports, industrial harvesting concessions that supply local wood product industries, and research to promote the use of secondary tree species.

Forest concessions are subject to MICOA environmental regulations, which require the preparation of an EIA for any activity involving partial or complete clearing of forest or other native vegetation in an area of 100 hectares or more.

An analysis of PROAGRI environmental activities for the period January 2000 to January 2002 (MADER 2002), Section 7 on Forests and Wildlife, includes two relevant points. First, DNFFB had approved a total of 25 forest concessions, 12 in Sofala and 13 in Cabo Delgado, and all of these concessions included a monitoring process for the life of the concession. The analysis mentions that three field visits had been made to monitor and verify the implementation of management plans, and that fines were levied for five infractions. Second, legislation on the exploitation of forests and wildlife has been reviewed with the objective of promoting and implementing projects with direct community involvement. The analysis states that about one hundred community projects were being implemented, and that these incorporate not only timber, but also other natural resources.

Information obtained by the ARD team indicates that a total of 42 concessions now have been granted in Cabo Delgado, Manica, Nampula, Sofala, and Zambezia Provinces (see Appendix 13, Forest Concessions in Mozambique). The combined area of concessions granted so far equals 1,651,500 hectares, which represents less than 10 percent of the 19 million-hectare area estimated to have potential for timber production (A. Cuco, personal communication). MADER technical staff expressed concerns about their ability to monitor forest concessions, given a shortage of staff and the expense of field visits to concession sites. This particular gap can be expected to widen as more concessions are granted.

It is the team's understanding that Mozambique will ban the export of all raw logs effective January 2003, which should have a strong influence on the forest product industry to upgrade sawmills and increase their efficiency. Sofala, Zambézia, Manica, Nampula and Cabo Delgado Provinces contain most of the tall and medium forests in the country, and these five provinces account for all of the 42 current forest concessions in the country. Details on these concessions are given in Appendix 13.

Mozambique recognizes one hundred and eighteen commercial timber species. These are divided into five different classes based on their value. The species in each class are listed in Appendix 9.

Plantation forests are becoming increasingly important in commercial timber production throughout the world, as natural forests are depleted. Mozambique now has only about 46,000 hectares of plantation forests, chiefly eucalyptus and pine, but one million hectares of degraded forest lands are said to be suitable for tree plantations. Plantation forests appear to have a large potential to contribute to the production of wood products in the country.

Although there are no certified forests, yet there are numerous ecoforestry initiatives (European Forest Institute [EFI], 2002; IAC, 2002). There is considerable interest in certification standards, such as that of the Forest Stewardship Council (FSC).

5.7 Fire Ecology and Management

Fire in woodlands and forests is an important and controversial issue in Mozambique. An estimated 39.6% of Mozambique's forests are affected by fire every year. The northwestern and central parts of the country are most affected, with 73.6% of these areas burnt annually. The coastal strip with its evergreen to semi-evergreen coastal vegetation has the lowest burning intensity in the country—4.6% per year (International Forest Fire News [IFFN], 2001; Taquidir, 1996). Approximately 90% of fires are thought to be caused by humans, and approximately 10% by natural causes. Understanding local people's use of fire is central to any fire management strategy or plan. Use of fire is clearly an entrenched cultural practice, and as such is likely to be quite resistant to change. In a recent report on the fire situation in Mozambique, Saket (1999) stresses that fire management is an important component in any technical forest management plan, because fire determines the composition and structure of the vegetation. Complete exclusion of fires from the forest is certainly impossible. In fact, because the structure and composition of miombo woodlands are often determined by human-caused fires,

complete exclusion of fire would lead to unintended ecological changes (IFFN, 2001; Saket, 1999).

5.8 Coastal Zone Planning and Management

Coastal ecosystems are the most sensitive ecosystems in Mozambique. At the same time, the coast appears to have the highest potential for the development of tourism in the country. The fragility of the coastal zone environment and the interdependence that exists between terrestrial and marine ecosystems requires that development planning be detailed and cautious to maintain the natural equilibrium that exists (MICOA, 1998; WWF, 2001a; WWF 2001b) (see Appendix 6, Coastal Priority Areas). For example, coastal mangrove forests are important shrimp-breeding grounds, and degrading or destroying mangroves will negatively affect the shrimp fishing industry—currently the most valuable export industry in the country. Or, to give another example, excessive pumping of ground water from coastal aquifers can result in saltwater incursions that render water sources unsuitable for domestic, agricultural, or industrial purposes. The coastal zone in Mozambique must be the subject of detailed planning, best dealt with through the adoption of an integrated coastal zone management planning process. The overall objectives in the coastal zone are to conserve coastal ecosystems and their resources, preserve and protect scenic landscapes and species, as well as to improve the quality of life for the human population.

Mangroves cover an area of approximately 400,000 hectares, of which 215,000 hectares are still relatively well preserved. Major mangrove degradation has occurred near Maputo and Beira, as well as in the Zambezi Delta. Mangroves are very important breeding areas and nursery grounds for fish and crustaceans (such as shrimp) that are caught in offshore fisheries. They are one of the most threatened types of ecosystem in the world, and are always a high priority for protection. Coastal zone planning in Mozambique should emphasize mangrove conservation.

The establishment of two national parks in the coastal zone, Quirimbas in Cabo Delgado and Bazaruto in Inhambane, are significant steps toward coastal zone conservation and management, and deserve full public and private support to achieve their respective goals. Such coastal national parks, or other kinds of coastal protected areas such as Ilha de Mozambique, a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site in Nampula Province, may have the greatest appeal for international visitors. Administration of national parks was recently shifted from MADER to the Ministry of Tourism (MITUR). The reason given for this administrative move was to promote conservation areas for tourism, as a potential source of rural employment and of revenue for the government.

6.0 Institutional Analysis

A number of interrelated policies, laws, and programs of the GRM have potential effects on environmental sustainability and the conservation of tropical forests and biological diversity. Broadly speaking, these legal “institutions” and the agencies responsible for their implementation have a relationship to environmental threats and opportunities in Mozambique. Of particular relevance are the National Environmental Policy (1995); the Environmental Framework Law (1997); the Land Policy; the Land Law (1997); the Agrarian Policy (1995); PROAGRI (1999); the Forest Law (1999) and Regulations (2002); and the National Biodiversity Strategy and Action Plan. Also relevant are the Water Law (1991); National Water Policy (1995); National Policy for Tourism (1995); and the Municipalities Law. As a member of the Southern African Development Community (SADC), Mozambique participates in various SADC protocols; in particular those related to shared watercourses and wildlife conservation. Finally, Mozambique is a party to the United Nations Convention on Biological Diversity (CBD); UN Convention to Combat Desertification; the Convention on International Trade in Endangered Species (CITES); and the Ramsar Convention on Wetlands of International Importance.

These institutions and their role in sustainable environmental management, the conservation of tropical forests, and biodiversity conservation is discussed below.

6.1 Mozambican Policies, Laws, and Regulations

6.1.1 Environmental Policy

The main objectives of the 1995 National Environmental Policy are to:

- Ensure that the environment and natural resources are managed in such a way that they maintain their functional and productive capacity for the present and future generations,
- Ensure an adequate quality of life to all citizens.
- Incorporate environmental considerations into socioeconomic planning.
- Promote local community participation in the planning and decision-making process on the use of natural resources.
- Protect ecosystems and fundamental ecological process.
- Link with global and regional efforts in the search for solutions to environmental problems.

6.1.2 Land Policy

The main objectives of the National Land Policy are to:

- Ensure the rights of the Mozambican people with respect to land and other natural resources.
- Promote investment and sustainable and equitable use of these resources.

This policy is meant to create favorable conditions for the development and growth of local communities and to promote investments by the commercial sector. The policy states that commercial investment must be done in such a way that local communities benefit directly from such investments, and are not harmed by them. Although under the Land Law of 1997 land belongs to the State, the land policy stresses the land rights of local communities.

6.1.3 The Land Law and Regulations (1997)

The Land Law stresses that all the land belongs to the State. No private land rights exist, and all holdings are secondary rights. It also maintains a bias toward land use planning for the good of society, rather than market mechanisms and decentralized control over resources.

Two types of land rights are possible. One type is land leased from the State as a concession. To obtain title, the applicant must follow a legally described process. The second type of land right is based on traditional occupation and customary norms and practices, if not contrary to the Constitution.

Both individuals and legally defined collective bodies (profit and no-profit associations and cooperatives) may obtain land titles for up to 50 years, renewable thereafter. The occupation rights of communities are supposed to have as much weight as rights acquired through formal titling procedures. The Land Law also specifies the responsibilities of different levels of government to grant rights in land. Provincial governors can approve land concessions or titles up to 1,000 hectares; MADER must approve land rights from 1,000 hectares up to 10,000 hectares, and the Council of Ministers must approve titles to areas of 10,000 hectares or more.

6.1.4 Agrarian Policy

The main goal of the Agrarian Policy, approved in 1995, is to develop agrarian activities to achieve food security for the country. In the short term, food security depends on the production of food crops for self-consumption and to fulfill national demand. It is also linked to income generation from production of cash crops, for direct export and to supply raw materials for agriculture and the industries in the country. The Agrarian Policy applies both to the family farm and the commercial agricultural sectors. The policy is based on the decentralization of land use planning and NRM, with full participation of the local communities. Two aspects of the Agrarian Policy are linked to NRM:

- involvement of communities in the management of natural resources to promote sustainable use of natural resources, and
- expansion of the production capacity both in terms of extension of the cultivated area and increased yield.

6.1.5 National Program for Agricultural Development (PROAGRI)

PROAGRI is an ambitious attempt to marshal government and donor community resources and support to promote major reforms by MADER in the areas of institutional development,

sustainable NRM, and development of agricultural services. It was introduced by the Mozambican government in 1997, for implementation during the period 1998-2003. USAID's Concept Paper for CSP 2004-2010 sets forth two Sos: SO 1 and SO 2, which relate to PROAGRI activities.

The program consists of three subprograms: institutional development, land and NRM, and strengthening of agricultural support services. These subprograms include the following components (Cuco and Songane, 2002):

- Institutional Development
- Agrarian Land Management
- Support Agricultural Production
- Livestock production
- Forestry and Wildlife
- Irrigation
- Extension
- Research

With PROAGRI, the government intended to decentralize management of human, financial and other resources to the provincial and district levels, and to channel a major share of the scarce resources to districts. The government also liberalized prices for most commodity crops and goods and reduced border control measures to allow farmers to sell their crops freely and to buy according to their purchasing power. The real goal of PROAGRI is to help secure an enabling environment for sustainable and equitable growth in the agricultural sector, so as to reduce rural poverty and improve household food security while protecting the physical and social environment.

The functional analysis conducted during the PROAGRI preparation process was aimed at defining the roles of the public and private sectors in agricultural development. As it is now, however, PROAGRI is basically focused on public-sector service delivery capacity, and the role of, and linkages to, the private sector remains still to be defined and implemented.

6.1.6 Forestry Law and Regulations

According to the Forest Law (Act n° 10 of 7th July 1999), all the forest and wildlife resources in Mozambique belong to the State. The main objectives of this law are to protect, conserve, develop and utilize the forest and wildlife resources of the country in rational and sustainable ways for economic, social, and ecological benefits for current and future generations. The Law and its Regulations also stress that the State may delegate the power of forest resource management, including the objectives of replanting forests and restocking wildlife, to local communities, associations or to the private sector. The Forest Regulations give a list of protected species of animals and plants (see Appendix 14), and lists fines for hunting, killing, or other exploitation.

No detailed forest inventory exists for the entire country. Because this is needed for the assignment of forest concessions, the government began a forest inventory in the 1990s (Saket, 1994; Saket et al., 1995). This will eventually provide information about areas with forest cover, and identify permanent production areas for forest concessions, areas in which natural regeneration will be

emphasized, and areas for biodiversity and watershed protection. The need for a national forest inventory is clear. Many informal small-scale industries, individuals, companies and community members have been provided with short-term forest extraction licenses, and have been extracting forest resources, in particular wood for poles, charcoal, and firewood. In many cases this has led to destructive and wasteful logging practices all over the country. To correct this situation, the Mozambican government intends to gradually replace the current short-term forest extraction licenses with concessions for sustainable forest management in forest areas designated for permanent production of forest products.

