BEST PRACTICES OF ENVIRONMENTAL
INFORMATION SYSTEMS (EIS):
THE CASE OF MOZAMBIQUE

MAY 1998

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Simão Pedro Santos Joaquim
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Philippe Gerbe

On behalf of the World Bank–Environment Group, Africa Region

Program on Environment Information Systems in Sub-Saharan Africa (EIS-SSA)
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- Ministry for Co-ordination of Environmental Affairs (MICOA);
- Ministry of Agriculture and Fisheries (MAP);
- Coastal Zone Management Unit of MICOA;
- Sustainable Development Network Programme (SDNP);
- National Agricultural Research Institute (INIA);
- National Directorate of Forestry and Wildlife (DNFFB);
- National Directorate of Geography and Cadastre (DINAGECA);
- National Directorate of Tourism (DINATUR);
- National Institute of Statistics (INE);
- National Institute of Meteorology (INAM);
- National Institute of Physical Planning (INPF);
- National Institute of Rural Development (INDER);
- National Demining Commission (CND);
- Transfrontier Conservation Areas project (TFCA);
- Secretariat for Eastern Africa Coastal Area Management (SEACAM);
- World Conservation Union (IUCN);
- Endangered Wildlife Trust (EWT);
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Special acknowledge and thanks go to the Norwegian Co-operation who strongly supports the EIS Committee activities, and especially the EIS Best Practices Working Group.
### Glossary of Terms

<table>
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<th>Description</th>
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</table>
| A       | ADB: African Development Bank  
African Development Fund  
ALES: Automated Land Evaluation System (developed by INIA) |
| C       | CBO: Community Based Organisation  
CENACARTA: National Remote Sensing Centre  
CIDA: Canadian International Development Agency  
CNA: Agriculture National Commission  
CND: National Demining Commission  
CSIR: Council for Scientific and Industrial Research South Africa  
CZMP: Coastal Zone Management Plan |
| D       | DANIDA: Danish International Development Agency  
DHA: Department of Humanitarian Affairs  
DINAGECA: National Directorate of Geography and Cadastre  
DINAP: National Directorate of Livestock  
DINATUR: National Directorate of Tourism  
DNER: National Directorate of Rural Extension  
DNFFB: National Directorate of Forestry and Wildlife  
DNG: National Directorate of Geology  
DNHA: National Directorate of Agricultural Hydraulics  
DPCCN: Department of Prevention and Combating of Natural Disaster  
DTA: Land and Water Department  
DXF: Autocad's Data Exchange Format |
| E       | EEC: European Economic Community  
EIA: Environmental Impact Assessment  
EIS: Environmental Information System  
ELMS: Environment and Land Management Sector  
ENSO: El Niño Southern Oscillation  
EU: European Union  
EWT: Endangered Wildlife Trust |
| F       | FAO: Food and Agriculture Organisation of the United Nations  
FINNIDA: Finnish International Development Agency |
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Abbreviation and Description</th>
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<tbody>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GEF</td>
<td>Global Environment Facility</td>
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<tr>
<td>GERFFA</td>
<td>Management of Forest and Wildlife Resources project</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GTZ</td>
<td>Deutsche Gesellschaft für Technische Zusammenarbeit</td>
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<tr>
<td>ICZM</td>
<td>Integrated Coastal Zone Management</td>
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<tr>
<td>IDA</td>
<td>International Development Association</td>
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<tr>
<td>IFAD</td>
<td>International Fund for Agriculture Development</td>
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<tr>
<td>IMERCSA</td>
<td>India Musokotwane Environment Resource Centre for Southern Africa</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
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<tr>
<td>INAHINA</td>
<td>National Institute of Hydrography and Navigation</td>
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<tr>
<td>INAM</td>
<td>National Institute of Meteorology</td>
</tr>
<tr>
<td>INDER</td>
<td>National Institute of Rural Development</td>
</tr>
<tr>
<td>INE</td>
<td>National Institute of Statistics</td>
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<tr>
<td>INFOTERRA</td>
<td>International Information System on Environment</td>
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<tr>
<td>INIA</td>
<td>National Agricultural Research Institute</td>
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<td>INIVE</td>
<td>National Institute for Veterinary Research</td>
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<td>INNOQ</td>
<td>National Institute of Standardisation and Quality</td>
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<td>INPF</td>
<td>National Institute of Physical Planning</td>
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<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
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<tr>
<td>IUCN</td>
<td>The World Conservation Union</td>
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<td>LC</td>
<td>Land Commission</td>
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<tr>
<td>MAE</td>
<td>Ministry of State Administration</td>
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<td>MAP</td>
<td>Ministry of Agriculture and Fisheries</td>
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<tr>
<td>MICOA</td>
<td>Ministry for Co-ordination of Environmental Affairs</td>
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<tr>
<td>MICTUR</td>
<td>Ministry of Industry, Commerce and Tourism</td>
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<td>MISAU</td>
<td>Ministry of Health</td>
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<td>MITC</td>
<td>Ministry of Transports and Communications</td>
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<td>MOPH</td>
<td>Ministry of Public Works and Housing</td>
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<tr>
<td>MTS</td>
<td>Meticales (local currency: 1 US$ = 11,600 MT April 1998)</td>
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<tr>
<td>NBU</td>
<td>National Biodiversity Unit</td>
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<td>NCSD</td>
<td>National Commission for Sustainable Development</td>
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<td>NDVI</td>
<td>Normalised Difference Vegetation Index</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>NEC</td>
<td>National Environment Commission</td>
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<td>NEMP</td>
<td>National Environmental Management Program</td>
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<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>NOAA</td>
<td>National Oceanographic and Atmospheric Administration</td>
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<td>NORAD</td>
<td>Norwegian Agency for Development</td>
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<td>PROAGRI</td>
<td>Sectoral Programme Investment of the MAP</td>
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<td>PROL</td>
<td>Local Agencies Reform</td>
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<td>REVIS</td>
<td>Regional Vegetation Information System</td>
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<tr>
<td>SAC</td>
<td>Satellite Applications Centre of the CSIR</td>
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<td>SADC</td>
<td>Southern Africa Development Committee</td>
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<td>SDNP</td>
<td>Sustainable Development Network Programme</td>
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<td>SEAC</td>
<td>State Secretariat for Civil Aeronautic</td>
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<tr>
<td>SEACAM</td>
<td>Secretariat for Eastern Africa Coastal Area Management</td>
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<tr>
<td>SETU</td>
<td>SADC Environmental Information Systems Technical Unit</td>
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<tr>
<td>SIDA</td>
<td>Swedish Co-operation</td>
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<td>SPGC</td>
<td>Provincial Services of Geography and Cadastre</td>
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<tr>
<td>TDM</td>
<td>Telecomunicações de Moçambique</td>
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<tr>
<td>TFCA</td>
<td>Transfrontier Conservation Areas (project)</td>
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<tr>
<td>TVM</td>
<td>Televisao de Moçambique</td>
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<tr>
<td>UEM</td>
<td>Eduardo Mondlane University</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNCF</td>
<td>United Nations Children’s Fund</td>
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<td>UNCHR</td>
<td>United Nations High Commissioner for Refugees</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNFPA</td>
<td>United Nations Population Fund</td>
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<tr>
<td>UNOHAC</td>
<td>United Nations Office for Humanitarian Assistance</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>VEGRIS</td>
<td>Vegetation Resources Information System</td>
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BEST PRACTICES OF ENVIRONMENTAL INFORMATION SYSTEMS (EIS): THE CASE OF MOZAMBIQUE

W
WB  World Bank
WFP  World Food Programme
WWF  World-Wide Fund for Nature
III. Administrative map of Mozambique
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<tbody>
<tr>
<td>County Surface Area</td>
<td>Total Population (millions inhabitants)</td>
<td>1996</td>
<td>INE</td>
<td>16.6</td>
<td>15.7</td>
<td>17.4</td>
<td>16.7</td>
<td>8.7</td>
<td>9.3</td>
<td>22.6</td>
<td>26.7</td>
<td>47.4</td>
<td>58.4</td>
<td>28.7</td>
<td>31.7</td>
<td>28.7</td>
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**IV. Mozambique: Some indicators**

- **Macro-Economic Indicators**
  - Total GNP (billions US$): 1.5
  - GNP Per Capita (US$): 90
  - Annual Growth Rate (% of GDP): 5.8
  - Agriculture (% of GDP): 35
  - Industry (% of GDP): 13
  - Services (% of GDP): -494
  - Balance of Payments (US$ million): -755
  - External Debt (US$ million): 7,453
Presented in this report should be used with caution. A series of tasks due to effects of the recent war. Thus, most of the data and estimates may be flawed. NE$: The Mozambican information management environment of environmental and natural resources has diminished.

Source: NE$ = World Bank; INE = Instituto Nacional de Estatística (National Institute of Statistics).

<table>
<thead>
<tr>
<th>NE$</th>
<th>MICOA</th>
<th>NE$</th>
<th>MICOA</th>
<th>NE$</th>
<th>MICOA</th>
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<tr>
<td>1997</td>
<td>167</td>
<td>1997</td>
<td>881</td>
<td>1997</td>
<td>222</td>
</tr>
<tr>
<td>1996</td>
<td>6492</td>
<td>1996</td>
<td>11222</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecology/Biodiversity Indicators</th>
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<tbody>
<tr>
<td>Services</td>
</tr>
<tr>
<td>Dow Jones Info.</td>
</tr>
<tr>
<td>WB 1998</td>
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<tr>
<td>US$ 1 = MT 11.400</td>
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<tr>
<td>Mechanical Exchange Rate</td>
</tr>
<tr>
<td>Grant Received (MT 10)</td>
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<tr>
<td>Deficit (MT 10) : Before Grant</td>
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<tr>
<td>Gov. Budget (MT 10) : Expenses</td>
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<td>Gov. Budget (MT 10) : Income</td>
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<thead>
<tr>
<th>Macro-Economic Indicators</th>
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<tbody>
<tr>
<td>Source</td>
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<tr>
<td>Period</td>
</tr>
<tr>
<td>Indicator</td>
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<tr>
<td>Sector</td>
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*Quantities of endemic or near-endemic species
V. Population map of Mozambique

Source: INE, 1997
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0. Executive Summary

The objective of this project was a case study on Best Practices of EIS in Mozambique within the context of EIS Program activities in Sub-Saharan Africa.

The potential, constraints, successes, and weaknesses of EIS, based on practical approaches in Mozambique, were assessed and "lessons-learned" were developed. The outcome of the study will be presented and discussed at the next EIS International Workshop in Sub-Saharan Africa.

The study included three main activities (i) Documents and publications review; (ii) EIS survey in Mozambique and (iii) Debriefing meeting with the key personnel. The mission in Mozambique took place from April 16 to May 15, 1998.

0.1 Conclusions

0.1.1 Political and Institutional Aspects

- Environmental planning and management is not totally new to Mozambique. It appeared as a core component of the overall development process in 1990. The civil war (1974–1992) weakened the capacity of the country to carry out a sustainable process of economic development or environmental management. The peace agreement in 1992 followed by the first democratic elections in 1994 were opportunities that gave a boost to the country's developmental activity, thus attracting new donors. Initially, external assistance focused on humanitarian assistance, extending on to investments in agriculture, rural development, education and road rehabilitation increased, reflecting a government's priorities.

- EIS activities also increased in the mid 90s with several initiatives including the creation in 1995 of the Ministry for Co-ordination of Environmental Affairs (MICOA). Even with the creation of MICOA, there is no nationwide EIS in Mozambique at the moment, and no leading agency has really started activities to create one. In other terms, the country does not yet have a comprehensive nationally co-ordinated EIS but several information co-existing systems which can be considered as EIS subsystems. Most of the systems are still in their installation phase even with the local private sector joining forces.

- For many decades, the EIS concept was not known as an operational concept by civilians. The first working group on remote sensing was created in 1978 in Mozambique and stopped running in 1989 upon the creation of the National Remote Sensing Centre (CENACARTA).
Obviously, modern environmental information management tools appeared in Mozambique less than ten years ago. Most of the EIS and GIS developments started with the implementation of information component for specific projects. This helped to design systems with a demand driven approach—even if some of them are finally product-oriented. On the other hand, this evolution did not create a favourable context to have a coherent and homogenous national EIS.

The first National Environment Management Programme (NEMP) was elaborated in the absence of an EIS. The planning process of EIS, which is very recent, is principally reflected in the NEMP. The NEMP process was undertaken in a context of post-war political transition. Several political changes took place in the country between 1992 and 1995. There were general elections in the framework of a new constitution that led to the establishment of a multiparty Parliament, immediately followed by the a new constitution. The attention paid to the NEMP was thus minor compared to huge nation-wide mobilisation and interest that followed the political transformation in Mozambique.

Currently, MICOA, in theory, is the government institution which has the greatest responsibility to manage, co-ordinate, and organise the environmental information system in Mozambique. To carry out this task, the National Commission for Sustainable Development (NCSD), and the National Environment Commission (NEC), if reactivated, will constitute its main political supports at higher level. The NEMP, which is a ten year old programme reflecting the environmental policy of the Government, should normally become its principal working tool in conjunction with the Environmental Framework Law.

Today, there is a growing awareness of environmental issues demonstrated by a strong interest among educated people in several institutions, agencies, Non Government Organisations (NGOs), as well as the private sector. There is an increasing demand for environmental information in general, and a growing need to acquire modern tools and equipment that permit access to it.

Within the new political and economic context, the Government and the donors’ community are favourable to this evolution. Consequently, it is expected that in the forthcoming years, the market of computers, hardware, software, and other telecommunication tools will develop considerably, boosted by the development of provincial capacities. The number of EIS initiatives is increasing every year. In the absence of a co-ordination body, they often lead to overlap and duplication.

The success of the EIS development process depends on political, managerial, and cultural willingness to manage the shift from the current state to that of the future. The implementation process will have to be approached in a multi-disciplinary and multi-sectoral way. This burden cannot sit on MICOA’s shoulders only. All ministries and related organisations will have to play their role in the EIS development process.
Internal co-operation for EIS development is necessary. The willingness for creating working groups and networks involving different categories of institutions proves that Mozambique wants to go that way. External co-operation is widely visible in this framework both at regional and international levels.

Internationally, many programmes, projects or initiatives have been recorded, mostly in coastal areas and in the forest and wildlife sector. These projects are usually designed with donors' assistance, and with the objective of promoting sustainable development and management of resources.

There is no real balance between Maputo and the provincial capitals in terms of resource collection and distribution, or in the framework of data gathering and management. The ongoing decentralisation process is likely to improve the EIS situation, by benefiting local communities and councils, and by reducing the weight of Maputo over the rest of the country. It will be a number of years before important progress can be seen.

Environmental information is available through various groups. Most information can only be found in Maputo, and in paper form. It is very difficult to locate and centralise all the information related to a specific topic or sector. Only a few organisations like CENACARTA, INIA or MICOA maintain a bibliography of their own information and data. As a result, a major complaint was that access to some information was difficult, time consuming, or even impossible.

The growing use of digital data confronts some suppliers with the problem of data exchange, including the legal ramifications. Mozambique does not have a copyright law and most public agencies need to market their product in order to find additional resources to maintain and update their data. Only a very few institutions have already started to define clear Data Exchange Policies to disseminate their information. Unfortunately, neither the content nor the format of the existing digital databases have been designed to be directly compatible. As a result, duplication of digital data production was observed in some agencies (1:250,000 maps digitising for instance). Some common elements to most of the EIS subsystems could facilitate data exchange during the next few years: same working scales, often the same GIS software used by the agency, and the completion in the next two years of large national databases which could be used as standard basic information layers.

**0.1.2 Technical Aspects**

The EIS subsystems are based on a combination of different techniques including digitising existing information like paper maps, and using remote sensing with strong emphasis on data collection. During the last few years, most agencies started or have prepared their conversion to computerised
information management technologies. The existing sub-systems are not technically linked, and the co-ordination is still weak.

Most information systems in Mozambique were planned on the basis of applying remote sensing and/or GIS technologies for data acquisition, update, management, and visualisation, and cartography. In most cases, very little attention has been given to application development. Moreover, the EIS development plans were not designed with an emphasis on establishing a networked EIS that ensured smooth data sharing, but were more designed to respond to specific needs of the host organisation.

Environmental information in Mozambique can be found mostly on analogue supports. The management of these documents is a very classical "library-like" approach. It is interesting to note that one of the most complete sets of environmental reports and studies is held by a private consultant company (Impacto).

The existing EIS subsystem are PC based, usually running Windows 95. The largest systems (in the most advanced units) are also running Windows NT 4.0. Most of the equipment has been financed by projects and are usually up to date, including plotters and telecommunication facilities.

Maputo has four operational private Internet Service Providers (ISPs) who give access to the full internet. In comparison to other African countries, the cost is minimal since it is financed by donors. Most agencies were equipped with modems, and had at least an email account and often had internet access.

Almost all computerised systems are installed in Maputo which can be considered as a "technological island" in Mozambique. Due to the ongoing decentralisation policy, this situation should improve (e.g., an internet connection will be opened in Beira in July 1998).

0.1.3 Economic Aspect

The value of geographic and environmental information is usually difficult to assess. In the case of Mozambique, difficulties come from (i) the lack of reliable figures on environment evaluation, (ii) the lack of available EIS information related to this aspect in the agencies, (iii) the early development state of EIS sector in the country, and (iv) the lack of economical approach in the EIS subsystem implementation. Efficient accounting and monitoring systems have not been established in the implementing agencies, and in the case of public agencies, a part of the budget (e.g. salaries and maintenance costs) is managed at a higher level, preventing these agencies from evaluating the exact cost of their activities.

It is difficult to evaluate the potential market for EIS in Mozambique. It is clear that the development priorities of the country are not focused on EIS implementation. Moreover, the lack of resources of the Government can not
facilitate such a project. Consequently, support from external donors, who financed EIS development during the past few years, will still be needed to support such investments and even a larger part of the operational costs during the next five to ten years in Mozambique.

- Staff salary usually represents the largest part of operational cost financed by the Government. Actual salaries of civil servants are quite low and as a result, most of the EIS projects provide a specific allowance to complement the basic salaries. The amount financed by the Government of Mozambique for the salaries of the local staff involved in EIS development is now compared with the external investments.

- Initially, maintenance of equipment and vehicles is often financed by the same funding mechanisms that finance the equipment.

0.1.4 Human Resources

- It appeared that very few institutions started their activities with a sufficient number of qualified and dedicated national staff in the sector.

- Prior to independence in 1975, there were few trained Mozambican scientists or high level technicians. Following independence, Mozambique embarked upon a massive educational development strategy focusing on primary, secondary and tertiary education Mozambique was in a position in the mid 90s to move from humanitarian assistance to development planning. Human Resources Development (Education) was one of the three high priority sectors.

- Investment from the donors reflected this orientation. Most of the high level technicians presently working on environmental information management were trained abroad, especially in Cuba, France, the Netherlands, Portugal, South Africa, United Kingdom and the former USSR. The Eduardo Mondlane University (UEM) in Maputo has a very limited budget, so all UEM research activities—including some teacher salaries are being supported by international aid.

- Today, experience shows that the capacity to undertake training programmes in most of the EIS technologies already exists in Maputo. Training of at least operators and technicians can now be done locally vice having to train these personnel abroad.

- At the central level, some agencies provide training programs for their staff in financial management, procurement and disbursement, project and strategic planning, policy formulation, programme development and extension, management planning, computer courses, and monitoring and evaluation. Study tours at regional and international level are also organised sometimes as mean to improve national expertise skills, to foster partnerships, sensitisation, and shared learning experiences.
The systems are administratively managed by local technicians, but a strong technical assistance is still in force in all technical aspects related to management and monitoring of EIS and GIS. Technical assistance is always financed through donor funding, usually in the framework of project implementation. For small EIS subsystems implementation, technical assistance turned to long term consultants (2–3 years) to short term consultants (a few weeks). Nevertheless, the set-up of major systems still needs the participation of important technical assistance in order to facilitate the integration of operational and application aspects. This is the case of the national Land Use/Land Cover database.

0.2 Recommendations

Considering all general and specific remarks recorded in the framework of this review, it is important to underline some relevant recommendations:

- Further development is possible and, if well co-ordinated and mastered, may have a determining impact over the whole process of decision making, and over the development of all sectors of the Mozambican economy, society, and culture.

- Development will rely heavily upon opportunities provided by the socio-political stability and legal context of the country as well as other important institutional set-ups that might become instrumental towards installing a dynamic process of information creation and exchange.

- Considering the fact that Mozambique has a lot of small systems, there is a need to set up a leading agency in the country. The « leading agency » in this context should not be considered as an hyper-centralising institution, but rather as a system co-ordinator and server.

- The following objectives are to be considered in this perspective:
  
  * The Environmental Impact Assessment (EIA) should be adopted as a political option by the government and accepted as such by all partners in public and private sector;

  * The country’s legal framework should be revised and reorganised in a coherent way including: (i) a review of existing legislation in certain sectors and their revision to conform to new policies, (ii) Land, Municipality, and Environmental Laws will actually provide a unique opportunity to take into consideration the environmental aspect of any project as an integral part of its designing and the conditions of its sustainability, (iii) the elaboration and adoption of timely and sound regulations relating to legal instruments, and (iv) the setting up of an updated regulatory framework for private sector and local communities to ensure their full involvement in all environmental issues in Mozambique; and
* The country should have signed and ratified all relevant international conventions and treaties related to the environment to which it is party.

- All institutional conflicts should be reduced and a functional administrative framework for EIS should be established in Mozambique leading to:

  * Development of transparent administrative procedures for all activities related to data collection and processing, information distribution, natural resources exploitation and utilisation, and effective management of environmental problems;
  
  * Strengthening the execution and implementation capabilities at central, regional, and local levels;
  
  * Acceptance by other institutional users of all standards approved and disseminated by the co-ordinating institutions as guiding tools for their activities; and
  
  * Effective sharing of information relating to sectoral programmes and projects by all institutions working in related fields in order to reduce overlap and conflicts resulting from those activities.

- Data Management should be done in a way that all information and data available within public agencies and private sector are made available and shared by any user or stakeholder.

- To facilitate data sharing and to avoid data production duplication, each agency should maintain a catalogue of available and maintained information of which it is in charge. It is recommended to create small databases (metadatabases) in these agencies, and also to implement a National Environmental Database in MICOA.

- Data sharing requires common standards for data transfer and storage. These standards have to be defined and should be based on existing large national databases (such as the Land Use/Land Cover database or the National Survey database) and regional needs. The institutions should start to focus on data exchange processes and interfaces rather than on data production only. It is recommended that they create an inter-institutional working group on data exchange, including public, private, and non governmental agencies.

- Even if the main national databases are not yet completed (Land Use/Land Cover, Forest Inventories, Coastal Zone, National Survey), it is high time to test data exchange between the supplying agencies. This can be easily done on a small geographic area. Data classification have to be harmonised when the databases are at the same level of accuracy (1:250,000 scale for instance). This will save a lot of money and time for the future data analyses and application development. Experiences like the FAO AFRICOVER program should be taken into account.
MICOA should define some key national—and for some areas, provincial—environmental indicators, and should establish a national framework to monitor these indicators in partnership with technical agencies. Coastal zone degradation and deforestation could be the two first primary sectors to be monitored in Mozambique. Monitoring means evaluating regularly the state of the environment through a few specific indicators, and the pressure on this environment.

Despite the burden of external assistance upon the country’s performance in all sectors, and despite the qualitative character of environmental information, it is essential to seek new ways and strategies to increase income generation in some EIS activities. Nevertheless, the data exchange policies to be defined must be very careful about the degree of cost recovery they want to apply. On one hand, cost recovery politics limit the access to data by creating additional cost barriers for potential users. Unused data is the same as no data at all! Moreover, it may urge these users to recreate the same data on their own, which will push them to focus on data production problems rather than added value application development. On the other hand, totally free data prevents suppliers from getting some revenues which would help them maintain at least their equipment and the data update. This leads to the death of EIS subsystems as soon as external funds disappear. A balanced national framework should be designed, taking into account the specific needs and constraints of each agency.

Besides the ongoing data production process, development of applications—especially in the domain of environmental planning—management and monitoring should become effective in the country. To reach this objective some conditions are necessary:

* Promotion or empowerment of one of the existing institutional bodies to play the key role of inter-institutional co-ordination—rather than creating a new institution—(NSDC or NEC could be positioned to accomplish such mandate);

* Upgrading staff capacity and capability through to supervise and co-ordinate inventories, planning, management, and monitoring functions in all provinces, including providing guidance to ecological monitoring units established in state protected areas. Training to support field activities in all sectors should be provided in the provincial capitals. It appears advisable that provincial and local staffs be trained, whenever possible at the local level, in close contact with their daily realities and activities.

* Support appointing lecturers, sending staff abroad for high level training in GIS/EIS, for Eduardo Mondlane University and other training institutions such as Chimoio Agricultural Institute.
All the recommendations need a favourable context to achieve their goals and objectives. This requires that some conditions be fulfilled during the next few years:

* Continuation and sustainability of the peace situation that actually prevails in the country as a major incentive for economic recovery and development;

* Continuation and evidence of the political will expressed by the Government of Mozambique to support and integrate environmental concerns in all investment projects and development programmes;

* Effectiveness of the decentralisation process in all sectors as to promote a real empowerment of local administration and local communities and their full participation to decision making processes;

* Finalisation and effectiveness in practice of the land regulations and the land titling process aimed at safeguarding the occupancy rights of local communities, without leading to speculative land use and management by private companies and individuals (this supposes the maintaining of a nominal presence of the State in the process of land management during and after the transitional period);

* Continuation and effectiveness of international support and assistance—already so important for the country's recovery—for a sufficient long period so as to launch the overall development of the nation in a sustainable way;

* Availability of timely financial resources required by the country to develop a sound EIS programme, and effectiveness of technical and managerial capabilities for better and efficient use and management of resources provided.
1. Intention of the Study

1.1 Background of Environmental Information Systems (EIS) in Sub-Saharan Africa

EIS in Sub-Saharan Africa was initiated by the World Bank in conjunction with other donors and international agencies. The objective of the program is to promote the implementation of effective EIS programme to support the process of sustainable development in Sub-Saharan Africa.

The program supports African countries as they assess their needs in terms of environment and land information systems, and analyse the technical, institutional, legal, and economic issues hampering their possibilities of meeting these needs. The program assists them in developing adequate, sustainable, and long term solutions to deal with these issues. The program is comprised of an international forum of donors and professionals involved in EIS development in Sub-Saharan Africa.

1.2 Study on Best Practices in EIS—The Case of Mozambique

The study objective was to carry out a case review on Best Practices of EIS in Mozambique within the context of activities by the Program on EIS in Sub-Saharan Africa. This is part of a series of country case reviews supported by the World Bank, the GTZ–Pilot Project on Institutional Development in Environment, the Norwegian Co-operation, and USAID, co-ordinated by a joint steering committee.

The overall goal is to support better application of EIS in Sub-Saharan Africa by the final elaboration of a manual on Best Practices on EIS.

Within the context of the case study, the potentials, constraints, successes and weaknesses of EIS, based on practical approaches in Mozambique, were assessed and lessons-learned were developed. The outcome of the case study shall be presented and discussed at the next International Workshop of the Program on EIS in Sub-Saharan Africa.

1.3 Rationale

The rationale behind the study involved an examination of the benefits of having an EIS programme in Mozambique vice an absence of one. It is envisioned that the outcome of the EIS study will be communicated widely (paper and electronic versions), put to use, and will perhaps be used to address the identified gaps.

The team was anxious to capture practices that could be referred to as best practices in EIS. Although there were not many, it was encouraging that even in
the absence of a formal EIS there are packets of activities and initiatives that can be highlighted as best practices.

1.4 Methodology

The EIS study included three phases as follows:

**Phase 1: Documents and Publications Review**

A review of existing initiatives and published reports on the subject of environment in Mozambique was conducted. The detailed list of relevant documents and publications collated and utilised is included as Annex 7.

**Phase 2: EIS Survey in Mozambique**

The survey was designed to implement structured discussions during meetings with selected respondents to address the following issues:

- Awareness of EIS and its interpretation;
- EIS existence in their organisations and Mozambique;
- Vision of EIS for their organisation and Mozambique;
- Institutions involved in environmental issues;
- Technical Issues with respect to equipment and personnel;
- Decision making processes; and
- Ownership of Environmental management and EIS mandate.

Respondents feedback, views, concerns and suggestions were collected for analysis. A list of organisations and individuals surveyed is illustrated as Annex 5.

**Phase 3: Restitution Meeting**

As part of the EIS study, a meeting was conducted with delegates from several institutions: Meeting objectives were:

- Solicit delegates’ feedback and input regarding the mission team findings;
- Involve and include participants’ input into the EIS study; and
- Encourage debate on the subject of EIS in Mozambique among delegates.

Annex 6 provides the list of delegates who attended the Workshop.

1.5 Study Outcome

The development build-up of an EIS is a process heavily dependent upon the political, economic, and institutional framework of the country. The study analyses the present state of EIS in Mozambique, focusing on framework conditions,
technical, institutional and economic aspects as well as on human resources development.

Opportunities—key success factors and best practices, both important for the future development of EIS in Mozambique—are presented along with threats, difficulties, weaknesses and constraints that affect future progress in building up a nation-wide EIS.

An evaluation of the findings is summarised in “Conclusions and Recommendations, a summary of important data are presented in the Table, including:

- A general review of important environmental acts;
- A reference list of the institutions and persons contacted during research and who attended the debriefing meeting;
- Brief details concerning EIS subsystems in operation; and
- A list of reference documents relevant to Environment Management in Mozambique.
2. Framework Conditions for EIS in Mozambique

2.1 General Context

Mozambique is a coastal country located between 21°27' and 26°52' latitude and 30°51' and 40°51' longitude. The total land area is about 800,000 km$^2$. It has a coastline of over 2,500 km. About 42% of the country lies within the coastal area. The country is bordered by South Africa and Swaziland in the south, Zimbabwe, Malawi and Zambia in the west, Tanzania in the north and the Indian Ocean in the east.

The climate of the country is determined in the south by the activity of the subtropical anticyclones located in the Atlantic and Indian Oceans (St. Helen and Mascarenhas) which causes thermal depression in the inner parts of the country and inter-tropical convergence zone (ITCZ) which affect primarily the northern region. Rainfall and altitude divide the country into two regions, the humid tropics in the north and east, and the semi-arid tropics in the highlands and south. The country faces frequent droughts (1974–84, 1991–92, 1994–95). Soil distribution generally follows the physiographic characteristics. In the north-east and areas of higher altitude, where the rainfall is 1,000 mm to 1,400 mm, the soils consist largely of fertile light clay. The southern region and the coastal plains have sandy soils, except for the rich alluvial deposits of the major rivers and streams.

The land and water resources of Mozambique are abundant relative to its population: interior waters including lakes and dammed waters constitute an area of about 30,000 km$^2$ with good fishing conditions. There are a large number of rivers and flood plains which also have excellent fishing conditions. It should be noted that fishing is one of the most important sectors of the national economy: it represents 40% of the country's exports in 1994, and occupied 50 to 60,000 of the active population. Physically, 70% of the territory is composed of savannah and secondary forest, and 45% of the emerged land has a potential for agriculture.

The total population has increased from 12.1 million in 1980 to 15.7 million in 1997 (General Census 1997). Other projections estimate that the same population has increased from 14.2 million in 1990 to 18.1 million in 1996, and would reach 19.0 million in 1998, and 20.1 million in 2000 (World Bank, INE, 1997). The population has a high natural growth rate of 2.5% to 2.8% per year according to sources. It is administratively distributed into ten provinces, 128 districts and a great number of subdivisions (Posto Administrativo). The administrative divisions show great variations in terms of spatial distribution and pressure on the various types of natural resources. There is a high concentration of inhabitants along the coastal strips, as well as in the main rivers valleys which are the most suitable area for farming. Specifically, 40% of the population is concentrated in Nampula and Zambezia Provinces which constitute a fourth of the territory. Twenty-five percent of the population lives in urban areas. Moreover, the
present spatial distribution of the population, as shown on many maps, result from
the war and drought which have disrupted the former human settlement scheme
and generated high mobility of people in rural areas.