The lack of information on forest potential and on its distribution forces the Mozambican government, in particular MADER and the DNFFB, to bow to pressure to use resources before proper resource management is in place.

The National Forest Program, within PROAGRI, seeks to:

- Support community-based management of forests and wildlife for production and income generation.
- Conserve biodiversity in national parks and forest reserves.
- Conserve mangroves.
- Protect soils and watersheds.
- Increase the production and utilization of forests and wildlife (Cuco and Songane, 2002).

Mozambique has made a significant step toward involving communities in NRM by recognizing, in the 1997 Land Law, the legal rights of communities to the lands they have traditionally occupied or used. Secure land tenure is the cornerstone of resource management. But land tenure alone is not enough. Communities must develop management plans for the resources they control. Community management plans must sustain natural resources while reflecting the values and meeting the needs of the community. Technical assistance may be needed to help communities secure land rights and legally delimit community boundaries, and to develop management plans.

Management plans for community lands and resources should focus on existing resources and their uses, but also incorporate practices that restore or expand the natural resource base. Village woodlots of either native or exotic species could satisfy local needs and lead to commercial opportunities, for example. Likewise, agroforestry systems that replace, at least partly, traditional shifting cultivation; restoration of wildlife populations; and, in areas of tourism potential, construction of basic infrastructure for visitors, are examples of this.

6.1.7 Water Law (1991)

The Water Law establishes general water management principles and rules for water utilization, priorities, rights, and obligations of water users. The Water Law establishes all the water bodies in the public domain as:

- inland waters, both surface and groundwater, belonging to the State;
- all dams, hydraulic equipment and other infrastructure built or funded by the State for public utility also belong to the State;
- all public domain watercourses are State propriety and they cannot be alienated; and
- the State water public domains and its management policy.

6.1.8 The National Water Policy (1995)

The National Water Policy establishes the satisfaction of basic needs of the Mozambican people as a basic principle, and emphasizes the need to increase access to potable water and sanitation, especially for the rural population. Water is considered as an economic and social good. The National Water Policy envisages decentralization and privatization. The role of the state in water implementation and management will be gradually transferred to communities, private groups and other civil society organizations. The state will maintain its role in defining priorities, defining a minimum level of services, providing information, and regulating water utilization. A catchment approach will be introduced for all river and lake water resources. The policy also aims to protect the interests and traditional rights of the population, establishes water conservation measures, and establishes groundwater protection areas.

6.1.9 National Tourism Strategy and Policy (1995)

The National Policy for Tourism and the Strategy for Tourism Development in Mozambique provide guidelines for reinvigorating the tourism industry. The National Directorate of Tourism and the National Directorate for Conservation within the Ministry of Tourism manage and regulate tourism operations in Mozambique. The latter is responsible for national parks and conservation areas, except for the forest and game reserves that remain under the jurisdiction of MADER. The policy recognizes that Mozambique possesses a variety of natural resources that could form the basis for developing high quality tourism. The policy recognizes the need to develop tourism while conserving the country's natural resource base. It identifies and recommends the creation of partially protected tourism zones, mostly located along the coast. In 1997, the Ministry of Tourism designed a Tourism Master Plan for four coastal areas of Mozambique, which identifies poles of development in these areas.

6.1.10 The Municipalities Law

This law aims at decentralization of authority to district level. The Municipalities Law stipulates that mechanisms should be developed for involving traditional authorities as well as any future community institutions in local administration.

6.2 SADC Protocols and Programs

6.2.1 Protocol on Shared Watercourses (1995)

Through this protocol, SADC countries are seeking to effectively manage the transnational rivers of the region, adopting a basin-wide approach that involves all riparian countries. The protocol is

linked with a “Strategy for Flood and Drought Management in the SADC Region.” In Mozambique, this protocol will be developed under country coordination by MICOA within the framework of the National Program for Environmental Management.

6.2.2 Protocol on Wildlife Conservation (1999)

The objective of this protocol is conservation of the region’s biodiversity. It aims to conserve globally significant wildlife habitats, especially in the transboundary drylands between SADC countries, where natural animal movements occur across international borders.

6.3 International Conventions

6.3.1 Convention on Biological Diversity (CBD)

Mozambique is a party to the CBD. One obligation of parties to the CBD is the preparation of a national strategy, and MICOA is in the final phase of the formulation of a National Strategy for the Conservation of Biological Diversity for Mozambique. The overall goal of this strategy is “The conservation of biological diversity and the maintenance of the ecological systems and processes taking into account the need for sustainable development and a fair and equitable distribution of the benefits arising from the use of biological diversity.”

The main objectives of the strategy are to:

- Identify issues for which national action will be taken as matter of priority and for which there is an immediate need for coordination of efforts.
- Identify important components of Mozambique’s biodiversity and improve knowledge about them.
- Determine the conservation status of species in Mozambique and to identify and implement appropriate conservation measures for threatened species.
- Establish and manage a representative system of areas for the protection of natural habitats and maintenance of viable populations of species in natural surroundings.
- Strengthen the capacity for *ex-situ* conservation of animals, plants, fungi and microorganisms.
- Ensure that biodiversity considerations are an integral part of the agricultural, forestry and fisheries sectors legislation, policies, strategies and practices.
- Promote community-based sustainable use of biodiversity, and recognize, document and promote the use of traditional knowledge systems of importance to the conservation of biodiversity.
- Integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies.
- Develop guidelines for EIAs and to ensure that EIAs are conducted for projects and activities likely to have significant adverse effects on biodiversity.

- Control the introduction and spread of alien and genetically modified organisms that threaten or have the potential to threaten Mozambique's biological diversity.
- Improve public awareness and education related to conservation and sustainable use of biodiversity.
- Ensure the prioritized and coordinated participation of Mozambique, internationally and regionally, in initiatives aimed at the conservation and sustainable use of biological diversity.

6.3.2 UN Convention to Combat Desertification

This is linked with land degradation and has been identified by the UN as an important crosscutting issue between the focal areas of biodiversity, climate change and international waters. The goal of Mozambican participation in this Convention aims at conserving globally significance ecosystems and arid lands-adapted plants and animals inhabiting transboundary drylands. The Convention stresses conservation and sustainable use of biodiversity through strengthening the involvement of local and indigenous knowledge and institution of NRM, capacity building, and sectoral integration and human resource development. Facilitation of international and regional cooperation, scientific assessments, conservation of representative habitats, as well as conservation and sustainable use of endemic flora and fauna should also be the focus for implementation of the Convention. Selected projects linked with the Convention should target areas that are suffering from severe land and natural resource degradation, placing global significant biological diversity at high risk of disappearance. The action should remove threats and integrate biodiversity conservation and sustainable use options into local and national NRM practices. A regional approach should be taken to similar problems across national borders, in conformity with the priorities defined by each country.

6.3.3 Convention on International Trade in Endangered Species (CITES)

Mozambique is a party to the CITES Convention. Participation in this and other international conventions is coordinated by MICOA. Nineteen species found within Mozambique are listed on Appendix I of CITES, and 142 species are listed on Appendix II
<<http://darwin.bio.uci.edu/~sustain/h90/Mozambique.htm>>.

6.3.4 Convention on Wetlands of International Importance (Ramsar Convention)

Mozambique is a party to the Ramsar Convention on Wetlands of International Importance, and some conservation organizations in Mozambique are advocating that the Marrromeu National Reserve, in the Zambezi Delta, be declared the first Ramsar Site in the country (GTA, 2002).

7.0 Conclusions and Recommendations

A number of conclusions flow naturally from the foregoing analysis, and based on those conclusions a number of recommendations naturally emerge. The team's main conclusion is that USAID/Mozambique has many opportunities to positively influence the conservation of tropical forests and biodiversity, and improve the sustainable management of natural resources in the country through its proposed strategy. The team's primary recommendation is that the Mission take advantage of these opportunities as much as possible.

7.1 Conclusions

The highest-priority needs for supporting the conservation and sustainable use of natural resources, biodiversity, and tropical forests in Mozambique fall into three main categories:

- *Natural Resource Information Needs*

The ETOA team was surprised to find that the information needed for planning and implementing sustainable national agricultural development strategies—including the sustainable management of forests and other natural resources—is very weak. This includes a lack of easily available and accessible information and maps of “agricultural potential” (including arable lands, irrigable lands, and natural grazing lands) and information on forest resources and their distribution.

- *Capacity Building in Government Agencies*

Human resources and technical capacity to carry out the new policies, laws, and regulations for land, agriculture, forests, wildlife, and tourism are very weak—so weak that it is currently impossible to really implement the progressive policies, laws, and regulations that exist on paper. PROAGRI has, as one of its three main components, the strengthening of agricultural support services. In order to provide services needed to implement the new policies and laws, the government must be able to train staff and provide this technical capacity, or somehow pay to “outsource” it. MADER's ability to outsource technical services is growing now that there is a strategy to move in that direction. At this stage, the human resources do not exist either within government agencies to provide such low- to medium-level extension and outreach, or within the private sector so that it could be outsourced. Support for research and training institutions at the mid- and higher levels must be a part of any successful PROAGRI reform. Donors such as USAID should insist that the development of human resources and technical capacity within the relevant government agencies is critical, and that adequate funds are allocated for supervision, monitoring, and evaluation of outsourced services.

- *Support to Communities*

Even if government agencies at the district and provincial levels had the human resources and technical capacity to reach out to local communities, those communities also need the resources, support, and capacity to participate effectively. The colonial history of Mozambique has not produced a culture of community entrepreneurship, so empowering

communities will be a slow process. Community empowerment is, however, an essential part of the “enabling environment” for sustainable, productive agriculture and NRM—and this is what USAID/Mozambique is seeking to foster through its aid programs. Training and capacity building within relevant government agencies can help those agencies reach out to communities, but other mechanisms are required to help empower communities. Below, is a recommendation of a small grants program, perhaps administered through an NGO partner organization that would provide a demand-driven mechanism for community support, community participation with government, and ultimately community empowerment.

7.2 Recommendations

7.2.1 Natural Resource Information Needs

USAID/Mozambique should work with appropriate agencies in the GRM, as well as with other donors, to make better use of existing information on agricultural and forestry potential in Mozambique, to make this information available to the NGO sector and civil society in general, and to develop better information where gaps are identified.

The lack of a thorough national forest inventory is holding up the process of delimiting lands to be included in a permanent national forest estate, where timber potential is high enough to make commercial concessions viable and attractive to private sector investors. USAID/Mozambique should try to move the forest inventory process forward. The national forest inventory should also assess forest land uses and forest condition. Information about the ecology of fire in forests of various types is essential for development management plans. If this information does not already exist it needs to be developed through research activities. Forest inventory information is needed to create the “enabling conditions” to forge links between communities with forest lands and the private sector, which can invest in sustainable forest management and in processing equipment that can add value to wood, creating jobs and earning income.

Once permanent forestry lands have been identified, local communities occupying those lands need support to obtain land titles, negotiate concessions, and participate in the development of management plans with the private sector (see specific recommendations under Section 7.2.3, “Support to Communities”).

7.2.2 Capacity Building in Government Agencies

The human resources and capacity for research and extension are both generally weak within the government agencies responsible for NRM in Mozambique. Human resource development and capacity building within MADER, especially DNFFB, is needed to:

- Work with communities in forest inventory, sustainable natural forest management, management plans, and CBNRM.
- Improve extension skills among mid-level technical staff through curriculum changes at national training institutions (such as the IAC).
- Improve training and research capacity at the university level.

Within DINAGECA, the government agency responsible for land demarcation, the human resources and capacity are very weak for working with communities in land demarcation and titling, and in intercommunity dispute resolution. It is not only technical survey work that is required. In fact, that type of work is probably more easily outsourced to the private sector than the more difficult tasks of negotiation and facilitation needed to work with communities. DINAGECA survey agents should be trained in new skills at the national training institution to enable them to support community land demarcation.

USAID/Mozambique should support such human resource development and capacity building.

The capacity to conduct applied research, and the dissemination of research results, are part of capacity building. Ecological and silvicultural studies on first class and prime timber species (see Appendix 9), is needed to manage forests and maintain sustainable stocks of those valuable species. Fire ecology studies focused on those first class and prime timber species are also needed to assess their susceptibility to fire, and the role fire may play in their recruitment and regeneration. For example, *Pterocarpus angolensis*, “umbila,” is a very desirable first-class timber species, and it has been depleted in many areas. This species is more fire tolerant than many other species—if not fire dependent—and fires of a certain intensity and return frequency may actually enhance the regeneration of this species.

Agroforestry systems should be promoted as an alternative to annual crops whenever possible. Agroforestry is the deliberate integration of trees and shrubs in crop and livestock production systems. Tree crops such as cashews, coconuts, and certain fruits are much better for watershed protection and soil conservation than annual crops. Mozambique has a traditional competitive advantage in certain tree crops, such as cashews and coconuts. Agroforestry systems can more closely duplicate the ecological processes and functions of natural woodlands than the cropping of annual crops.

7.2.3 Support to Communities

In order to achieve the Intermediate Result proposed in IR 1.3, communities will require support to gain secure tenure over their land and natural resources. Two interrelated obstacles currently hinder CBNRM. One obstacle is insecure land use rights, especially with regard to the legal boundaries of traditional community lands. Without clearly recognized land rights, communities often lack the incentives needed for sustainable resource management. The second obstacle is a lack of technical knowledge to formulate and implement a sustainable community-wide natural resource management plan.

Communities need support in obtaining certificates of land occupation, but this should be a demand-driven, bottom-up process. Communities must organize and begin the process on their own, rather than having an outside agency arrive on the scene to “organize” the community. Once a community has title to its land, it may require support to develop management plans for community forest management and other types of CBNRM, or to negotiate forestry concessions with private sector operators.

The process of involving communities in forestry or any other land use concession should not just be community “consultation,” but rather true and balanced participation by the community

or its legitimate representatives in negotiations and decision making. In many cases around the world, “community consultation” has turned out to be a rather cursory, top-down, and sometimes exploitative process. A balance of power is needed to guarantee that community needs and interests are met. True community participation, leading to joint forest management—or even “community-based” management in some cases, which means communities are in charge—should be the goal.

Government agencies with the relevant authority must have the capacity to reach out to communities and support them in the process, but the community must likewise rise up to meet the government half way. NGOs and private voluntary organizations (PVOs) may be appropriate kinds of organizations to assist communities from the bottom up, as long as they are not so large and well-funded that they intimidate or overwhelm either the community or the relevant government agency actors. Negotiating concessions and developing joint management plans requires that communities (with very little capacity) communicate and “interface” with the government agencies (at the district or provincial level) that have the responsibility for land demarcation and titling (DINAGECA), and forest concessions and management plans (provincial directorates of agriculture and rural development).

In order to provide demand-driven support to communities, the assessment team recommends that USAID consider developing a small grants mechanism or fund to support community land titling, participation with the private sector in developing forest concessions, and the development of joint management plans. USAID could establish a small grants fund that would provide support to communities for the purpose of technical support to obtain legal use rights and demarcation of their lands, as well as technical support to design a management plan that embodies conservation of tropical forests and biological diversity, addresses community needs and provides commercial opportunities for the generation of cash income to the community as a whole or to community members through employment.

The fund could be administered by an existing organization to avoid excessive overhead expenses, and the USAID partner PVO/NGOs are good candidates for this role. A grants manager will be required to assist applicants, provide guidelines for the titling and management planning, and to monitor the technical activities and approve payments for each community grant. Private sector partners may want to contribute to this fund, as a mechanism for speeding up and improving the quality of the process of negotiating forest concessions with communities with title to forest lands.

This small grants program should strategically target geographic areas in which national forest inventory data show good potential for timber production OR non-timber uses of natural forest with high potential to generate rural community jobs and income. Some geographic coverage—that is, a division of funds throughout many or most of the provinces and/or forest types of Mozambique, would be idea.

7.2.4 Other Key Linkages to Support

The team also recommends that USAID/Mozambique consider supporting several other key linkages between its proposed results framework and improved environmental management. These, in the team’s view, are very important issues, and could be rationalized within the three

main priority needs identified above. They are listed separately here for emphasis and ease of communication.

Support for ecologically sensitive coastal zone planning

USAID/Mozambique should work with WWF and IUCN, and use WWF's map of priority areas for biodiversity conservation in Mozambique's coastal and marine zone to identify coastal areas of special interest. The Mission should help to support the development of integrated coastal zone management plans for those zones, for all coastal protected areas, and for other areas of tourism development. Community-level participation (not merely "consultation") should be part of the planning processes in all cases, so that any coastal tourism development has a direct impact on rural poverty alleviation through creating local jobs and increasing local incomes. Artisanal fisheries and other access by local people to coastal and marine resources they have traditionally used and that contribute to their livelihoods and food security should be maintained.

Support for regional ecological and environmental planning and integration

USAID/Mozambique should contribute to and support regional ecological and environmental planning and integration. Transboundary NRM is one way to think of this—but transboundary protected areas, such as the Great Limpopo conservation areas complex—is only one, relatively small, piece of transboundary NRM. Others include, for example, the very important issue of transnational rivers and water management. The entire miombo ecoregion is a giant hydrological system of interconnected watersheds. Because of this, for example, maintaining miombo woodland cover in Zambia and Zimbabwe is of critical concern for Mozambique's sustainable development—without it, the severity and frequency of floods in Mozambique will increase, the sustainability of dams such as Cahora Bassa are threatened, and so on. SADC cooperation and development of protocols may be the primary way to go here. USAID/Mozambique should link with USAID/RCSA in this effort, in order to contribute to the large-scale, ***regional enabling environment*** required for sustainable economic development in Mozambique.

7.2.5 Other Suggestions for Relatively Low Cost, Targeted Support

The Mission should continue to provide support to build capacity for EIAs at the provincial and district levels, especially EIAs for roads and other transportation infrastructure (under SO 1), and for agricultural and industrial developments related to labor-intensive export industries (under SO 2).

USAID/Mozambique should continue to follow developments at MICOA and work with other donors to enable MICOA to grow into its role as a coordinator of environmental affairs in Mozambique.

USAID/Mozambique could use DG SO funds to assist municipalities in developing better environmental governance in their areas. Municipalities could be viewed as tapping natural resources from their surrounding regions—in particular this is true of woodfuel (firewood and charcoal)—and this would be a perfect theme around which to develop improved environmental governance activities. Relevant questions would be, for example: What is the impact of woodfuel

Conclusions and Recommendations

use in this municipality on surrounding woodlands and forests? How sustainable are current levels of consumption? Is the woodfuel industry in this municipality operating legally, in compliance with national laws and regulations?

The Mission could use Health SO funds to further investigate the health implications of urban (or rural) use of firewood and charcoal for cooking, and the prospects of improving both human and environmental health by promoting “enabling conditions” for a switch from woodfuels for cooking to other fuels such as kerosene or electricity.

USAID/Mozambique could use SO 1 or DG SO funds to support national/international NGOs (such as IUCN) in making environmental information more accessible to the public, environmental decisions at the national level more participatory and transparent, and building the capacity for civil society in general to participate in national-level decision making regarding the environment and NRM.

The Mission could collaborate with the International Center for Research in Agroforestry (ICRAF) to develop and promote improved agroforestry systems for cashews, coconuts, and other tree crops in Mozambique, and with ICRAF’s “Alternatives to Slash and Burn” agriculture (ASB) program <<http://www.grida.no/cgiar/arendal2/icrafpap.htm>>.

Appendices

[Appendix 1: Scope of Work](#)

[Appendix 2: Persons and Institutions Consulted](#)

[Appendix 3: Documents and Sources Consulted](#)

[Appendix 4: Topography Map](#)

[Appendix 5: Potential Natural Vegetation of Mozambique](#)

[Appendix 6: Coastal Priority Areas](#)

[Appendix 7: Forest Cover Map](#)

[Appendix 8: Cropland Use Intensity](#)

[Appendix 9: Classification of Commercial Timber Tree Species in Mozambique According to Article 11, No. 1, Forest Law](#)

[Appendix 10: Population Density](#)

[Appendix 11: Agro-Ecological Regions of Mozambique \(INIA, 2002\)](#)

[Appendix 12: Descriptions of Agro-Ecological Regions of Mozambique \(Source: INIA, 2002\)](#)

[Appendix 13: Forest Concessions in Mozambique](#)

[Appendix 14: List of Protected, Threatened, and Endangered Species, with Fines](#)

Appendix 1: Scope of Work

**USAID/Mozambique Country Strategic Plan (CSP)
Environmental Threats and Opportunities Assessment
with Special Focus on Biological Diversity and Tropical Forestry**

Scope of Work

The Consultant will undertake an Environmental Threats and Opportunities Assessment (ETOA) that will constitute the Environmental Annex required in the Mission's Country Strategic Plan (CSP). The assessment will be carried out by a short-term consultant team with experience in USAID strategic planning and with a sound knowledge of USAID's environmental policies, legislation and requirements as governed by 22 CFR 216 and the Foreign Assistance Act.

1. Background and Purpose

Strategic Planning Process. USAID/Mozambique is currently in the process of developing a six-year country strategic plan (CSP: 2004-2010) wherein the Mission will align its proposed strategic objectives with the Government of Mozambique's (GRM's) Action Plan for the Reduction of Absolute Poverty (PARPA). The PARPA has become the GRM's guiding strategy for all its development efforts. Alignment of USAID Mozambique's program with the PARPA will signal support for GRM's poverty reduction strategy. Moreover, it will enhance synergy across sectors, and increase management efficiency.

Under the current CSP, there is no Environment SO, nor is there one proposed for the CSP: 2004-2010. Most environmental activities of the Mission are now conducted through the current SO1: Increased Rural Household Income (in focus areas), in particular through PROAGRI, a multi-donor reform program of the Ministry of Agriculture and Rural Development (MADER) and PVO activities. PROAGRI and the PVOs are achieving positive results and the activities are proposed to continue into the new CSP. Much of the existing body of knowledge related to environmental conditions and issues in Mozambique has been collected under the auspices of PROAGRI. An area of focus of this assessment contract will be the review of PROAGRI-generated reports and documents and the identification of gaps in that data.

Environmental Requirements. The core environmental requirements of USAID operating unit strategic plans are spelled out in ADS 201.5.10g, and are derived from provisions of the Foreign Assistance Act (FAA).

- Environmental Sustainability. USAID/Mozambique recognizes that protection of the environment and wise management of the natural resources base are absolute requirements of any successful development program. Section 117 of the FAA "*Environment and Natural Resources*," dictates that operating units will implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment. The legal requirements of the FAA are reflected in USAID's *ADS Chapter 204 "Environmental Procedures*," which provides essential procedures and policy on the application of *22 CFR Part 216*. This regulation codifies the Agency's procedures "to ensure that environmental factors and values are integrated into the A.I.D. decision making process." Further, 22 CFR 216.5 requires USAID

operating units to conduct their assistance programs in ways that are sensitive to the protection of endangered or threatened species and their critical habitats.

- Tropical Forestry and Biological Diversity. Sections 118 “*Tropical Forests*” and 119 “*Endangered Species*” of the FAA codify the more specific U.S. interests in forests and biological diversity. These two provisions require that all country plans include: 1) an analysis of the actions necessary in that country to conserve biological diversity and tropical forests; and 2) the extent to which current or proposed USAID actions meet those needs. Section 118/119 analyses are specific legal requirements of all USAID operating unit strategic plans.

Translating the intent of the above legal requirements into a practical strategic planning approach, the ADS provides a priority-setting framework for missions to use in determining environmental threats and opportunities (See 201.5.8; and Supplementary References, Joint Planning and Guidelines for Strategic Plans, and Technical Annex B Environment, dated February 1995). The priority-setting process is intended to guide the setting of environmental strategic objectives, as well as to inform strategic objectives in other sectors.

The result of this consultancy will be used by the Mission SO teams, the Mission Environmental Officer (MEO) and the Bureau Environmental Officer (BEO) as well as the Agency’s reviewers of CSPs as the basis for the following analyses:

- The positive and negative impacts on FAA 117, 118 and 119 issues of each of these laws/policies/initiatives as currently implemented and/or as projected;
- Plans and outcomes of efforts to mitigate the impacts of the foregoing;
- The effectiveness of relevant public institutions that supervise and govern the utilization, development and/or monitoring of environmental resources in terms of how they achieve environmental sustainability and mitigate negative development impacts, prevent degradation and/or achieve restoration of tropical forests and biodiversity.