Economically, Mozambique emerged from a long and brutal war at the end of
1992 with the distinction of being one of the poorest countries in the world.
"External assistance was equivalent to nearly 78% of GDP. At US$ 4.7 billion, its
debt burden in 1991 was more than four times the country's GDP, the highest
ratio in Africa," (UNDP, 1993). The dramatic economical, political, and social
conditions of the country can be summarised as follows:

"War, which dated from the struggle for independence in the 1960s, was a
major, but not the only factor in contributing to a level of destruction and
devastation that earned Mozambique a ranking of 159 in the UNDP
Human Development Report. The country colonial legacy, periodic
droughts in a country where rain-fed cultivation is extremely sensitive to
climatic change, a poorly managed centralised economy, destabilisation
by antagonistic neighbours, global economic recession triggered by oil-
price increases in the early 1980s, and a structural adjustment
programme introduced in the late '80s were all factors in Mozambique
being one of the most aid-dependent countries in the world in 1990.

As warfare ceased in 1992, it was increasingly apparent that
Mozambique's economy and infrastructure had been ruined and a
massive amount of assistance would be required to get the country back
on its feet. An estimate one million Mozambican died during the conflict
and one third of the country's population, understood to be 16 million in
eyear 1990s, were up-rooted, 4.2 million were displaced internally and 1.5
million became refugees in neighbouring countries. With a per capita GNP
of just US$ 80, some 60% of the population was living in absolute poverty
and in need of food assistance. It was estimated that the war had resulted
in the destruction of 70% of schools and 50% of clinics and had brought
about an almost total collapse in markets." (Department of Humanitarian
Affairs—UN, 1998).

For three decades, Mozambique has been a disaster-stricken country. The
country gained its independence in 1975, after fifteen years of a harsh struggle
with the aim to end a nearly five centuries of Portuguese colonial experience. The
Mozambique Liberation Front (FRELIMO) was the leading group of an armed
movement that finally conducted to the Lusaka Agreement (September 1974)
"which committed Portugal to the unconditional hand-over of power to a
FRELIMO-dominated transitional government." Unfortunately, soon after
independence a new round of warfare was opened in the western, central and
south-western part of the country with the emergence of National Resistance of
Mozambique (RENAMO), created and heavily supported by Rhodesia and South
Africa. These countries used RENAMO as a tool for destabilising Mozambique's
regime and as a bargaining counter against Machel's support for the international campaign against apartheid. The civil war grew in ferocity after 1980 followed in 1982–84 by one of the most severe droughts and famine ever faced by the country. As a result, millions of rural people were displaced and sent into Maputo and other urban centres which were already suffering serious food shortages. After many attempts to overcome the situation through negotiations (Nkomati Agreement 1984, Nairobi 1989, Rome 1990), a partial cease-fire was announced in December 1990. In October 1991, the first protocol of a General Peace Agreement (GPA) was signed. During the next two years, other peace talks took place under the auspices of the UN and finally concluded on October 4, 1992, with an agreement on the framework for a transition to a multi-party State, demobilisation, and elections.

Mozambique is generally viewed today as a country in transition:

- From war to reconstruction and resettlement;
- From one party system to pluralism;
- From centralised economy to market economy; and
- From centralised State to decentralised and participatory system of government

These national and political options are definitely instrumental in all development processes and have induced a reorientation of the approach towards management of natural resources whilst building human resources capacity.

MICOA was created in 1995, in the context of post war reconstruction. Such action was viewed as a strong will of the newly elected Government to integrate environmental considerations among other urgent problems it had to deal with simultaneously.

### 2.2 Main Environmental Problems

The main environmental problems in Mozambique are the following:

- **Soil Erosion.** It is caused mainly by two factors, coastal erosion and rainfall. The last factor reduces the fertility through washing out the organic layer and nutrients. In Mozambique, the intensity of rainfall increases from the south towards the north, but the frequency of breaks in heavy rainfall shows considerable regional differences, with some high risk zones like the mountainous areas and the coastline.

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1 Samora Machel was the leader of FREDIMO, and became Mozambique's first president after Independence in 1975.
• **Population Growth and Distribution.** Mozambique has an average population growth rate of over 2.6% per year. 51.4% are women and 41.6% are men. In 1996, this population had a crude mortality rate of 18.3 per 1000 and a crude birth rate of 46.1 per 1000. Two thirds of the 16 million inhabitants live in rural areas, and the average density is 23 inhab/km². Migration and people displacement caused by wars and natural hazards such as prolonged droughts are among the environmental constraints to be addressed today.

• **Industrial Pollution.** Industrial pollution is another concern. Viewing the environmental impact of industrial pollution World-Wide, Mozambique may be regarded as a country without major problems because the degree of industrialisation and the levels of production are low and practically insignificant.

• **Water and Soil Pollution.** Some industries or agro-industries are known as sources of water and soil pollution and thus have strong impact on the state of the population living in their surroundings. Despite their small size, some industrial activities have been located in heavily populated areas without prior environmental impact assessment. Among these, some major cases can be emphasised:
  
  - Waste products resulting from the textile and paper industries (caustic soda and cellulose) which are dumped in rivers and streams in Manica;
  - The cement industry with its well known problems as regards to its filtration systems;
  - The engineering of petroleum refining industries situated in the major cities and close to bays into which they discharge untreated effluents; and
  - Industrial chemicals as well as explosives, fertilisers and paints resulting from the chemical industry located in Maputo.

• **Environmental Impact of Mining.** The exploitation of mineral resources and other related activities has local environmental effects such as atmospheric and water pollution, infertility of land, devastation of forests, pollution of populated areas, and changes in the equilibrium of specific ecosystems. It is usually the case of excavations caused by the great movement of the land involved in mining. Other cases are related to the emission of toxic gases from some minerals and factories, the disturbance of the water level, and the destruction of vast forest areas during or after mining operations. This is the particular situation of the coal mines at Moatize, the copper mines at Mundonga, the exploitation of gold in Manica, the treatment of bentonite at Boane, the coastal sands, beach sands, dunes and mangroves in Mozambique’s coastline (Angoche, Pebane, Xai-Xai) which suffer from mining operations of heavy minerals. (Source: National Biodiversity Unit of Mozambique, 1994).
• **Emission of Gases.** Many atmospheric pollutants, notably various kinds of toxic gases (oxides of nitrogen, carbon monoxide and dioxide) are a danger to people who suffer from respiratory diseases. The combustion of coal in the mines could likewise produce much harm to human physiological systems.

• **Urban Environment.** Uncontrolled urbanisation is considered the most recent environmental degradation in Mozambique. Urban poverty, increased occurrence of diseases, inadequate sanitation and services, poor living conditions, pollution, and lack of administrative capacity to cope with the basic needs of the ever growing population are the most visible aspects. During the periods of war and drought, the rural-urban migration lead to the rapid urbanisation of the country. In many cities, that situation resulted in an unprecedented demands for specific resource and services, and substantial pressure on existing urban infrastructure. The urban population roughly tripled in ten years and local governments were unable to meet the increasing demand for sanitation, water, supplies, and garbage collection. Maputo, Beira, Chimoio, and other provincial capitals are the cities in which urban environmental degradation has now transcended the urban limits to affect rural land, coastal ecosystems, and water resources. The above conditions have resulted in widespread water-borne diseases in Mozambique such as cholera, typhoid, diarrhoea, and malaria as the major causes of mortality in the country.

• **Tsetse Fly Infection:** The Tsetse fly and the disease transmitted by it (sleeping sickness) are among the principal limitations to the growth of livestock production and consequently of rural development in Mozambique. Approximately 75% of the surface of the country is infested by four species of tsetse, and there are indications that it is advancing southwards, putting livestock production in this area at risk (Report NBU, 1994).

• **Threatened Ecosystems.** Mangroves and coral reefs are among the most threatened natural ecosystems in Mozambique. The mangroves are being destroyed as a whole through their use (agriculture, fish farming tanks, salt pans and traditional uses) which exceed sustainable production and do not permit regeneration. Over exploitation of mangrove is predominantly linked to the general problems of the rapid increase of the population and the associated decline in economic patterns. If the country loses its mangrove ecosystem, it will mean the disappearance of one of its most important source of poles and timber for building, firewood, charcoal, and other products, the loss of space for nourishment and protection of many species of fish, crustaceans, the loss of a shield of protection against coastal erosion, and other additional assets.

• **Deforestation and Bush Fire.** There is not a reliable long term data on deforestation and bush fire in Mozambique. One estimate suggests that between 45,000 ha and 120,000 ha of forest disappear annually. Two primary cause of the loss are clearance for agriculture and the high concentration of people due to displacement. The intensive use of land and the exploitation of
forests have caused significant local soil degradation and forest depletion. For example, many mangrove areas along the coast, which play an important economic and environmental role, are under threat because of the excessive harvesting for fuel.

- **Water Resources Degradation.** Mozambique’s water resources are relatively important in terms of river basins (more than 100), lakes, lagoons, marshes, wetlands, dams, and aquifers formations. The surface water is estimated at 217,000 million m³, nearly half of which comes from rainfall. The major rivers cross the country eastward (Zambezi, Rovuma, Limpopo, Messalo) Some of the most important lakes such as Lake Niassa (30,600 km²) and Lake Chirua (1,000 km²) are shared with the neighbouring country Malawi. The coastal strip includes extensive wetlands representing very important ecosystems. Yet, these resources are extremely vulnerable to variation of rainfall in accordance with the hydro-geological conditions, and pollution originating from urban and industrial areas. In the coastal zone, salt intrusion in dry season poses a threat by increasing the risk of salinisation, especially at high tide.

- **Natural Disasters, Drought, and Desertification.** Mozambique has more than half of the ten provinces affected by desertification, which consists on the soil degradation in arid, dry and sub-humid lands. Nearly 80% of the Mozambican population has agriculture as a main source for subsistence. According to some organisations linked to the struggle against desertification, an inadequate combination of this human sector with the nature and land, constitutes a heavy burden. This causes the migration of communities of their “natural habitat” to places with more security. Coastal erosion is also a major problem. In Sofala province, the erosion has caused a disastrous situation which endangers, the Sanctuary of Nova Sofala. In Zambezia Province, the townships of Chinde and Macuse have been nearly destroyed.

- **Landmines.** Mozambique is listed among the most severely affected countries in Africa. Landmines have been laid over a protracted period covering some thirty plus years. The number of mines is not exactly known but a national survey carried out in 1994 by Halo Trust estimates that several hundred thousand mines is probable. The United Nations officially estimate the number of mines to be about a million. In 1996 and 1997, landmines claimed around 15 victims each month. A National Demining Commission was created in 1997 to co-ordinate the demining process, but it is the opinion of the United Nations that it may be another ten years before some areas can be considered to be mine free.

### 2.3 Causes of Environmental Problems

The country’s natural resources are of global interest and importance. They are seriously threatened by the population growth, extreme poverty, poor management and utilisation, lack of financial resources, and finally by various kinds of problems that arise from institutional failure at certain levels.
2.3.1 Population Growth, Agriculture and the Environment

Internationally, the increase of the basic needs of a growing population requires ever higher levels of exploitation of natural resources. This resulted in an increased demand on natural resources.

In Mozambique, the rapid population growth has resulted in rapid environmental degradation which includes high rates of deforestation, desertification and degradation of the soil. This has impacted on the productivity of agriculture and the socio-economic levels of the communities.

The population distribution map of Mozambique was dramatically changed due to both the armed conflicts and the drought which affected the country over the last twenty years. More than half of the Mozambican population was displaced. Population crowded itself in the urban centres, along the coastal areas and the major transport corridors, leaving the hinterland and large arts of the countryside devoid of people.

This was beneficial to the abandoned areas, where resources, particularly vegetation and wildlife, had an excellent opportunity to regenerate. The areas with high population concentrations suffered from overcrowding and the depletion of the capacity of the land and other resources to sustain the people. In some areas, the increased population in addition to the pre-existing negative environmental impacts assisted in hastening the degradation of the agro-ecological resources.
Density of population by district

Source: INE, 1997
2.3.2 Poverty

The phenomenon of poverty is a contributor to environmental problems in Mozambique. Considering different socio-economic and demographic patterns recorded between 1980 and 1996, Mozambique is desperately poor and is actually trying to consolidate a process of post war reconstruction. GDP per capita was estimated US$ 90 in 1996. The statistical indicators (Office of the Human Development and the World Bank, 1996) show that the level of human poverty in the country is 50.1%. A major part of the population lives in absolute poverty. The living conditions of this group oblige it to exploit in an uncontrolled manner the existing resources to guarantee their survival. This contributes to the acceleration environmental degradation. The deficit in 1995 was 20.3% of GDP, and the current account deficit was 22.2%. Only 21% of the Government's investment budget is financed locally. These severe financing limitations mean that many environmental projects as presently designed would simply not be undertaken in the absence of external supports.

Poverty reduction is the Government's main development goal and is based on agriculture and rural development. The Mozambique National Strategy in combating poverty is outlined in a framework policy document adopted in 1994 (Poverty Alleviation Fund) whose main objective is to invest in people as the country's key resource. The Government, assisted by international agencies like FINNIDA, UNDP, the World Bank and others, is implementing programs to help population in areas of great concern. Since 1992, economic growth, largely fuelled by strong support from the international community, has averaged around 6.7%, and progress has been made in implementing programmes aimed at stimulating private sector investment and reducing the role of the State in the economy.

2.3.3 Institutional Problems and Policy Failure

Many conflicts are associated with the lack of effective institutional co-ordination and policy failure in Mozambique:

- Weakness of institutional capacity for the monitoring of the exploitation of resources;
- Ineffective implementation of rules and regulations adopted by the government for better co-ordination of activities carried out by several institutions working in the same area;
- Existence of large project schemes centrally planned in the south;
- Illegal tourist development initiatives along the coast;
- Unplanned geographic location of some private investments; and
• Lack of transparent procedures in relation with private investments and the poor practices with respect to foreign investor utilisation of natural resources in some areas.

There still exists at all institutional levels, a real need for a global strategy. In regards to the complexity of the environmental sectors and problems, as well as the great number of the agencies and institutions involved, it is assumed that this strategy shall aim at bringing together these different emphases and interests in a cohesive program.

2.4 Environmental Policy

A primary task of the government, elected in 1994, was the formulation of policies for the implementation of the reconstruction and development program. As far as Mozambique is concerned, the primary developmental issue is the land issue, in view of the complexity of problems to be addressed in this sector. With regards to land and other natural resources, the council of Ministers approved three sector policies:

• Agrarian Policy. The aim is to develop agrarian activities to achieve food security for the country based on a sustainable use of the natural resources. The strategy is to achieve this objective is: i) the involvement of the local communities in the management of natural resources to promote the sustainable use of natural resources and ii) expansion of production capacity both in terms of the extension of the cultivated area and an increase in yield;

• Land Policy. The objective is the right of Mozambican population over the land and other natural resources, and to promote investment and a sustainable and equitable use of these resources. This Policy creates conditions for the development and growth of the local community and promotion of investments by the commercial sector. Although the land belong to the State, the land policy stresses the recognition of the local community’s rights, as well as their methods and approaches to agrarian management of land.

• Environmental Policy. The primary main purpose of the 1995 National Environment Policy is to:
  - Ensure an adequate quality of life to all citizens;
  - Ensure environment and natural resource management in such a way that they maintain their functional and productive capacity for the present and future generations;

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- Ensure environmental considerations in the process of socio-economic planning;
- Promote the ecosystems and the fundamental ecological processes; and
- Integrate the global and regional efforts in the search for solutions to environmental problems.

The National Policy in the environmental sector constitutes an instrument by which the Government recognises in clear way the inter-dependency between the environment and development. This is a means for the execution, of socio-economic and macro policies that are environmentally acceptable with the aim of fostering an economic growth which is based in the principles of sustainable development.

The objectives of the National Policy of Environment is intended to secure sustainable development of the country, taking into account its specific conditions, through acceptable and realistic commitment between socio-economic progress and the protection of the environment.

The National Policy is finally consecrated by two sets of instruments and general development principles:

- National Environmental Management Programme (NEMP) finalised early 1996 and supported by a framework Environmental Law signed in 1997; and
- National Conservation Strategy within which an institutional and legal framework has been built concerning most relevant sectors and sub-sectors of the national development.

2.4.1 National Environmental Management Programme (NEMP)

NEMP has developed as its first great task by the newly created MICOA. The NEMP comprises sectoral plans, for the medium and long term goals, which are intended to lead the sustainable development. The NEMP was adopted by the Government of Mozambique in August 1995 and MICOA has been given the authority to oversee its implementation. Discussions to launch a national environmental planning process started in 1991 with the World Bank and other donors. In 1992, a National Commission for Environment (NEC) was set up to conduct the practical aspects of this process. The active phase of the NEMP began in 1994, immediately after the adoption of a new Constitution and involved several institutions including the Ministry of Commerce, Industry, and Tourism, the Ministry of Agriculture and Fisheries, the World Bank and the United Nation Development Programme (UNDP). Meetings were organised both at central and provincial levels with public institutions, local communities, national NGOs and the private sector to design main objectives and priorities.
The NEMP process was conducted with the view of targeting two main objectives:

- To prepare a first draft of an Environmental Policy and Strategy Framework to be approved by the Government and the World Bank; and

- To raise the awareness of national decision makers, public and donor organisations, and improve public information on sustainable development and conservation priority issues. MICOA had the key role of co-ordinating and facilitating the preparations.

Current discussions will be whether or not MICOA, as a ministry, is really capable of carrying out the task of co-ordination of overall environmental matters at the institutional level.

**Cost Estimate.** The NEMP process was supported financially by the World Bank (through a Japanese Grant of US$ 200,000), Swedish and Norwegian Co-operation, and UNDP (for equipment and support to regional consultations). According to MICOA, it is difficult to provide the precise cost of the NEMP since there was donations of time by many people, public institutions, and NGOs(particularly in working groups.) The Government provided staff, some basic infrastructure, accommodations, and political support.

### 2.4.2 National Environment Commission (NEC)

In order to cope with its environmental strategy, the Government of Mozambique set up a NEC at the very beginning of the NEMP process. NEC’s mandate was to control and provide political orientations in order to ensure that environmental concerns were taken into account in all development activities. NEC was an inter-sectoral body with a broad mandate and power to oversee any question or action at inter-ministerial or inter-institutional levels. As such, its decisions were placed beyond any single ministry’s initiatives. The NEC, a public institution, is subordinate to the Council of Ministers. Its headquarters was located in the capital with regional offices or delegations, as needed. The NEC was composed of the following members:

- Ministry of Agriculture and Fisheries (MAP);
- National Institute of Physical Planning (INPF);
- National Institute of Rural Development (INDER);
- Ministry of Industry, Commerce and Tourism (MICTUR);
- Ministry of Transports and Communications (MITC);
- State Secretariat for Civil Aeronautics (SEAC);
- Ministry of Public Works and Housing (MOPH); and
• Ministry of Health (MISAU).

Other public agencies, as well as private institutions including NGOs, were represented in the NEC's different structures (the National Secretariat, the Executive Directions and Departments, the Councils and the Permanent Consultative Group).

Since MICOA's creation and the adoption of NEMP,, the NEC has ceased all activities, despite the fact that it seemed to be institutionally more powerful than MICOA to face the challenges of integrated co-ordination within the context of multifaceted approaches to development in the country.

2.4.3 National Conservation Strategy

Mozambique’s biodiversity, particularly in terms of overall habitat quality, is recognised internationally to be of global significance and among the best preserved in Africa. This is due to a combination of factors: i) relatively low demographic density; ii) the general depopulation of rural areas over 20 years of civil strife, and iii) the underdeveloped basic infrastructure.

In 1994, Mozambique established a National Biodiversity Unit (NBU) within MICOA. NBU’s mission is to oversee the implementation of the Biodiversity Convention in Mozambique. One of MICOA's principal tasks in 1997 has been the formulation of a National Strategy and Action Plan for the Conservation of Biological Diversity. Within the framework of this strategy, a number of issues need to be addressed in order to be able to conserve diversity. These issues include technical, legal, political, cultural and socio-economic aspects of biological diversity. Conservation of biodiversity may be envisioned as a goal of all activities related to nature and environmental policies. For example, the guiding principles of both the National Policy for Tourism and the Strategy for Tourism Development in Mozambique stress the necessity for: “The promotion of initiatives which assure the maintenance of ecological integrity, preservation of the environment and the sustainable use of natural resources so as to improve the quality of life of local people” (Impacto 1997).

2.5 Institutional and Legal Set-up

The National Conservation Strategy in Mozambique has a single objective and specific goals. The institutional and legal set-up constitute the general framework through which a National Conservation Strategy is to be reviewed or drafted. This framework varies with every sector referred to as a target programme, and mostly relies on the Government and donors interests and support. However, one of the basic problems faced by the Government of Mozambique in implementing an overall strategy is the lack of a strong organisational structure capable of facing the challenges of the sectors. MICOA remains a line Ministry and as such, is not empowered enough to assure overall a transsectoral co-ordination of environmental activities at all levels. No Environmental Agency has established
to address this issue as it has been the case in many countries since the Rio Conference in 1992.

2.5.1 Hydrology Sector

The monitoring of water resources in Mozambique suffers from various constraints. Most of the existing hydrometric networks are defective, therefore accurate data are not available.

The water department has ambitious plans to rehabilitate the sector but financial constraints hamper the implementation, particularly of the networks. Essential water measurement devices cannot be obtained nor is it possible to construct small dams, reservoirs, or boreboles for irrigation purposes within the drought ridden areas.

2.5.2 Meteorology Sector

INAM’s contribution to drought mitigation is in the form of data dissemination. Different meteorological and climatological analyses and research activities are carried out at the institution and made available to interested parties.

Of particular importance is the work in seasonal forecasting based on the state of the El Niño Southern Oscillation (ENSO) and sea surface temperatures of the Pacific and Indian Oceans. There is enough evidence that these ocean atmosphere phenomena are responsible for part of the inter-annual variability in rainfall and are one of the direct causes of drought in Southern Africa and in the Central and Southern regions of Mozambique.

2.5.3 Agricultural Sector

Mozambique has an Early Warning System for food security co-ordinated by the National Directorate of Agriculture with assistance from the Ministry of Commerce and Tourism, Ministry of Health, and Ministry of Transport and Communications through the National Institute of Meteorology. The information obtained allows the identification of areas affected by drought, the food deficit, and the areas where nutritional levels have increased.

The Early Warning System’s main role is to alert farmers, smallholders, and population in general about the agrometeorological situation near agriculture campaigns. The System is linked to the national meteorological network and a tabular database of meteorological data is maintained.

The Extension Department Services of the National Directorate of Agriculture plays an important role in the introduction of new production technologies and the
establishment of ways to prevent unorganised fires when the farmers are preparing the land or hunting.

Most of agricultural research is INIA, which is within the Ministry of Agriculture and Fisheries. INIA's mandate encompasses all agronomic and crop research, land resource assessments, mapping and ensuring continuity of effort on priority research topics for the public sector. INIA's responsibility is to provide information on land resources and to assess the potential of these resources in different agro-ecological zones. A number of databases have been established by INIA to carry out this mandate.

2.5.4 Biodiversity Sector

The nature of the task of conserving biodiversity calls for a well co-ordinated and cross-sectoral approach. Given that many of the problems faced are not confined to just one sector, but involves various stakeholders and sectors. The institutional arrangements for biodiversity should integrate the following institutions:

- MICOA is the implementing institution at the political level. MICOA's specific task is to promote environmental awareness and education on a large scale among public agencies and population at all levels, and to regulate environmental impact assessment (EIA) procedures. It therefore hosts the Biodiversity Unit whose mandate is to co-ordinate and monitor all activities that might have impacts on biodiversity at national and regional levels, and to link other institutions involved in the sector. MICOA also hosts the Coastal Zone Management Unit (CZMU) which will focus on the sustainable use and conservation of coastal and marine biological resources;

- The Council for Sustainable Development, (linked to the Council of Ministers and assisted by the NBU), is a high level political institution whose mission is to ensure that biodiversity considerations are incorporated into all sectoral plans, programmes and policies;

- The Ministry of Agriculture and Fisheries (MAP) has formulated an Agricultural Policy in which it is stated that all agricultural activities will have as basis the sustainable use of natural resources and the guarantee of social equity;

- The National Directorate of Forestry and Wildlife (DNFFB) co-ordinates a series of activities related to the management of the protected areas network, forestry, and wildlife resources. DNFFB also controls several projects in co-ordination with other public agencies and NGOs working in rural areas.

- The Ministry of Commerce, Industry, and Tourism (National Directorate of Tourism, and National Tourism Company) has the general mission of planning, managing, and regulating tourism operations. It is mandated to take into account the need to preserve natural ecosystems and the population's security where tourism operations are organised;
There are also several public agencies and NGOs involved in biodiversity research. They are the Eduardo Mondlane University (Department of Biological Sciences, National History Museum, Department of Forest Engineering, Department of Geography), the research institutes under MAP (Forestry Research Centre, Forestry Inventory Unit, National Herbarium, Institute of Agronomic Research, Institute of Animal Production, Research Veterinary Institute), and NGOs (Endangered Wildlife Trust, Frontier-Moçambique, WWF, IUCN). Table 1 is list of the most relevant institutions involved in biodiversity research in Mozambique.
Table 1. Biodiversity Research in Mozambique: Involved Institutions

<table>
<thead>
<tr>
<th>Sector / Central Institution</th>
<th>Institute</th>
<th>Research Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>University / Eduardo Mondlane University (UEM)</td>
<td>Department of Biological Sciences (DBS)</td>
<td>Coastal and Marine Biodiversity</td>
</tr>
<tr>
<td></td>
<td>National Institute for Veterinary Research (INIVE)</td>
<td>Botanical Collection (herbarium)</td>
</tr>
<tr>
<td></td>
<td>National History Museum</td>
<td>Veterinary research</td>
</tr>
<tr>
<td></td>
<td>Department of Forest Engineering</td>
<td>Currently re-organising collection</td>
</tr>
<tr>
<td></td>
<td>Department of Geography</td>
<td>Selected Surveys (especially Avifauna)</td>
</tr>
<tr>
<td>Agriculture and Fisheries / Ministry of Agriculture and Fisheries (MAP)</td>
<td>Forestry Research Centre</td>
<td>Seed Collection</td>
</tr>
<tr>
<td></td>
<td>Forestry Inventory Unit</td>
<td>Forest Ecology</td>
</tr>
<tr>
<td></td>
<td>Institute of Agronomic Research</td>
<td>Resource Use Patterns</td>
</tr>
<tr>
<td></td>
<td>Department of Forest and Wildlife</td>
<td>Forest Inventory</td>
</tr>
<tr>
<td></td>
<td>Fisheries Research Institute</td>
<td>Crops Research</td>
</tr>
<tr>
<td></td>
<td>Animal Production Institute</td>
<td>Soil Surveys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biosafety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment : Ministry for the Co-ordination of Environmental Affairs (MICOA)</td>
<td>Coastal Zone Management Unit</td>
<td>Coastal and Marine Biodiversity Surveys</td>
</tr>
<tr>
<td></td>
<td>National Biodiversity Unit</td>
<td>Country Wide Biodiversity Surveys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sectoral Co-ordination</td>
</tr>
<tr>
<td>Others / Non-Governmental Organisations (NGOs)</td>
<td>Endangered Wildlife Trust</td>
<td>Production of Birds Atlas</td>
</tr>
<tr>
<td></td>
<td>Mozambican Ornithological Club</td>
<td>Follow-up of some Species</td>
</tr>
<tr>
<td></td>
<td>Frontier-Moçambique</td>
<td>Coral Reef and Marine Surveys of Quirimba Archipelagos</td>
</tr>
<tr>
<td></td>
<td>World Wildlife Fund for Nature (WWF)</td>
<td>Biodiversity Conservation, Barazuto Archipelago</td>
</tr>
<tr>
<td></td>
<td>World Conservation Union for the Nature (IUCN)</td>
<td>Zambezi Delta Surveys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support to Several Mozambican Organisations</td>
</tr>
</tbody>
</table>

Source: MICOA, 1997
2.6 Legal Framework

In the Mozambican national legal framework, the environment, and its related issues are presently ruled by three main regulations:

- The newly adopted Environmental Law;
- The Land Law and related Regulations; and
- The Municipalities Law.

2.6.1 The Status of Environmental Law

A Framework Environmental Law was passed in July 1997. This action was a determinant watershed for environmental protection in the country. Importantly, the law requires all sectoral legislation related to environmental management to be reviewed and, if necessary, revised so that it is consistent with the Environmental Law (see complete text in appendix).

The Framework Law refers to the prevention of environmental damage. An EIA is required for any project likely to significantly impact the environment. The issuing of an environmental licence is contingent upon the EIA and is a necessary prerequisite for the issuance of any other legally necessary licences. The law also recognises the need to guarantee the participation of local communities and to utilise their knowledge and human resources in the protection of the environment.

A National Commission for Sustainable Development (NCSD) was created by an Environmental Law provision. The NCSD is a consultative body directly linked to the Council of Ministers which will ensure that considerations related to the conservation and sustainable use of resources are integrated into sectoral programmes and policies at the highest level.

2.6.2 The Land Law

The Land Law was approved in July 1997 (N° 19/1997). That law follows the same path as the Constitution and is similar to the previous legislation (1979 Land Law) in that all land is still owned by the state. No private land right exists and all holdings are secondary rights. The land use planning is considered for the good of the society rather than market mechanisms and decentralised control over resources.

According to the Land Law, two types of rights are possible: i) land acquired through the state as the concession and leasehold and ii) land acquired via occupation. To obtain title via the state, the applicant must follow a legal process. To acquire land via occupation, communities can secure occupancy rights based upon customary norms and practices which are not contrary to the Constitution. Individuals and collective bodies may acquire renewable leases for up to 50
years. Occupation rights by communities are supposed to have equal weight as those acquiring rights through the formal titling procedures. The new law also specifies competencies of Council of Ministers, Ministry of Agriculture, and Provincial Governors to grant rights in land according to the extent of the requested area.

A parallel PROAGRI appraisal mission has been working at the same time as the present review. The objectives are to combine with other initiatives to secure an appropriate enabling environment for sustainable and equitable growth in agricultural sector so that rural poverty is reduced, while physical and social environment is preserved. In its preliminary draft that, mission states that studies have demonstrated that under the 1979 Land Law, provincial and central government institutions have granted provisional land use rights for millions of hectares of and throughout the country. Much of this land has been in the most fertile areas and in areas optimally situated in terms of access to markets and transport infrastructure. These provisional concessions have been granted without meaningful consultation of local communities regarding the occupancy status of the land in question.

Different government ministries and departments have granted licenses to engage in forestry, mining, hunting, tourism, and other activities in a manner in which the recipients have an unclear understanding of the rights and responsibilities which such licenses confer. Many individuals and entities mistakenly perceive, for example, that a forestry licence grants exclusive land rights. In addition, local communities have rarely been consulted when such licenses have been issued. The resultant in the land use rights and the emergence of overlapping land use claims has resulted in conflicts which have diminished the tenure security of many smallholders and private investors.

The Land Law (Lei n° 19/97) which became effective January 1, 1998, creates the legal framework to strengthen the land use rights of Mozambican smallholders and larger investors and while remedying many of the problems associated with 1979 Land Law. The law opens possibilities for co-titling of land for women and men, and this may eventually be expanded to facilitate community co-titling. Additional legislation and regulatory instruments will be important to strengthen this framework.