Natural resource management (NRM) activities likely to be conducted under the new CSP also are consistent with objectives of minimizing climate change. NRM activities will pertain to agriculture, forestry, community-based natural resource management and eco-tourism. The consultancy will be used to identify links between planned Mission activities and climate change.

2. Scope of Work: Specific Tasks

The consultant(s) will:

- i. Document the state of key natural resources by quantifying trends in their management, biophysical condition, productivity, abundance and distribution and identifying the threats (e.g., degradation, depletion, pollution) to which they are subjected. The more noteworthy natural resources include: wildlife; forests and woodlands; marine and coastal systems; freshwater systems including shared watercourses, wetlands, rivers and lakes; soils (fertility

and stability) as related to agricultural systems and other forms of land clearing; and energy resources such as biomass.

- ii. Conduct an analysis of how past events and current initiatives (both Mozambican and donor) have shaped the country's development trajectory. The concern is how Mozambique's response to the global development setting, its geo-political position in the southern African region and its internal development agenda are currently impacting environmental sustainability (Section 117), tropical forest conservation (118) and bio-diversity (119) and climate.

There are several, mutually supporting GRM laws, policies, and initiatives that must be studied and investigated for their environmental impacts to produce a creditable ETOA. Of particular relevance is the PROAGRI program (Its 1999 environmental assessment, titled "Phase 1: Overview and Initial Environmental Assessment of PROAGRI" provides a baseline.). Others include: 1) various SADC protocols, in particular those related to shared watercourses, wildlife conservation, and tourism; 2) Water Law (1991); 3) National Water Policy (1995); 4) Forestry and Wildlife Policy and Strategy; 5) Forestry and Wildlife Law of 1999; 6) Environmental Framework Law (1997); 7) Biodiversity Strategy; 8) Land Law (1997); 9) National Policy for Tourism (1995); UN Convention on Biological Diversity and its Action Plan; UN Convention to Combat Desertification and its action plan; and the Convention for the Control of International Trade in Endangered Species (CITES).

- iii. Identify and analyze gaps in the existing knowledge base, both within and outside the purview of PROAGRI (for example coastal and marine resources). Collect available data, conduct interviews, and recommend needed follow up work.
- iv. Examine environmental activities and plans of other donors in Mozambique.
- v. Conduct an environmental review of proposed USAID/Mozambique strategy components. This will be an analysis of the activities of all proposed SOs and SpOs, in particular SO1: Rural income growth accelerated and SO2: Labor-intensive exports increased. The intent is to identify and/or emphasize environmental threats and opportunities relevant to the Mission's SO programs, and their potential impacts on FAA Section 117, 118 and 119 issues and climate. Here, the focus will be on activities that will carry over from the current SOs and illustrative new activities/development initiatives under the CSP: 2004-2010.
- vi. Identify opportunities and entry-points for USAID/Mozambique efforts under the new CSP that will positively influence the conservation of tropical forests, biodiversity, river and coastal water resources and improve environmental and natural resource management. This is important because the Mission is concerned not only with the potential negative impacts of its programs' and thus, identifying mitigation that must occur, but also how the SO teams might actually improve environmental condition with their activities.

3. Expertise Required

International Technical Assistance (2). BIOFOR IQC Senior Level Natural Resource Management Specialists with post-graduate qualifications in biology, zoology, forestry or closely related field in natural resource management. Background in tropical biodiversity and natural resource conservation. Knowledge of USAID Strategic Planning process related to Environmental Threats and Opportunities Assessment. Knowledge of 22 CFR 216 and of FAA Sections 117, 118 and 119. Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems and of environmental impact assessments. Experience in Sub-Saharan Africa and experience in Southern Africa and Mozambique preferred.

Local Technical Assistance (1). BIOFOR IQC Senior Level Natural Resource Management Specialists with demonstrated experience in Mozambican environmental law, the policy and legal frameworks governing environmental management in Mozambique and the analysis of relevant policies.

4. Period and Level of Effort

A maximum of 60 working days based on a six-day work week is authorized for the team. The consultancy will conclude on or before November 1, 2002. The consultant will work under the technical direction of the USAID/Mozambique SO1 Team Leader and MEO.

5. Deliverables

- Work plan/schedule within three working days of start date.
- Oral debriefing within five days of ending date.
- One report containing the information described in 3i, ii, iii, iv, v and vi above.
- The final draft report will be submitted on diskette (1) and hard copy (5) within five days of end date.

Appendix 2: Persons and Institutions Consulted

Name	Institution	Title
David L Stephens	USAID-Mozambique	Mission Environmental Officer
Scott Simons	USAID-Mozambique	Agricultural Policy Advisor
David Hess	USAID-Mozambique	Deputy Mission Director
Christine de Voest	USAID-Mozambique	Team Leader, Rural Incomes
Timothy W. Born	USAID-Mozambique	Team Leader, Private Sector Enabling Environment
Sidney Bliss	USAID-Mozambique	Food for Peace Officer
Suzanne Poland	USAID-Mozambique	Food for Peace Officer
Sharon Carter	USAID-Mozambique	Team Leader, Democratic Institutions
James Watson	USAID-Mozambique	Program Officer
Bill Messiter	USAID-Mozambique	Rural Enterprise
Luis Santos	USAID-Mozambique	Roads Advisor
Andy James	USAID-Mozambique	Program Officer
Wijnand J. van Ijssel	Netherlands Embassy	First Secretary, Forestry & Environment
Simon Norfolk	DFID	External Advisor, Natural Resources
Lis Rosenholm	Danish Embassy	First Secretary
Arlito Cuco	MADER/DNFFB	National Director for Forestry & Wildlife
Eurico Cruz	MADER/DNFFB	Head of Forestry Department
Samuel Nacala	MADER/DNFFB	Head of Economic Department
Ana Menezes	MADER	Environmental Coordinator
Agostinho Zacarias	MADER/DNFFB	FAO Community Management Project Coordinator
Eulalia Macome	MADER/DNFFB/CEF	Forestry Experimental Center
Evaristo Baquete	MICOA	National Director for Natural Resources
Lolita Fondo	MICOA	Deputy Director of Natural Resources
Afonso Madope	MITUR	National Director for Conservation Areas

**Provincial Directorate of Agricultural and Rural Development
(DPADR), Nampula Province**

Aly Awasse		Community Management Coordinator,
Antonio Diniz		Head of Forestry and Wildlife Services
Antonio Moronha		Community Management Officer
John Hatton	IMPACTO	Consultant

Appendix 2

Todd R. Johnson	DAI	Chief of Party, Great Limpopo Transboundary Natural Resources Management Initiative
Rod de Vletter	World Bank	Environment, Natural Resources & Tourism Consultant
Robert Clement-Jones	World Bank	Senior Environmental Economist, Africa Region
Patrick Matakala	ICRAF	Country Representative

NGOs

Corene Crossin	Global Witness	Campaign Researcher
Sally Henderson	World Vision	Deputy Director of Agriculture
Helena Motta	WWF	Country Director
Isilda Nhantumbo	IUCN	Country Programme Coordinator
Rosie Sharpe	Global Witness	Assistant Campaigner
Peter Frost	Miombo Network	Ecologist

Private Sector

Graeme White	TCT Industrias Florestais, Lda - Dahlman Furniture	Business Owner
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Community Meetings, Nampula Province

Martino Daudo Amido	CBNRM-Senhote	Game ranger
António Aires Aquino	CBNRM-Senhote	President of Community Council
Vanheque Amade	CBNRM-Senhote	Carpenter
Juma Omar Saide	CBNRM-Senhote	Logger
Mustafá Jamal	CBNRM-Senhote	Carpenter
Amade Motepana	CBNRM-Senhote	Carpenter
Ernesto Necama	CBNRM-Senhote	Logger
Carlos Alberto	CBNRM-Senhote	Fiscal
Lito Mussa	CBNRM-Senhote	Carpenter
Muanahumo Armando	CBNRM-Senhote	Carpenter
Arlindo Amade	CBNRM-Senhote	Fiscal Comunitário
Bernardo Alfane	CBNRM-Senhote	Fiscal
Manuel Nawehe	CBNRM-Senhote	Logger
Razaque António	CBNRM-Senhote	Logger
Armando Ussene	CBNRM-Senhote	Carpenter
Macário Amade	CBNRM-Senhote	Gamer Ranger
Gemito Manuel	CBNRM-Senhote	Carpenter
Momade Ali	CBNRM-Senhote	Carpenter
Carlos Abudo	CBNRM-Senhote	Logger
Julião João	CBNRM-Senhote	Carpenter
José Tailu	CBNRM-Mecubure	Head of the Game rangers

António Chomeleque	CBNRM-Mecubure	Carpenter
Fernando Mecossa	CBNRM-Mecubure	Game ranger
John Fernando	CBNRM-Mecubure	Game ranger
Américo Natape	CBNRM-Mecubure	Community member
Neves Paulo	CBNRM-Mecubure	Community member
Constantino Armando	CBNRM-Mecubure	Community member
Elias José	CBNRM-Mecubure	Community member

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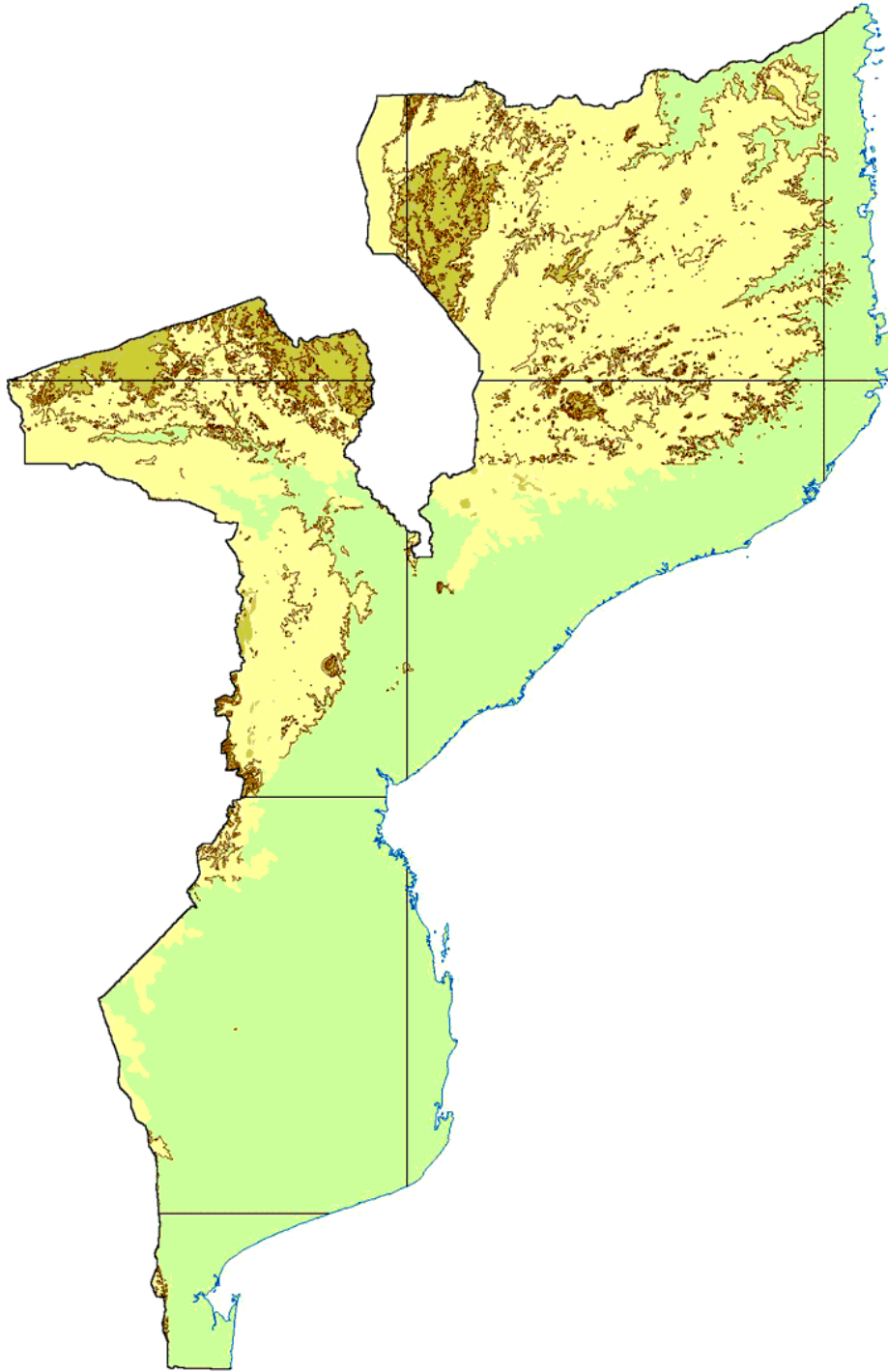
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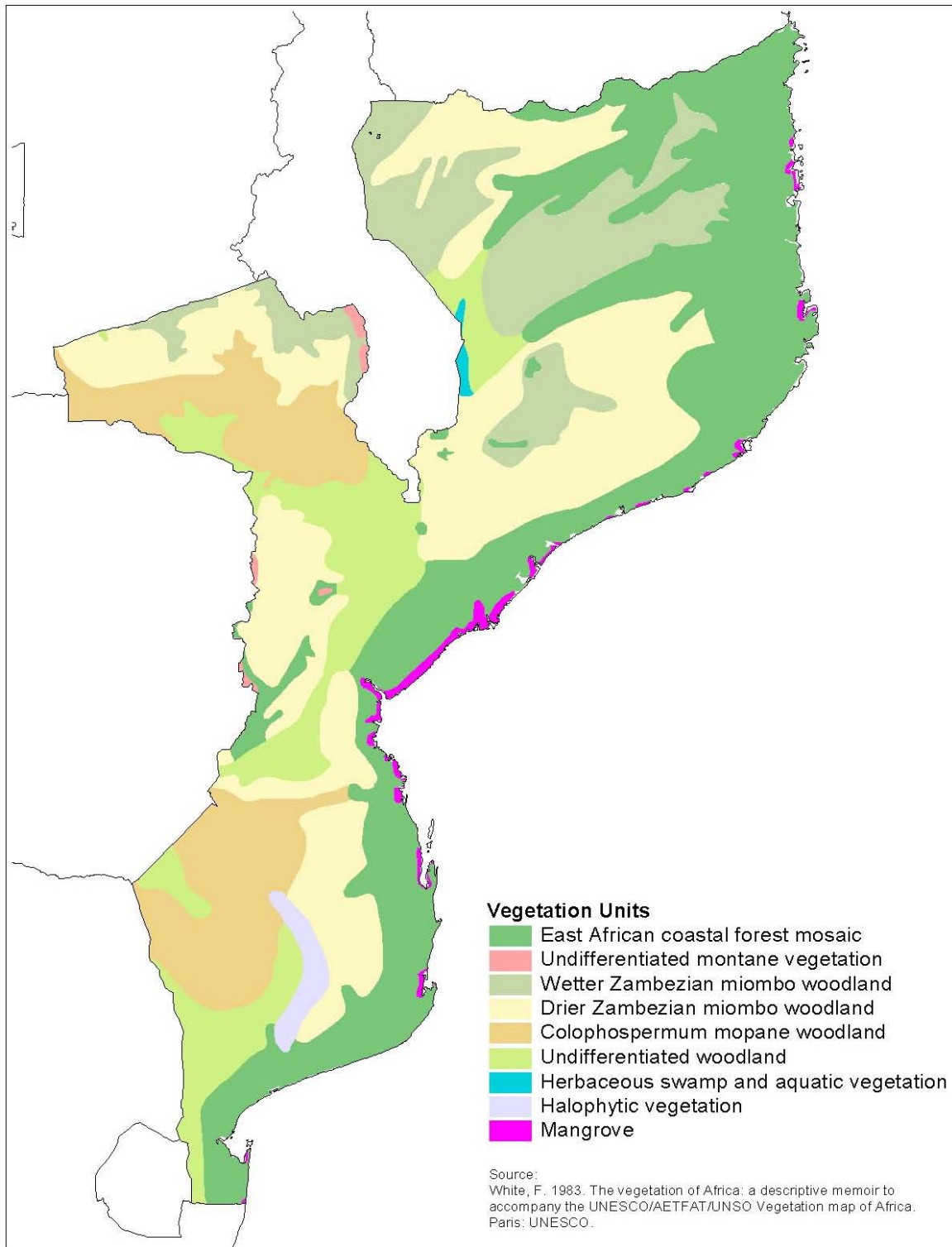
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Appendix 4: Topography Map