2.6.3 The Municipalities Law

The Ministry of State Administration (MAE) is involved in the decentralisation of local government through Local Agencies Reform (PROL). The 1994 Municipalities Law is the foundation of the local elections. In this law, provisions are made to the Municipal Assembly which will be responsible for approval of land development and use plans.

Decentralisation will have little impacts if the administrations are not authorised to use their own revenues. Revenues and fees coming from the natural resources
could be a valuable source of income. With respect to the involvement of traditional authorities in local administration, the Municipalities Law stipulates that mechanisms should be developed for involving traditional authorities, as well as any future community institutions, in local administration.

To implement the new laws and regulations (Environment Law, Land Law, and Municipalities Law), capacity building is needed at certain levels. DINAGECA and SPGC should be seen as some of those institutions to be enforced, with the aim of promoting design and location of any relevant area concerned within the framework of each law. Without this capacity, the new instruments will have limited impact on security of tenure as pressure can be brought to bear on officials.

2.6.4 Other Legal Instruments Related to the Environment at Sectoral Level

Mozambique has developed an important set of rules and regulations (laws, decrees, decisions) which have direct links with environment in different specialities. In 1993, the national package comprised over 76 legal instruments summarised as follows:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of Laws</th>
<th>Other Regulations</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Air</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fauna</td>
<td>1</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Flora</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Soil (Land)</td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Hygiene And Housing</td>
<td>3</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>62</strong></td>
<td><strong>76</strong></td>
</tr>
</tbody>
</table>


The majority of economic and social sectors are addressed in that legal framework. Some examples are:

- **Water Sector.** Law decree 31/76 of 19 August 1976; and Law decree 16/91 of 3 August 1991 (Regulation of the law of seas) which define the rights on the marine resources adjacent to the Coastal zone of the Republic of Mozambique and address the Law of seas as described in an international vision relating to the sector.

- **Fauna Sector.** Legislative Diploma nº 51/72 of 30 May 1972; Legislative Diploma nº 2787 of 23 May 1967; Decree nº 7/87 of 18 April 1987; Portaria nº 117/78 of 16 May 1978; Decree nº 10/81 of 25 July 1981; and Law 3/90 26 September 1990. These regulations govern the manner on which the hunting and fishing regulations should be developed. The regulations also oversee the
shipment of ivory, precious woods, wild animal pelts, and precious stones out of the country.

- **Flora Sector:** Portaria n° 547 of 23 July 1927, establishes the prohibition of cutting down of mangrove. Legislative Diploma n° 2642 of 20 September 1965 which approves the Forest Regulation of Mozambique. Portaria n° 12/81 of 25th July 1981, which classifies precious wood. Dispatch of 19 March 1989 of the Ministry of Agriculture, which establishes the maximum quotes for the exploitation of the precious wood. The Ministerial Diploma n° 95/91 of 07 August 1991 which organizes and regulates seed import.

- **Environmental Impact.** i) Portaria n° 22678 of 20 December 1969 establishes the criteria of the opening (or reopening) of various factories. Legislative Diploma n° 801 of 25 July 1942 provides greater emphasis to preexisting industrial activity legislation. Portaria n° 5717 of 30 September 1930 creates organizations and public services authorized to develop industrial activity procedures. Portaria n° 6231 of 15 December 1945 sets up the Technical Services for Industry and Geology which organizes and monitors the development of industrial activity. Decree n° 495/73 of 20 September 1973 determines measurements related to the pollution of water, beaches, and coastal zones. Law n° 4/84 of 18 August 1984, which approves the Law for Foreign Investment in the Republic of Mozambique.


### 2.6.5 International Legal Instruments (Agreements and Conventions)

Mozambique participated in the Earth Summit and ratified many international conventions related to the environment. Treaties, agreements, and conventions are important legal instruments which guarantee the preservation of critical habitats against harmful consequences of certain development activities. They are also the instruments which guarantee the enhancement of environmental management at various levels. Mozambique is party to a number of international conventions and has already signed the following ones:
Table 2. List of International Instruments to Which Mozambique is Party:

<table>
<thead>
<tr>
<th>International Instrument</th>
<th>Place and Date of Issue</th>
<th>Status in Mozambique</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Montreal Protocol on Substances that Deplete the Ozone Layer</td>
<td>Montreal, 1987</td>
<td></td>
</tr>
<tr>
<td>12. The Southern African Development Community (SADC) treaty,</td>
<td></td>
<td>Signed</td>
</tr>
</tbody>
</table>

2.6.6 Environmental Rights

Article 72 of the constitution (1990) states the general principle of sustainable development guarantees the right of a balanced environment and the right of all to maintain it. Article 95 stipulates that the state controls all natural resources. Article 36 states natural resources are to be used in the public interest. Article 37
addresses the promotion of ecological equilibrium instrumental to conservation of environment and the improvement of the quality of life. Article 38 indicates that economic policy is aimed at the improving the living conditions and by definition an environment of acceptable health.

Following these constitutional statements, the Government of Mozambique has adopted a body of legislation and regulations which have an impact on the control of the use and preservation of the environment. The Framework Environmental Law and the Land Law are legal instruments that cover all activities, public or private, which may directly or indirectly affect the environment. The Framework Environmental Law specifically recognises the right of all citizens to an ecologically sound environment suitable for their physical and mental well being. Some recent laws, decrees, diplomas, and portarias, are among the most important dispatched on the use and preservation of the environment.

The evolution within NEP should be contingent on the overall policy development and thoughts all levels (national, regional and international) that have been done over the last few years. Although most of the basic concepts and principles are not new, their impact is only now being felt in the country. The new vision of the management of natural resources encompasses these basic principles:

- **An equitable use of the national resources in all sectors.** Unfortunately, the Mozambican rural society has historically not received equal treatment with the commercial sector. The new Governmental strategy is based mainly upon the local community and is focused on supplying equitable use of natural resources.

- **Sustainable use of natural resources.** The quantity of the land and other natural resources is not infinite and their productivity should be preserved, through sustainable use for the future generations. A sustainable use of resources can only be achieved if they are preserved.

- **Natural resources participation management methodology.** The management of natural resources will be decentralised down to district level. It is hoped that this will facilitate a legitimate, co-operative environment of resource management.

### 2.6.7 Economic Factors

After the 1994 election and the reforms undertaken by the new Government, the economic indicators show improved conditions to support sustainable development, especially development based on information management and technologies. For example, the inflation rate dropped from an average annual value of 50 % for the period 1988 - 1995 to 16.3 % in 1996 and 5.8 % in 1997.

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The development of services is important in Mozambique and grew from 42% to 52% of the GDP between 1985 and 1996. This evolution is favourable to the development of the sector of information management in general, and more specifically, environmental information.

Nonetheless, with a relatively weak private sector, the state still plays a significant role in the economy. In 1994, the total government expenditure accounted for near 50% of GDP, and public investment an estimated 35% of the total investment. Government revenue collection has deteriorated. As a result, improvement of environment management and EIS in Mozambique are still dependant on external aid and investments.

In the five year Strategy for the Development of Tourism in Mozambique (1995-1999), the guiding principles highlight the promotion of initiative that aim to ensure ecological balance, preservation of environment and sustainable utilisation to improve the quality of life. No mention is made specifically concerning the payment of an environment tax. The State's share for the tourism sector as well as taxes collected from tourism activities are directed to national treasury.

It is obvious that evolution and progress towards better use of environmental resources exist in policies and strategies. For example, the National Policy of Tourism recognises explicitly that « together with culture, environment constitutes a basic factor of tourism. Therefore, the whole process of tourism development must finds its basis on ecological balance, environmental protection, preservation, and valorisation. The development of tourism activities in Mozambique, must be considered within the global context of country's environment and economy. There is a need to undertake studies on the environmental impact of tourism projects, particularly those located in the defined strategic zones for development of tourism.
3. Technical Aspects of EIS

3.1 Overview

At the moment, there is no national EIS in Mozambique. Currently, no leading agency has really started activities to create one. A couple of individual EIS subsystems already exist or are in their installation phase. EIS activities are still new in Mozambique. They started in a few public agencies at the end of the 80's and at a larger scale at the beginning of the 90s. The local private sector joined this sector at the middle of the 90s.

The EIS subsystems are based on a combination of different techniques including digitising existing information like paper maps and using remote sensing with strong emphasis on data collection. The critical mass of digital geographic and environmental data is not yet available to allow a strong focus on application development. This first stage should be completed early in 2000 with the completion of some major databases.

The existing subsystems are not technically linked, and the institutional co-ordination is still weak. Currently, there is no major duplication in data collecting or management, but this could easily happen in the next few years if no real co-ordination and data exchange policies are implemented. For example, several agencies are digitising 1:250,000 maps including topographic information (roads, rivers, administrative boundaries, town) because digital versions are not available yet. Due to the lack of co-ordination, the different database structures will not be compatible to facilitate data exchange.

3.2 EIS Characteristics

3.2.1 Technical Concepts/EIS Plans

EIS development is still new in Mozambique and even if some good subsystems are being implemented, this sector has not reached its maturity yet. The primary initial investments for computerised geographical information management was in 1989 with the creation of the National Remote Sensing Centre (CENACARTA), under a French aid programme. The role of CENACARTA was to introduce modern techniques for geographic information production and analysis.

Most information systems in Mozambique were planned on the basis of applying remote sensing and/or Geographic Information Systems (GIS) technologies for data acquisition or update, data management, data visualisation and cartography. Very little attention has been given to application development in most cases. The EIS system plans were not designed with an emphasis of establishing a networked EIS that ensured smooth data sharing, but were designed to respond to specific needs of the host organisation.
The implementation of EIS was also an opportunity to introduce new technologies (GIS, database management, telecommunications)- and to train local technicians through academic courses attended abroad, technical assistance and on-the-job training. The critical mass of competent technicians and installed systems has nearly been reached, if not already accomplished. This will allow new EIS implementation to focus more on application development rather than on capacity building and data production. The National Demining Commission’s GIS on landmines in Mozambique is a good example of recent application-oriented system.

3.2.2 Tools and Equipment

It appeared that the tools and equipment designed for EIS sector are principally used for GIS and database creation and monitoring. Occasionally, they have a remote sensing component and address such issues as mapping.

3.2.2.1 Information Management Tools

Environmental information in Mozambique can be found mostly on analogue supports (reports, catalogues, maps, and studies). The management of these documents is a very classical “library like” approach. Some catalogues have been transferred into PC databases, running with standard database system or specific software. It is interesting to note that one of the most complete set of reports and studies related to Environment and Natural Resource Management in Mozambique is hold by a private consultant company (Impacto).

During the last few years, most of the agencies have started or prepared their conversion to computerised information management technologies. The existing EIS subsystem are PC based, usually running Windows 95. The larger systems in the most advanced units running Windows NT 4.0. Most of the equipment has been financed by projects and are generally up to date.

Almost all computerised systems are installed in Maputo, which most definitely can be considered as a “technological island” in Mozambique. Most of the ministry’s directorates are planning to extend their system to their provincial offices and at times even down to the district level. It is clear that the technical context of the province’s cities is far from the capital’s in terms of power supply, telephone reliability, technical support.

PC Arc/info, including the NT version, Arc View and MapInfo are the most common GISs used. Some additional software such as IDRISI, ILWIS, Geoconcept, PUMATES, PS Map or KONMAP is also available. Some agencies sometimes run more than one GIS, but usually use only one. Geographic data are captured through digitalisation of existing maps, (using digitising tables A1 or A0). No scanner larger than A3 format is available at the present time in Maputo.
Plotting is mostly done with A1 or A0 inkjet colour plotters. CENACARTA has capacities to print black and white or colour films of satellite images at A4 format. For larger formats, printing is subcontracted to the Satellite Applications Centre in South Africa. Laser printers and A4 colour printers are widely used for small document printing. Plate printing can be subcontracted to local printing companies in Maputo. DINAGECA uses such agreement to print all the topographic maps. In this case, the basic information is provided by the agencies, and DINAGECA is responsible for writing the printing films and transmitting them to the local printing company. No facility is available yet to print large films directly from GIS or Remote Sensing systems.

Table 3 summarises the tools and software used by the primary agencies.

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Mapping</th>
<th>GIS</th>
<th>Remote Sensing</th>
<th>Databases</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENACARTA</td>
<td>Arc/Info</td>
<td>Arc/View 3.0</td>
<td>Erdas Multiscop e</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arc/View 3.0</td>
<td>MapInfo IDRISI Geoconcept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DINAGECA</td>
<td>Photogrammetry</td>
<td>Arc/Info Autocad Pumates</td>
<td></td>
<td>Cartographic GPS</td>
<td></td>
</tr>
<tr>
<td>DNFFB Forest Inventory</td>
<td>Classical cartography</td>
<td>Arc View 3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INIA</td>
<td>ILWIS</td>
<td></td>
<td></td>
<td>DBase 4 ALES</td>
<td></td>
</tr>
<tr>
<td>INE</td>
<td></td>
<td></td>
<td></td>
<td>DBase 4 Excel</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SPSS Access</td>
<td></td>
</tr>
<tr>
<td>Coastal Zone Management</td>
<td>Arc View 2.1</td>
<td>Arc/Info</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UEM / Geography</td>
<td>Arc/Info</td>
<td>ArcView</td>
<td>SPSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UEM / Geology</td>
<td>ILWIS</td>
<td>Autocad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demining GIS unit</td>
<td>MapInfo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.2.2 Telecommunication Tools

The telephone network covers only 61% of the territory of Mozambique. The provinces of Maputo (South) and Cabo Delgado (North) are the only two areas with complete coverage. Mozambique has an average number of 3.2 telephone lines per 1,000 inhabitants. This figure is below the average estimated value for Sub-Saharan African countries (5 lines / 1,000 inhabit.), and far from the

* ALES: Automatic Land Evaluation System
neighbouring countries Zimbabwe (11 lines) and South Africa (95 lines). There is an important imbalance between Maputo province, which counts 33 lines/1,000 inhabitants, and the rest of the country. A good point is that 93% of the telephone lines in use are connected to digital centrals.

Mozambique has a full connection to the internet. Under the Leland Initiative, USAID donated a gateway to Telecomunicações de Moçambique (TDM). The gateway (a satellite dish, network equipment, and a link to a server in the United States) provides an inexpensive direct high-speed link to the Internet. TDM leases 64 kbps lines to local, private Internet service providers (ISPs) at prices reflecting their costs. Since USAID is donating the equipment and paying a portion of operational costs for three years, the cost is low enough to encourage a rapid expansion. The Network Operations Centre of TDM was set-up on June 4, 1997. Mozambique has presently 4 operational private ISPs, who provide full internet access. Two other ISPs are starting their activities in this sector. The access is only available in Maputo, and connection to internet is thus not possible from outside of the city but by dialling directly to it. The subscriptions vary from US$ 25 to US$ 45 per month with unlimited connection access. This puts Mozambique in a good position compared with other African countries. The number of people connected to the net was estimated around 1500 at the beginning of 1998.

In addition, the UNDP funded Sustainable Development Network Project (SDNP) supports email access in two provincial capitals, Beira and Nampula, with respectively 40 and 16 people connected. A 128 kb/s VSAT connection should be installed in July 1998 in Beira to provide full Internet access, with a capacity set-up for 3 private ISPs. The gateway will be managed by the Catholic University of Beira. No full Internet connection has been planned yet for Nampula.

Under the SDNP initiative, MICOA developed a WEB site in Portuguese. This site provides general information on environmental policy, laws and main activities in Mozambique. SDNP plans to develop an English version of this site. The National Demining Commission also developed a WEB home page for the dissemination of information on its activities, and on landmines in Mozambique.

### 3.2.3 Sources of Data and Information

The data relevant for Environment Management in Mozambique is available in several agencies. Most information is only accessible in analogue format (paper documents or maps) but some can already be accessed in digital format. The following list describes the primary data and information sources sorted by type of information:

---

5 MICOA's WEB address: www.mozambique.mz/ambiente (in Portuguese)

6 National Demining Commission's WEB page: www.tropical.co.mz/~plans
• Reports. The Library of MICOA, the Document Centre on Agriculture of the MAP and Impacto (a private company) are three reliable sources of paper documents. Specific information are also accessible in DNFFB, INAM, IUCN and the donors representative offices.

• Maps. DINAGECA is the supplier of basic cartography in Mozambique. The topographic maps include national coverage's at 1:250,000, 1:500,000, 1:2,000,000 and 1:8,000,000 scales, and a partial coverage at 1:50,000 scale. Larger scale topographic maps are available on specific areas. The maps are only available on paper format. In the framework of the Rural Rehabilitation project, DINAGECA is producing with CENACARTA a digital version of the 1:250,000 scale Land Use/Land Cover map of Mozambique. This database includes an updated simplified topographic layer. Some selected areas will also be covered at the 1:50,000 scale. DINAGECA has just decided to disseminate its data on digital format in February 1998. Other thematic maps are also available on paper format in DNFFB (1:250,000 scale FAO's Forest inventory), INAM (meteorology), INIA (soil), DNG (Geology) and INAHINA (maritime information).

Table 4. Environmentally Relevant Maps in Mozambique

<table>
<thead>
<tr>
<th>Maps</th>
<th>Data owner / custodian</th>
<th>Scale</th>
<th>Source</th>
<th>Source year</th>
<th>Product- ion year</th>
<th>Extend</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime,</td>
<td>INAHINA</td>
<td>1:20,000 -</td>
<td>Survey</td>
<td>1986</td>
<td>1988</td>
<td>National</td>
<td>Paper 52 charts</td>
</tr>
<tr>
<td>Navigation</td>
<td></td>
<td>1:2,000,000</td>
<td>National</td>
<td></td>
<td></td>
<td>Waters</td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>DINAGECA</td>
<td>1:5,000,000</td>
<td>1986</td>
<td>1988</td>
<td>National</td>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>DINAGECA</td>
<td>1:2,000,000</td>
<td>1986</td>
<td>1988</td>
<td>National</td>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>DINAGECA</td>
<td>1:8,000,000</td>
<td>1985</td>
<td>1988</td>
<td>National</td>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Topographical</td>
<td>DINAGECA</td>
<td>1:250,000</td>
<td>Aerial Photo</td>
<td>1960-74</td>
<td>1970-96</td>
<td>National</td>
<td>Paper 102 sheets</td>
</tr>
<tr>
<td>Topographical</td>
<td>DINAGECA</td>
<td>1:50,000</td>
<td>Aerial Photo</td>
<td>1958-74</td>
<td>1960-95</td>
<td>National</td>
<td>Paper 1,027 sheets</td>
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<tr>
<td>Topographical</td>
<td>DINAGECA</td>
<td>1:500,000</td>
<td>Larger scale</td>
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<td>1970-96</td>
<td>National</td>
<td>Paper 24 sheets</td>
</tr>
<tr>
<td>Topographical</td>
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<td></td>
<td>maps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>DNFFB</td>
<td>1:1,000,000</td>
<td>Landsat TM</td>
<td>1990-91</td>
<td>1994</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Forestry</td>
<td></td>
<td>1:250,000</td>
<td>Landsat TM</td>
<td>1990-91</td>
<td>1994</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Vegetation</td>
<td>DNFFB</td>
<td>1:250,000</td>
<td>Aerial Photo</td>
<td>1991</td>
<td>1991</td>
<td>Maputo - Gaza</td>
<td>Paper</td>
</tr>
<tr>
<td>Geomorphology</td>
<td>DNG</td>
<td>1:1,000,000</td>
<td>Field survey</td>
<td>1983</td>
<td>1983</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
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<td>DNG</td>
<td>1:2,000,000</td>
<td>Field survey</td>
<td>1983</td>
<td>1983</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Metalogenic</td>
<td>DNG</td>
<td>1:1,000,000</td>
<td>Field survey</td>
<td>1986</td>
<td>1993</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Meteorological</td>
<td>INAM</td>
<td>Field stations</td>
<td>Every year</td>
<td></td>
<td></td>
<td></td>
<td>Paper</td>
</tr>
<tr>
<td>Chats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geological</td>
<td>DNG</td>
<td>1:1,000,000</td>
<td>Field survey</td>
<td>1987</td>
<td>1987</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Land Use</td>
<td>INIA</td>
<td>1:500,000</td>
<td>Landsat Mss</td>
<td>1985</td>
<td>1985</td>
<td>National</td>
<td>Paper</td>
</tr>
<tr>
<td>Soil</td>
<td>INIA</td>
<td>1:1000,000</td>
<td>Aerial Photo</td>
<td>1990</td>
<td>1990</td>
<td>Maputo - Gaza</td>
<td>Digital Paper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:250,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>INIA / DTA</td>
<td>1:1,000,000</td>
<td>1994</td>
<td>1994</td>
<td>National</td>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>Maputo Council</td>
<td>Aerial Photo</td>
<td>1995</td>
<td>1997</td>
<td>Maputo</td>
<td>Paper</td>
<td></td>
</tr>
</tbody>
</table>

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• Atlas. The Endangered Wildlife Trust (EWT), a South African NGO, is producing in collaboration with the Ornithological Club of Mozambique a Bird Atlas for the entire country. This Atlas will be disseminated on paper format and through EWT’s WEB page.

• Statistics. The National Institute of Statistics (INE) is responsible for collecting, gathering, storing, analysing, and disseminating information on economics, statistics, demographics, and social issues. The institute has an inter-ministerial status and manages data from different ministries. INE was responsible for the 1997 population and housing census. Preliminary analyses of the census have been published in December 1997, but the primary database will be available in early 1999. INAM accumulates data that are sent every hour or every 3 hours from the 20 stations of its national network. This data is available on paper format. INAM is also creating a database of historical meteorological information with the data provided by 77 stations from 1951 to 1990.

• Satellite Images. CENACARTA, was created in 1989 and is the Mozambican supplier of satellite images. These images come from different satellites, including SPOT, Landsat, Radarsat, ERS and SPIN. Mozambique does not have a receiving station, but CENACARTA has agreements with image suppliers, South African receiving station, and the CSIR’s Satellite Applications Centre (SAC). CENACARTA has technical capacities to process images and supply them on analogue (hard copies) or digital format (CD-ROM).

• Aerial photographs. DINAGECA is the supplier of aerial photographs. Photographs are usually at 1:40,000 scale, but can be varied for specific missions. The oldest photographs were taken during the 50s. DINAGECA has a photographic laboratory with facilities to duplicate or enlarge the original films.

• Field work. Most of the National Directorates have provincial offices that assist them with field data and information. Data gathering is extremely difficult and dangerous due to poor roads, the large number of landmines, and limited availability of four-wheel drive vehicles. For instance, the GPS points acquisition for the Land Use/Land Cover database was limited to the points that were absolutely necessary. Most information managed by the National Demining Commission come from the demining operators in the field, and transmitted to the central commission of standardised forms.

7 EWT’s WEB page: www.tropical.co.ma/~reinier (under construction)
3.2.4 Databases

3.2.4.1 Metadatabases

Metadata is information about a data set. This usually includes source references, conditions of access, data production, area of coverage, time frame, scale of applications, accuracy, other technical specifications (format, list of entities), and quality control. Metadata is stored in a specific database (metadatabase) and are disseminated through paper catalogues, WEB servers, and diskettes.

In Mozambique, several agencies maintain such metadata using different formats and tools. The primary available metadata are:

- **DINAGECA** has a list of available maps and photographs on paper format only;

- **CENACARTA** has developed a GIS application on MapInfo that provides the coverage of the satellite images available in the centre. It additionally displays a “quick look” of the selected images;

- **MICOA** has a library with a broadbased variety of environmental documentation. Each document of the library is referenced in a database managed by the Q&A software. This cataloguing activity was implemented in the framework of the INFOTERRA initiative.

- **INIA**, The National Agriculture Research Centre created metadatabases for its photographs and document libraries. The databases are running with the DBaseIV software, and are used for internal researches. A catalogue of published documents is printed every 2-3 years.

- **MAP's Documentation Centre on Agriculture (CDA)**. As in MICOA, the document references are stored in a database and the catalogue of the centre is published every year.

- **Impacto**. This private company specialises in environmental projects and studies has gathered an important set of documents on Environment Management in Mozambique.
3.2.4.2 Tabular Databases

The list of Tabular databases refers to databases which are not managed with a GIS and thus do not have spatial information directly connected to tabular records.

Table 5. Environmentally Relevant Tabular Databases in Mozambique

<table>
<thead>
<tr>
<th>Database name</th>
<th>Data owner / custodian</th>
<th>Ref. year</th>
<th>Data source</th>
<th>Spatial unit</th>
<th>Time interval</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>INE</td>
<td>1997</td>
<td>Population and housing census</td>
<td>&quot;area of enumeration&quot;</td>
<td>10 years theoretically</td>
<td>DBase, Excel, Access</td>
</tr>
<tr>
<td>Sectoral databases</td>
<td>INE</td>
<td></td>
<td>Provincial bureau and Ministries</td>
<td>Province</td>
<td>Monthly to yearly</td>
<td>SQL DB</td>
</tr>
<tr>
<td>Land Application Handling System</td>
<td>DINAGEC / Cadastre</td>
<td>1988</td>
<td>Provincial cadastre offices</td>
<td>Parcel</td>
<td>Regularly updated (historical data under keyboarding)</td>
<td>SQL DB</td>
</tr>
<tr>
<td>Protected Sites</td>
<td>DNFFB</td>
<td></td>
<td>National and provincial offices surveys</td>
<td>Protected areas</td>
<td>Regularly updated</td>
<td>Lotus, Excel</td>
</tr>
<tr>
<td>Agricultural Statistics</td>
<td>Directorate of Agricultural Economics (DEA)</td>
<td></td>
<td>Provincial offices Surveys</td>
<td>Province</td>
<td>1 year</td>
<td>DBase, Excel, Access</td>
</tr>
<tr>
<td>Water Statistics</td>
<td>about 1970</td>
<td></td>
<td>DNA network stations</td>
<td>station</td>
<td>Monthly to yearly</td>
<td>Excel</td>
</tr>
<tr>
<td>Meteorology</td>
<td>INIA</td>
<td>about 1970</td>
<td>INAM</td>
<td></td>
<td></td>
<td>DBase 4</td>
</tr>
</tbody>
</table>
3.2.4.3 Spatial Databases

Table 6 shows the existing main spatial databases in Mozambique.

<table>
<thead>
<tr>
<th>GIS Database</th>
<th>Data owner / custodian</th>
<th>Scale</th>
<th>Source</th>
<th>Source year</th>
<th>Production year</th>
<th>Extend</th>
<th>GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use / Land Cover</td>
<td>DINAGECA / CENACARTA</td>
<td>1:250,000</td>
<td>Landsat TM</td>
<td>1995-97</td>
<td>1998-99</td>
<td>National</td>
<td>Arc/Info, ArcView, MapInfo</td>
</tr>
<tr>
<td>Land Use / Land Cover</td>
<td>DINAGECA / CENACARTA</td>
<td>1:50,000</td>
<td>Landsat TM</td>
<td>1995-97</td>
<td>1998-99</td>
<td>National</td>
<td>Arc/Info, ArcView, MapInfo</td>
</tr>
<tr>
<td>Coastal Zone</td>
<td>MICOA</td>
<td>1:250,000</td>
<td>Maps &amp; Landsat TM</td>
<td>1995-96</td>
<td>1997 - 98</td>
<td>Coastal Districts</td>
<td>Arc/Info, ArcView</td>
</tr>
<tr>
<td>Soil</td>
<td>INIA</td>
<td>1:1000,000</td>
<td>Maps</td>
<td></td>
<td></td>
<td></td>
<td>ILWIS</td>
</tr>
<tr>
<td>Demining</td>
<td>CND</td>
<td>1:250,000</td>
<td>Maps &amp; field survey</td>
<td>1996-97</td>
<td>1997-98</td>
<td>National</td>
<td>MapInfo</td>
</tr>
<tr>
<td>Land Use</td>
<td>CENACARTA</td>
<td>1:500,000</td>
<td>Maps</td>
<td>1985</td>
<td>1996</td>
<td>National</td>
<td>Arc/Info, MapInfo</td>
</tr>
<tr>
<td>Digitising tests Geology</td>
<td>UEM</td>
<td>1:50,000, 1:250,000</td>
<td>Maps</td>
<td>1997 - 98</td>
<td></td>
<td></td>
<td>ILWIS</td>
</tr>
<tr>
<td>UNMOZ DB</td>
<td>No more owner</td>
<td>1:250,000</td>
<td>Maps, provincial technicians</td>
<td>1992 -94</td>
<td></td>
<td>National</td>
<td>MapInfo</td>
</tr>
<tr>
<td>Urban Database</td>
<td>DINAGECA</td>
<td>1:25,000</td>
<td>Aerial Photographs 1:40,000 scale</td>
<td>1997</td>
<td>1997</td>
<td>Beira, Nampula, Quelimane, Pemba</td>
<td>PS Map</td>
</tr>
<tr>
<td>Urban Database</td>
<td>DINAGECA</td>
<td>1:5,000</td>
<td>Aerial Photographs 1:10,000 scale</td>
<td>1997</td>
<td>1997</td>
<td>Maputo, Beira, Nampula, Quelimane, Pemba</td>
<td>PS Map</td>
</tr>
<tr>
<td>Urban Database</td>
<td>Maputo Council</td>
<td></td>
<td>Aerial Photographs 1:10,000 scale</td>
<td>1995</td>
<td>1997</td>
<td>Maputo</td>
<td>Adobe</td>
</tr>
</tbody>
</table>

Land Use/Land Cover Database. This major spatial database should play an important role at the national and regional levels in the next few years. This database is created in the framework of the Rural Rehabilitation project. This activity aims at mapping the land use and land cover of Mozambique at 1:250,000 scale and at 1:50,000 scale for selected areas. The final product will be a thematic information showing the localisation of areas under natural vegetal cover (forests, wooded grassland, etc.) and areas under actual land use (plantations, fields, villages, cities, etc.). The thematic data was obtained by visual interpretation of recent high resolution satellite images completed with field surveys. Taking the ground truthing into account, the final visual interpretation of the images is digitised and integrated into a GIS (Arc/Info for Windows NT). The database contains a Simplified Topographic Base which includes the main
information of the classical 1:250,000 paper maps. This information has been updated with the help of satellite images and GPS field survey (the last update of the paper maps took place in mid 70s). The final product will consist in one homogenous database covering the whole territory (1:250,000) plus additional separate databases for 8 selected districts (1:50,000). The databases will be maintain by DINAGECA.

Post-conflict databases. A special place should be reserved in this chapter for the former information system that was implemented by the United Nations Office for Humanitarian Assistance Co-ordination (UNOHAC) from 1992 to 1994. After the peace agreement in 1992, the difficulty of obtaining reliable and accurate information on population, health, water supply or education prevented the donors from efficiently co-ordinating their efforts. This was the reason UNOHAC created a special Information Management Unit of 27 people (including 7 technicians in Maputo and one in each of the 10 provinces) to piece together a picture of the target groups, their needs for assistance, and the response to those needs. The system, called SHAMAN (System for Humanitarian Affairs Management) was developed with Clipper 5 and MapInfo 3, and contained the digital version of the national topographic maps and a draft and simplified version of the whole national topographic coverage. The database was updated, through upload and download, or diskette exchanges with the provinces. The system produced a monthly report with a series of maps related to the post-conflict activities. The topographic layer of this database is now used by the National Demining Commission (CND) which started a GIS application in 1997 in order to maintain and disseminate information on landmines. The national database coverage will be completed in October 1998. The CND plans to replace this topographic database by DINAGECA’s new 1:250,000 simplified topographic database as soon as it becomes available.

3.2.4.4 Regional databases

Coastal Zone Information. Apart from the coverage of the Eastern Africa Region by the UNESCO International Classification and Mapping of the Vegetation in 1973, no regional vegetation coverage using a standardised classification and a larger scale was available. So, the UNEP EAF/14 project, funded by the Government of Belgium, endeavoured to create a coastal land cover of the Eastern Africa Region, at the scale of 1:250,000, and even at the more detailed scale of 1:50,000 for island nations and sites of particular interest. The structure and content of the database will be the same for the 10 involved countries, and will cover a 100 km band of the coastal area. Some thematic layers are already available for the whole coast of Mozambique.