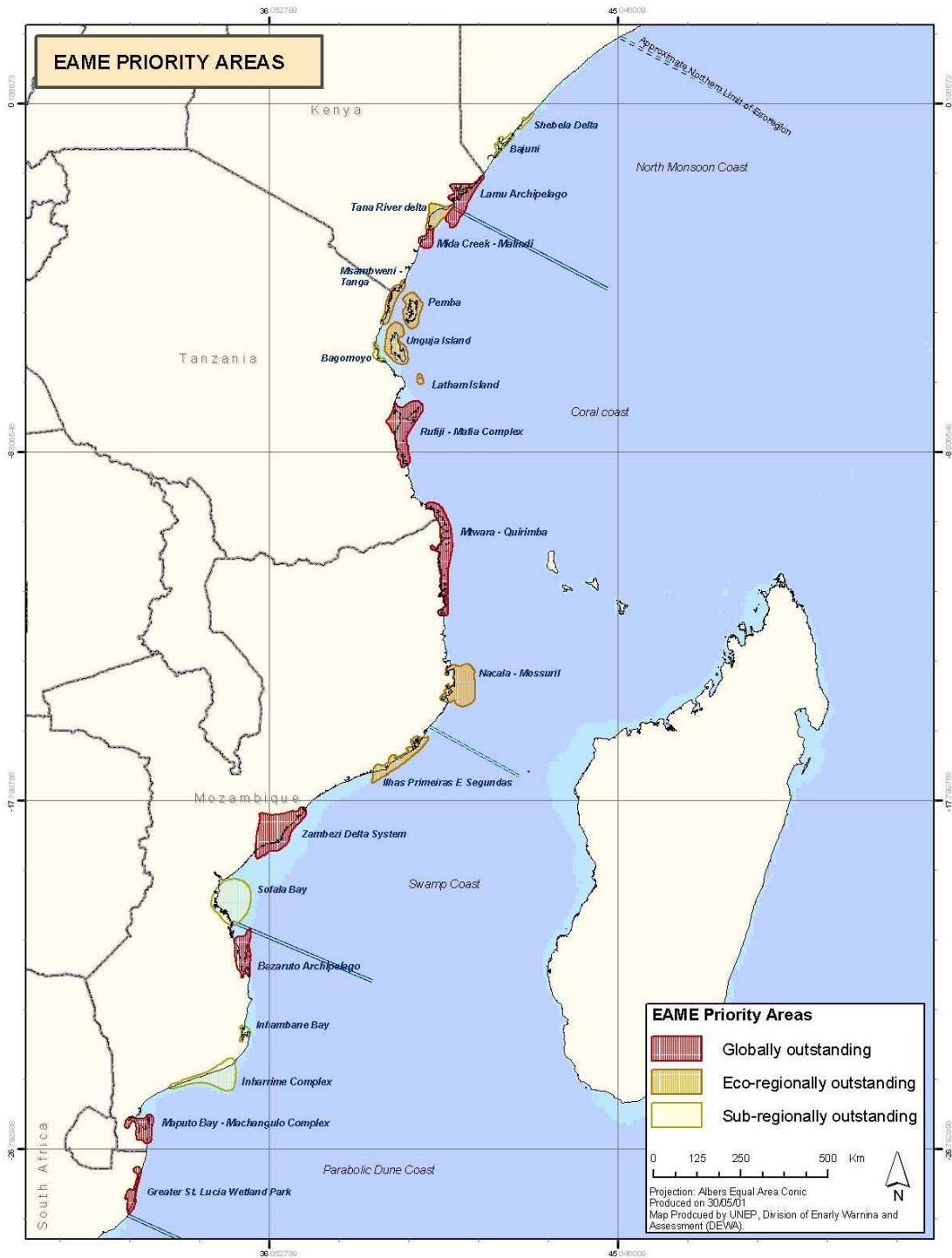


Appendix 5: Potential Natural Vegetation of Mozambique

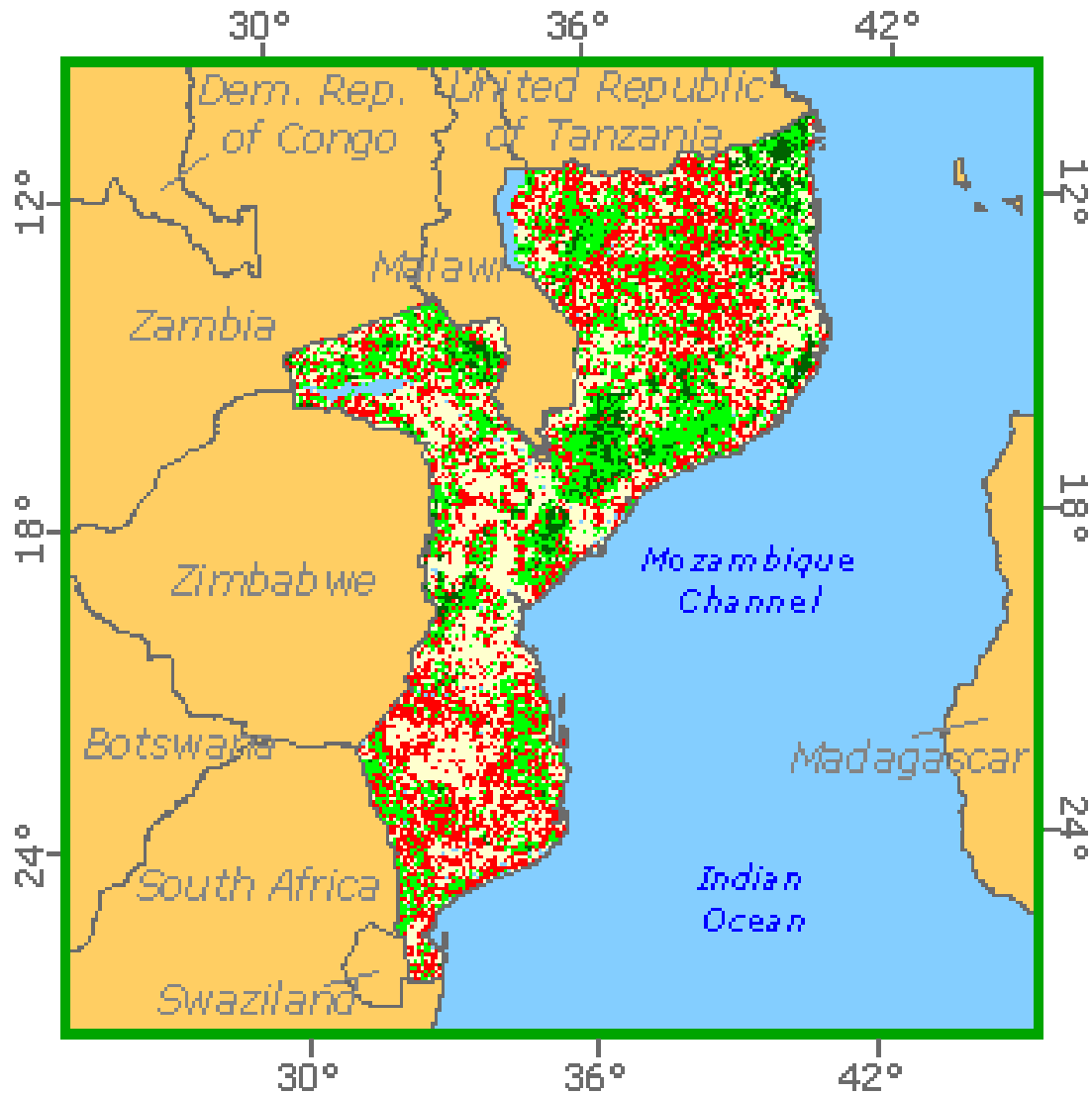


Source: Jennifer d'Amico, WWF-US

Appendix 6: Coastal Priority Areas

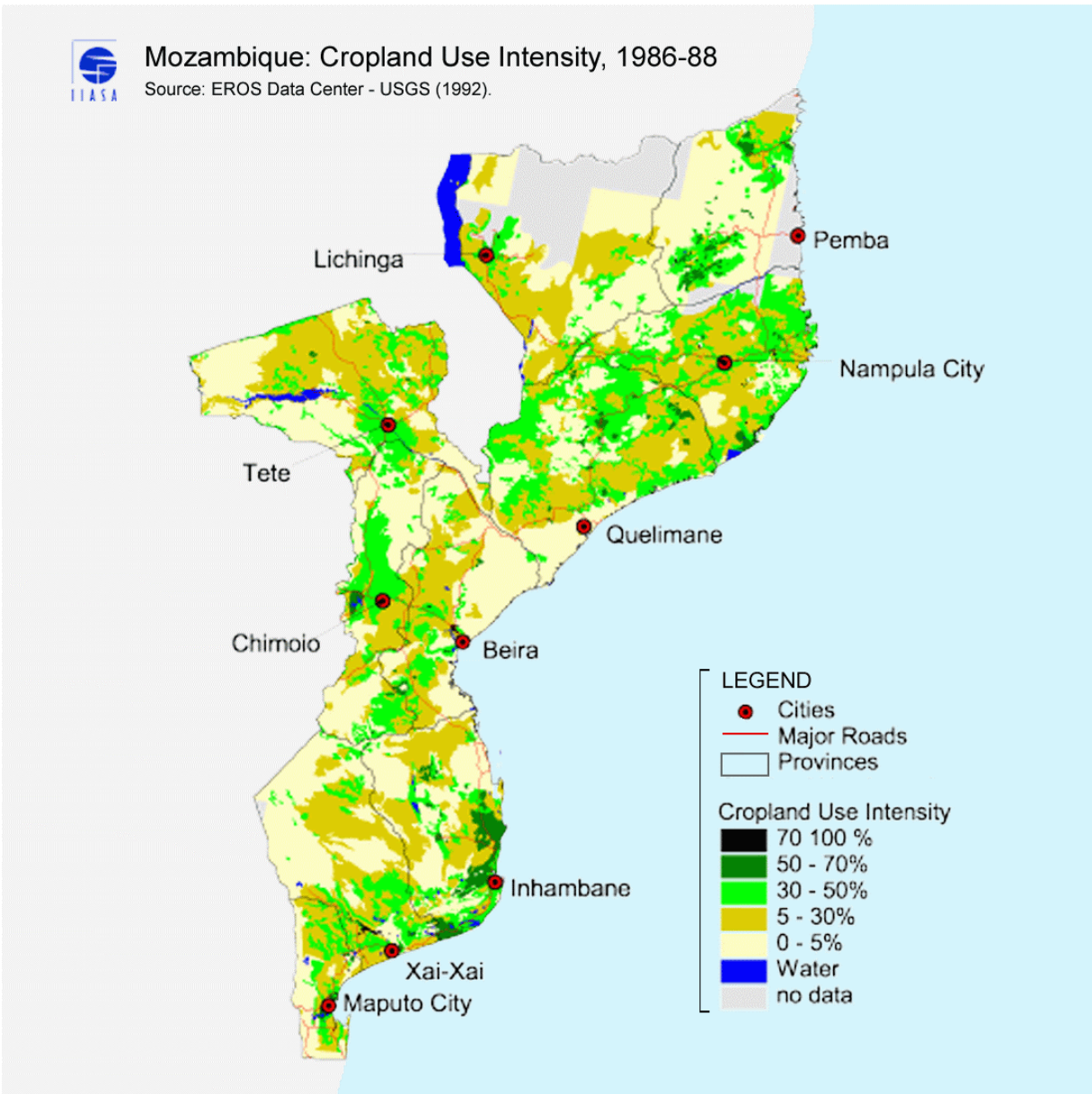


Appendix 7: Forest Cover Map



Source: http://www.fao.org/forestry/fo/country/index.jsp?geo_id=16&lang_id=1

Appendix 8: Cropland Use Intensity



**Appendix 9: Classification of Commercial Timber Tree
Species in Mozambique According to Article 11, No. 1,
Forest Law**

I. PRIME TIMBER SPECIES

Scientific Name	Trade Name	Vernacular Name	Minimum Diameter (DBH) (cm)
<i>Berchemia zeyheri</i>	Pau-Rosa	Mulatchine, Sungagoma	20
<i>Dalbergia melanoxylon</i>	Pau-Preto	Mpinge, Mpivi, N'mico	30
<i>Diospyros kirkii</i>		Mucula-cula, Muoma	40
<i>Dyospiros mespiliformis</i>	Ebano	Mfuma, Ntoma	50
<i>Ekebergia capensis</i>	Inhamarre	Inhamarre	50
<i>Entandophragma caudatum</i>	Mbuti	Bubuti, Mubuti	50
<i>Guibourtina conjugata</i>	Chacate Preto	Chacate	40
<i>Milicia excelsa</i>	Tule	Megunda Mecuco, Mahundo	50
<i>Spirostachys africana</i>	Sândalo	Chilingamache, Mucunite	30

II. FIRST CLASS TIMBER SPECIES

Scientific Name	Trade Name	Vernacular Name	Minimum Diameter (DBH) (cm)
<i>Azelia quanzensis</i>	Chanfuta	Mussacossa, Mugengema, Muoco	50
<i>Androstachys johnsonii</i>	Mecrusse	Cimbirre	30
<i>Albizia glaberrima</i>		Mutivera	40
<i>Albizia vericolor</i>	Tanga-Tanga	Tingare, Mpoвера	40
<i>Balanites maughamii</i>	Nulo	Muvando, Nanluve, Sacanono	30
<i>Breonardia microcephala</i>	Mugonha	Muonha, Nkonha	50
<i>Baikiaea plurijuga</i>		Chiti	30
<i>Combretum imberbe</i>	Mondzo	Munagari, Mungari, Ehupu	40
<i>Cordyla africana</i>	Mutondo	Bonjua, Murroto	50
<i>Diospyros spp.</i>		Mucucul-cula, Muoma	40
<i>Erythrophloeum suaveolens</i>	Missanda	Muave	40
<i>Faurea speciosa</i>		Muxiri, Nthethere, Mussossola	40
<i>Inhambanella henriquesii</i>	Mepiao	Mepiao	50
<i>Khaya nyasica</i>	Umbáua	Mbawa	50
<i>Millettia stuhlmannii</i>	Jambirre	Panga-Panga, Panguire	40
<i>Monotes africanus</i>		Muculala	30
<i>Morus lactea</i>	Mecobeze	Mecobeze	50
<i>Pterocarpus angolensis</i>	Umbila	Mbila, Mucurambira	40
<i>Podocarpus falcatus</i>		Gogogo, Izulambite, Chongue	50
<i>Pseudobersama mossambicensi</i>		Tondue, Minhe-Minhe	40
<i>Swartzia madagascariensis</i>	Pau-Ferro	Nhaquata, Pau-Rosa, Cimbe	30

III. SECOND CLASS TIMBER SPECIES

Scientific Name	Trade Name	Vernacular Name	Minimum Diameter (DBH) (cm)
<i>Albizia adianthifolia</i>	Mepepe	Goana, Megerenge	40
<i>Ambligonocarpus andongensis</i>	Mutiria	Banga-wanga, Mutindire	40
<i>Bombax rhodognaphalon</i>	Sumauma	Meguza, Mefuma	50
<i>Brachystegia boehmii</i>	Mafuti	Mfuti, Mopwo	40
<i>Brachystegia bussei</i>		Kokoro	40
<i>Brachystegia longifolia</i>		Tagate, Takata, Itakhata	40
<i>Brachystegia manga</i>	Messassa	Mpapa Rupakhole	40
<i>Brachystegia spiciformis</i>	Messassa	Mpapa, Tsondo	40
<i>Brachystegia utilis</i>		Nankweso, Mucoio	40
<i>Burkea africana</i>	Mucarala	Mucarati, Nkarara, Mecimbe	40
<i>Julbernardia globiflora</i>	Messassa Encarnada	Muhimbe, Mpacala	40
<i>Newtonia buchananii</i>	Mafumuti	Nipovera	50
<i>Newtonia hildebrandtii</i>	Infomoze	Infomoze	50
<i>Parkia filicoidea</i>	Mucuti	Mucuti	50
<i>Ptelendron myrtifolia</i>	Mungoroze	Mduro, Nleva	40
<i>Ricinodendron rautaneii</i>	Mungomo	Ngomo, Iphaka	50
<i>Sclerocarya birrea</i>	Canho	Mfula, Tsula, Nkokwo	50
<i>Sterculia quinqueloba</i>	Metonha	Ntonha, Nthumpu	40
<i>Stercuria appendiculata</i>	Metil	Njale	50
<i>Terminalia spp.</i>	Messinge	Meculungo	40
<i>Trichilia emetica</i>	Mafurreira	Muciquiri, Mafurra	40

IV. THIRD CLASS TIMBER SPECIES

Scientific name	Trade Name	Vernacular Name	Minimum Diameter (DBH) (cm)
<i>Acacia nigrescens</i>	Namuno	Mecungo, Micaia	40
<i>Anthocleista grandiflora</i>	Mezambe	Rotanda	30
<i>Avicannia spp.</i>	Magal Branco	Mangal Branco	30
<i>Bridelia micrantha</i>	Metacha	Melelha, Mussaba	40
<i>Barringtonia recemosa</i>	Mangal	Massinha, Mussaba	30
<i>Bruguiera gymnorhiza</i>	Mangal Encarn	Mangal Encarnado	30
<i>Cassipourea gummiflua</i>	Mezambe	Mezambe	30
<i>Celtia africana</i>		Messucandiri	40
<i>Celtis gomphophylla</i>		Mrtuzite	50
<i>Cleistanthus holtzii</i>		Nacuva.Nacura	50
<i>Cynometra carvalhoi</i>	Evate	Evate	40
<i>Ceriops tagal</i>	Mangal Branco	Mangal Bronco	30
<i>Dialium schlechteri</i>	Ziba	Nziba, Ziva	40
<i>Dialium spp.</i>		Mepepete	40
<i>Erythrophloeum spp.</i>		Incalazi, Tchaia, Muacari	40
<i>Funtumia latifolia</i>		Nhapwepwa	30
<i>Guibourtia coleosperma</i>	Chacate Encar.	Chacate Encarnado	40
<i>Heritiera littoralis</i>	Mangal Branco	Luabo	30
<i>Kigelia pinnata</i>		Vunguti, Nrikiriki	40
<i>Parinari curatellifolia</i>		Muhula, Muhula, Muanka	30
<i>Pericopsis angolensis</i>	Muanga	Chuanga, Muaca, Muanka	40
<i>Phyllanthus spp.</i>		Chire, Mecua	50
<i>Piliostigma thoningii</i>	Mucequece	Mucequece	40
<i>Pseudolachnostylia maproneifolia</i>		Messolo, Ntholo, Mussonjoa	30
<i>Ptaeroxylon obliquum</i>		Tchetcheretane	40
<i>Rhizophora mucronata</i>	Mangal Encar.	Mangal Encarnado	30
<i>Sapium ellipticum</i>	Tchaia	Tchaia	40
<i>Sideroxylon cordatum</i>		Mebope	40
<i>Syzygium cordatum</i>		Mecurri, Tucura, Mudlho	40
<i>Syzygium guineense</i>	Jambaloeiro	Mecurre Nakuthanthe, Mecuti	40
<i>Terminalia sericea</i>	Inconola	Sai-Sai, Kassanche, Messusso	30
<i>Terminalia stenostachya</i>		Sai-Sai, Kassanche	30
<i>Uapaca kirkiana</i>	Metongoro	Metela, Nahunkwo	30
<i>Upaca nitida</i>	Metongoro	Metela, Nakachunkwo	30
<i>Upaca zanguebarica</i>	Metongoro	Kochokore	30
<i>Vitex doniana</i>		Nhazuovo	40
<i>Vitex spp.</i>		Nakuna	40
<i>Xeroderris sthulmannii</i>	Mulonde	Merunde, Nlothe	40
<i>Xylia spp.</i>			40
<i>Xylopiia aethiopica</i>		Mepeza	40

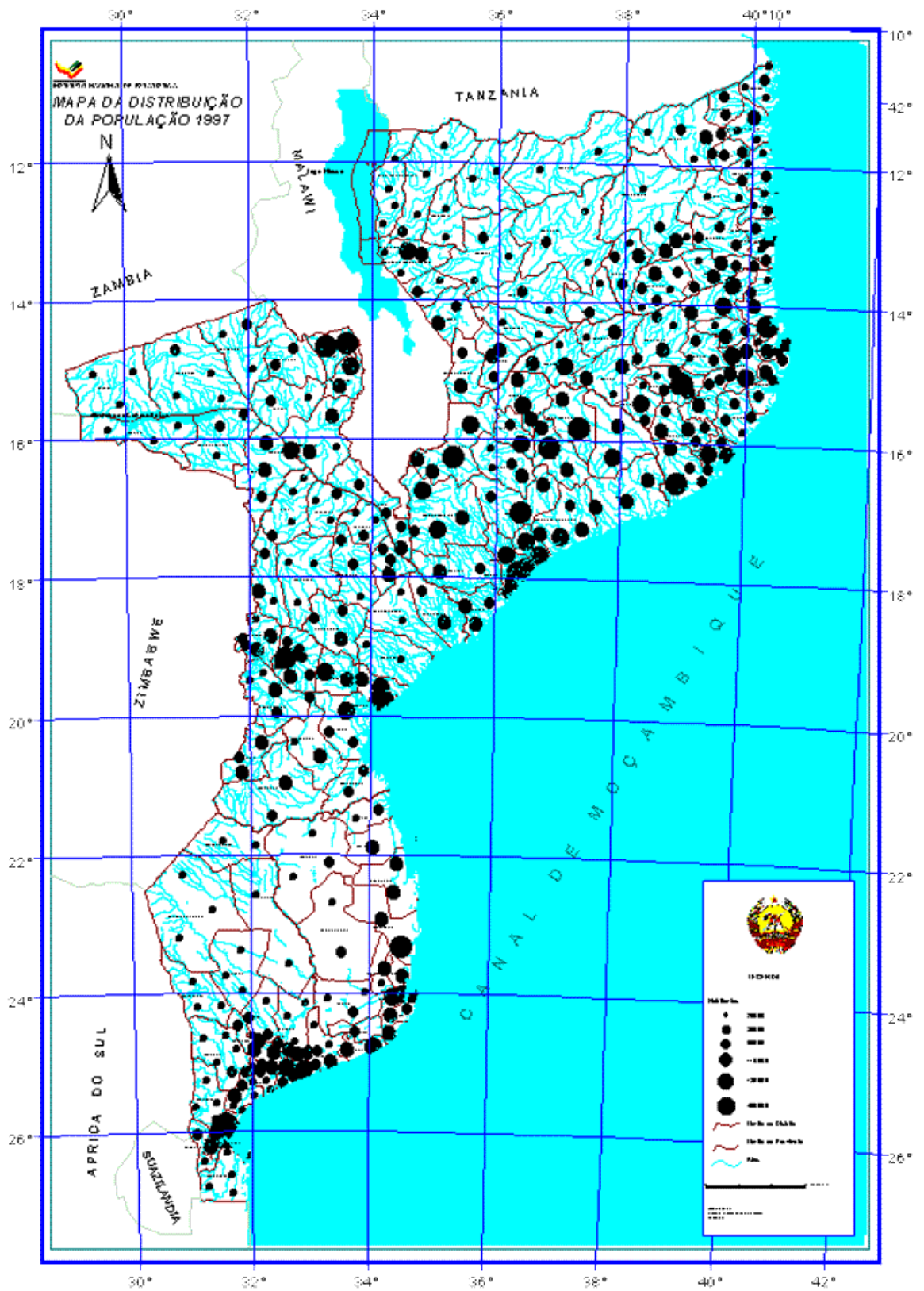
V. FOURTH CLASS TIMBER SPECIES

Scientific Name	Trade Name	Vernacular Name	Minimum Diameter (DBH) (cm)
<i>Acacia albida</i>		Micaia, Dzungua, Sango	40
<i>Acacia burkei</i>		Micaia, Munga	40
<i>Acacia erioloba</i>		Micaia, Munga	40
<i>Acacia karroo</i>		Micaia, Munga	40
<i>Acacia nilotica</i>		Micaia, Munga	30
<i>Acacia polycantha</i>		Micaia, N'roca	40
<i>Acacia robusta</i>		Micaia, Massadzi	40
<i>Acacia senegal</i>		Micaia, Munga	40
<i>Acacia siberana</i>		Micaia, Gunga	30
<i>Acacia tortilis</i>		Micaia, Munga	40
<i>Acacia xanthophloea</i>		Micaia, Megerenge	30
<i>Antidesma venosum</i>		Micaia, Chongue	30
<i>Borassus aethiopicum*</i>		Micaia, Palmeira	30
<i>Colophospermum mopane</i>		Chanato, Nissamo, Missanye	30
<i>Cussonia spp.</i>		Capwapwa, Nampuko-puko	50
<i>Dolichandrone alba</i>		Tsani	30
<i>Erythrina livingstonei</i>		Titi, Nancilacona	40
<i>Fernandoa magnifica</i>		Tondjua, Mpovataci	30
<i>Hirtella zanguebarica</i>		Cimboma, Mucimboma	30
<i>Hyphaene spp.*</i>		Micheu, Palmeira	30
<i>Kirkia acuminata</i>		Mtumbui, Poko-Poko	40
<i>Lannea spp.</i>		Chiucanho, Msatoto, Cimuii	40
<i>Lecanidiscus fraxinifolia</i>		Mutarara	30
<i>Manilkara spp.</i>		Nheve, Nhewa	40
<i>Mimusops spp.</i>		Ntzole, Bengwerwa	40
<i>Treculia africana</i>		Tchaia	50
<i>Tamarindus indica**</i>	Tamarindo	Tamarinho, wepa	50

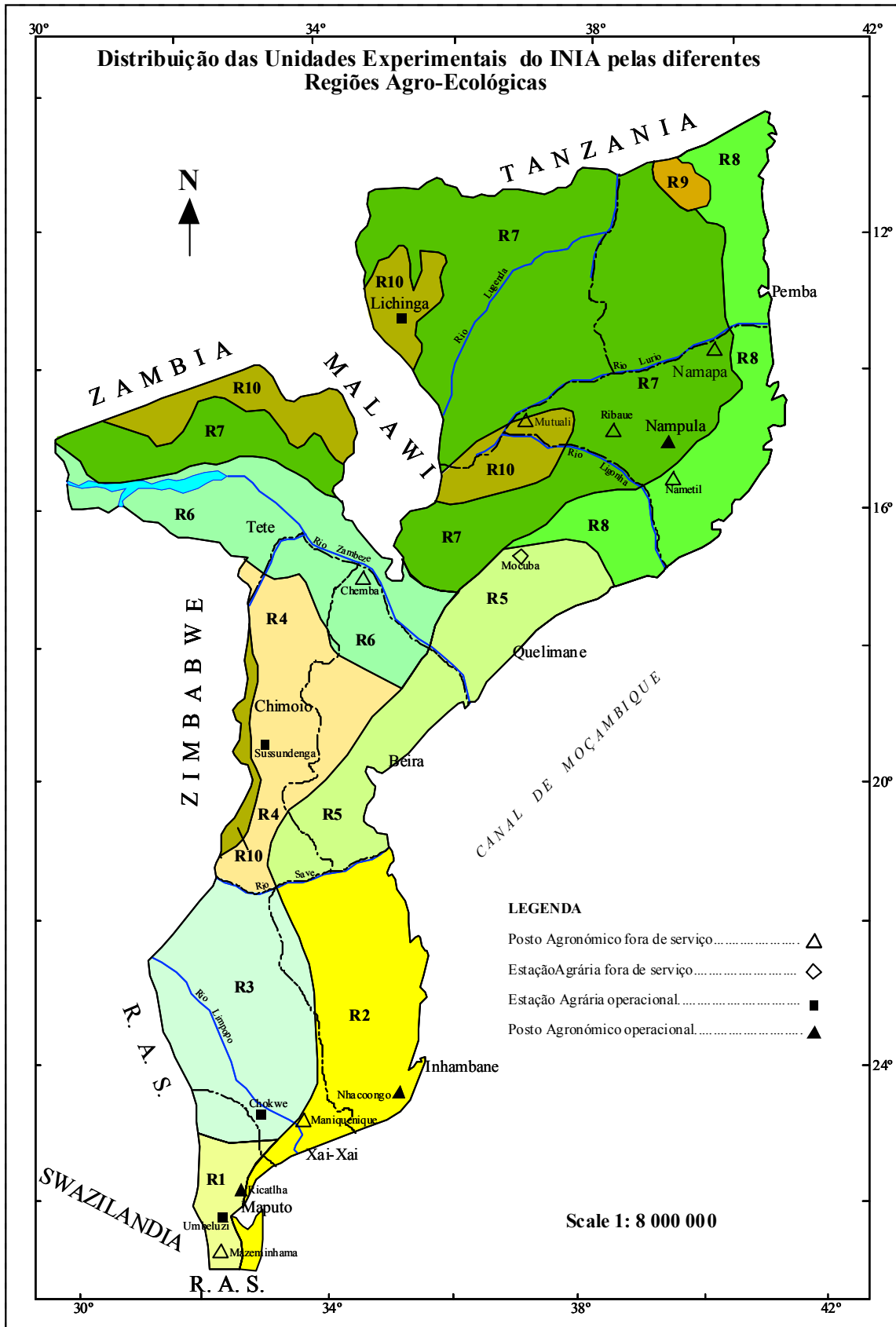
* Palm tree

** Introduced naturalized species.

Appendix 10: Population Density



**Appendix 11: Agro-Ecological Regions of Mozambique
(INIA, 2002)**



**Appendix 12: Descriptions of Agro-Ecological Regions
of Mozambique (Source: INIA, 2002)**

The Inland Maputo and South Gaza Region (R1)

The Inland Maputo and South Gaza Region is a relatively small area covering an covering an Inland strip of Maputo Province and the southern interior land of Gaza Province. The major part of the region is under 200 meters altitude; the land of Namaacha reaches 500 meters altitude. The rains are concentrated from November to March, season characterized by great irregularity with respect to the beginning of the season, the duration of the season, and the quantity of precipitation. Rain can occur in this region during the cool season. The growing period during the rainy season has a moderately warm temperature regime (20-25 degrees).

With the exception of the soils in the region of Pequenos Libombos, Moamba and the valley of the Limpopo, Incomati and Umbeluzi rivers, the soils are of sandy or sandy loam texture. The family farmers cultivate the land during the rainy season and the cool season. During the rainy season they produce maize, cowpea, peanuts and cassava. The soil most preferred for cassava and groundnut is of light texture. Given the short duration of the growing season, short-cycle crop varieties are normally used. The production of sweet potato is carried out on the lowest land and along watercourses and where there are conditions of moisture retention. This region has large areas of pasture and a rural population that traditionally raises cattle and goats. In the region exist important areas of irrigation that could be increased in the medium term.

The Coastal Region South of the Save River (R2)

The Coastal Region South of the Save River is an extensive area from southern Maputo Province to northern Inhambane Province that has one of the highest population densities in the country. There is a warm rainy season between November and March in most of the region, not including an area adjacent to the coast where rain can start in October and last until April. Rains can occur during the cool season, which has particular benefit for cassava and cashew. With the exception of alluvial land and certain low zones, the soils have a sandy texture.

The most important annual crops are maize, cowpea, groundnut, sweet potato and cassava. Depending on the type of land, the cropping of maize/cowpea and cassava/groundnut are dominant. Due to the limited availability of land, there is a tendency to intercrop all four crops. The practice of shifting cultivation encounters difficulties due to the lack of land. As a result the fallow period has been reduced from 20 years with three of cropping, to five years with three years of cropping. Without the use of fertilizers where conditions allow, it can be expected that land productivity will decrease significantly. The production of cashew in this region is one of the most important sources of income for the rural population. The low areas and the river valleys are important for the production of rice.