Bird Atlas. The Endangered Wildlife Trust NGO is preparing a Bird Atlas that will integrated in a regional Atlas, and disseminated on the WEB.

Regional Vegetation Information System (REVIS). In 1997, the European Commission evaluated a project to create a Regional Vegetation Information
System. This system would provide a regional database on vegetation coverage. Since ongoing digital mapping of Mozambique will cover this regional database needs, no data will be produced. The project will only focus on data exchange and interface with the regional database structure and format.

Land Use/Land Cover databases in neighbouring countries. Some neighbouring countries of Mozambique are producing land use or land cover databases similar to DINAGECA's. In Zimbabwe, the Vegetation Resources Information System (VEGRIS) project is creating a land use database for the whole country from SPOT satellite imagery of 1992 and ground truthing. This database also contains topographic information. In South Africa, the National Land-Cover Database (NLC) project is producing a standardised land-cover database for South Africa, Swaziland, and Lesotho. This database is derived using manual photo-interpretation techniques from a series of 1:250,000 scale spacemaps, based on Landsat imagery captured in 1994-95. In both countries, data are available in Arc/Info format. Since the Land Use/Land Cover database created by DINAGECA and CENACARTA is derived from photo-interpretation of Landsat and SPOT images captured in 1995-96, the final databases will be very similar. The only but important problem will come from the differences between the databases data dictionaries. Since these dictionaries have been defined without co-ordination, the exchange and comparison of data from the different countries will be difficult, and will need at least some translation analyses and development.
Table 7 gives a list of regional projects which are relevant to environmental activities in Mozambique.

Table 7. Regional Projects of Interest to Mozambican EIS

<table>
<thead>
<tr>
<th>Project name</th>
<th>Host organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SADC Forestry Vegetation Database</td>
<td>SADC Forestry Sector and Technical Co-ordination Unit, Malawi</td>
</tr>
<tr>
<td>FAO AFRICOVER</td>
<td>Food and Agriculture Organisation of the U.N. (the Land Use/Land Cover database was defined with the AFRICOVER approach)</td>
</tr>
<tr>
<td>SADC Herbarium Information System</td>
<td>National Botanical Institute (R.S.A)</td>
</tr>
<tr>
<td>SADC Food Security Database</td>
<td>SADC Food Agriculture and Natural Resources sector, Harare</td>
</tr>
<tr>
<td>SADC Wildlife</td>
<td>SADC Forestry Sector and Technical Co-ordination Unit, Malawi</td>
</tr>
<tr>
<td>EAF/14 Eastern African Coastal and Marine Environment Resources Database and Atlas project</td>
<td>UNEP project based in UNEP Nairobi, Kenya. The project will provide a digital mapping with thematic information on a 100 km large band of the coastal line of Eastern Africa (10 countries)</td>
</tr>
<tr>
<td>Transfrontier Conservation Areas Pilot and Institutional Strengthening Project</td>
<td>DNFFB in Maputo. The project does not provide financial support to other countries, but will link the conservation's activities between Mozambique, South Africa and Zimbabwe.</td>
</tr>
</tbody>
</table>

3.2.5 Standardisation and Data Quality

The existing EIS in Mozambique is not standardised. Two workshops have been held to address this issue; i) in 1996 in the framework of INFOTERRA and ii) in 1997 in the framework of the Local Authorities Reform Programme (PROL) but without any concrete result until recently. Neither the content nor the format of the existing databases have been designed to be directly compatible. Even if the community of technicians involved in EIS development is small enough to allow all the members to know each other, there hasn’t been apparently any willingness at the institutional level to co-ordinate and harmonise the development of the systems. There are, some elements are common to most of these systems:

- Primarily used scales are 1:50,000 for the local to the district levels, 1:250,000 for the district to national level, and 1:1,000,000 for the national level or wider;

- The most frequently installed systems are Arc/Info, Arc View, and MapInfo on PC. These systems have specific interfaces that are used to exchange data
sets. This should facilitate data exchange between information producers and users; and

- DINAGECA should become the main geographic data supplier after the completion of the Land Use/Land Cover database. This will provide a standard topographic reference for any other national or provincial thematic database.

The National Institute of Standardisation and Quality (INNOQ) is responsible for co-ordinating the national quality policy, and carrying out activities such as standardisation, measuring, certification and management of quality. INNOQ activities are directed to governmental institutions, economic associations, laboratories, consumers and others. The quality control of sensitive products is undertaken by the institutions and laboratories themselves. INNOQ does quality control.

The quality control of environmental data is done by the supplier himself. In the case of the Land Use/Land Cover database, the data quality is checked at different points of the production line and is well organised. These controls cover coherence of the database, geometric accuracy, semantic accuracy, and comparison with up-to-date data.

- **Coherence.** There is only one database for the whole country rather than one database for each original map. This structure is also used in the Coastal Zone database of MICOA. A precise definition of the database dictionary prevents most of misinterpretation or miscoding.

- **Spatial accuracy.** Draft printouts are compared with original maps. Data are superposed on recent high resolution satellite images and are updated with GPS field survey.

- **Semantic accuracy.** Data are compared with original maps and thematic interpretation of satellite images is systematically controlled with field survey and/or aerial photographs.

Some metadatabases contain information on the quality of the data (resolution of the images, scale application, clouds coverage), but this is still the exception.

### 3.2.6 Environmental Standards and Key Indicators

The goal of environmental indicators is to communicate information about environment - and about human activities that affect it, in ways that highlight emerging problems and draw attention to the effectiveness of current policies. These indicators should be evaluated and published regularly in order to communicate relevant and meaningful information to decision-makers.

In the framework of EIA, efforts are made today in many African countries by environmental agencies and other groups involved in environmental management (networks, associations), towards establishing standards at local and national
levels and general indicators for monitoring the state of the environment, mostly on the following aspects:

- State of forest resources and utilisation, vegetation indices, bushfire, and wildlife;
- Meteorological data, monthly and annual rainfall, hydrological surveys;
- Population distribution, population pressure on natural resources, settlements, economic activities;
- Socio-economic data, consumption of certain goods, origin, health, education, and housing;
- Agricultural techniques and land use, crop production, fertilisers usage;
- Public utilities such as electricity, water, sewerage, telephone, transport, services and other facilities;
- Urban sanitation, waste and garbage, green space, and access to residential areas; and
- Location of infrastructures such as markets, roads, schools, and dispensaries.

Surveys on various size scales, inventories, census and enumeration, data collection and analysis are among the techniques currently used in these fields. In Mozambique, all these issues are addressed at different institutional levels according to need. Yet, a set of well defined standards and indicators for environmental management does not exist. The building of relevant database is an ongoing process and probably will require some time to reach a full operational stage. It has been demonstrated in many circumstances that data availability has not always translated into greater use, nor necessarily led to environmental sustainability. This is still to be developed with an intersectoral dialogue, and a strong co-ordination which could be provided minimally by MICOA. There is no clear definition on environmental standards in Mozambique. Adequate standards is needed in order to maintain a safe environment.

The following sectoral environmental indicators are already monitored in technical departments of various institutions:

- The National Institute of Standardisation and Quality (INNOQ) is responsible for defining applicable standards related to the environment. This includes standards on industrial pollution, water quality, and imported goods.
- The National Laboratory of the Ministry of Health is responsible for the analysis of tap water quality, and works in conjunction with the Epidemiological Department, which has the responsibility for co-ordinating all activities related to prevention of diseases.
• Since 1991, some punctual analyses have been done to provide information on the vegetation using the Normalised Difference Vegetation Index (NDVI) based on NOAA satellite images analysis. This technology is not currently used.

3.2.7 Types of Data Analysis

Since the development of modern environmental information management systems started just a few years ago, Mozambican institutions are still at the data capture stage. GIS in Mozambique is still mostly used only as mapping tools and not analytical tools. Digital data is usually produced to create clear printouts of geographical information, but when compared to the original paper maps, there was not a lot of added value. CENACARTA tries to develop the concept of geographical and environmental data analysis by showing GIS capabilities.

INIA's soil database contains about 40,000 points of measure on the whole territory. With this database, INIA can provide analysis of soil potentials, monitor soil problems, and various other soil requirements. In partnership with the University of Cromwell, INIA also developed an Automated Land Evaluation System (ALES). This expert system uses three input databases providing information on soil, crop, and meteorology, that calculates the suitability of land to support specific agricultural activities. The system is not connected yet to a GIS for mapping of the results of analyses, but INIA plans to add this facility.

Since most of the pressure on land is located on coastal zones in Mozambique, the Coastal Zone Management database of MICOA is expected to be able to provide precise and multisectoral analyses at both national and provincial levels. Applications of this database have not been defined and at the moment the system is still very data production oriented.

The National Directorate of Physical Planning (INPF) uses GIS to create printed film versions of various data layers. The GIS in this case only provides cartography facilities since the final analysis is done "by hand" with the film version of the data.

The National Institute of Meteorology (INAM) only disseminates analysed data such as meteorological charts and weather forecasts. Raw data are not disseminated except in some very specific cases.

The National Demining Commissions GIS allows analyses on existing mine areas that are used to co-ordinate the demining operation supported by different donors, and to provide the adequate support for prioritisation and land planning.

EIAs are another common data analysis being performed. The only private consultant company working on EIA in Mozambique doesn't have the computer capability to directly analyse geographic information, but it has memoranda of understanding with INIA and CENACARTA who have competencies to provide complementary data analysis.
3.2.8 Outputs

The most important outputs of the existing EIS-subsystems are printed thematic maps created from the existing spatial data or analogue maps. Reports and statistical tables are produced by many institutions as results of information analyses. The paper version of documents is the most common way to obtain information from the technical agencies.

The National Statistic Institute produces multi-sectoral and sectoral national and provincial statistical reports. Unfortunately, none of these reports contain geographic presentation of the data which could easily emphasise the distribution of socio-economical indicators by geographic entities.

INAM has a National Weather Forecasting Centre located at Maputo's international airport. It provides analysed information on the evolution of the weather via fax and phone. INAM also publishes a ten day climatological bulletin.

For each type of natural disaster, including droughts, the communication of effective warnings to communities and decision makers is very important. The present setting of the Early Warning System in Mozambique suffers from two main defects: i) there are difficulties due to lack of appropriate institutional framework and means of communication that can reach the community especially in remote areas, and ii) the response of communities to the warnings and advice is highly variable. Often there is reluctance by people to take action due to various social, economical, and technical factors.

Sets of data can always be exported from the different existing databases, but digital data exchange is still new and rare in Mozambique. For instance, DINAGECA is still defining its digital data dissemination policy. As a result, digital outputs are created for each specific demand without standard procedures.

3.2.9 Information Distribution

Each organisation involved in Environmental activities practises its own information dissemination policy. This policy is not always clearly formalised. The present trend of most public agencies is to sell information on an incremental cost basis.

DINAGECA and the National Institute of Statistics (INE) have a documentation centre opened to the public for the purchase of maps and reports. Apart from the 1:8,000,000 and 1:2,000,000 administrative maps, none of these documents are available directly from the supplier.

The National Institute of Meteorology is the only agency which disseminates its information by phone or fax.

Some magazines and general information publications are widely disseminated. The main publications are:


- **Moçambiente.** This magazine is published by MICOA. This can be considered a pioneer initiative of the Ministry of Co-ordination for Environmental Affairs, aimed at promoting the information related to environment issues. The magazine covers the following issues:
  - Activities developed at the MICOA;
  - Co-operation with different partners;
  - Management of natural resources;
  - Participation of the local communities;
  - Coastal management;
  - Biodiversity; and
  - Urban environment;

- **Savana** Magazine is a weekly general information magazine was published for about one year with a monthly supplement on environment, addressing several Mozambican and general environmental issues. This publication stopped in November 1997.

- **Diário De Moçambique,** a daily newspaper issued in Beira, used to publish in collaboration with a local association named "Propeca" information related to environment in general, such as urban environment, degradation of the coastal zone, and participation of the local communities.

- INDER publishes a monthly magazine named **Revista Rural,** and an internal bulletin, both covering issues related to activities carried out by the institution. The institution intends to have this information available at the Mozambique home page.

- The **National Demining Commission** publishes a **Bulletin** every two months which describes ongoing demining in Mozambique and provides updated evaluation of several indicators. This bulletin includes national maps of these activities and indicators.

- **Extra** is a quarterly publication of Agrarian Training Centre (CFA) related to Rural Development activities and Rural Extension in Mozambique. It publishes around 45 to 50 pages describing different issues on rural development, agriculture, fisheries, environment and legislation.

For the majority of the public, national radio and television disseminate the greatest portion of the environmental information.
Radio Cidade is a station broadcasting in Maputo, which includes in its programme special attention to issues related to the environment on specific days. It reports on environment, sensitisation, dissemination of information and participation of city-dwellers in the management of the urban environment.

A few WEB sites such as MICOA’s home page have been developed locally to disseminate information. These sites are dedicated to international dissemination of information for interested parties. Information on Mozambique and its Environment can also be found in some international servers such as:


- The USAID Mission to Mozambique Home page: http://www.info.usaid.gov/mz/Environment/environ.html; and

- The SADC Food Security and Technical Administrative Unit (FSTAU) page on Mozambique: http://www.zimbabwe.net/sadc-fanr/mz/mztocl1e.htm;

It is important to note that, the public access of this type of information in different institutions is still far from having a desirable impact.

The final form of communication, which plays an important role, is the so-called “proximity” or person to person communication.

3.3 Data Flows

Since most of modern environmental information technologies are relatively new, there is still limited data exchange between the various existing systems. This is partly due to technical factors (data structure, export format) and various institutional factors.

There is apparently no real cultural restraints in the dissemination of environmental information in the different institutions and the EIS community in Mozambique. The data managers and owners are all convinced of the importance of their data to monitor, evaluate, manage or plan the activities related to Environment and Natural Resources.

This favourable context is rarely translated into operational actions because of a lack of willingness to exchange information. The National Environmental Management Program mentioned that “in fact, a considerable number of sectors particularly at central level made the acquisition of data difficult, mainly because they consider such data as their particular product or property”.

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### 3.3.1 Data Exchange Between Agencies

There is no well organised data exchange between the various agencies working in EIS related fields. Each agency has its own practices which are not always clearly defined. Thus data is exchanged mostly through special arrangement or by purchasing it in the cases where they are available for public sale. Digital data is still rarely exchanged.

Informal contact between technicians seems to be one of the best ways to facilitate data exchange. Moreover, the EIS community in Mozambique is small and thus the boundary between professional and personal relationships is blurred.

Information is exchanged regularly between the central office of most of the public agencies and their provincial delegations. Nevertheless, provincial offices are less equipped than the central ones, so the local competencies have to be reinforced. As a consequence, provincial offices are often used to collect local data, but the analyses are processed in Maputo. The new decentralisation programme will facilitate the development of local competencies. For instance, The National Institute of Statistics will produce its 1997 Statistical Yearbook directly in some of the provinces.

Digital data is exchanged on diskettes, tapes, or CD-ROM (satellite images). Network exchange is very rare, even if it was already in use. Email attachments are becoming the easiest way to exchange data files through the network in Maputo, or between the capital and the rest of the world. This facility is also available in Beira and should improve in the next few months with the access to the full Internet.

### 3.3.2 Data Access by the Media and the Public

Environmental documentation and information products are available for free at MICOA's documentation centre or at the INAM's meteorological information centre, and for sale in some other agencies such as DINAGECA, CENACARTA, INIA, INE or INAHINA. Dissemination through book-shops is very rare, and people have to go directly to the producing agencies to buy the products. General information on environment is also disseminated by the press and radio. Specific events such as the Environment's week in June are an opportunity to alert the public to the main environmental issues in the country.
4. Institutional Aspects of EIS

4.1 Decision Making Process in Mozambique

Role of EIS in Decision Making. The importance of the role of EIS in the decision making process is very crucial. It is becoming more and more obvious that all activities related to development and natural resources management will require provisions of timely and accurate relevant spatial data or statistics with products including:

- Country overview (standard land cover and adequate zoning/land use);
- Biophysical indicator monitoring;
- Thematic representation of resources inventory, species location records, systematic reports on depletion of forests, degradation of soils, and agricultural land, ecosystem maintenance;
- Human population and demographic patterns across selected communities; and
- Infrastructure and social indicators.

The Government of Mozambique recognises the importance of preserving and maintaining its natural assets, but has been hampered by years of war and its very limited capacity to tackle even the most pressing problems in the environment and developmental sectors.

The improvement of the natural resources management and sustainable development practices require the establishment of a sound EIS among the stakeholders, either institutional or private and individuals. Within every sector of activity, the management of the information system would seek to enhance the flow of information within and between the administrations involved and all other concerned partners. It would seek also to build upon the existing achievements and effective standards framework for storing, managing and reporting critical information required to define and implement policies.

It is assumed that a sound EIS is of multi-sectoral interest. For example, a deep assessment of land use in the country has direct implications not only within the agricultural sector but in many areas of planning such as population growth and migration, public health, transport and marketing, and in long term investment strategies. Furthermore, of particular importance in the assessment of the potential of Mozambique's land resources for agricultural development is the recognition of provincial and regional differences in natural resources potentials, and the consequent effects that these may have in the attempted promotion of regional equity of development and services.
4.2 Who, Why, When

Who gave the first impetus for EIS development in Mozambique? The answer to this questioning is not simple. The question of who, why, when and what related to the EIS issues is deeply rooted in the historical evolution of Mozambique, and thus can hardly address a single situation. EIS is an ancient process, although it was developed in an unsystematic way under the colonial rule and was pursued after independence.

The concept of EIS, as well as its twin concept EIA is among the tools gradually developed since Stockholm Conference in 1972 and widely disseminated, particularly after the Rio Conference in 1992. These tools among others were some of the means used to further the implementation of international framework conventions and agreements (biodiversity, climate change, ozone layer, sea and water pollution, toxic wastes) that were adopted by the parties in these occasions.

Policy makers, planners and managers need information for decision concerning development priorities and allocation of resources. Farmers and other land users need improved information and technology to increase their productions and profits in a sustainable fashion. Extension workers rely on research results to produce appropriate messages to farmers and to report back on research farmers constraints. Universities and agricultural colleges curricula benefit from research programs and professional staff supervision of thesis. NGOs and development agencies need advice and information in order to co-ordinate, plan, and carry out agricultural and rural projects.

In Mozambique, all these issues are closely linked at the institutional and technical level. The country's specific context within the Southern African region, as well as its present stage of economic development, lead to a situation where it difficult to separate in a clear fashion environmental information producers from the consumers of such information. In order to cope with the lack of information available on request and on time in different domains, many agencies are obliged to carry out separate initiatives for data collection and processing such as inventories and mapping. Financial means and technical capabilities do not usually follow these initiatives.

4.3 Main Actors of EIS

There are several institutions which are actively involved with environmental issues, the development of some EIS or GIS data processing and information management systems which are to a great extent designed to address internal mandates and objectives. Annex 1 provides an organisation chart of these main public agencies in Mozambique.
4.3.1 Ministry for Co-ordination of Environmental Affairs (MICOA)

In 1995, Mozambique adopted a National Environmental Management Programme (NEMP) comprised of a National Environmental Policy, an Environmental Framework Law, and an Environmental Strategy. The recently created Ministry for Co-ordination of Environmental Affairs (MICOA) has the mandate to co-ordinate, supervise and monitor environmental management. The Environmental Law gives more precision on the role and powers of this government institution, with a little more emphasis on the natural resources management.

In terms of natural resources management, MICOA has two directorates, namely the National Directorate for Natural Resources Management and the Directorate of Territorial Planning, with the later also being linked to integrated land use planning. The National Directorate for Natural Resources Management oversees environmental impact assessment studies and monitors environmental sustainability. The Directorate of Planning manages the coastal strip and urban zones, sets standards for planning at district levels and promotes integrated development plans for regional, provincial and district levels.

The responsibility could well overlap with other institutions, such as the Regional Planning Directorate of the Institute of Rural Development (INDER) and the National Institute of Physical Planning (INPF).

4.3.2 Institute of Rural Development (INDER)

INDER is responsible for co-ordination, and preparation of rural development policies and programs proposed by MAP and Public Works and Housing (MOPH). Its regional Planning Directorate is also involved in the management of natural resources.

4.3.3 National Institute of Physical Planning (INPF)

INPF is under the Ministry of Planning and Finance. At national level, its responsibility is to co-ordinate all activities of physical planning. For example, INPF produced in 1985 the Maputo Land Use Plan, but due to the immigration during the war and the lack of technical competencies in the local council, this plan was not applied.

4.3.4 National Institute for Agricultural Research (INIA)

In Mozambique, agricultural research is for a greater part carried out by INIA which directly reports to the MAP. INIA's mandate encompasses all agronomic and crop research, land resources assessments and mapping and has the
essential task of ensuring continuity of efforts on priority research topics for the public sector.

Provision of land resources information and on land use are of equal priority within INIA's responsibilities, regarding the assessment of the potential of land resources in different agro-ecological zones for subsistence agriculture, smallholder cash cropping, commercial agriculture, and population growth.

The Land and Water Department (DTA). The Land and Water Department (DTA) is a branch of INIA. It is mandated to execute research related to use, management, assessment, and conservation of land resources. Most of the land resources inventory done so far in Mozambique since independence have been carried out by DTA which is de facto the leading government agency in this branch of knowledge.

Being responsible for providing information on land resources required for land use development at different levels of decision making, the promotion of land literacy among the potential users is another task carried out by the DTA. The main purpose of this type of assessment is to provide suitable information on land quality and use for development planning, while ensuring long term sustainable use of land resources.

4.3.5 Ministry of Agriculture and Fisheries (MAP)

As the largest ministry in Mozambique, the Ministry of Agriculture and Fisheries (MAP) has a broad range of activities related to agricultural production, land management, fisheries, forestry and wildlife. The ministry, which is managed by a Minister assisted by one Secretary General and one Inspector General, comprises 9 directorates, 2 departments, 7 institutes and 5 centres. Among these substructures, some are very important considering their involvement in the environmental matters and information exchange (data collection, planning, and management of natural resources):

- National Directorate of Rural Extension (DNER) is responsible for agrarian extension, mainly at provincial and district levels;

- National Directorate of Livestock (DINAP) is responsible for formulating and implementing livestock policies in the country;

- National Directorate of Agricultural Hydraulics (DNHA) is involved in policy-making, co-ordination and use of water in relation to agriculture;

- National Directorate of Forestry and Wildlife (DNFFB) is responsible for all issues regarding forest and wildlife;

- National Directorate of Geography and Cadastre (DINAGECA) is in charge of inventory and mapping regarding the sector of land use and natural resources; and
National Remote Sensing and Cartography Centre (CENACARTA) is responsible for co-ordinating all remote sensing activities.

By its nature, the forestry and wildlife sector appears as a dominant structure and is based upon a highly decentralised system with the bulk of its staff being in the provinces. The Ministry of Agriculture sees it as essential that a high degree of responsibility for both budget management and decision-making is devolved to provincial level with appropriate delegation of powers. In the coming years, the ministry envisions institutional changes which will enable DNFFB to set up cost-centres for the major State Protected Areas and Provincial headquarters.

With the assistance of IUCN, FAO and the World Bank, MAP recently completed an organisational review and produced a sectoral programme - The National Program of Forestry and Wildlife for the period 1995-2000. The programme's objectives are:

- Strengthening DNFFB to fulfil its central function of policy formulation, planning and programming, technical guidance, program administration, and monitoring and evaluation;
- Consolidation of human resource development and applied research, to raise the professional and technical capabilities required for forestry and wildlife sector development;
- Increased participation of rural communities as direct agents and beneficiaries of the integrated management, utilisation, and conservation of forest and wildlife resources; and
- Promotion of the role, interventions, and regulation of private sector in sustainable forestry and wildlife management.

### 4.3.6 National Directorate for Forestry and Wildlife (DNFFB)

Responsibility for managing the vast forestry and wildlife estate lies with the National Directorate for Forestry and Wildlife (DNFFB), one of the seven directorates in MAP. The DNFFB has a mandate for the management of gazette protected areas in Mozambique as well as for the management and conservation of wildlife and forestry resources outside the protected areas network. DNFFB organisational structure includes a department of Economics and Development which has 4 sections, of which one is a Resource Evaluation and Data Management section.

Among the 1404 qualified staff (high and medium levels) working at central level, the central office of DNFFB consists of the National Director, very few wildlife officers and three veterinarians. The field staff consists of about 150 people, including 50 anti-poaching guards. The department estimates it requires about 2,000 staff to manage the country's 87,000 square kilometres of protected areas.
With limited staff and resources, DNFFB’s stature within MAP is modest. Between 1992 and 1994, the public total investment and recurrent resources available declined from MT 3.5 billion to MT 2.1 billion (representing in real terms a decline from US$ 1.4 million to US$ 0.35 million). DNFFB was allocated only 2% of the Ministry of Agriculture’s 1995 Development Budget, which in turn received 10% of the national budget. Of the recurring budget, over 95% is used for personnel costs, leaving virtually nothing for operational expenses.

That leading agency plays a key role within the institutional organisation for rural development in Mozambique, notably in view of the number of important and fund driven projects that have been launched under its initiative or are being implemented under its co-ordination.

4.3.7 The National Directorate of Geography and Cadastre (DINAGECA),

DINAGECA is under MAP. This institution has two main responsibilities: (i) the land registration, which includes establishing and documenting occupancy rights in land and (ii) the maintenance of basic mapping of the country which includes the maintenance of the geodetic network, surveying, photogrammetry, and cartography.

DINAGECA consists of a national office based in Maputo, ten Provincial Services of Geography and Cadastre offices (SPGC), some district representatives and a technical training school in Maputo (Machava) for surveyors and cartographers. About 500 people work for DINAGECA, including 80 technicians and university degree level staff.

On-going Projects in DINAGECA:

The Swedish International Development Agency (SIDA)/Swedesurvey is supporting a five years programme in the framework of National Land Programme. This programme involves technical assistance, training, and supplying of equipment.

Two relevant projects linked to the land component are supported by the World Bank, the Agricultural Services Rehabilitation and Development Project (PRDSA) and the Rural Rehabilitation Project (PRR). One of the PRR components is a thematic mapping for the whole country at 1:250,000 scale (Land Use/Land Cover database) and some selected areas at 1:50,000 scale. This project started in 1996 and is due to be completed at the end of 1999.

The PRDSA is funding projects in Nampula and Cabo Delgado provinces, to collect data related to land use practices, land quality, land tenure, and land occupancy information.

In the framework of the Local Authority Reform Programme (PROL), the Norway government (NORAD), supports a mapping project of five cities- Maputo, Beira, Nampula, Quelimane and Pemba. This project includes technical assistance,
training, rehabilitation of the national geodetic network, aerial photo surveying, stereoplottng and the set-up of a Numeric Topographic data base for the 5 cities (1:25,000 and 1:5,000 scales).

Following an agreement with the Japanese co-operation, DINAGECA is planning to map an area of mineral interest in the Northwest of Niassa province, probably at 1:100,000 scale.

The PROAGRI programme proposes to improve and facilitate DINAGECA's management by establishing its administrative and financial autonomy and developing its statistical, accounting, monitoring and planning systems. PROAGRI also plans to support technical development through the completion of national topographic maps and improvement of the geodetic network.

4.3.8 National Remote Sensing and Cartography Centre (CENACARTA)

CENACARTA was created in 1989 under a French aid programme, and it is now a semi-autonomous institution under MAP.

The main responsibilities of CENACARTA are to co-ordinate activities concerned with Remote Sensing in the whole country and to acquire, process and supply satellite data. Other duties are the establishment of a GIS database and promote training for RS/GIS users.

This department holds a very important archive of satellite data which comprises data from Landsat MSS/TM, Spot, NOAA and ERS mainly obtained from the Satellite Applications Centre (SAC), South Africa, and from other receiving stations and sources.

CENACARTA's technical staff is well trained in both remote sensing and GIS techniques.

The hardware and software was upgraded in 1997 to meet the requirements of current standards. The equipment includes a set of Pentium PCs and 386 with extended memory, plotters, writers, and archive onto CD-ROM, optical disks and CCT's.

Presently CENACARTA is running a Land Use/Land Cover Mapping project funded by the World Bank in a joint venture with the French National Geographic Institute (IGN-FI). Other links have been established under agreements with some national and international organisations involved in the use of RS/ GIS tools.

4.3.9 National Institute of Hydrography and Navigation (INAHINA)

When DINAGECA manages information on land, INAHINA manages maritime information. INAHINA was created in 1989 and its main objective is to guarantee
safe navigation in the Mozambican waters by providing navigational aids, survey assistance, maritime charts, notices to mariners and other nautical publications.

Data Acquisition. The Hydrographic Department includes a Survey Section which is equipped with echosounder to survey the depth of important Mozambican waters areas. The system is connected to a GPS which provide precise position of the measure. Data are pre-processed on the surveying boat.

Data Processing. The Survey and Cartographic Sections produce and maintain 52 multi-colour charts at 1:10,000 to 1:2,000,000 scale. The Norwegian "KONMAP" GIS is used as hydrographic survey system for chart production.

Data Dissemination. The navigation charts are only disseminated on paper format. In addition to the charts, INAHINA provide daily notices which are broadcasted by Radio Mozambique. These notices give mariners information on the status of the Aids for Navigation and on specific events, and provide updated information for the navigation charts. INAHINA also publishes a quarterly English/Portuguese bulletin, which is only available in Maputo.

INAHINA’s operational costs are financed by the tax that is paid by each boat entering the port of Maputo ($ 2 million annually).

4.3.10 Special Programmes and Projects

Apart from institutions and agencies actively involved in EIS activities, there are many programmes and projects that are generally supported by external assistance. These projects and programmes, most of the time share a great amount of information, either as data producers from their field of work or sector of activities, or as information users for their implementation purpose.

4.3.10.1 Coastal Zone Management Programme

The Coastal Zone of Mozambique is highly sensitive in all ecological, economic, and social aspects. The activities of this project were initiated in December 1992. The overall programme has several components, also usually referred to as Projects and summarised below. Among other objectives, the project has the following goals:

- Reduction of pressures on natural resources through the introduction and adaptation of practices of sustainable management which allow the population to satisfy their basic needs for food;

- Creation of an environmental awareness in the population through the implementation of environmental education programmes and encouragement of direct participation in the management of coastal resources; and
Sensitisation of the governmental and non-governmental organisations towards including the environment components in their activities.

The second phase commenced in 1997. During the year the project concentrated its efforts in the implementation of various activities scheduled, namely environmental and socio-economic surveys, planning and use of soil, environmental education. In 1995, an Inter-Institutional Technical Committee for the Coastal Management has been set up under the co-ordination of MICOA. It was strengthened during the National Workshop on Coastal Management held in 1996 and was assigned to propose setting up mechanisms of integrated management of the Coastal Region, focusing special attention to the fields of priority, inventories, pilot projects and technical assistance. During 1997, this Committee was completely involved in the preparation of macro-diagnosis of coastal zone of Mozambique, one of the first steps identified for the preparation of the National Programme for Coastal Management.

This macro-diagnosis is in a preliminary phase in the drafting the main objectives of government policy to plan and organise the settlement and use of coastal zone of Mozambique. Therefore, it is an initial phase whose execution is advised through prudent manner assumed in the implementation of the programme. It was recommended that the programme be implemented step by step, vice initially by assessing the initiatives already existing, available information and legal procedures for the implementation of this nature. Within this spirit, the following activities were or are being carried out:

- Inventory and strengthening of the existing information on coastal management;
- Collection and consolidation of cartographic material on coastal zone;
- Identification of shortcomings of information and necessary surveys for an integrated management of coastal zones;
- Establishment of a data bank and handling of a coastal zone geographic information system;
- Inventory of legislation on coastal zone;
- Proposal of precise and concrete spatial delimitation for the extension of coastal zone; and
- Identification of priority areas for the execution of illustrative projects.