Center and North of Gaza and the West Inhambane Region (R3)

The Center North of Gaza and the West Inhambane Region consists of a vast interior zone with relatively low level of population. It is one of the most arid regions of the county with an annual rainfall 400-600 mm. Concentrated in the period between November and February. Given the lack of soil moisture, sorghum and millet are also grown in the region. Maize has limited potential.

The family farmers also have smallholdings of cattle and goats. Considering the duration of the crop growing period, short cycle varieties and techniques of moisture conservation would be important requirements to ensure an acceptable degree of food self-sufficiency for the rural population of this region.

Médium Altitude Region of Central Mozambique (R4)

The Medium Altitude Region of Central Mozambique is a region that includes land between 200 and 1000 meters above sea level located in the provinces of Sofala and Manica. It has an annual rainfall of 1000-1200 mm. Concentrated in the period between November and March. The crop growing period varies between 120 and 180 days. The majority of soils are light, with some occurrence of heavy soils. The average temperature during the crop growing period varies between 17.5 and 22 degrees Celsius. The crops of maize, sorghum, cassava and cowpea predominate. In the more moist areas, farmers cultivate sweet potato and rice. In this region there is good potential to produce cotton. It is a region with a moderate to high population.

Low Altitude Region of Sofala and Zambézia (R5)

The Low Altitude Region of Sofala and Zambézia embraces a strip of land on the coast of variable width that extends from the south of Sofala to Pabane district in Zambezia Province. Depending on the topography, the soils have a sandy texture alternating with regions of heavy texture (fluvisols and vertisols).

In general the region has moderate to high annual rainfall (1000 – 1400 mm) and a corresponding evapo-transpiration range. The rainy period starts in November and ends between March and May, depending on the area.

In the heavy soils areas, the cultivation of rainfed rice predominates. In the regions of well-drained soils, the crops of maize, sorghum, millet, cassava and cowpea are found in association depending on the availability of land and water. Cashew and cotton are important cash crops in the farming systems.

Semi-arid Region of the Zambezi Valley and Southern Tete Province (R6)

The Semi-arid Region of the Zambezi Valley and Southern Tete Province consists of land from the driest region of the Zambezi watershed upstream from Mopeia district to the border of Zambia. Most of the land does not exceed 200 meters in altitude and the rainfall is 500-800 mm, concentrated between November and March. A zone more downstream is more rainy and has two distinct regions of annual evapo-transpiration potential: one of 1200-1400 mm and an area with a large water deficit for most of the year and an elevated risk of crop loss. The crops of sorghum and millet predominate. No cassava is cultivated due to the complete absence of rain during the cool season and the elevated evapo-transpiration rate. There is great potential for the cultivation of cotton on well-drained land and rice on the margins of watercourses.

Médium Altitude Region of Zambeze , Nampula, Tete, Niassa and Cabo Delgado (R7)

The Medium Altitude Region of Zambezia., Nampula, Tete, Niassa and Cabo Delgado is a vast region including the land between 200 and 1000 meters in altitude (sub-planaltic, low planatic and mid-planaltic) in the interior of Zambézia, Nampula and southern Cabo Delgado and Niassa. The annual rainfall and potential evapo-transpiration of the region range between 1000 and 1400 mm. In terms of the average temperature during the growing season there are areas with above 25 degrees (classified as warm region) and others with temperatures between 20-25 degrees (moderately warm). The texture of the soils varies from sandy to clay, consistent with the topography.

Basically there are two types of cropping systems that differ by being dominated by maize or sorghum. Cassava is widely cultivated, and cowpea and groundnut are other important crops. In the most eastern part of the region cashew is very important, in almost all the region there is a high potential for the production of cotton, which has been practiced over several decades. This is an agricultural area with important human and agro-ecological potential

Coastal Littoral of Zambezia, Nampula and Cabo Delgado (R8)

The Coastal Littoral of Zambezia, Nampula and Cabo Delgado consist of a strip of land of varying width on ths coast from Pebane in Zambezia to Quionga in Cabo Delgado. The average temperature during the growing season is greater that 25 degrees. The annual rainfall ranges between 800 and 1200 mm, and the evapo-transpiration rate ranges between 1400 and 1600 mm. The soils generally are of sandy type, with heaver soils in the lowest areas. The production system is characterized by the production of cassava and millet. In the low areas rainfed rice is cultivated. Cashew has great importance for income for family farmers.

North Interior Region of Cabo Delgado – Mueda Plateau (R9)

The North Interior Region of Cabo Delgado includes the plateau of Mueda and Macomia and the surrounding areas of more that 200 meters altitude. The annual rainfall is between 1000 – 1200 mm, and the annual evapo-transpiration potential is between 1200 – 1400 mm. The rains are concentrated between December and March; the rains are normally regular. The soils are generally of loamy to sandy texture, with heavier soils occurring in the lowest areas. The dominant crop in the production system is maize. The crops of sorghum, Cowpea, cassava and sesame are also cultivated. Cashew is an important source of income.

High Altitude Region of Zambezia, Niassa, Angonia and Manica (R10)

The High Altitude Region of Zabezia, Niassa, Angonia-Maravia and includes land above 1000 meters, notably in the planaltic regions of Lichinga, Angonia, Maravia, high Zambezia, Serra Choa, Manica and Espungabera. The annual rainfall is greater that 1200 mm and average temperature during the period is between 15 and 22.5 degrees. The soil types are principally ferrasols of common beans and potatoes are also important. Given the high levels of rainfall, erosion and the loss of soil fertility are important problems. Finger millet is also cultivated in the areas and has important potential as a food and cash crop.

Appendix 13: Forest Concessions in Mozambique

Company Name	Concession Number	Province	Total Area (hectares)
S. Moveis Licungo	1	Zambezia	43,576
Madal	2	Zambezia	110,491
Madegraria	3	Zambezia	11,017
Comp. de Mad. de Moç.	4,10,11,27	Sofala, Manica (#27)	104,637
Eco-Timber, Lda.	5,6,7	Sofala	33,904
Empacol	8,9,12,13,16,18,25	Sofala, Manica (#25)	84,824
I.M.M.	14	Sofala	23,021
Carpintaria Marcenar	15	Sofala	10,630
Volfrez, Lda.	17	Sofala	42,126
TCT	19,20	Sofala	34,822
Timber Word Moç.	21,24	Nampula	137,210
Ali Ossene	22	Nampula	72,528
A.E.I.	23	Nampula	61,073
Inbcio A. Nunes	26	Manica	63,869
Cimac-Gonsalves Chaz.	28	Manica	54,994
Adam Ismail	29	Cabo Delgado	51,423
PANGA	30	Cabo Delgado	83,364
SIMAF	31	Cabo Delgado	76,556
ROMACA	32	Cabo Delgado	51,882
WOOD EXPORT	33	Cabo Delgado	98082
MITI Ltda.	34,35,36	Cabo Delgado	134,804
MAHUMED FARUK	37	Cabo Delgado	15,261
ETCM	38,39	Cabo Delgado	72,053
Mahate Florestal	40	Cabo Delgado	63,831
Moçambique Madeiras	41	Cabo Delgado	40,224
MADEIRAM	42	Cabo Delgado	75,302
		(Total)	1,651,504

Source: DNFFB/UIF, October 2002

**Appendix 14: List of Protected, Threatened, and
Endangered Species, with Fines**

Notes: These animals cannot be hunted. If someone do so there is a fine attached to each of the animals. The list is related with the no. 5 of article 43 of the forestry and wildlife regulation from the Law no. 10/99 of 7 of July.

Name in Portuguese	Scientific Name	Fines in (1000 MT) (1 USD= 24500 MT) 13/11/2002
Mamíferos		
<i>Cabrito das pedras</i>	<i>Oreotragus oreotragus</i>	2.000
<i>Caracal</i>	<i>Felis caracal</i>	2.000
<i>Chacal dorso preto</i>	<i>Canis mesomelas</i>	4.000
<i>Chacal listrado</i>	<i>Canis adustus</i>	4.000
<i>Cahango da montanha</i>	<i>Redunca fulvorufula</i>	8.500
<i>Chita</i>	<i>Acinonyx jubatus</i>	50.000
<i>Civeta</i>	<i>Viverra civeta</i>	2.000
<i>Dugongo</i>	<i>Dugong dugon</i>	50.000
<i>Doninha de nuca branca</i>	<i>Poecilogale albinucha</i>	1.000
<i>Gato bravo</i>	<i>Felis Lybica</i>	1.000
<i>Gato serval</i>	<i>Felis serval</i>	5.000
<i>Ganeta ou simbas</i>	All species	1.000
<i>Girafa</i>	<i>Giraffa camelopardalis</i>	40.000
<i>Hiena castanha</i>	<i>Hyaena brunnea</i>	4.000
<i>Jagras</i>	All species	1.000
<i>Lontras</i>	All species	2.000
<i>Mabeco</i>	<i>Lycaon pictus</i>	8500
<i>Macaco de cara preta ou Azul</i>	<i>Cercopithecus pygerythrus</i>	1.000
<i>Macaco simango</i>	<i>Cercopithecus mitis</i>	3.000
<i>Manguços</i>	All species	1.000
<i>Maritacaca</i>	<i>Ictonyx striatus</i>	1.000
<i>Matagaiça</i>	<i>Hippotragus equines</i>	8.500
<i>Mzanze</i>	<i>Damaliscus lunatus</i>	8.500
<i>Pangolim</i>	<i>Manis temminckii</i>	3.000
<i>Protelo</i>	<i>Proteles cristatus</i>	4.000
<i>Raposa aorelhuda</i>	<i>Otocyon megalotis</i>	4.000
<i>Ratel</i>	<i>Mellivora capensis</i>	2.000
<i>Rinoceronte de labio prensil</i>	<i>Diceros bicornis</i>	100.000
<i>Rinocenronte de labio quadrado</i>	<i>Ceratotherium simum</i>	100.000
<i>Sitatunga</i>	<i>Limmotrague spekii</i>	8.500
Aves		
<i>Rapina (diurnal e noturna)</i>	All species	2.000
<i>Abetarda gigante</i>	<i>Choriotis kori</i>	4.000
<i>Abutres</i>	All species	2.000
<i>Avestruz</i>	<i>Struthio australis</i>	25.000
<i>Calau do solo</i>	<i>Bucrovus cafer</i>	3.000
<i>Cegonhas</i>	All species	2.000
<i>Flamingos</i>	All species	3.000
<i>Gaivotas e gaivinhas</i>	All species	2.000
<i>Garças</i>	All species	2.000
<i>Marabu</i>	<i>Leptoptilos crumeniferus</i>	3.000
<i>Pelicanos</i>	All species	2.000
<i>Sepentario</i>	<i>Sagittarius serpentarius</i>	3.000

Name in Portuguese	Scientific Name	Fines in (1000 MT) (1 USD= 24500 MT) 13/11/2002
Repteis		
<i>Pitao ou Giboia</i>	All species	2.000
<i>Tartaruga marinha</i>	All species	25.000

Source: Forestry and Wildlife Regulation Decree no. 1272002, June 6

List of precious wood:

Note: Fines for cutting a precious wood are similar for all species. It cost 2,000,000 MT per m³. This value correspond to four times more than a first class wood and 7 times more for 2nd class and 10 times more for a 3rd class and 20 times more for a 4th class wood.

Scientific Name	Commercial name	Local name
<i>Berchemia Zeyheri</i>	<i>Pau-rosa</i>	<i>Mulatchine, sungagoma</i>
<i>Dalbergia melanoxylon</i>	<i>Pau-preto</i>	<i>Mpinge, Mpivi, Nmico</i>
<i>Diospyros kikki</i>		<i>Mucula-cula, Muoma</i>
<i>Dyospiros mespiliformis</i>	<i>Ebano</i>	<i>Mfuma, Ntoma</i>
<i>Ekebergia capensis</i>	<i>Inhamarre</i>	<i>Inhamarre</i>
<i>Entandophragma caudatum</i>	<i>Mbuti</i>	<i>Bubuti, Mubuti</i>
<i>Guibourtia conjugata</i>	<i>Chacate preto</i>	<i>Chacate</i>
<i>Milicia excelsa</i>	<i>Tule</i>	<i>Megunda, Mecuco, Mahundo</i>
<i>Spirostachys africana</i>	<i>Sandalo</i>	<i>Chilingamache, Mucunite</i>