4.3.10.2 Management of Marine and Coastal Biodiversity

This project, which would be funded by the GEF, is concentrated in coastal areas and protected marine species, and is presently in phase of discussion. During the preparatory activities, several surveys and inventories were undertaken with the
aim of creating a data bank for the phase of execution. In 1997, a World Bank mission reviewed the programme of activities for the preparatory phase. The objectives of the project are as follows:

- To improve the capacity of Mozambique in the protection, conservation, and use of its coastal ecosystems;
- To establish and to improve the existing capacity within the relevant institutions in the conservation and promotion of sustainable use of coastal and marine biodiversity; and
- To test alternatives of participatory systems for the management and protection of biodiversity.

This project would be complementary in some extend to the Project of Coastal Management, funded by DANIDA, which has three components: two related to demonstration practices of coastal management and one for capacity building.

4.3.10.3 Coastal Atlas (EAF/14)

Funded by UNEP, the project of drafting a coastal atlas is focused on resuming the information of coastal environment, in an accessible way to the planners and decision makers and community in general.

The data and information on coastal and marine environment will be available through the maps of coastal resources accompanied by explanatory text of respective resources. It will be also available through data bank in the GIS. Data collection and digitisation of maps, started in October 1997 and is on-going.

4.3.10.4 Preparation of the National Programme of Coastal Management of Choral Recifes In Mozambique

With the aim of preparing the National Programme for the Management of Coastal Zone in Mozambique, a team of marine biologists, skippers, and image producers is working together in order to collect information on those ecosystems. The group is integrated in the Unit of Coastal Management (UGC) and has the support of SIDA/SAREC. Training activities on the methodology of gathering of information, including diving courses, are being undertaken. A strong inter-institutional integration is planned, with the participation of the Eduardo Mondlane University, the Institute of Fishing Research, the National Directorate of Fauna and Wildlife.

4.3.10.5 Sustainable Development Networking Programme (SDNP)

The main objective of the SDNP is to increase and improve the access to the information on sustainable development. In the mean time, the SDNP will implement the following activities:
• Improve facilities of communication in two provincial capitals, Beira and Nampula;

• Disseminate information on Sustainable Development to a large number of users through WEB pages;

• Provide training courses on electronic communication to various groups of users;

• Promote a mechanism of sustainability for the follow-up activities of SDNP; and

• Conduct a major awareness campaign by providing better access to information, and improve the capacity of decision making on sustainable development.

The SDNP unit works in close relationship with UNEP, who has an Internet WEB station in MICOA (UNEP Net), and is working on the same type of activities. SDNP and UNEP are considering merging their efforts to create a unified "communication unit" in MICOA.

4.3.10.6 Natural Disasters, Drought, and Desertification

Mozambique, which is a signatory of the Convention of United Nations against the Desertification, has an institution called the Department of Prevention and Combating of Natural Disaster (DPCCN) which deals with all types of natural disasters. In case of drought, this department assists the affected areas, mainly through the distribution of seeds of drought tolerant crops in the regions of high hydric deficit. DPCCN recommends the communities to use wetlands for agricultural purposes taking into account that these areas have water for a relative long period of time during the year. The department works in collaboration with the FAO Early Warning System to provide support to the affected people and distribute seeds for the next planting season.

Some public institutions and NGOs are dealing with desertification, and are involved in the implementation of the Convention to Combat Desertification (CDD):

• Ministry of Co-ordination of Environmental Affairs;

• Ministry of Agriculture and Fisheries (National Directorate of Agriculture);

• Ministry of Transport and Communication (National Institute of Meteorology);

• Ministry of Commerce, Industry and Tourism;

• Ministry of Public Works (National Directorate Water Affairs);

• National Institute of Agronomy; and
Several NGOs assisting the population in the most affected areas.

4.3.10.7 Inter-Ministerial Commission for Revision of Land Regulation

In the sector of natural disasters, drought, and desertification, a co-ordinating Commission, chaired by the Prime Minister, has been created to analyse the problems derived from the implementation of the new Land Law with the view to revising that regulation in the most suitable manner. The Commission includes the representatives of the following institutions:

- Ministry of Planning and Finance;
- Ministry of State Administration;
- Ministry of Agriculture and Fisheries;
- Ministry of Co-ordination of Environmental Affairs;
- Ministry of Justice;
- Ministry of Commerce, Industries, and Tourism;
- Ministry of Mineral Resources and Energy;
- Ministry of Public Works;
- Ministry of Culture, Youth, and Sports; and
- Rural Development Institute (INDER).

With the support of several donors and co-operative agencies, the Land Commission is actually working to set up specific regulations that would improve sustainable land use and natural resources in Mozambique. The group is taking into account the necessity to promote a modern and sustainable agriculture as a means to fuel the country’s economic recovery without frustrating the occupancy rights of local communities over some of their traditional land and pastures.

4.3.11 Specific Programmes and Projects Managed by the National Directorate of Forestry and Wildlife (DNFFB)

DNFFB is benefiting significantly from a large number of projects (22 as of October 1997). Among these, four primary projects are implemented in the framework of the National Programme for Forestry and Wildlife (PROAGRI). The total amount of this five year programme is estimated US$ 47 million, including $16.6 million of recurring costs. Those primary projects are:

The Forest and Wildlife Resources Management Project. This project is funded by the African Development Bank (ADB). Its aim is to assist the development and
management of commercial forestry concessions, restore a National Park (Gorongosa), and a game reserve (Marromeu), and develop social forestry programmes. The project has an estimated cost of US$ 11.8 million over 5 years.

The Transfrontier Conservation Areas Project: This project is funded by the Global Environment Facility (GEF) with the objective of providing assistance in the Gaza Province with the rehabilitation of two National Parks (Banhine and Zinave) and development of community programmes. This project will support the establishment of GIS/EIS capacity for DNFFB as part of the inventory unit. This is an integral part of the institutional building component, but will also be essential for the monitoring and evaluation component. Its estimated cost is US$ 8.1 million over 5 years.

The Support for Community Forestry and Wildlife Management Project: This project, with an estimate cost of US$ 9.6 million over 5 years, will be funded by the Netherlands Government. It is implementing pilot community forestry projects in Nampula and Maputo provinces, and meeting the full costs of the Community Based Natural Resources Management Co-ordination Unit within DNFFB.

The regional SADC Zambezi Basin Wetlands Conservation and Resource Utilisation Project. With a cost of US$ 7.6 million, it will be funded by the Canadian International Development Agency (CIDA). It aims at examining the socio-economic, biological, and hydrological impacts of development projects or climate change on the ecology of the Zambezi River estuary.

4.3.12 The Southern African Development Community (SADC) Initiatives

SADC is a regional institution, whose role is particularly important within the organisation in view of its strategic position along the coast, composed of eleven Southern African countries including Mozambique. SADC, like the European Union, is a grouping of regional nations established initially for development and co-operation reasons. Moreover it has been recognised that for a large number of issues such as planning, environmental management and resources development, these countries could no longer operate as single units.

Among other divisions, SADC has an Environment and Land Management Sector (ELMS) unit which deals specifically with natural resources management programmes.
In the SADC region, wildlife habitats, migration, watershed management, desertification, diseases (such as those spread by tsetse fly), agricultural pressures, and many others, do not recognise international borders. In this context, SADC initiatives are directed towards the various sectors with greater environmental interrelationship such as capacity building for land management, environmental management, partnerships for sustainability.

**Capacity Building: Land Management Programme.** Training is a key element of the sector's effort towards improving land management practices. Several courses and workshops are being conducted, targeting primarily trainers. They include integrating conservation into farming system and land husbandry courses, integrated land use planning, practical workshops and land degradation and desertification control workshops.

**Environmental Management Programme.** To raise environmental awareness and the level of environmental education in the region, SADC ELMS is in the process of establishing an environmental education centre. This centre will assume responsibility for the implementation of a regional programme and the production of materials. Similarly, SADC ELMS is working towards the identification of a regional centre for the monitoring, storage and exchange of EIS. A regional institution has been identified to undertake the training of trainers in EIS, remote sensing, GIS, and other related techniques.

**Partnerships for Sustainability.** The environmental resource management capacity of professionals in the member states - where the implementation of the sector's programme takes place - SADC ELMS has emphasised the building of institutional capacities in training. A number of training activities are implemented through training institutions around the region, which are often assisted by other sectors with similar training needs.

### 4.4 Institutional Conflicts

The overall institutional framework has various types of institutional conflicts. The conflicts usually result from multiple institutions carrying out the same activities in the same sectors. Most of the time, the incumbent institutions are governments institutions usually supported by external funding agencies like multilateral and bilateral donors. As far as EIS is concerned, there is a need to eliminate the institutional overlapping relative to the functions of data collection, land use allocation, mapping and cadastre, and an occasional acquisition of equipment.

#### 4.4.1 Planning Conflicts

Although DINAGECA is the main government organisation in charge of mapping and cadastre, there are number of other institutions involved as well. Those technical units located in some ministries or belonging to specific projects are: CENACARTA, DNFFB, INIA, CZMP, National Directorate of Planning, and at the regional level SADC/ELMS.
These institutions participate in the process of data collection and processing, mapping, or various types of information use. There is no hierarchy controlling environmental issues, and there are too many conflicts of interest between certain ministries involved in environmental activities. Those conflicts are usually in line with the allocation of public funds to sectoral activities, which in turn, are a political issue. There is an actual trend towards the modernisation and restructuring of main institutional bodies such as MAP in the framework of PROAGR. In this context, there is a need to ensure a clear definition of the horizontal and vertical relationships among the different institutions, agencies, units operating in environmental sector, and between those and their clients.

4.4.2 Conflicts in Legislation

In most African countries, the hierarchy of norms primarily addresses the relationships between the Constitution, and other legal acts in force (laws, decrees, legislative provisions), which are the instruments of its implementation. The present legislative and legal framework in Mozambique is progressive. The legal environment, after many years of disruption, has not yet reached its last stage of stability. Since the beginning of 1990s, new institutions are being created and installed. In the present context, there are two major conflicts with the legislation currently in place. One is the lack of hierarchy and legislation inadequacy. It is rather difficult to establish a difference in terms of hierarchical power or strength between the laws, decrees and other specific acts that organise the national activities at sectoral level. A case in point is the relationships that may exist between the Environmental Law versus the Land Law and related Regulations. Currently, it is not easy to determine what would be the ultimate legal instrument to call upon as reference in case of conflict between the framework Environmental Law and the new Land Law under revision.

Among sectoral legislation, many regulations in force today are obsolete and urgently need updating. Some were elaborated under colonial rule (Protaria n° 547 of 23 July 1927 prohibiting the cutting down of mangroves, or Portaria n° 5717 of 15 December 1930 establishing the procedures related to the authorisation for development of industrial activities). Others were adopted in the warfare context (Decree n° 495 of 20 September 1973 determining several measures for the protection against the pollution of water, beaches and coastal zones, or the Decree n° 20568 of 07 October 1967 regulating the security in the installations used for the storage of gross petroleum and its by-products and waste-products). Concerning the utilisation of natural resources, it is not difficult to juxtapose regulations encouraging their exploitation to others restricting it. Most of the time, those contradictions which are not evidenced at the stage of programmes formulation appears only at the stage of project implementation.

Therefore, the need is to promote the dissemination of all information related to relevant laws and regulations among a wide range of the society, so that every stakeholder should be aware of what is the existing regulation in each environmental sector before starting or developing any activity.
4.4.3 Environmental Policy Conflicts

Policy and Legislation. Laws and regulations are normally some of the primary instruments used to implement policies that are approved at a political level. Therefore, it is important that harmony be created between policy and legislation in each sector. It is also important to avoid contradiction between different policies approved by the same government concerning different sector of concern. For example, the National Environment Policy and the National Conservation Strategy considered implementing instruments in the hands of the National Commission for Sustainable Development and MICOA's (pending the possible reactivation of the NEC). They are actually politically entitled to play the role of the national coordinating bodies.

In the field, these policies have to face other sectoral governmental policies and strategies among which some have been adopted and are under implementation while other are under revision or drafting:

- The Agricultural Policy;
- The Land Use Policy;
- The Forest and Wildlife Policy;
- The National Policy of Tourism;
- The Investment Policy;
- The Urban Development Policy; and
- The Water Management Policy.

Further studies are needed to provide more clarification and information about these strategies and the legislation that accompanies them, as well as the possible overlaps which might occur during implementation. The fact is that each sector is considered equally important because of its political, economical or social impacts or interest, and often when an event of great concern, such as drought or disaster occurs, the Government creates a national commission or committee to monitor it. In turn, the commission (or committee) usually comes out with a national policy or strategy. Occasionally, after a period of time, the coordinating commission or committee simply ceases to exist without prior evaluation, leading at the same time to the death of the policy.

The recently approved Land Law and Environmental Law provide a workable basis to commence implementation of community programmes. The new Forest and Wildlife Legislation will be the most important in this respect, because it will provide the enabling mechanisms to devolve authority to the thousands of local communities for them to manage their resources in a sustainable way and reap the benefits. Finally, considering the importance of the EIS for the country, and viewing the poor level of information flow among and between the stakeholders, it also seems crucial today the initiate a National Policy for Information Exchange in which EIS would have a central position, with MICOA and NCSD should playing paramount roles.

### 4.5 Information Producers

All institutions, agencies, and groups involved in data collection, data processing, and sometimes data conservation can be considered information producers. Among these, general research institutes, some university departments and some field projects hold a central position. Annex 2 gives a list of institutions and agencies which play an important role in EIS development in Mozambique. Considering the sector of EIS or natural resources management, the institutions directly involved:

- DINAGECA;
- CENACARTA;
- National Institute for Rural Development (INDER);
- National Institute for Agronomic Research (INIA);
• National Institute of Physical Planning (INPF);
• National Institute of Statistics (INE);
• Fisheries Research Institute;
• Department of Plants Health;
• National Directorate for Forestry and Wildlife (DNFFB) and its Forest Inventory Unit;
• National Directorate for Fisheries;
• National Herbarium;
• National Directorate of Geology;
• MICOA (Coastal Zone Management Project);
• Eduardo Mondlane University (Department of Forest Engineering, Department of Biological, Department of Geography, National Institute for Veterinary Research, National History Museum);
• Impacto;
• NGOs (IUCN, WWF, EWT, FEF, Forums);
• SADC ELMS; and
• Donors & Co-operation Agencies.

4.5.1 Information Managers

All institutions, agencies or groups involved in the process of policy formulation, dissemination of information, or co-ordination of inter-sectoral activities, can be considered information managers. Among these, as far as EIS is concerned, we can also list MICOA and other line ministries involved in natural resources management (such as MAP and MICTUR), co-ordinating commissions and committee; networking groups and some funding institutions. It happens sometimes that information managers also participate actively in the process of data collection and processing, as is the case of certain projects within MICOA and MAP (see Annex 2 for details). They can also use information, but in normal circumstances, that information should be used in the purpose of co-ordination and monitoring. The following institutions are considered main managers:

• MICOA: National Biodiversity Unit, Directorate of Environmental Impact Assessment, Directorate of Planning and Studies, National Directorate of Natural Resources Management, National Directorate for Environmental
Promotion and Education, National Directorate for Environmental Urban Management, and Department of Gender;

- MAP: National Directorate of Rural Extension (DNER), National Directorate of Livestock, National Directorate of Agricultural Hydraulics, and National Directorate of Forestry and Wildlife;

- National Commission for Sustainable Development (NCSD);

- National Commission for Environment (NEC);

- Land Commission (LC);

- National Demining Commission (NDC);

- Ministry of Commerce, Industry, and Tourism;

- Other line Ministries: Transport and Communications, Town Planning and Housing, Health, Education;

- Sustainable Development Networking Programme (SDNP);

- NGOs Networks (EWT, WWF, IUCN, AMODER, World Vision, Africare, Forums);

- International Networks: UNEP, INFOTERRA, EAF/14;

- Regional Organisations and networks: SADC ELMS, EAF/14;

- Donors and Co-operative Agencies;

- Private Sector (Impacto); and


4.5.2 Information Users

Among all information users, those organisations involved in education and training, production of goods and services, daily management of natural resources, trade and exchange, EIA, economic activities, policy formulation, can be considered the primary addressees of EIS products. Many fields projects related to area development, many investment projects in industry sector, tourism sector, human settlements or forest and wildlife sectors require timely and accurate information for more efficient implementation process.

Education and training centres, universities, as well as other public and private agencies need information from various suppliers to develop courses adapted to the environment realities of trainees. The same consideration is true for other
investors, transport companies, farmers, agro-industries, traders involved in the import/export of goods, who need updated information for the purpose of legal and economic sustainability of their enterprises. Due to the weak capacity of certain organisations in charge of data production, those requirements are not readily available on a timely basis. The institutions or agencies concerned are obliged to participate in the process of information production and management. This involvement of non-specialised institutions to cope with urgencies or priority issues constitute the main risk of overlapping with other sectoral institutions. The most relevant organisations that can now be considered as the principal EIS users are:

- Ministry of State Administration (MAE);
- Ministry of Transport and Communications (MTC);
- Ministry of Industry Trade and Tourism (MICTUR);
- Ministry of Agriculture and Fisheries (MAP);
- MICOA: Coastal Zone Management Project, Directorate of Environmental Impact Assessment, and National Directorate of Natural Resources Management;
- National Institute of Hydrography and Navigation (INAHINA);
- NGOs: EWT, IUCN, GTA, AMDU, World Vision, AMODER;
- Agrarian Development and Training Centre;
- National Institute for Rural Development (INDER);
- Other Fields Projects Zambezi Basin Wetlands Conservation and Resource Utilisation Project - ZBWCRUP, and TFCA;
- Private Investors;
- Farmers; and
- Local Councils and Communities.

It appears with clear evidence that EIS is a theoretical framework which integrates many subsystems. Each subsystem can be referred to as a sector with development activities or simply a group of activities sharing close relationships that potentially are susceptible to environmental impacts or generating environmental degradation. All institutions or agencies belong to one or several subsystems such as information producer, manager or user according to the depth of its involvement in the activities of production, management or consumption of products deriving from a specific sector. Each subsystem incorporates many institutions, and can be managed in sectoral way. By their nature, some of the institutions are more important for a subsystem than others.
and has a more prominent position within the sector. Considering these observations, it can be assumed that the sectoral orientation of the EIS analysis offers more flexibility and a better vision to co-ordinate the EIS as a whole. Likewise, sectoral EIS subsystems that partly reflect the system in a sector can be analysed separately. MICOA and NCSD play (or should really play) a central and catalytic role to give life to the overall EIS system. Figure 2 provides a holistic vision of the EIS co-ordination and co-operation for better management of activities.

Figure 2. Cross-sectoral Co-operation for EIS Implementation

4.5.3 National and Regional Networks

Most networking activities in Mozambique are based on informal and personal exchanges between technicians. Communication between institutions seems to be quite easy and the vertical direction communication is far from being the only way to exchange information or experiences. We experienced a lot of transparency in information sharing during the study and apparent ease for an organisation to get information from another one (mainly by copying documents). The organisation link is facilitated by the concentration of most personnel in the capital, where telecommunication and transportation services are quite efficient.

The large number of projects related to Environment and Natural Resource Management is also a factor of information and experience exchanges between local personnel. Indeed, most of the project documents have been prepared by the multi-sectoral team, including participants from the public sector, NGOs and the private sector. A couple of good technicians from public agencies are also
participating in studies, reviews or project preparation as consultants to add complementary revenues to their low salaries. This allow them to increase their contacts with other agencies. The environmental community in Mozambique is growing rapidly with people that have a good base knowledge of organisational and personnel involvement.

4.5.3.1 National Networks

The Network for Environmental Information Exchange that was created under the initiative of MICOA is still not working as a network - in the sense of multilateral and bilateral exchanges between the participating agencies - but as a distribution list for MICOA to disseminate regularly information on environmental activities. A National Network on Environmental Information and Dissemination is under a consolidation process with more than 30 members.

Among these institutions, some specialise in the publication of books and pamphlets (Archivo do Patrimonio Cultural), informative bulletins, study and research reports (departamento de Hygiene Ambiental), maps (DINAGECA) and various other sources of informational publications. Many of the institutions have created their own database and use them as source and means of communication listing: catalogues, newsletters, publicity, videos, magazines, journals, reports, photographs, and other means of information. It should be noted that MICOA is also encouraging dissemination of environmental information through traditional channels of the mass communication like television, radio, newspapers, magazines, reports, and workshops.

The Sustainable Development Networking Programme (SDNP) is a national component of an UNDP's international initiative. SDNP is trying to develop, among public and private institutions, internet access and the use of electronic communication for information exchange.

The final objective of the National Network on Environmental Information Exchange and Dissemination is to bring together all stakeholders working within the environmental sector to share their experience towards an environmentally sustainable development.

4.5.3.2 Regional Networks

The regional context of EIS has involved some institutions that are actively involved with environmental issues such as development of EIS or GIS, environmental data processing, training, and capacity building. Those institutions play a catalytic role in networking activities for environmental management and sustainable development process. The leading networking groups at that level are: SADC, SEACAM, UNEP Net, and NGOs net.

SADC ELMS is a network for the exchange of environmental information at the SADC level. This network is composed of eleven countries created during the
SADC ELMS' meeting in Swaziland. One of the issues discussed was a possible redundancy of SADC ELMS and SASIN, which have the similar objectives, cover the same geographical space, and use the same focal points. The conclusion reached was that both networks should work in parallel.

The SADC Environmental Information Systems Technical Unit (SETU), in collaboration with the International Union for the Conservation of Nature and Natural Resources (IUCN) and the India Musokotwane Environment Resource Centre for Southern Africa (IMERCSA) is currently undertaking an assessment of existing national and regional EIS activities in the SADC region. This is part of a joint initiative to determine how best to develop a co-ordinated strategy effective management and utilisation of regional environmental information.

The Secretariat for Eastern Africa Coastal Area Management (SEACAM) is a network launched in August 1997 in Maputo. It regroups a wide variety of stakeholders committed to Integrated Coastal Zone Management (ICZM) in ten Eastern African countries: Comoros, Eritrea, Kenya, Madagascar, Mauritius, Mozambique, Réunion, Seychelles, South Africa, and Tanzania. The network aims at addressing two regional issues to accomplish large scale coastal zone management: i) better co-ordination and collaboration between agencies/stakeholders and between countries regionally and ii) more systematic exchange of experiences showing and evaluating successes, failures, and lessons learned. The Secretariat has established a Reference Group composed of ten country representatives. Other objectives SEACAM seeks to improve are: access to information on coastal zone projects and programmes, as well as practitioners and institutions, develop database, research activities and dissemination of results via print and on Web.

UNEP Net is also directed towards coastal management and incorporates a component of acquisition of necessary information to better understand the problems and opportunities available in the countries concerned principally by the EAF/14 Project. For this purpose, an Eastern African Action Plan has been prepared, together with the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern Africa Region (known as the Nairobi Convention). These instruments and their protocols have already been ratified by all Eastern African countries concerned, including Mozambique. The primary areas of concern are in the fields of coastal management, pollution monitoring, contingency planning to combat marine pollution, coastal erosion, and environmental impact assessment.

In order to promote the achievement of the goals of the Action Plan, various governments, organisations, and institutions operating at regional level, and potentially members of the network, are contacted:

- Regional Office for Africa of the World Conservation Monitoring Union;
- Regional Economic Development Office for Eastern and Southern Africa of the United States Agency for International Development;
Regional Co-operation in the Scientific Information Exchange in the Western Indian Ocean;

Indian Ocean Commission;

Coastal Resource Centre of the University of Rhode Island;

Administration for Development co-operation of the Government of Belgium (AGCD);

Swedish International Development Agency (SIDA) of the Kingdom of Sweden; and

IUCN (NGOs net) and WWF

4.5.3.3 International Networks

World Network for Exchange of Information (INFOTERRA)

INFOTERRA is one of the world's largest networks for the exchange of environmental information and whose objective is to stimulate and allow the exchange and flow of technical and scientific environmental information between the countries. The INFOTERRA network is co-ordinated by United Nations for Environment Programme (UNEP) and based in Nairobi, Kenya and is a 173 country affiliation. Mozambique became member of INFOTERRA in 1989.

Mozambique is also member of the Southern African Sub Regional INFOTERRA Network, an organisation which has the same objectives as INFOTERRA, but varies only in terms of geographical coverage. The network of SASIN is co-ordinated by Regional Centre based in Gaborone, Botswana. Most recently, a Sub-regional Group of INFOTERRA was created by the five African Portuguese Speaking Countries known as PALOP INFOTERRA. This network includes Portugal, Brazil and Guinea-equatorial.

Under these environmental information exchange networks, the following activities were undertaken in 1995:

- Creation of the Network for the Exchange of Environmental Information in Mozambique involving governmental institutions and NGOs;
- Registration of NGOs working in field of environment as source of environment information;
- Query processing, in primarily through the Internet;
- Working visit to the Regional Centre;
- Training Course on the Management of Environmental Information in ENFO; and
-
- Participation in the second workshop of the SADC/ELMS on the Network for the Exchange of Environment Information.

4.6 Initiation Process of EIS

For many decades, the concept of EIS has not been known as an operational concept by all practitioners of civil society. Those who were regularly involved in several activities ignored the environmental impacts of their activities. The first working group on remote sensing was created in 1978 in Mozambique. The former director of DINAGECA played an important role in the development of this technology for land monitoring. The activities of this working group led to the creation of CENACARTA in 1989.

Most of the EIS and GIS developments started with the implementation of information components for specific projects. This helped to design systems with a demand driven approach—even if they are finally often product-oriented. This evolution did not create a favourable context to have a coherent and homogenous national EIS.

4.7 Planning Process of EIS

The planning process of EIS, which is very recent, is principally reflected the process of elaboration of the National Environment Management Programme (NEMP). Along with the diagnosis of the political, economic and social context of the Mozambique, the NEMP in its overall objectives covers all sectors of development: demography and social changes, natural resources management and development, institutional and legal framework, international conventions, environmental information, erosion, pollution, water, energy, urban sanitation, health, and education and training.

The NEMP process was undertaken in a context of post war political transition. Several political changes took place in the country between 1992 and 1995, marked by general elections in the framework of a new constitution that lead to the establishment of a multiparty Parliament. The attention paid to the NEMP was thus minor compared to huge nation-wide mobilisation and interest that accompanied the political transformation in Mozambique. The adoption of the first draft of NEMP in June 1994 sound as an hasty procedure aiming at accommodating the change with the Council of Ministers that occurred at the same time.

Considering the communication aspect during the preparation and discussion phase, the NEMP led to a public awareness built through information workshops for which staff members, computers, video equipment were allocated, and panels that were constituted to prepare sectoral papers on priority areas.

As lessons learned, data collection benefited from the involvement of high level technicians of government sectors during the process, while in fact, a
considerable number of sectors particularly at central level made the acquisition of data difficult, mainly because they consider such data as their particular product or property. Since the very beginning of the process, sensitisation and participation of line ministries and other stakeholders (research institutions, private sector, NGOs, and donors community) have been recognised as the key element to induce the implementation of the national environmental policy in a sustainable manner.

4.7.1 Definition of Targets and Products

What can be considered as the main EIS targets and products are well reflected in the NEMP's components which finally constitute the majority of domains in which information flow is essential for better co-ordination and sharing of experience. The main components of the NEMP process consist of the following dimensions:

- **Institutional**: Promote capacity building and empowerment within MICOA and other related agencies at national level during the implementation process;

- **Policy**: Promote and support analysis, review, and development of priority sectors and areas of environmental concerns;

- **Laws and Regulations**: Implementation of policy, revision of existing laws and regulations leading to environmental incidences;

- **Research and Information**: Encourage and facilitate ongoing data collection in all sectors, and monitoring, organisation, and publication of findings;

- **Priority issues**: Emphasise immediate concerns such as Coastal Zone Management, Urban Environment Management, Land Use or Land Cover, Biodiversity through implementation of specific programmes and projects.

4.7.2 Responsibilities, Mandates, and Limits

Today MICOA is the government institution which has the greatest responsibility to manage, co-ordinate, and organise the environmental information system in Mozambique. To carry out this task, the NCSD, and the NEC, if reactivated, constitutes its main political supports at the higher level. The NEMP should normally constitute its principal working tool as well as the Environmental Framework Law. Unfortunately, as a ten year programme that should normally reflect the environmental policy of the Government, the implementation of the NEMP actually meets the following problems:

- Most information contained in the NEMP were collected during the war period and urgently need to be updated;
- The NEMP document was poorly disseminated and the information gathered was not always available. Despite the participatory approach that was adopted during the preparatory phase, it is easily noticeable, even in public institutions and projects that many high authorities at different levels have never seen a copy of such document, and therefore ignore its objectives and principles;

- The preparation process itself seemed to have taken into account mostly the needs of the former Government rather than reflecting the priorities of the new one, necessitating some adaptations. According to the Secretary General of MICOA, « most aspects in the NEMP do not fully respond to the needs nor to the priorities of MICOA today. It is becoming more and more obvious that the actual version should be revised. A consensus exists to create working groups to undertake reflections for that operation pending the decision that would arise from the next Government after the forthcoming electoral period;

- The transitional political period is not really over yet. The forthcoming elections by the end of 1998, will certainly bring other changes in terms of Governmental organisation, priorities, and environmental management. Its is obvious that the Government of Mozambique actually views the importance of the environment, urging sustainability in many programmes and projects. But other priorities seem to appeal it with the same urgency such as the health care, education, food security, land use recovery and probably resettlement of displaced population.

### 4.7.3 Organisation of EIS Development

This aspect has already been developed in different sections above. What can be added to this point is that actually, there is a growing awareness and a strong interest among the majority of institutions, agencies, NGOs, private sector and even educated people concerning environmental issues. There is an increasing demand for environmental information in general, and growing need to acquire modern tools and equipment that permits access.

Consequently, it is expected in forthcoming years, the market of computer, hardware and software, and other telecommunication tools will develop considerably. The number of EIS initiatives is increasing every years, even though in the absence of co-ordination they often lead to overlap and duplication.

### 4.7.4 Involvement of Stakeholders

The involvement of stakeholders is a key issue for the future development of EIS. For environmental matters in general, efforts have been made at different levels since the Rio Conference to involve as many people as possible through consultations, seminars and workshops, working groups and co-ordination committees. This consultation process started before Rio, the preparation of the country's participation in the conference, and was pursued again during the
NEMP preparation process. The set up NEC, NCSD, working groups and networks at national and regional levels have had many attempts to involve stakeholders in the decision making and to the building up of the national environmental policy.

Decision Makers. The role of decision makers is very crucial for EIS development. This role should be reflected through the preparation of the regulations and rules which must organise the overall environmental activities, and the improvement of the co-ordination framework for better circulation and sharing of information among all stakeholders. It has been shown that very little co-ordination exist between the EIS subsystems currently running in the country. One of the consequences of this lack of communication was the poor knowledge of data producers about the final utilisation of their products, the little awareness of most users about the availability in specific agencies of some outstanding information useful for the purpose of their activities, and finally the misunderstanding of the co-ordinating administrative superstructure of the real economic finality of the information system.

It is expected that in the near future, a co-ordinating body, endowed with extended and real powers, will be created or institutionalised at a high level to give the necessary impetus that the EIS sector requires for its full development. If MICOA could become an Environmental Agency under the Prime Minister's Cabinet or the Presidency, rather than a line ministry among others, it could efficiently accomplish such mandate. However, such support for environmental issues could also be dedicated to any of NEC or NCSD if they could be provided, a part of their outstanding political position, sufficient flexibility necessary for the inter-sectoral and inter-institutional co-ordination.

4.8 Implementation Process of EIS

The success of the EIS development process depends on political, managerial, and cultural will to manage shift from the current state to the future. The implementation process will have to be approached in a multi-disciplinary and multi-sectoral way. This burden cannot lie on only MICOA's shoulders. All ministries and related organisations will have to fulfil their role in the EIS development process.

Also, in Mozambique, "The EIS co-ordination body would have to be mandated to ensure effective monitoring of other institutions to ensure their compliance with the new environmental legislation. Such legislation should allow for transparency by way of being able to access certain information as it relates to it as a stakeholder and should also allow for arbitration through mechanisms that are acceptable."

4.8.1 Internal and External Co-operation

The internal co-operation for EIS development is necessary and is guaranteed as it is proven actually through willingness for creating working groups and networks involving different categories of institutions. Networking initiatives and working groups constitute the platforms for more collaboration among stakeholders by pooling resources and harmonising initiatives to avoid duplication. This is an asset that would promote and enforce better organisational approaches aiming at sharing of responsibilities and experience for information management. It is also important to note that the provincial and district authorities as well as local communities are becoming more and more involved in the process. External co-operation is widely visible in this framework both at regional and international levels.

At the regional level, there are all SADC initiatives (among which the SADC's Region-wide Network System and Environmental) and EAF/14 plans within which Mozambique plays a key role, harvesting benefits from its strategic position in the coastal area. It is also important to mention other initiatives relevant to the sector of natural resources management such as GEF’s TFCA projects through which Mozambique is beginning to work hand in hand with neighbour countries (Zimbabwe, South Africa, Swaziland, Malawi). With GEF’s support, TFCA is aiming at providing subsistence, logistical arrangements and other facilities for international community exchange programs related to biodiversity conservation in the border areas, and foster linkages with ongoing regional programs.

At the international level, so many programmes, projects or initiatives have been recorded, mostly in coastal area and in the forest and wildlife sector, usually designed with donors’ assistance, and with the objective to promoting sustainable development and management of resources. In Mozambique, this form of co-operation involving a large panel of multilateral and bilateral donors and co-operation agencies, is presently being developed in the framework of PROAGRI initiatives towards sustainable rural development and land use. Similarly, it should be recognised that the EIS could not germinate and grow up in a sustainable way without the pivotal role of donors. The co-operation will surely continue at this level between donors and the recipient country. What requires to be worked on this side is the issue of sustainability of those initiatives with respect to capability to keep up with the technology shifts of local personnel.

4.8.2 Organisational Adjustment

The organisational structure for the management of EIS is actually insufficient. Lack of institutional co-ordination, insufficient flow of information, overlapping of initiatives, duplication of field activities and results, poor management of resources and insufficient qualification of the technical staff are some of the most important EIS problems. It will be necessary to revise the mandates of some of the institutions in charge of EIS management to ensure that they are well equipped to deliver expectations.
4.8.3 Qualification of Staff

In this review, it was not possible to carry out a functional analysis of MICOA as one of the central institutions in the EIS management. It was difficult to make an assessment of staffs and personnel really working in the sub-sector of EIS within other institutions and agencies. Even when people were capable to offer some explanations about the personnel situation, it was more difficult to establish clear distinction between graduate staff engaged in administrative and managerial tasks and those committed to technical duties according to their specialisation. Moreover, it was noticed and also recognised by several managers that usually, skilled and ambitious staff members tend to look for more promising activities as soon as they have become specialists, quite often, soon after they finished their expensive training, that private industry or international organisations are offering much better salaries and more promising professional perspectives than isolated EIS units.

In 1995, a total of 690 qualified staff (high and medium levels) was listed at the central, provincial, and local levels. This number included forestry and wildlife personnel in teaching and research institutions and the remaining state forest industries, as well as park staff. At the provincial and local levels, 475 personnel cover 10 provinces. Most staff have received no training since the 1970s due to the destruction of training facilities during the civil war. Today, one PROAGRI Report points out that the MAP’s personnel is composed of 4659 persons both at central and provincial levels. Among those, only 395 people were University Graduates (7%), and 1370 pre-University Graduates (23%). The rest (70%) were support staff with Secondary and Primary Education. In MICOA, discussions with one of the officials led to estimates of 3000 people working within the institution among which only 70 people (less than 3%), were graduated at medium and high level. About 300 personnel worked at central level and 2700 in the provinces and districts. CENACARTA as a more technical agency has a limited number of personnel, concentrated at central level and no staff at provincial level. Most of them (52%) are graduated (medium and high levels) and capable of using modern computer tools applied to remote sensing, photogrammetry, cartography etc. The volume of field work and manual operations require a lot of support staffs, particularly at provincial level, while the majority of technical staffs are concentrated at central level, where the data collected are processed. In other institutions, the personnel situation is reflected in the table below. But it is important to inform that these figures which derived from rapid appraisal are simply indicative and should be considered with caution.
Table 8. Distribution of Staff in Some Institutions

<table>
<thead>
<tr>
<th>Institution</th>
<th>Staff</th>
<th>Central Level</th>
<th>Province Level</th>
<th>Graduates (High + Med. Levels)</th>
<th>Percentage of Graduates (%)</th>
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<tbody>
<tr>
<td>MICOA</td>
<td>300</td>
<td></td>
<td></td>
<td>70</td>
<td>23</td>
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<tr>
<td>MAP</td>
<td>4659</td>
<td>1404</td>
<td>3255</td>
<td>1462</td>
<td>31.4</td>
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<tr>
<td>DINAGECA</td>
<td>500</td>
<td>200</td>
<td>300</td>
<td>80</td>
<td>16</td>
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<tr>
<td>CENACARTA</td>
<td>21</td>
<td>21</td>
<td>0</td>
<td>11</td>
<td>52</td>
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<tr>
<td>INPF</td>
<td>200</td>
<td>80</td>
<td>120</td>
<td>30</td>
<td>15</td>
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<tr>
<td>DINATUR</td>
<td>30</td>
<td>12</td>
<td>18</td>
<td></td>
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<tr>
<td>INAM</td>
<td>200</td>
<td>52</td>
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<tr>
<td>INIA</td>
<td>?</td>
<td>103</td>
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<tr>
<td>EWT (NGO)</td>
<td>60</td>
<td>4</td>
<td>56</td>
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</table>

Human resources development is of particular concern at various levels. In most institutions, less than 10% of the total staff are specialised and really qualified with a University Degree and capable of working at managerial and decision-making posts. Another 5 to 10% have a pre-university degree. They cannot fully participate in policy formulation without additional training aimed at improving qualifications. At both the medium and high levels, technical staff will also need to be trained through programs to develop them into effect managers.

4.9 EIS Evaluation Process

4.9.1 EIS Products Versus User Requirements

Modern Environmental Information management tools appeared in Mozambique less than ten years ago. The development of EIS is still ongoing, and the first National Environment Management Programme was actually produced in the absence of an EIS.

Apart a few examples as UNMOZ or demining information systems, most EIS subsystem have been set-up to facilitate computer-assisted cartography without a clear evaluation of the user requirements. The user mainly include decision-makers at a national and local level. As a result, the implemented system are at the present time rather data and product oriented than application oriented.
4.9.2 Access to Information

Many pieces of information on environment are available in various organisations. Most information can only be found in Maputo, and usually on paper versions. It is very difficult to localise all information related to a specific theme or sector, or to find specific information on a topic, even if one knows that this information exists. The Mozambique National Strategy for the Conservation of Biological Diversity includes in its objectives “to improve the knowledge of important components of Mozambique’s biodiversity” by promoting the compilation, synthesis, and analysis of existing biodiversity information, and ensure that this information is disseminated in a suitable form.

Only a few organisation like CENACARTA, INIA or MICOA maintain a catalogue of their own information and data. As a result, some people complained that the access to some information was difficult, potentially time consuming, or was even impossible. In few cases, as for the maps of localities, information seems to be inaccessible because “it had not been approved”. This situation is rare and apparently, there is no major difficulty to obtain information from Mozambican agencies as soon as you know where it is localised. The national Directorates involved in Environmental Information Management have been equipped with copiers and printers with the support of development projects.

The apparition of digital data confronts some suppliers with the problem of data exchange, including the legal aspect. There is no copyright in Mozambique and most public agencies need to market their product in order to find additional resources to maintain and update their data. For instance, DINAGECA accepted in early 1998 to disseminate the Land Use/Land Cover database in digital format. The question of data exchange policy has not been really addressed yet.

4.9.3 Impact of EIS

Theoretically and in the best of cases, EIS outputs and guidelines will address different environmentally sustainable development objectives such as:

- Capacity building for sustainable development;
- Improved Management Information Systems;
- Improved Planning, Management, and Monitoring;
- Development of Policy and Legislation;
- Achievement Revenues Enhancement, Collection, and Retention; and
- Improved Fire Management and Fuelwood Utilisation.
4.9.3.1 Capacity Building for Sustainable Development

In a country like Mozambique, which is coming out of a long period of civil war and starting a recovery period, the process of co-ordination and management of activities in different sectors heavily relies on a relevant information system. The environmental issues are among the most critical ones. In this framework, the sharing of information on the conservation and management of natural resources, sharing of scientific, technical information, and expertise will be of significant importance. In order to move towards these objectives. A number of important outputs are to be achieved and the following activities to be carried out:

- Upgrading staff capacity and capability to carry out planning, management and monitoring functions in all the provinces, including providing guidance to ecological monitoring units established in State Protected Areas;
- Providing material support for adequate performance;
- Linking the provincial monitoring and reporting to the central system;
- Periodical review of macro economic projections and planning;
- Policy analysis and development, including the institutionalisation of a policy and strategy discussion group involving the representatives of concerned government agencies, stakeholders, donors and other partners;
- Updated regulatory framework for private sector and local communities; and
- Participation in international treaties and conventions with a view to strengthening the national and regional position on sustainable use issues and protecting the interests of local stakeholders.

4.9.3.2 Improved Management Information Systems

The objectives of creating a GIS/EIS unit within certain institutions is primarily to concentrate on planning, design, programming and full maintenance of a spatial database both at the national and provincial levels. The unit will perform the same function for textual database management system for community area management, law enforcement, surveillance, and economic/financial data management directed towards overall planning, monitoring and evaluation, revenues and tax collection from the public and private sectors operating in the region. The critical activities would include:

- Establishment of data generation, storage, analysis and reporting facilities at central and field levels;
- Improvement of management information reporting and feedback; and
- Training of key operating personnel.
4.9.3.3 Improved Planning, Management, and Monitoring

The ongoing decentralisation process and implementation of policies for participatory natural resource management call for a strong field administration in the provinces. As in the situation of DNFFB, it is intended that there should be minimum proliferation at provincial headquarters and that the decentralisation process should extend to individual protected areas - so avoiding any criticism on further growth at the centre;

Further along in the investigation, activities to be achieved in this framework include:

- Overseeing the implementation of sectoral programs;
- Regular monitoring and evaluation of specific projects;
- Annual review of sector progress to analyse prevailing issues and propose corrective measures; and
- Periodic publication of sectoral statistics.

4.9.3.4 Development of Policy and Legislation

There is a need to formulate sectoral policies and adjust legislation so as to respond adequately to the new political, social, and economic environment. The policies would comprise:

- A review of existing legislation in certain sectors and their revision to conform to new policies and take into account other legislation including the Land Law, the Municipality Law, and the Environmental Law;
- Address the regulatory requirements for rural community and private sector involvement in the management of natural resources and assessment of environmental problems; and
- Development of transparent administrative procedures for all activities related to natural resources exploitation and utilisation and effective management of environmental problems.

4.9.3.5 Achievement Revenues Enhancement, Collection, and Retention

The long term sustainability of each sector depends heavily on the assurance of adequate budget viability, provisions to demonstrate the economic viability of its major undertakings and their contribution to social and ecological objectives. Activities to be implemented to improve revenue generation:

- Review the existing fee structure with recommendations for its improvement and the formulation of a system for its regular updating;
• Review and revise the existing revenue collection system, including collection points, with a view of improving its efficiency and ensuring it is consistent with the aims of a participatory resource management; and

• Study and propose mechanisms that would allow each sector to retain part of revenues generated from its activities for self-financing. This may begin to address the problem of salary.

4.9.3.6 Improved Fire Management and Fuelwood Utilisation

Ground cover in the majority of the forested areas is burned every year due to inadequate agricultural practices, grazing, traditional hunting, and honey gathering. This has a significant negative impact on the composition and quality of the vegetative cover. This should be addressed through the following:

• A strengthened capacity to combat fires through strategically located fire prevention units in the provinces;

• A public awareness campaign at provincial and district levels which would include materials to be developed and incorporated into community based resource management plans; and

• A consistent study of urban wood supply and demand, especially fuelwood and charcoal, for resource management purposes and establish the magnitude of revenue which can be generated from commercial fuelwood and charcoal production.

4.9.4 Potential EIS Users

The potential users of EIS in Mozambique are principally the same institution recorded in Section 4.5.2. This group which could easily be integrated in a networking system, it is possible to distinguish following sub-groups:

1. Public institutions in charge of policy formulation, design, and monitoring with their divisions at central and provincial levels:
   * Ministry of State Administration (MAE);
   * Ministry of Transport and Communications (MTC);
   * Ministry of Industry Trade and Tourism (MICTUR);
   * Ministry of Agriculture and Fisheries (MAP); and
   * Ministry for the Co-ordination of Environmental Affairs (MICOA).

2. The Co-ordinating Commission established at sectoral level for better monitoring of specific activities and their impacts:
* National Commission for Sustainable Development (NCSD);
* National Commission for Environment (NEC);
* Land Commission (LC); and
* National Demining Commission (NDC).

3. Some institutes and field projects which are sometimes also involved in the process of data collection and promotion:

* National Institute of Hydrography and Navigation (INAHINA);
* Agrarian Development and Training Centre;
* National Institute for Rural Development (INDER); and


5. Private investors (industry, agriculture, transport, tourism infrastructure, housing, forest exploitation, wildlife exploitation).

6. Farmers groups, local communities and councils.

7. National and regional Networks in sustainable development.

8. Media (national and international levels).

9. Donors & co-operative agencies.
Figure 3 gives an overview of the EIS subsystems with the core institution management involvement.

<table>
<thead>
<tr>
<th>Sector(s) / INSTITUTION</th>
<th>Co-ordination</th>
<th>Data Production</th>
<th>Sub-Regional</th>
<th>Area Develop.</th>
<th>Biodiversity</th>
<th>Industry Energy &amp; al.</th>
<th>Info &amp; Com.</th>
<th>Research</th>
<th>Education &amp; Training</th>
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<td>MICOA/ NCSD</td>
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### 4.9.5 Developments and Future Options

The sustainable development scheme and the need to internalise environment issues are the concepts that have been taken as the strategic direction for Mozambique. It is clearly understood that any development which ignored environmental considerations will not be sustainable. The reference to environment as a central concern is quite clear in all national policies documents (Land Use Policy, Water Policy, Economic Policy, Forest and Wildlife Policy).

For the future developments and under the above conditions, mainstreaming the environment will not simply mean acceptance of these concepts and principles at
political and institutional levels, but also transcription into common behaviour at the community level. For this purpose, raising awareness through sensitisation campaigns and building capacities through medium and high level training shall be viewed as instrumental to achieve the objective of sustainable development and environmental information system that support it.
5. Economic Aspects of EIS

It was very difficult during the mission to collect precise economical data due to (i) the lack of available information related to this aspect in the agencies, (ii) the early development state of EIS in Mozambique and (iii) the fact that EIS development has not been considered as a specific sector yet. Efficient accounting and monitoring systems have not been established in the implementing agencies, and in the case of public agencies, a part of the budget such as salaries and maintenance costs is managed at a higher level which prevent these agencies to evaluate exactly the cost of their activities.

Environmental information production, management, and dissemination is financed through three sources:

a) **Government Investment.** The implementation of an EIS is a long term process with important investments which can not provide quick investment returns. Thus the implementation of these systems is usually supported by the government. In the case of Mozambique, the Government could only implement such systems with the support of external donors. Data produced by these systems are - or more precisely used to be - usually disseminated free of charge (public domain). Dissemination of information through WEB servers can also be added to this category since none of the Mozambican WEB servers related to environment is selling its services (directly or through advertising).

b) **Sale at Recurrent Cost.** This seems to be the method adopted by most of Mozambican environmental information suppliers, such as DINAGECA, INE, INAM, DNFFB and partly CENACARTA or INIA. Recurrent costs cover paper copying, diskette producing or CD-ROM recording and the time spent by the operator. These costs do not cover the price of data production and usually do not include provision for depreciation of equipment.

c) **Information Production Cost Recovery.** Private companies and consultants usually try to recover their entire cost for data production when they are working on a contract for a specific study (environmental impact assessment for instance). Some public agencies such as CENACARTA or INIA have also the same approach for specific works or studies which are not directly included in their mission of public service. Financial autonomy and efficient accounting system are the two key factors needed to develop such approach. Both are still rare in Mozambique.

It is difficult to evaluate the potential market for EIS, but it is clear that the development priorities of the country are not focused on EIS implementation. The lack of resources of the Government can not facilitate this implementation. As a consequence, support from external donors will be needed to support such investments and even a large part of the operational costs during the next five to ten years in Mozambique.
5.1 Implementation Costs

All recent investments related to Environmental Information Management have been financed by the following external donors:

- Multilateral donors (European Union, UNEP, UNDP, World Bank);

- Bilateral donors (DANIDA, SIDA, NORAD, USAID, French Co-operation, Dutch Co-operation, CIDA, British Co-operation); and

- Technical international agencies (FAO, UNIDO, UNICEF, UNFPA, UNCHR) and NGOs (IUCN, WWF).

Table 9 gives the list of the major programmes which have supported or will support EIS development in Mozambique.

<table>
<thead>
<tr>
<th>Project's name</th>
<th>Donors</th>
<th>Start year</th>
<th>Duration</th>
<th>Amount (millions $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support to CENACARTA's capacity</td>
<td>French Co-operation</td>
<td>1989</td>
<td>7 years</td>
<td>US$ 2.4</td>
</tr>
<tr>
<td>Forestry Inventory</td>
<td>FAO</td>
<td>1990</td>
<td>5 years</td>
<td>~ US$ 6.0</td>
</tr>
<tr>
<td>Support to DINAGECA's Cadastre unit</td>
<td>SIDA (Swedesurvey AB)</td>
<td>1991</td>
<td>8 years</td>
<td>US$ 6.0 (1996-99)</td>
</tr>
<tr>
<td>Rural Rehabilitation Programme</td>
<td>World Bank</td>
<td>1993</td>
<td>3 years</td>
<td>US$ 23.0</td>
</tr>
<tr>
<td>Institutional Support for Land Resources Inventory and Assessment Project</td>
<td>Dutch Bilateral Aid Program</td>
<td>1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfrontier Conservation Areas (TFCA)</td>
<td>World Bank / GEF</td>
<td>1998</td>
<td>5 years</td>
<td>US$ 8.1</td>
</tr>
<tr>
<td>PROAGRI / Forestry and Wildlife</td>
<td>Multi donors</td>
<td>1998</td>
<td>5 years</td>
<td>US$ 46.9</td>
</tr>
<tr>
<td>National Programme for Coastal Zone Management</td>
<td>DANIDA, IUCN...</td>
<td>1998</td>
<td>5 years</td>
<td>US$ 15.0</td>
</tr>
<tr>
<td>Coastal Zone Biodiversity (CMBMP)</td>
<td>World Bank / GEF</td>
<td>2000</td>
<td>5 years</td>
<td>US$ 10.0</td>
</tr>
<tr>
<td>Forest and Wildlife Resources Management Project</td>
<td>African Development Bank</td>
<td></td>
<td></td>
<td>US$ 11.8</td>
</tr>
<tr>
<td>Support for Community Forestry and Wildlife Management Project</td>
<td>Dutch Government</td>
<td></td>
<td></td>
<td>US$ 9.6</td>
</tr>
</tbody>
</table>

None of these programmes are totally dedicated to EIS implementation, but most of them include an information component or support information collection and dissemination. The creation of the Land Cover/Land Use is supported by the Rural Rehabilitation Programme financed by the World Bank. It was not possible to extract for each programme or project the part of the budget that was allocated.
to EIS development. The initial budget described in the project documents do not reflect the distribution of the real investments.

5.1.1 Concept/Design

Most EIS subsystem design have been done during project preparation stage. Until recently, the design was usually done by an external consultant. Local consultants and implementing agencies took a higher part in the preparation and the writing of the PROAGRI programme, which reflects the improvement of local capacities.

When financed by bilateral funds the system design can reflect specific technologies developed in the financing country (for instance, the Norwegian KONMAP software in DINAGECA).

5.1.2 Investment Categories and Costs

The two most expensive categories in EIS implementation are technical assistance and equipment. They can easily absorb more than 75% of the investment and are financed by donors in the project budgets. The only exceptions seen were the renewal of nine GIS/Remote Sensing work stations in CENACARTA that the centre financed in 1997 from its own budget (US $100,000) and a part of the investment programme of INAM that was financed in 1996 by the Government (US $120,000). The other major cost categories are data acquisition (mainly satellite images and aerial photography) and training. Field work or survey can be costly due to the difficulty to access some parts of the country and the need of good four-wheel drive cars.

The following table shows the investment budget for the production of the national 1:250,000 scale Land Use/Land Cover database for DINAGECA. This work began at the end of 1996, and completion due by the end of 1999. In this example, the investment for the creation of this database and the associated capacity building is just a bit more than $1 million per year for 3 years.

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data (satellite images + correction + printing)</td>
<td>825,000</td>
</tr>
<tr>
<td>Ground truth campaign</td>
<td>225,000</td>
</tr>
<tr>
<td>Technical Assistance</td>
<td>1,370,000</td>
</tr>
<tr>
<td>Training</td>
<td>70,000</td>
</tr>
<tr>
<td>Equipment (mainly computers, printers, GIS) + vehicles</td>
<td>550,000</td>
</tr>
<tr>
<td>Administration, logistics</td>
<td>150,000</td>
</tr>
<tr>
<td>Total</td>
<td>3,190,000</td>
</tr>
</tbody>
</table>
The two highest costs are related to technical assistance and data acquisition. This can easily be explained by:

(i) this database creation is the first implementation of a digital cartographic database production line in DINAGECA (need for technical assistance), and

(ii) the satellite images had to cover the whole territory (799,380 square km).

There is not an average cost for the set-up of the different EIS subsystems. Amount ranges from hundreds of thousands dollars (Coastal Zone database) to tens of million dollars (INAHINA information system). Investments are usually spread over 1 to 5 years. For instance, CENACARTA was created in 1989 with an investment of $3 million from French co-operation, including $1.2 million of technical assistance over 3 years. DINAGECA receives about $2 million per year from the Swedish Co-operation and $3 million per year from World Bank's projects, including some operational costs. The investment of the INAHINA information system is estimated $37 million and has been financed by Norway. This investment included a survey ship for $12 million, and more than $20 of technical assistance.

The five year PROAGRI/Land Component proposes some major investments on Land Cadastre ($23.5 million) and Land Use Information and Planning: ($6.5 million).

5.2 Operational Costs

5.2.1 Staff

Salaries usually represent the major part of operational cost financed by the Government. Salaries of civil servants are quite low and as a result, most of the EIS projects provide specific allowance to complement the base salaries. This also helps to decrease absenteeism by preventing civil servants, especially the best technicians, to have to have a parallel job in order to increase their salaries. Some donors can not or do not want to use these facilities and have hired technicians on a contractual basis. The main problem in this case is the
reintegration of these technicians as civil servants in their administration after the completion of the project.

The amount financed by the Government of Mozambique for the salaries of the local staff involved in EIS development is low compared with the external investments. For instance, the annual allocation for the salaries of DINAGECA's staff is around $55,000 for 500 people. This means an average allocation of $110 per person per year. The amount provided annually to DINAGECA by external aids and projects exceeds $5 million.

The Eduardo Mondlane University (UEM) has very limited budget. All UEM research activities including some salaries are being supported by international aid. The local budget allocated for 1994 is less than US$ 100,000 and finances primarily teachers salaries.

5.2.2 Maintenance

Maintenance of equipment and vehicles is often financed by the same funding mechanism that finances the equipment, at least initial implementation of the EIS subsystems. This means that the donors support usually includes a part of the maintenance costs for the duration of the project. For public agencies, the contribution of the Government covers the maintenance of office space, electricity, and telephones. Since most of equipment such as computers or printers have been bought during the last 2 to 3 years, it can be predicted that the maintenance costs should increase in the next few years. This issue is almost never properly taken into account in agency's budget. It is better considered in agencies that have a cost recovery approach. For instance, CENACARTA which tries to work on a cost recovery basis spends about $100,000 per year for the maintenance of its equipment.

5.3 Economic Benefits

The value of geographic and environmental information is usually difficult to assess. In the case of Mozambique, difficulties come from (i) the lack of reliable figures on environment evaluation, (ii) the youth of the EIS sector in the country and (iii) the lack of economical approach in the EIS subsystem implementation.

Most systems are still in a development phase and more precisely in the data production phase. The economical impact of EIS on decision making has yet to be evaluated. It is obvious that some systems like UNMOZ information system or the Automated Land Evaluation System of INIA had or have an important impact on the peace process for the first one or land planning for the second one. The assessment in terms of reduced risk, environmental costs saved or benefits generated is a very important exercise to be done but which has to be delayed due the present stage of development of EIS in Mozambique.
5.4 Financing Mechanisms

All implementations and various parts of operational costs of EIS subsystem are financed through projects heavily dependant on donor funds. The national recurrent budget usually finances salaries and operational costs (office space or electricity).

Lack of co-ordination in environmental information development on both Mozambican and donors sides can have devastating effects on the use of available funds such as implementation of donor-driven but not demand-driven activities, overlapping of activities, donor competition, or imbalance between project-financed agencies and not-project-financed ones.

Regarding public funds, the State Budget allocates approximately US $2 million to the Ministry for the Co-ordination of Environmental Affairs (MICOA) for the 1998 fiscal year. This covers salaries, consumables and services, recurrent costs, and a few investments for the Ministry. Between 1992 and 1995, the total public sector financial resources made available for managing forest and wildlife resources declined from US $1.4 million to US $0.35 million due to a combination of declining budget, currency devaluation, and low priority.

The only source of funds coming from the private sector that was mentioned during the mission was the financing of Environmental Impact Assessment (EIA) studies by private companies. Hydraulics, tourism, electricity production, transportation, and pollution are the primarily private sectors involved in the EIA process. These studies are punctual and are not integrated in the development of a general environmental information development plan in Mozambique.

5.5 Financing Alternatives

Aside from the external donor funding mechanism, currently, there is no real financing alternatives for EIS development. Since EIS is still growing, it can already begin to focus more on application development rather than on data production. It is important that all involved institutions start taking serious measures in order to optimise the use of existing funds. The following points are some examples of what could be done:

- Improving the national co-ordination of EIS planning and development, including the maintenance of catalogues of available information;
- Reducing the overlapping of activities, especially data production;
- Facilitating data exchange between institutions to allow each to focus on specific data;
- Saving operational costs by better management;
- Introducing clear budgeting and accounting of information system activities in the agencies; and
- The use of a combination of different funding mechanisms simultaneously.
6. Human Resources Development and Capacity Building

It has been demonstrated that very few institutions started their activities with a sufficient number of qualified and dedicated national staff. The development of human resources for EIS/GIS is currently based on capacity building through training and technical assistance. This usually requires external support for logistical provisions, equipment, and training in the process of day to day activities.

At the central level, some agencies provide training programs for their staff in such domains as financial management, procurement and disbursement, project planning, strategic planning, policy formulation, programme development and extension, management planning, computer courses, monitoring, and evaluation. Study tours at regional and international level are also organised sometimes as mean to improve national expertise skills, to foster partnerships, sensitisation and shared learning experiences.

In 1996, the EAF/14 project financed a ten-day training course in Geographic Information Systems (GIS) using PC Arc/Info software. This course was conducted in Maputo by a Kenyan consultant from the Arc/Info distributor company for East Africa. Five people of MICOA who are working now on the Coastal Resources Information System attended this training session. Additionally, three of them participated to a two-week training on GIS and Remote Sensing in Nairobi in September 1997.

6.1 National Training Infrastructure

Prior to independence in 1975, there were few trained Mozambican scientists or high level technicians. Following independence, Mozambique embarked upon a massive educational development strategy focusing on primary, secondary and tertiary education. It was only the 1980s and early 1990s that the first cadre of trained Mozambican biologists, foresters, and agronomists graduated from Mozambique’s national University, the Eduardo Mondlane University (UEM).

Evolution of Capacities During the Last 20 Years. After peace, Mozambique was in a position in the mid 90’s to move from humanitarian assistance to development planning. Human Resources Development (Education) was one of the three sectors of priority. Investment from the donors reflected this orientation.

The training of local technicians and engineers really started only after the independence of the country in 1975. At that time, Mozambique had only 17 high degree technicians. Another example is the training of local meteorologists which started in 1979, while the first meteorological service was created in 1908. The first biology degree was obtained in 1990 in Maputo.
Most of the high level technicians working presently on environmental information management were trained abroad, and primarily in Cuba, France, the Netherlands, Portugal, South Africa, United Kingdom, and the former USSR.

Experience shows that the capacity to undertake training programmes in most of the EIS technologies already exists in Maputo. Training of at least operators and technicians can now be done locally while it was obligatory to send these people abroad a few years ago.

Today, the process of consolidating scientific capacity building is continuing through a variety of postgraduate programmes. All postgraduate degrees earned by the Mozambicans are obtained at foreign universities.

6.2 Technical Assistance

As already mentioned, technical assistance is always financed through donor funding, usually in the framework of a project implementation. If in the past, EIS or GIS developments were directly linked with the presence of at least one permanent technical assistant, the context is a bit different today. Some information system initiatives such as the Coastal Zone Information System development mobilise only short term technical assistance and not full time assistance. The set-up of major systems still needs the participation of important technical assistance in order to facilitate the integration of operational and application aspects of the developments.

For example, at the creation of CENACARTA in the beginning of the 90s, the French Co-operation funded two technical assistants for one year and then one assistant for another 2 years. After that, the centre only received short term technical assistance. Two permanent technical assistants presently work with the seven local technicians who are responsible in DINAGECA for the production of the Land Use/Land Cover database. This assistance will be maintained until the end of 1999, but with only one person during the last months of database production.

6.3 International Co-operation

It was obvious during the meeting with organisations that many public agencies benefited from large investments from donors, especially in terms of equipment, such as computers, telecommunication tools or vehicles, and training. Most of the computers were purchased within the last two years (Pentiums with Windows 95 or NT 4.0).

In 1994, Government revenues accounted for only 17.6% of GDP. As a result, the budget was - and still is - heavily dependent on external aid in the form of grants and concessional loans, which in 1994 financed 65% of total expenditure and 78% of public investment. In 1994, grants (21.5% of GDP) actually represented 122% of Government revenue.
The external assistance’s disbursements totalled US $1.048 million in 1994. Figure 5 shows the evolution of external assistance with the distribution between the different types of donors. If the bilateral aid has been relatively stable between 1991 and 1994, we can notice the regular increase of multilateral support during the same period. IDA’s disbursement particularly increased from US $40 to US $152 million between 1993 and 1994.

Figure 5. External Assistance from 1991 to 1994 (US$ million)

The assistance dedicated to activities relative to Environment and Natural Resources Management increased from around US $120 million to almost US $150 million between 1991 and 1994. This evaluation includes activities directly connected with the management of environment, but also related activities like managerial training, statistics, cartography, and community based development.

The natural resources and the environmental part of the Agriculture, Forestry and Fisheries sectors represent a total amount of about US $45 million (4.3% of total external assistance). As shown on Figure 6 the support to Area Development doubled between 1991 and 1994. This sector includes mainly community based development with activities managed by local authorities and NGOs. This orientation of the donors’ assistance reflects actually the willing decentralisation of the government.
Figure 6. Evolution of Assistance by sector from 1991 to 1994

Figure 7 shows the distribution of this assistance between the sectors over the same period.

Figure 7. External Assistance by Sectors (1991-1994)
6.3.1 Multilateral Co-operation

In 1994, the primary multilateral donors supporting activities related to EIS and other Environmental activities were the European Economic Community (EEC), the United Nation Development Programme (UNDP), the International Development Association (IDA), the United Nations Children’s Fund (UNCF), the African Development Fund (ADF), the Food and Agriculture Organisation (FAO) and the World Food Programme (WFP). Table 10 shows the distribution of multilateral donors by sectors for 1994’s disbursements.

<table>
<thead>
<tr>
<th>Multilateral donors</th>
<th>Area Development</th>
<th>Agriculture, Forestry and Fisheries</th>
<th>Technical and Managerial Training</th>
<th>Telecommunications and media</th>
<th>Natural Resources</th>
<th>Disaster preparedness</th>
<th>General Statistics and Cartography</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEC</td>
<td>9,831</td>
<td>555</td>
<td>430</td>
<td>531</td>
<td>2,247</td>
<td>46</td>
<td></td>
<td>13,650</td>
</tr>
<tr>
<td>UNDP</td>
<td>257</td>
<td>5,781</td>
<td>10,024</td>
<td>957</td>
<td>1,800</td>
<td></td>
<td></td>
<td>17,019</td>
</tr>
<tr>
<td>IDA</td>
<td>489</td>
<td>4,750</td>
<td></td>
<td></td>
<td>1,106</td>
<td></td>
<td></td>
<td>7,039</td>
</tr>
<tr>
<td>UNICEF</td>
<td>1,557</td>
<td>29</td>
<td>999</td>
<td>377</td>
<td>123</td>
<td></td>
<td></td>
<td>3,085</td>
</tr>
<tr>
<td>ADF</td>
<td>825</td>
<td></td>
<td>1,140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,931</td>
</tr>
<tr>
<td>FAO</td>
<td>428</td>
<td>2,773</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,201</td>
</tr>
<tr>
<td>IFAD</td>
<td>1,140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,140</td>
</tr>
<tr>
<td>WHO</td>
<td>170</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>170</td>
</tr>
<tr>
<td>UNFPA</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>882</td>
</tr>
<tr>
<td>ADB</td>
<td>231</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>231</td>
</tr>
<tr>
<td>UNEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>165</td>
<td></td>
<td></td>
<td>165</td>
</tr>
<tr>
<td>Total</td>
<td>13,387</td>
<td>15,009</td>
<td>11,118</td>
<td>6,052</td>
<td>169</td>
<td>419</td>
<td></td>
<td>48,513</td>
</tr>
</tbody>
</table>

With peace, Mozambique turned from humanitarian assistance to development planning with an important place for rural development and food security. As a result, the following sectors are still playing a strategic role in this transition, which is reflected in the donors disbursements: Agriculture, Human Resources Development (Education), and Transport (including rural road rehabilitation).

Multilateral co-operation supported and supports EIS development for DINAGECA (Land Use/Land Cover database), MICOA (SDNP), DNFFB (FAO) or the Demining Commission. Important additional support should be provided by multilateral donors within the next years in the framework on the PROAGRI. Most of these aids are provided in partnership with bilateral donors. Figure 8 shows the total volume of disbursement of international funds per sector in Mozambique in 1994.
6.3.2 Bilateral Co-operation

Figure 9 shows that bilateral co-operation in the environmental sector is particularly active in Area Development projects and Training. This orientation is in line with the general policy of the Government and the urgent needs.
Bilateral donors are particularly involved in financing (i) area development such as increasing family agricultural production, small rural equipment, water supply, security of tenure, and (ii) Technical and Managerial Training through technical assistance and support to schools, universities, and research centres.

When looking at the activities related to environment, the list of the top five bilateral donors in 1994 was the following: United States, Italy, Sweden, France and Norway. Table 11 reflects a more complete list.

Table 11. Bilateral Donors' Disbursement for Environmental Activities 1994

<table>
<thead>
<tr>
<th>Bilateral donors</th>
<th>Agriculture, Forestry and Fisheries</th>
<th>Technical and Managerial Training</th>
<th>Telecommunication and media</th>
<th>Natural Resources</th>
<th>Disaster preparedness</th>
<th>General Statistics and Cartography</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,228</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>188</td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,532</td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,778</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,885</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,994</td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,238</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,112</td>
</tr>
<tr>
<td>Norway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6,515</td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5,571</td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>417</td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12,534</td>
</tr>
<tr>
<td>Switzerland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,197</td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,149</td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27,463</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>42,456</td>
<td>19,614</td>
<td>21,880</td>
<td>7,539</td>
<td>6,928</td>
<td>317</td>
<td>99,969</td>
</tr>
<tr>
<td></td>
<td>42%</td>
<td>20%</td>
<td>22%</td>
<td>8%</td>
<td>7%</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>
The graphical representation of the bilateral assistance by sector in 1994 in Mozambique is reflected in Figure 10.

Figure 10. Volume of Bilateral Donors Disbursement (1994)

Some bilateral donors have been highly involved in EIS development or at least in the implementation of tools and procedures related to environmental information collection and/or dissemination. The contribution of Norway to INAHINA's capacity building ($37 million) and the support of Sweden to the implementation of the Land Information Handling System in DINAGECA (about $6 million) are the two prime examples.
7. Importance, Role, and Contribution of EIS

Though no well defined concept ever existed at the early stage of the process to catalyse its development, it was becoming more and more crucial to recognise and use EIS as an indispensable way to the common goal of sustainable development. Establishing a sound EIS for Mozambique is and remains an essential conditions for the implementation of the sustainable development programme in the country. That major objective is to be achieved by both the Government and the international community that is actually supporting the country economic recovery and is still in the framework of the post war reconstruction and development. Mainstreaming the common efforts towards the realisation of such objective requires the full participation of all other stakeholders from the civil society (private institutions, NGOs, CBOs, etc.).

7.1 Impact on Environmental Policy

The importance of EIS on decision making has already been described in section 4.2.1. Section 4.9.3. goes further in the description of EIS impacts in the domains of capacity building, planning and management, policy and legislation development, revenues enhancement. Those analysis raise up the crucial role of a sound EIS process as a barometer of the country overview preceding or following any important decision that affects the biophysical environment. Such overview includes a set of indicators and standards regarding ecosystems and land use, resources inventories and monitoring, population growth and distribution, infrastructure, water and energy consumption and socio-economic patterns. Generalised, the impact of EIS on environmental policy could be observed or measured if the following goals and objectives are achieved:

1. Effectiveness of Environmental Planning, Management, and Monitoring. In order to move towards this objective, the NEMP, which is actually the translation of the government environmental policy, should be revised and adopted as a reference document by all institutional partners. Above all, the new NEMP version shall reflect the vision of the new Government of Mozambique and the general aim expressed by the Government and its partners at both national, regional and international level to face the challenges of national reconstruction and sustainable development. In that perspective, some activities previously mentioned shall then be carried out to complete certain specific objectives underlined in the NEMP document among such as:

- Overseeing the implementation of sectoral programs;
- Regular monitoring and evaluation of specific projects;
- Annual review of sector progress to analyse prevailing issues and propose corrective measures; and
• Publishing sectoral statistics periodically as indicators of progress in each sector.

2. The Country's Legal Framework is Revised and Reorganised in a Coherent Way. This objective derives from the fact that Mozambique has a great number of sectoral legislation which sometimes lead to overlapping, conflicts and institutional failure. To achieve this objective, there is a need that all sectoral legal tools are harmonised in order to eliminate legal conflicts, between sectoral acts. For this purpose, the activities to be carried out should include:

• A review of existing legislation in certain sectors and their revision to conform to new policies and heed other legislation including the Land Law, the Municipality Law, and the Environmental Law;

• Elaboration and adoption of timely and sound regulations relating to the implementation of the Land Law, the Municipalities Law, and the Environmental Law. Those regulations shall take into consideration the interest of NGOs, local communities and private sectors as primary members of the EIS;

• Setting up an updated regulatory framework for private sector and local communities to ensure their full participation and involvement in all environmental issues in Mozambique; and

• Definition of specific standards and indicators to be monitored for each sector or sub-sector and addressing all kinds of stakeholders working in those areas.

3. Effectiveness of the Environmental Co-ordination in the Country. The first element for monitoring this impact shall consist of the setting up at institutional level of an active co-ordination body (committee or commission), sufficiently empowered to carry out the difficult task of institutional co-ordination of line ministries and other governmental and non-governmental institutions activities. The setting up of this type of unit shall probably meet the need of effective environmental co-ordination. For this purpose, the following principles shall be taken into consideration:

• Location at a higher institutional and political level (normally above the competencies of line ministries) and preferably under the chairmanship of a representative of the Office of the Prime Minister or the President's representative;

• Promotion or empowerment of one of the existing institutional body to play the key role of inter-institutional co-ordination rather than creating a new institution. It appears that the National Sustainable Development Commission (NSDC) or the National...
Environment Commission (NEC), if reactivated, could be well positioned to accomplish such a mandate;

- Involvement of the representatives of all major sectors or interest groups (including some outstanding trade unions and political parties) in all decision making processes at that level; and

- Regular meeting of members (once or twice annually) for political orientation related to very important environmental issues only, while the day to day management and monitoring of environmental activities shall remain under the responsibility of a technical environmental agency and the sectoral ministries themselves.

4. An Environmental Agency is Created and Placed at the Highest Political Level Possible. Following the path of the co-ordinating unit at institutional level, it is necessary to ensure the follow-up and monitoring of environmental matters at technical level. Considering the inter-institutional and trans-sectoral dimension of such matters, it is obvious that a line ministry is not empowered enough, and will never have sufficient staff and capabilities, to cope with the whole commitment and difficulties resulting from this endeavour. For the effectiveness of technical management and monitoring of environmental problems, the proposed Environmental Agency shall fulfil the following conditions:

- Creation and location above the level of line and sectoral ministries (preferably within the Prime Minister's Office or at the Presidency of the Republic). As it already happened in many African countries, it is also possible to imagine that MICOA could be re-structured and consequently relocated to play such key role in the future;

- Flexibility and adaptability as a unique chance for surviving and remaining in force throughout the changing process in which the country is embarked since the peace agreement;

- Providing the agency with good technical staff, well trained and capable of using multi-disciplinary knowledge, computers equipment and other Information Technologies (IT) tools as well as sufficient material support for adequate performance;

- Upgrading staff capacity and capability by in-service training to supervise and co-ordinate inventories, planning, management and monitoring functions in all provinces, including providing guidance to ecological monitoring units established in State protected areas; and

- Linking the provincial monitoring and reporting to the central system.
5. Institutional Conflicts in Mozambique are Reduced. This impact will derive mostly from the implementation of some of the measures already developed. The following conditions shall be necessary to reach the objective of building a functional administrative framework for EIS in Mozambique:

- Development of transparent administrative procedures for all activities related to data collection and processing, information distribution, natural resources exploitation and utilisation, and effective management of environmental problems;

- Strengthening the execution and implementation capabilities at the provincial, district, and local levels for decentralised sector development, particularly in resource assessment, planning, and monitoring and evaluation;

- Acceptance by other institutional users of all standards approved and disseminated by the co-ordinating institutions as guiding tools for their activities;

- Effective sharing of information relating to sectoral programmes and projects with other institutions working in related fields in order to reduce overlapping and conflicts resulting from those activities; and

- Definition in each sector of a specific and precise set of objectives, targets and goals to be achieved by all institutions involved in this domain.

6. The Country has Signed and Ratified all Relevant International Legal instruments Related to the Environment.: Mozambique is party to many international treaties related to environment among which some have been signed and ratified. The case of the Ramsar Convention on wetlands of international importance (1971) and the Convention on the conservation of migratory species of wild animals (Bonn 1979) are still waiting to be ratified. The geographical situation of the country on the coast (presence of wide humid zones) and the importance of its biodiversity merely appear as major reasons to fully adopt those legal tools at national level. Despite the importance of its natural assets, the country is not presently in the position to gain full profit from its participation to international treaties (conventions, agreements, protocols). It would be profitable that the country fills up this legal gap with a view to strengthening the national and regional position on sustainable use issues and protecting the interests of local stakeholders.

7. The Environmental Impact Assessment is Adopted as a Political Option by the Government and is Accepted as Such by All Partners in Public and Private sector. The new Environmental Law provides a
unique opportunity to take into consideration the environmental aspect of any project as an integral part of its design and sustainability. The EIA is progressively becoming a key factor for approving any investment project in the country. Therefore, it is essential that all national authorities agree with such an option and consider it not simply as an objective but rather as a government commitment to safeguard the environment through development activities. Some required conditions to reach this goal are:

- The acceptance of EIA by all stakeholders as one of the preliminary stage for the formulation and implementation of their project; and

- The development of EIS to support the need of data, information and experience exchange necessary in each sector of activity.

7.2 Impact on Co-operation and Networking

In the domain of inter-agencies co-operation and networking, EIS development is susceptible to have considerable impact either on existing systems or on new systems which are being organised. This is possible considering the fact that a lot of NGOs are already installed in Mozambique. Some of them are already organised into working groups and networks, sometimes with strong linkages at regional and international levels. Likewise, the partners of the international community including donors and co-operation agencies are also organised and consult very often to share their experiences before making certain decisions concerning some crucial issues. It seems important to stimulate and encourage consultation processes at macro-levels. In this respect, it is essential that:

1. Existing networks are strengthened and new thematic networks systematically created and managed in each important environmental sub-sector;

2. Each networking group is considered and managed as an EIS subsystem while the overall EIS sector is managed by an institutional body located at the political level;

3. Members of those networks meet very often as formal working groups around well defined objectives, strategies, plans, programmes and actions, and not simply for informal and limited consultations;

4. Information flow is effective among and between institutions working in the same sector, while bridges are launched to link together different sectors within a global system;

5. Effective sharing of information leading to better co-ordination of activities in such a way that complementary actions are promoted at all levels and overlapping reduced to a minimum;
6. Information and reporting management are improved in such a way that feedback is adequately managed for the benefit of all stakeholders;

7. Training for networks members is organised to strengthen their management capacity for data collection and processing, information dissemination, access to modern technologies, use of modern tools and equipment; and

8. Information relevant for specialised sectors are made available and understandable for all potential users who might not necessary be specialists in that field. This is important to guarantee the effective use of good information and not only its accessibility.

7.3 Impact on Environmental Consciousness

Another area to monitor the impact of EIS development is the raising of environmental awareness at all levels of civil society. Dissemination of environmental information among institutions and other stakeholders, education and training of staff in the public and private sector, sensitisation of urban population and rural communities for environmental issues are among the means to reach such objective. In such perspective, many situations or outputs are to be expected:

1. The regulatory requirements for rural community and private sector involvement in the management of natural resources and assessment of environmental problems are met in the framework of the new laws and regulations;

2. Improvement of the protection, management, and utilisation of the environment which will contribute to sustainable national development, biodiversity and protected areas conservation, and appropriate land-use. The set-up of the Land Information System which has to link the ongoing activities in DINAGECA/Cadastre and the future PROAGRI/Land activities is one of the best ways to address this issue;

3. Strategically located fire prevention units are created in the provinces and strengthen their capacity to combat fires;

4. A public awareness campaign is launched at provincial and district levels including materials to be developed and incorporated into community based resource management plans;

5. Environmentally driven campaigns are organised periodically by public institutions, NGOs and CBOs using the same traditional channels of health and sanitation surveys that usually take place in the country;

6. Many working groups are organised without any pressure for activities against erosion, pollution, urban waste, and unsustainable use of natural resources;
7. Training centres are created and equipped in Maputo and as well as in the provinces aiming at developing better EIS management programmes;

8. Environment is introduced in training programmes since the level of primary education till university level;

9. Increase the use of national media such as radio, television, newspapers since they have really become channels of environmental training, sensitisation and campaign through several, well conceived and regular environmental programs; and

10. New protected area have been classified by UNESCO in the country.

Under all these conditions, it is expected that EIS will harmoniously reach its plain development in Mozambique and thus permit the country to complement its institutional and technical capabilities towards the realisation of one of the main objectives defined of the NEMP. The sustainable development of the nation through the rational management of natural resources.
8. Conclusions

8.1 General Remarks

Absence of a Unified EIS and Indicators Monitoring. Currently, there is no real unified national EIS in Mozambique, just a few EIS subsystems that are managed by various (mainly public) institutions. No regularly monitored environmental indicators have been identified. There is a lack of an EIS conceptual framework that allows the definition of comprehensive national environmental indicators an may guide the co-ordination and integration of the existing sub-systems.

New Sector. The Environment sector started quite recently and is still growing and developing. Consequently, the EIS sector is still in the development stage. Despite the existence of a National Environmental Management Programme (NEMP), the majority of environmental problems are addressed only when they occur and are monitored according to the availability of means that can be found in the framework of punctual projects. The long term vision of sustainable development is compromised by the lack of resources and capacity, but also by the absence of a complete set of standards and indicators to be used as reference in the purpose of environmental impact assessment studies for projects and programmes.

National Policy and Strategy. The NEMP process has recorded the main environmental problems faced by the country. Regarding the most important issues such as capacity building for sustainable development, institutional development, public awareness for environmental management, environmental assessment and monitoring, the NEMP appears mostly as a catalogue of objectives, programmes, and activities to be achieved in the framework of global policies for national recovery.

Laws and Regulations in Force. The Environmental Law is still a framework law and does not provide the environmental indicators and standards as expected. It is general and addresses primarily the common aspects of environmental concerns and leaves to sectoral laws and regulations the mandate to elaborate more precise definitions, indicators, and relevant standards for specific domains or activities.

Centralisation in Maputo. Information processing capacities are concentrated in Maputo, with very little capacity in provinces or districts. Today, in Maputo, concentrates much of dynamism and the essential part of institutional, technical, infrastructure and also financial bodies and facilities of the country. There is no real balance between Maputo and the provincial capitals in terms of resource collection and distribution or in the framework of data gathering and management. The ongoing decentralisation process is likely to improve the EIS situation, benefiting the local communities and powers by reducing the weight of Maputo over the rest of the country.
Strong Technical Assistance. The systems are administratively managed by local technicians, but a strong internationally supported technical assistance network is still in force in all technical aspects related to management and monitoring of EIS and GIS.

Computer Equipment. Some institutions are provided with modern equipment. All the existing EIS subsystems are PC based, usually running Windows 95. or Windows NT 4.0 (in the larger systems). It appears sometimes that this equipment seems oversized compared to global achievements and daily use. Some computers are often used under full capacity. A good team work organisation could improve the equipment use.

Information Management in New Projects. Major Environmental Management related development projects that are in preparation or implementation include Information Management and training activities.

Informal Networking. It has been observed that good networking relationships exist between people, but, those relationships are based on individual contacts and sensitivities, are not reflected in an operational co-ordination of activities.

8.2 EIS Development Process: Problems and Constraints, Options, and Potentials

8.2.1 Problems and Constraints

Population Growth and Instability. In Mozambique, the population grows very rapidly (annual rate of over 2.6%) and is very mobile. The rural-urban migration is high as well as trans-boundary movements of displaced people. The population is very young (more than 65% are less than 25 years old) and poorly educated (more than 60% of people over 15 years are illiterate). These indicators show the difficult conditions for the implementation of most projects that have been initiated in the country. The EIS management cannot expect better conditions for its development in a near future.

Nonsustainability of Existing Systems. The lack of the State’s resources to maintain basic information collection, management, and dissemination, has lead to an over-dependence on external support and funding. Most systems have been created in the framework of timely designed projects such as biodiversity management, coastal areas protection, forest and wildlife inventories, or with the aim to address events of particular concern such as drought and desertification, war or to fulfil international agreement. Usually, donors who support such projects provide their funding under certain conditions, like a time limit for implementation after which there are no further disbursement of funds. The future of many systems surrounded by those conditions are uncertain after the end of international assistance. Almost 90% of projects surveyed at Maputo challenge this situation.
The adoption of technologies for information management is new. The number of
competent technicians is not far from raising the critical mass to boost the
development of the sector. As it was observed in many other countries during the
past 15 years, the first activities in this sector are directly linked with data
production, rather than demand-driven application development. Apart from a few,
most EIS subsystems in Mozambique are supply-driven and have been designed
by technicians rather than the end-users. It seems that a few agencies are
changing their strategy to a more demand-driven approach.

**Insufficient Information Flow and Use of Existing Information.** Another frequently
observed constraint is the weakness of information exchange between most
institutions involved in data production. This situation has lead to overlapping of
activities at different levels. For example, 1:250,000 scale maps are digitised at
the same time by several public agencies (such as CENACARTA, CZMP Unit,
INPF, DNFFB). As a result, it could be observed the insufficient use of existing
information by different institutions. Little effort was made by some users to go
towards the information providers. In such context, many of them spent quite a
long time and resources to build up their own database when the same
information was available elsewhere. It has been proved that there is little
compatibility between existing data and systems. Those constraints reduce
efficiency in programme implementation should be lifted throughout a better co-
ordination and exchange between the institutions involved in each sector.

**Concentration of EIS in Maputo:** In Mozambique today, most projects have
located their headquarters in Maputo. Due to security conditions and other
facilities available only in the city, Maputo has become the area which has the
highest concentration of the country's informational systems. In Mozambique,
Maputo is a technological island compared to the poor conditions that reign over
the rest of the country. Consequently, most of the existing EIS seem to have been
created at and for Maputo. Despite the ongoing decentralisation process, the
public services installed at provincial and district level participate in data collection
(inventories and census). In return, there is minimal informational feedback to
those decentralised units. Almost all information analysis capacities are gathered
in Maputo.

**Environmental Co-ordination Process Weaknesses.** The question to whether or
not MICOA is capable of ensuring the inter-ministerial co-ordination of
environmental matters in Mozambique. MICOA has a limited capacity in terms of
budget, technical staff, and institutional power. According to the Law, it is entitled
to put its stamp on the sectoral projects before their final approval when EIA has
been carried out. MICOA can only monitor a limited number of field projects.

The lack of co-ordination between agencies is translated into some data
production redundancy. The quality of digitised data will not be harmonised.
Actually, this lack of co-ordination is primarily due to the absence of an general
EIS and national conceptual framework that would allow the definition of
comprehensive environmental indicators.
The lack of compatibility between all the databases comes from the absence of a leading agency and the immaturity of EIS in Mozambique. Focusing on basic data production helps the EIS subsystem implementing agencies to embrace new technologies and train their technicians. At the same time, these activities take them away from their specific application domains and the development of particular competencies. The lack of harmonisation of digital information will make data exchange more difficult and the necessity to develop specific interfaces.

**Lack of Metadata.** Documentation on who is doing what, and types of available information is generally poor. This has a double negative effect. On one hand, potential data and information users have difficulties finding or having access to needed relevant information and on the other hand, information suppliers do not know what they have which prevents better organisation of information for dissemination and to enhance the value of the information. Properly cataloguing the existing environmental information in Mozambique should be one of MICOA's priorities.

### 8.2.2 Options and Potentials

**Key Success Factors.** The development of EIS in Mozambique will rely heavily upon the opportunities provided by the socio-political and legal context of the country as well as other important assets that might become instrumental towards a dynamic process of information creation and exchange.

**Existence of a Peaceful Political Context in Mozambique.** Obviously, the country is moving slowly but surely out of decades of misfortune characterised by war, violence, destruction, and to some extent natural disasters. Mozambique's experience as a multi-party democracy commenced with the promise of a widely shared desire for peace, stability, and reconciliation. The elections held in 1994 marked a significant change in the country's political status, with FRELIMO returning to power as a dominant party and RENAMO acquiring the status of being the legitimate and the most important opposition party. By the end of 1996, the vast majority of those who had been displaced by war had returned home and were making steady progress in resettling. The economy grew by 3% in 1995, with the year-end inflation of 55% vice 70% in 1994. The peace dividend became progressively visible by establishing basic conditions for the economic recovery and mobilising the international community interest to support Mozambique's reconstruction programme. The Government persisted with market-based economic reforms, including privatisation and by the end of 1996, the investment climate, which was generally considered buoyant, improved consequently. At the donors' level, the country's image is becoming more than ever positive. With their support, a great number of development programmes and projects are being designed and implemented among which some are environmentally oriented.

**The Decentralisation Policy of the Government.** The ongoing decentralisation process in the country is an opportunity to disseminate these technical competencies to at least in the provincial capitals. All public agencies had
planned some development to improve local data collection, data analyses and data exchange with Maputo. For instance, about three-quarters of the US $200 million plus PROAGRI financing plan should go to decentralised activities over the next five years.

Existence of an Internal Set of Legislation and Regulations Related to the Environment. The Environmental Law, the Land Law, the Communities Law and their related regulations constitute the backbone of the National Conservation Strategy in Mozambique. These instruments, completed by dozens of sectoral laws, regulations, and international conventions or agreements to which Mozambique is party, constitute today a legal framework on which many programmes, projects, and actions can be developed in a sustainable manner.

There is a persistent need to better co-ordinate and harmonise some of these instruments. It is of critical importance that the regulations which are to accompany the laws are completed in a timely fashion. The Government of Mozambique has already made a significant effort in revising the regulations regarding the new Land Law and is intending to initiate public debates on a draft version of the regulations prior to final approval. Such regulations should conform to the spirit of the laws, with particular emphasis on ensuring that smallholders have strong occupancy-based use rights which strengthens tenure security and enable local communities to meaningfully negotiate in adjudication processes with outside investors.

Availability of Data in Public Institutions. It was noticed that a lot of data was available in public services and agencies. Some of this data is part of colonial legacy (basic cartography) and some have never been used properly, except for the purposes of research and training. A substantial amount of information has also been produced during the post-independence period (General Population Census, Forest and Wildlife Resources Inventories, Mines, Waters, Meteo and Climatic Change, thematic cartography) though it was completed in an incoherent manner by different institutions for their own purposes. All data has rarely been updated because of the limited capacities of concerned institutions. It is reassuring to know that in any matter of research, monitoring and evaluation, an indicative basis exist from which progress should be made development activities assessed.

The poor sharing of some geographical data comes from the absence of a common referenced database. The role of DINAGECA should be important in the next five years to improve this situation, with the completion of the national Land Use/Land Cover database. The database contains a simple but updated topographic coverage of the country which should be used by all institutions to base their thematic data. DINAGECA should also consider improving this base topographic information by densifying the content of this layer, and obtaining a density of information similar to the present 1:250,000 scale maps. The completion of the national population survey database is also an opportunity for Mozambique to connect Natural Resources Management and Social
Development at a national and local scale. This database should thus be shared as much as possible to facilitate and improve environmental activities.

**Existence of Few Institutions Specialised in EIS/GIS.** In order to fill the gaps of information in certain sectors, some institutions have been created by the Government with the assistance of multilateral and bilateral co-operation agencies. Those institutions are mostly public agencies. The most important ones are DINAGECA and CENACARTA for mapping and remote sensing, INPF and National Institute for Statistics for demography and human settlements monitoring, DNFFB, INDER and INIA for natural resources surveys and inventories, UEM departments for research and training materials, and SDNP for networking and exchange improvement. There are also some small branches dealing with EIS/GIS within some Fields Projects under MICOA (Integrated Coastal Zone Management Project, and Biodiversity Project) and MAP (Transfrontier Conservation Areas Project).

**Capacity Building.** The capacity building view as human resources improvement is a full component of all programmes and projects design and management. In most of them, the national human resources met are constituted of young people, who have limited technical skills and limited work experience. They are usually willing and have been placed in better position for further training through daily contacts with external assistants, and through their participation in seminars, workshops, short courses and travel studies periodically organised at various levels. Mozambique probably needs another few years before a real critical mass of national expertise is constituted. The essential process of capacity building is well engaged and could be sustained in the present sphere of influence.

**Availability Technical Assistance.** With the increase of local technical competencies in EIS and GIS, it appears that the need for external permanent technical assistance has decreased. Most GIS implementing agencies only receive today short term assistance. The recently trained technicians are young and dynamic, and have the opportunity to practice their techniques using good equipment. This is especially true for Maputo but less true for the provincial cities.

**Creation of Networks.** It is also a potential for EIS to develop in a context of a growing environmental awareness at all levels. Since the Rio Earth Summit, a number of networking groups have emerged in several countries and regions. In Mozambique, the most representative networks are SDNP, INFOTERRA, SADC-ELMS, SEACAM, EAF/14, NGOs, working groups, co-ordination committees or commissions created by the Government to monitor some of the most critical inter-institutional problems (Land Use, Environment, Demining). All these networks contribute in capacity building and the improvement of information sharing. MICOA's library is an elaborate directory of institutions involved in production, management, and dissemination of environmental information. In this directory, some 30 institutions belonging to public agencies, NGOs and the private sector are recorded with clear indications of activities, addresses, contact persons and status. This is the kind of undertakings that necessitates external support.
Involvement of Private Sector and NGOs. Some NGOs and the private sector, as well as some sub-regional project activities working in collaboration with the institutions cited above should also be outlined. Such is the case of IUCN (Zambezi Basin Wetlands Conservation and Resource Utilisation Project) and Impacto (EIA). The apparition of the private sector in environmental activities in the mid 90s is also a good indicator of sector development.

Growing Interest of Users for EIS & GIS. In Mozambique today, there is growing concern for environmental management through better use of EIS and GIS tools. This is why so many subsystems have been created among data producers to manage data collection and processing. A few users are also aware today of the importance of sound information in decision making. The great interest for most users is for spatial referenced information. Many do not even feel it necessary to restart gathering information that others could easily provide for them at low cost.

Business Orientation. Most of public agencies are conscious that the government resources are very limited and that they need a business-oriented approach to be able to cover at least their operational costs and to maintain their activities after the completion of the development projects financed by external donors. The legal status of some agencies prevents them to develop their technical facilities by reinvesting a part of the benefits from data and information selling. For instance, DINAGECA does not have the financial autonomy and can not use the money from the sale of its maps to buy toner and paper for the map copier. This problem must be addressed with institutional measures that would facilitate the development of technical capacities and competencies.

8.3 Self-reliance and Sustainability

8.3.1 Capacity Building for EIS Management and Institutional Development

Budget. The Government of Mozambique's limited budget is reflected in inadequate budgets allocation and staff in all relevant departments. Despite Government's efforts towards sustaining recurrent costs in its expenditure, most of the costs are not being met. The Government has not been capable of allocating resources for capacity building, policy formation, or management issues and most if not all of rehabilitation effort is being funded externally. The overall budgetary deficit was about -18.4% of GDP in 1985, -20.9% in 1995 and -17% of GDP in 1996. In this context, it is unrealistic to expect much increase in the support to build the necessary capacity for EIS within all relevant institutions.

Institutional Empowerment and Enforcement. MICOA, CNA and INDER are relatively new institutions with a poorly defined mandates and little co-ordinating power. Their staff have limited experience and insufficient technical capacity.

The responsibility for managing the vast forestry and wildlife estate lies with the National Directorate for Forestry and Wildlife (DNFFB), one of the nine
directorates in the Ministry of Agriculture and Fisheries (MAP). Staff resources and capacity are extremely weak.

The Eduardo Mondlane University (UEM) has very limited budget. UEM researchers, lecturers and assistants do not have adequate experience and most of them start lecturing immediately upon graduation. The present capacity of the University does not allow to cover the yearly demand in terms of new students.

**Keeping External Assistance.** In parallel to the weak public institutions, there is limited experience in Mozambique of NGO and community conservation activities. Most conservation operations are dependent on outside support. For example, Barazuto Marine National Park has been supported for a number of years by World Wildlife Fund (WWF) and the Endangered Wildlife Trust (EWT). The community-based wildlife programs are being supported in Tee Province by the Ford Foundation and the International Development Research Centre.

In order to reduce the burden of uncertainties deriving from these insufficiencies, it would be essential that a new system be developed in Mozambique along the following lines:

**Improvement of Salaries for National Civil Servants and Other Staff.** Presently, low salary levels in the sector are seen as perhaps the greatest constraint on effective implementation of the programme. Some projects have proposals under which this might be addressed through fund-retention, cost centres, and performance related achievements.

**Improvement of Training Capacity at National and Regional levels.** It seems advisable that provincial and local staffs be trained whenever possible at local level, in close contact with their daily realities and activities to be implemented. In the wildlife sector for example, it has already been proposed that the Gorongosa Wildlife Training School Project will focus on training needs at primary, secondary and tertiary levels and a large part of this sub-component has already attracted donor funding (PROAGRI, Forest and Wildlife Component, 1998).

### 8.3.2 Moving Towards the Internalisation of the Development Process in Mozambique

**Promotion of Self-funding Mechanisms Within Some Sectors.** Despite the burden of external assistance over the country’s performance in all sectors and the qualitative character of the environmental information, it is essential to seek new ways and strategies to increase income generation in some EIS activities. Commercial based exchange of data between producers and end users to a certain extent could constitute an experimental stage towards promoting self-funding mechanism within some sectors of EIS/GIS. The financial analysis undertaken showed that delays in the investments resulted in proportional delays in realisation of benefits. This negatively impacts the programme’s financial performance.
Encouragement of Decentralisation Process. In Mozambique, a lot of structural and political changes have taken place during the last 20 years. The processes of centralised planning ended some years ago. The privatisation of the state controlled companies is almost complete. The shift from the emergency activities to development activities has been conducted. Commissioning of the execution of some public services to private entities has been started. The process currently ongoing. Under these conditions, empowerment of local people entails the transfer of central government authority to local rulers and communities so that they have the legal status and internal decision-making power to manage local resources and receive the benefits of improved activities.

Strengthening of Local Communities. Current government efforts to decentralise through the new Environmental Law, Municipalities Law, and also the new set of Regulations related to the Land Law, and empower local communities should be strengthened and encouraged. For this purpose, the actions should intend to focusing financial resources institutional strengthening and capacity building on lower levels of government, community institutions, local councils and NGOs. It should also address the objective of re-defining the role of each level of decision-making.

Capacity Enhancement for the Environmental Management: Control over Mozambique’s resources needs to be re-established and this can only be done by placing government representatives in the areas where resources are concentrated. In the case of the protected areas alone, the Government will focus its efforts on the national parks which require some 400 staff, officers, game guards etc., to re-establish control and to manage the areas. An additional 400 people will also be required to establish and maintain control over the proposed Permanent Production Forest Estate and the system of Forest Concessions from which private sector parties will extract forest products. This investment is increasing staffing, all of which are required in the provinces, is one of the essential conditions upon which revenue projections from the sector are based. (PROAGRI, 1998) It is obvious that many other environmental and activities sectors in Mozambique presently are facing the same unmet needs and priorities. A survey of conditions in the bay of Maputo carried out in 1981 by the food and water Hygiene Laboratory indicated the need to draw up a programme of action on water pollution of domestic and industrial origin.

Taking everything into consideration, it is clear that the country’s capacity to manage its environment still need to be created and strengthened if the objective is to use the resources in sustainable way.
9. Recommendations

The following recommendations are the result of the mission's review and reflect what could be done during the next few months and years to improve Environmental Information Management and Development in Mozambique. These recommendations have been shared and completed with representatives of visited institutions during the restitution meeting held in Maputo on May 8, 1998.

- Further EIS development in Mozambique is possible, if well co-ordinated and mastered, is susceptible to have a determining impact over the whole process of decision making, and over the development of all sectors of the Mozambican economy, society and culture.

- The development of EIS in Mozambique will rely heavily upon opportunities provided by the socio-political stability and legal context of the country as well as other important institutional set-up that might become instrumental towards installing a dynamic process of information creation and exchange.

- Considering the fact that Mozambique has a lot of small systems, there is a need to set up a leading agency in the country. The leading agency in this context should not be considered as an hyper-centralising institution, but rather as a system co-ordinator and server. It would be empowered enough to carry out the heavy task of trans-institutional and trans-sectoral co-ordination environmental matters throughout the country and the ongoing political changes. It does not seem necessary to create such agency ex-nihilo. The reactivation of the National Environment Commission (NEC) could probably meet these requirements. For this purpose, the NEC should be a high level political institution under the Prime Minister or the Council of Ministers, and would establish checks and balances that ensure that the environmental considerations are really integrated in all sectors or activities. In order to avoid the ever long consultation process that usually surrounds the creation of a new entity, it is advisable to adapt the existing institutional arrangements with the view of better control over the line ministries. MICOA's position today as a line ministry among other line ministries does not permit it to successfully ensure such a mandate. A workshop could be organised with the main institutions to define and create this National Leading Agency.

- The following objectives are to be considered in this perspective:

  * The Environmental Impact Assessment should be adopted as a political option by the government and accepted as such by all partners in public and private sector;

  * The country's legal framework should be revised and reorganised in a coherent way including: (i) a review of existing legislation in certain sectors and their revision to conform to new policies; (ii) the Land Law,
the Municipality Law and the Environmental Law which actually provide a unique opportunity to take into consideration the environmental aspect of any project as an integral part of its design and the conditions of its sustainability; (iii) the elaboration and adoption of timely and sound regulations relating to legal instruments; and (iv) setting up an updated regulatory framework for private sector and local communities to ensure their full involvement in all environmental issues in Mozambique; and

* The country should have signed and ratified all relevant international conventions and treaties related to the environment to which it is party.

♦ All institutional conflicts should be reduced and a functional administrative framework for EIS should be built in Mozambique leading to:

  * Development of transparent administrative procedures for all activities related to data collection and processing, information distribution, natural resources exploitation and utilisation, and effective management of environmental problems;

  * Strengthening the execution and implementation capabilities at central, regional, and local levels;

  * Acceptance by other institutional users of all standards approved and disseminated by the co-ordinating institutions as guiding tools for their activities; and

  * Effective sharing of information relating to sectoral programmes and projects by all institutions working in related fields in order to reduce overlapping and conflicts resulting from those activities.

♦ Data Management should be done in such a way that all information and data available within public agencies and private sector are made available and shared by any kind of user or stakeholder.

♦ To facilitate data sharing and to avoid data production duplication, each agency should maintain a catalogue of available and maintained information it manages. It is recommended to create small databases (metadatabases) in these agencies, and also to implement a National Environmental Database in MICOA.

♦ Data sharing requires common standards for data transfer and storage. These standards have yet to be defined and should be based on existing large national databases (such as the Land Use/Land Cover database or the National Survey database) and regional needs. The institutions should start to focus on data exchange processes and interfaces rather than on data production only. It is recommended to create an inter-institutional working group on data exchange, including public, private and non governmental agencies (NGOs), that will have to define a National Data Exchange Policy.
Even if the primary national databases are not completed yet (Land Use/Land Cover, Forest Inventories, Coastal Zone, National Survey), it is high time to test data exchange between the supplying agencies. This can be easily done on a small geographic area. Data classification have to be harmonised when the databases are at the same level of accuracy (1:250,000 scale for instance). This will save a lot of money and time for the future data analyses and application development. Experiences like the FAO AFRICOVER program should be taken into account.

MICOA should define some key national and provincial area environmental indicators, and then establish a national framework to monitor these indicators in partnership with technical agencies. Coastal zone degradation and deforestation could be the two first sectors to be monitored in Mozambique. Monitoring means evaluating regularly the state of environment through a few specific indicators, and the impact on this environment.

Despite the burden of external assistance over the country’s performance in all sectors, and the qualitative character of the environmental information, it is essential to seek new ways and strategies to increase income generation in some EIS activities. The data exchange policies to be defined must be very careful on the degree of cost recovery they want to apply. On one hand, cost recovery policies limit the access to data by creating additional cost barriers for potential users. Unused data is the same as no data at all! Moreover, it may urge these users to recreate the same data on their own, which will push them to focus on data production problems rather than added value application development. On the other hand, totally free data prevent suppliers to get some revenues which would help them to maintain at least their equipment and the data update. This leads to the dead of EIS subsystems as soon as external funds disappear. A balanced national framework should be design, taking into account the specific needs and constraints of each agency.

Aside from the ongoing data production process, development of applications, especially in the domain of environmental planning, management, and monitoring should become effective in the country.

Considering the land issue, which is particularly important and urgent in Mozambique today and with regard to its huge environmental impact, the Land Commission should also benefit from all national and international attention as it is the case now in the framework of PROAGRI activities. The Land Commission should therefore become a more permanent inter-sectoral land management institution, with a legal mandate to ensure that the activities of MAP departments and other ministries (Environmental Co-ordination, State Administration, Justice, Mines) are systematically co-ordinated, financed, monitored, evaluated, and modified according to the objectives of sustainability in land use and environmental protection. It would therefore become essential that tenure security is guaranteed and that smallholders and large investors rights are preserved to ensure that agricultural productivity, land and natural resources utilisation are improved in a sustainable manner.
Even if training and education related to the strengthening of the EIS sectors improved during the last 5 years, there is still an important need to develop such competencies. Mozambique is a large country, and the lack of technicians being able to deal with modern environment management tools actually slows down the establishment of these tools out of Maputo. The activities to be carried out should include:

- Upgrading staff capacity and capability by training to supervise and coordinate inventories, planning, management and monitoring functions in all provinces, including providing guidance to ecological monitoring units established in State protected areas. Training to support field activities in all sectors should be provided in the provincial capitals;

- Supporting for Eduardo Mondlane University and other training institutions such as Chimoio Agricultural Institute (appointing lecturers, sending UEM staff abroad for high level training in GIS/EIS); and

- Training urgently provincial and local staffs, whenever possible in local institutions, in close contact with their daily realities and activities to be implemented.

All above recommendation need a favourable context to achieve their goals and objectives. This involves that some conditions should be fulfilled during the next few years:

- Continuation and sustainability of the peace situation that actually prevails in the country as a major incentive for the economic recovery and development;

- Continuation and evidence of the political will expressed by the Government of Mozambique to support and integrate environmental concerns in all investment projects and development programmes;

- Effectiveness of the decentralisation process in course in all sectors so as to promote a real empowerment of local administration and local communities and their full participation to decision making processes;

- Finalisation and effectiveness in practice of the land regulations and the land titling process aiming at safeguarding the occupancy rights of local communities, without leading to speculative land use and management by private companies and individuals. This supposes the maintaining of a nominal presence of the State in the process of land management during and after the transitional period;

- Continuation and effectiveness of international support and assistance, which is already so important for the country's recovery, for a sufficiently long period so as to launch the overall development of the nation in a sustainable way; and
* Availability on time of financial resources required by the country to develop a sound EIS programme, and effectiveness of technical and managerial capabilities for better and efficient use and management of resources provided.
As elsewhere time and space are limited - this was true also for this survey. It was not possible for the mission team, to visit and interview all institutions within Mozambique, nor was it possible to mention all details in this report we saw during our mission. Nevertheless we hope that we have been able to present an accurate and correct overall picture of the actual "landscape of EIS" in Mozambique and to give some indications about how this "landscape of EIS" could be transferred in order to be a helpful instrument to build a save and happy future for Mozambique, based on a sound, reliable and sustainable environmental development.

All these circumstances warrant further studies in order to evaluate the environmental impact more precisely. This sort of appraisal should make it possible to introduce measuring routines and establish a database with the aim of defining a policy on environmental supervision.

The mission members would like to express their thanks to all those having made it possible to produce this survey.
ANNEXES
10 Annexe

List of annexes:

1. Organisational structure of the Government of Mozambique
2. Partnership within the Institutional Framework for the Environmental Management in Mozambique
3. EIS in Mozambique
4. List of Environmental Acts in Mozambique
5. Institutions and Contact Persons Surveyed
6. List of Restitution Meeting Participants
7. Reference Documents and Publications
10.1 Organisational structure of the Government of Mozambique

The structure only contains the institutions relevant to Environment Management.
### 10.2 Partnership within the Institutional Framework for the Environmental Management in Mozambique

<table>
<thead>
<tr>
<th>Sector</th>
<th>Central Institution (s)</th>
<th>Institutional Partnership</th>
<th>Focal point</th>
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<td>Ministry for the Co-ordination of the Environmental Affairs (MICOA)</td>
<td>Ministry of Agriculture and Fisheries (MAP); Eduardo Mondlane University (UEM); Ministry of Commerce, Industry and Tourism; Other line Ministries, NGOs (EWT, WWF, IUCN, Forums); Private Sector (Impacto); Donors and Co-operation Agencies</td>
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<td>National Directorate for Environmental promotion and Education Department of Gender</td>
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<td>Institutional Partnership</td>
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<td>• National Institute for Veterinary Research (INIVE)</td>
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* Ministry of Industry Trade and Tourism (MICTUR)  
* NGOs (ETW, IUCN, WWF, etc.)  
* Research Institutes (INIA, INDER ...)  
* Frontier-Mocambique  
* Mozambican Ornithological Club | * DNFFB  
* Rural Extension National Directorate  
* Agricultural Sector Directorate Committee  
* Provincial Directorate of Agriculture and Fisheries |
| Coastal Areas          | Ministry of Environmental Affairs (MICOA)MICOA | * Ministry of State Administration (MAE)  
* Ministry of Transport and Communications  
* Ministry of Industry Trade and Tourism (MICTUR)  
* Ministry of Agriculture and Fisheries (MAP)  
* NGOs (EWT, IUCN, GTA, AMDU, etc.) | * Coastal Zone management Project (CZMP)  
* Directorate of Environmental Impact Assessment  
* National Directorate of Natural Resources Management  
* National Institute of Hydrography and Navigation (INAHINA) |
<p>| Urban Areas            | Ministry of Civil Work and Housing (MOPH) | * Ministry of Environmental Affairs (MICOA)MICOA | * Directorate of Environmental Impact Assessment |</p>
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### 10.3 EIS in Mozambique

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<td>Host organisation</td>
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<tr>
<td>Purpose</td>
<td>Mapping the land use/land cover of Mozambique at scale of 1:250,000 and some selected areas at 1:50,000 scale</td>
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<tr>
<td>Description</td>
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<td>• Communication network</td>
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<td>• Reserves and National Parks</td>
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<td>• Benchmarks</td>
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<td>Land Use and Land Cover</td>
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<td>Status</td>
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<td>Purpose</td>
<td>Soil mapping of Mozambique at different scales and data analysis</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Digital data base covering the whole country at the scale of 1:1000,000 and 1:250,000. Main data source maps, aerial photography and satellite images Thematic data • Soil types • soil suitability • Land Use types</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Regular update</td>
<td></td>
</tr>
<tr>
<td>Users / clients</td>
<td>• Government, Public and private organisations</td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>4 technicians</td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>1 A0 digitising table, 1A0 plotter</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>ILWIS, MapInfo</td>
<td></td>
</tr>
<tr>
<td>Used standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start date</td>
<td>1990</td>
<td></td>
</tr>
<tr>
<td>Existing digital databases</td>
<td>Soil database</td>
<td></td>
</tr>
<tr>
<td>Data stored as</td>
<td>ILWIS coverage</td>
<td></td>
</tr>
<tr>
<td>Outputs</td>
<td>Analysis maps</td>
<td></td>
</tr>
<tr>
<td>Data Transfer Formats</td>
<td>ILWIS format or DXF files</td>
<td></td>
</tr>
<tr>
<td>Donor support</td>
<td>FAO, The Netherlands</td>
<td></td>
</tr>
<tr>
<td>Name of the system</td>
<td>Coastal Resource Maps (EAF/14 project)</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Host organisation</td>
<td>MICOA</td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td>Coastal resources database to provide assistance to policy makers in developing and managing the coastal environment at a regional level.</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Digital coastal atlas covering a 100 km deep band of the country's coast at the scale of 1:250,000 and gathering information from different sources, including:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• socio-economical databases,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• roads maps,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• administrative boundaries maps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• towns maps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• coral reefs maps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Forestry</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Digitising ongoing. Should be completed at the end of 1999.</td>
<td></td>
</tr>
<tr>
<td>Users / clients</td>
<td>• Regional Eastern African Coastal and Marine Environment Resources Database and Atlas project (EAF/14)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• MICOA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provincial government offices</td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>3 technicians</td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>4 Windows 95 PC; 1 A1 digitising table; 1 A1 plotter</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>1 license Arc/Info PC 3.5 and 2 Arc View 2.1</td>
<td></td>
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<tr>
<td>Used standards</td>
<td>Regional EAF Land Cover classification</td>
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<tr>
<td>Start date</td>
<td>September 1997</td>
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<td>Existing digital databases</td>
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</tr>
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<td>Data stored as</td>
<td>Arc/Info coverage</td>
<td></td>
</tr>
<tr>
<td>Outputs</td>
<td>Analysis maps</td>
<td></td>
</tr>
<tr>
<td>Data Transfer Formats</td>
<td>Arc/Info format</td>
<td></td>
</tr>
<tr>
<td>Donor support</td>
<td>DANIDA</td>
<td></td>
</tr>
<tr>
<td>Name of the system</td>
<td>Mapping Project of Five Cities</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------</td>
<td></td>
</tr>
<tr>
<td>Host organisation</td>
<td>DINAGECA</td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td>Mapping the cities of Maputo Beira, Nampula, Quelimane and Pemba at 1:5,000 and 1:25,000 scales</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Digital data base covering the five cities at 1:5,000 and 1:25,000 scales. Data obtained by stereoplotting of aerial photos at 1:10,000 and 1:40,000</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Digitising on going. Should be completed at the end of 1999.</td>
<td></td>
</tr>
<tr>
<td>Users / clients</td>
<td>• Local governments, Public and private organisations</td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>8 technicians (PS Dig operators), 4 technicians (PS Map operators)</td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>7 Windows NT PC; 4 stereoplotters, 1 A1 plotter, Ethernet network for aerotriangulation</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>PUMATEC</td>
<td></td>
</tr>
<tr>
<td>Used standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start date</td>
<td>March-April 1997</td>
<td></td>
</tr>
<tr>
<td>Existing digital databases</td>
<td>December 1998</td>
<td></td>
</tr>
<tr>
<td>Data stored as</td>
<td>PUMATEC coverage</td>
<td></td>
</tr>
<tr>
<td>Outputs</td>
<td>Analysis maps</td>
<td></td>
</tr>
<tr>
<td>Data Transfer Formats</td>
<td>DXF files</td>
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</tr>
<tr>
<td>Donor support</td>
<td>NORAD</td>
<td></td>
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<tr>
<td>Name of the system</td>
<td>Cadastre database</td>
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<tr>
<td>Host organisation</td>
<td>DINAGECA</td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td>Create a national Land Information System database</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Digital data base covering some areas of the country</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>On going (keyboarding existing data on land ownership)</td>
<td></td>
</tr>
<tr>
<td>Users / clients</td>
<td>Central, provincial and local governments, DINAGECA’s offices, land applicants, public and private organisations</td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>6 technicians</td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>3 Windows 95 PC; 1 A0 plotter, 1A0 digitising table</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>Autocad, LIHS</td>
<td></td>
</tr>
<tr>
<td>Used standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start date</td>
<td>1991</td>
<td></td>
</tr>
<tr>
<td>Existing digital databases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data stored as</td>
<td>Autocad coverage and LIHS formats</td>
<td></td>
</tr>
<tr>
<td>Outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Transfer Formats</td>
<td>Internal format. Installing data exchange through modem connection with the provincial offices.</td>
<td></td>
</tr>
<tr>
<td>Donor support</td>
<td>SIDA</td>
<td></td>
</tr>
<tr>
<td><strong>Name of the system</strong></td>
<td><strong>Demining National Database</strong></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td>Host organisation</td>
<td>National Demining Commission</td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td>Demining operation co-ordination</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Mines and accident spatial position by province</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Ongoing (national coverage available in October 98)</td>
<td></td>
</tr>
</tbody>
</table>
| Users / clients       | • Demining operators  
                        | • Local governments |
| Staff                 | 4 technicians |
| Hardware              | 4 PC, Ethernet 10 Base 2 Network  
                        | 1 A1 digitising table  
<pre><code>                    | 1 A1 colour plotter |
</code></pre>
<p>| Software              | MapInfo 4.0 |
| Used standards        | |
| Start date            | September 1997 |
| Existing digital databases | |
| Data stored as        | MapInfo coverage |
| Outputs               | |
| Data Transfer Formats  | MapInfo coverage |
| Donor support         | UNDP |</p>
<table>
<thead>
<tr>
<th><strong>Name of the system</strong></th>
<th><strong>CENACARTA database</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Host organisation</td>
<td>CENACARTA</td>
</tr>
<tr>
<td>Purpose</td>
<td>Catalogue of existing</td>
</tr>
<tr>
<td>Description</td>
<td>National digital database based on satellite images and GIS coverage</td>
</tr>
<tr>
<td>Status</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
| Users / clients       | • Public and private operators  
                        | • Government agencies |
| Staff                 | 2 GIS/RS specialists   
                        | 1 MSc digital electronics  
                        | 4 technicians |
| Hardware              | 9 PC, Novel Network    
                        | 3 A0 digitising table    
                        | 1 A1 colour plotter      
                        | 1 A3 colour printer      |
| Software              | Erdas Imagine 8.2, Multiscope, Arc/Info, ArcView 3.0, Mapinfo 4.0 |
| Used standards        |                        |
| Start date            | 1990                   |
| Existing digital databases |                        |
| Data stored as        | Erdas, Multiscope      
                        | Arc/Info, ArcView and Mapinfo coverage |
| Outputs               |                        |
| Data Transfer Formats | BSQ, BIL, DXF, SHP     |
| Donor support         |                        |
10.4 List of Environmental Acts in Mozambique

NATIONAL COMMISSION FOR ENVIRONMENT : LEGAL OFFICE
DRAFTING OF THE BASIC ENVIRONMENTAL LEGISLATION GOVERNING IN
MOZAMBIQUE (JANUARY 1993)

WATER

- Law-Decree 31/76 of 19 August 1976: Defines the rights on the marine economic resources adjacent to the Coastal zone of the Republic of Mozambique
- Law of seas.

AIR

- Decree nº 29094 of 30 November 1938: There is no need for the nomination of witnesses in case of transgression of vehicles in the roads.

FAUNA

- Legislative Diploma Nº 2787 of 23 May 1967: It is prohibited to hunt in the islands of Inhaca and of Portuguese.
- Decree nº 7/87 of 18 April 1987: It governs the modalities on which the hunting should be developed in the Republic of Mozambique
- Portaria nº 117/78 16 May 1978: It establishes the list of modalities on which the hunting can be developed in the Republic of Mozambique
- Decree nº 10/81 of 25 July 1981: It governs the transference to overseas of ivory, precious woods, skin of wild life animals, precious stones.
- Decree nº 37/90 of 27 December 1990: It governs the law of Fishing
- Penal Law (act 254): It establishes the prohibition of hunting and fishing in the period of closed season.
- Legislative Diploma nº 2977/70 of 6 June 1970: Creation and exploration of wild animals.
• Portaria nº 23.406/70 of 02 September 1970: Regulations for the creation and exploration of wild animals.

**FLORA**

• Portaria nº 547 of 23 July 1927: This establishes the prohibition of cutting down of mangrove.

• Legislative Diploma nº 2642 of 20 September 1965: Approves the Forest Regulation of Mozambique.

• Portaria nº 12/81 of 25 July 1981: This classify the precious wood.

• Dispatch of 19 March 1989 of the Ministry of Agriculture: This establishes the maximum quotes for the exploitation of the precious wood.

• Ministerial Diploma nº 95/91 of 07 August 1991: Regulations on the imports of seeds

**ENVIRONMENTAL IMPACT**

• Portaria nº 22678 of 20 December 1969: Establish the criteria on which the opening and the re-opening of factory installations are guided.

• Legislative Diploma nº 801 of 25 July 1942: It gives more emphasis to the existing legislation on industrial activity.

• Portaria nº 5717 of 30 September 1930: It creates organisations and public services for the procedures related to the authorisation for development of industrial activities.

• Portaria nº 6231, 15 December 1945: It sets up the Technical Services for Industry and Geology in order to organise and monitor the development of industrial activity.

• Decree nº 495/73 of 20 September 1973: It determines several measures related to the protection against the pollution of water, beaches and coastal zones.

• Law nº 4/84 of 18 August 1984: It approves the Law for Foreign Investment in the Republic of Mozambique

• Decree nº 7/87 of 30 January 1987: It approves the Regulation regarded the National Investment.

• Decree nº 8/87 30 January 1987: It approves the Regulation regarded to the Direct Foreign Investment.
HYGIENE, HEALTH AND SECURITY IN THE WORKING PLACES

- Portaria nº 20568, 7 October 1967: It establishes the regulations for security in the installations used for the storage gross petroleum and its by-products and waste-products.

- Decree nº 36270 of 9 May 1947: It approves the regulations of security of the installations for storage the gross petroleum, its by-products and waste-products.


- Legislative Diploma of 1/71 of 7 January 1971: It approves the regulation on explosive substances.

- Legislative Diploma nº 48/73 of 5 July 1973: It approves the General Regulation on Hygiene and Security in the work.

- Legislative Diploma nº 57/73 of 29 November 1973: It establishes that the monitoring prevailed in the General Regulations of Hygiene and Security in the Work is under the competence of several Organisms.

- Portaria nº 11/78 of 14 January 1978: It establishes that the institutions that produce and sell food items, should have a book of “sanitation control”.

- Decree nº 32/89 of 08 November 1989: Re-organises the Inspection of Labour and sets the rules of its functioning.

- Ministry Diploma nº 88/87 of 29 July 1987: It approves the regulations on pesticides

- Portaria nº 428/71 of 30 September 1971: The International Sanitation Regulations (nº 2) of the World Health Organisation (WHO) is extended Overseas (ex-Portuguese Colonies).


- Legislative Diploma nº 120/71: Regulations on the Security of the Staff and Hygiene at the Working Places (Civil Engineering Projects)

- Ministerial Diploma nº 17/90: Regulations on Inspection in the Work.

- Law 8/82 of 23 June 1982: Crimes against public health related to food hygiene.

- Ministerial Diploma 51/84 of 03 October 1984: It approves the regulation on hygienic demands of the buildings handling food items.


- Ministerial Diploma n° 100/87 of 23 September 1987: Food additives


SOIL

- Decree n° 40040 of 24 February 1995: It establishes the procedures aimed at protecting the soil, flora and fauna in the ex-Portuguese Colonies.

- Dispatch of 18 May 1979: Exploration of stone-pits.


- Law n° 3/81 of 3 October 1981: It approves the Law for Petrol Exploration Activity

- Law n° 6/79 of 3 October 1979: Law on the Use and Exploration of Land


- Decree n° 16/87 : It approves the regulation of Land Act.


- Resolution n° 7/86 of 25 July 1986: Transference of some areas among the districts, by province.

- Resolution n° 8/86 of 25 July 1986: Some urban centres are elevated to the category of city.

UNITS OF PROTECTION

- Legislative Diploma n° 1993 of 23 July 1960: It sets up the National Park of Gorongosa

- Legislative Diploma n° 1994 of 23 July 1960: It creates the Special Reserve of Protection of Elephants

- Legislative Diploma n° 1961: It alters the limits of the Special Reserve of Marromeu.

- Legislative Diploma n° 1966: It creates the Special Reserve of Protection of Gilé.

- Legislative Diploma n° 2673 of 8 January 1996: It approves the description of the limits of the National Park of Gorongosa.

- Legislative Diploma n° 2570 of 6 May 1967: It defines the limits of the National Park of Gorongosa.

- Legislative Diploma n° 2573 of 27 May 1967: It approves the Regulation of National Park of Gorongosa.

- Legislative Diploma n° 2884 of 24 May 1969: It establishes the limits of the Partial Reserve of Niassa.

- Legislative Diploma n° 2903 of 9 August 1969: It creates the Special Reserve of Protection of Elephants of Maputo, designated as the Special Reserve of Maputo.

- Legislative Diploma n° 2935 of 22 November 1969: It integrates in the National Park of Gorongosa the prohibition for hunting which was created by Portaria n° 14267 of 3rd September 1960.

- Legislative Diploma n° 46/71 of 25 May 1971: It creates the National Park of Bazaruto.

- Legislative Diploma n° 46/73 of 26 June 1973: It creates the National Park of Banhine.

- Legislative Diploma n° 47/73 of 26 June 1973: It creates the National Park of Zinave.

- Portaria n° 14228 of 20 August 1960: Vigilance regime of Marracuene.

- Portaria n° 14845 of 04 March 1961: Vigilance regime of Limpopo.

- Legislative Diploma n° 2767 of 29 July 1967: Vigilance regime of the abolished prohibition for hunting n° 3.

- Legislative Diploma n° 2787 of 23 December 1967: It creates the Zones of Special Vigilance of the Inhaca and Portuguese Islands.

- Legislative Diploma n° 2904 of 09 August 1960: Vigilance regime of Maputo.

GENERAL LAWS


- (the articles 35,36,37,38,47,54,72,89).

- Presidential Decree n° 2/92 of 3 June 1992: It creates the National Commission for Environment

INTERNATIONAL CONVENTIONS


10.5 Institutions and Contact Persons Surveyed

<table>
<thead>
<tr>
<th>Agency</th>
<th>Contact</th>
<th>Tel</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public agencies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MICOA:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Coastal Zone Management Unit</td>
<td>Helena Motta</td>
<td>46 58 43</td>
<td>46 58 49</td>
<td><a href="mailto:micoa@ambinet.uem.mz">micoa@ambinet.uem.mz</a></td>
</tr>
<tr>
<td>- GIS Unit</td>
<td>Abilio Murima</td>
<td>49 61 08</td>
<td>/09</td>
<td></td>
</tr>
<tr>
<td>- Sustainable Development Network Program - SDNP (UNDP)</td>
<td>Teresa Alfaro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Library</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENACARTA (Remote Sensing Centre)</td>
<td>Manuel Ferrão</td>
<td>42 47 89</td>
<td>42 19 59</td>
<td><a href="mailto:manuel@carvalho.uem.mz">manuel@carvalho.uem.mz</a></td>
</tr>
<tr>
<td></td>
<td>Simão Joaquim</td>
<td>30 21 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DINAGECA - National Directorate of Geography and Cadastre</td>
<td>Albino Júnior, Azarias Banze, Luis Abrão</td>
<td>30 25 55</td>
<td>42 69 38</td>
<td><a href="mailto:soheil@dinagec.uem.mz">soheil@dinagec.uem.mz</a></td>
</tr>
<tr>
<td>- Direction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cadastre Unit</td>
<td>Soheil Chohan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Cover/Land Use Mapping Project (CENACARTA / IGN-FI)</td>
<td>Corinne Carvalho Mr. Guyot</td>
<td>30 21 45</td>
<td>42 18 02</td>
<td><a href="mailto:corinne@carvalho.uem.mz">corinne@carvalho.uem.mz</a></td>
</tr>
<tr>
<td>Ministry of Agriculture and Fisheries - National Directorate of Forestry and Wildlife (DNFFB)</td>
<td>Boutolomeu Soto Maria Regina Cruz Joaquim Macuácu</td>
<td>43 00 77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transfrontier GEF project (Wildlife Department)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- GERFA (Mgt of Natural. Resources and Forestry)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Institute for Agriculture Research (INIA)</td>
<td>Jorge Francisco Moisé Vilanculos Jacinto Mafalacuss Joao Mario Ruy Marques</td>
<td>46 01 90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency</td>
<td>Contact</td>
<td>Tel</td>
<td>Fax</td>
<td>Email</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
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<td>--------------------------------------------</td>
</tr>
<tr>
<td>National Institute of Meteorology (INAM)</td>
<td>Ernesto Mussage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEACAM</td>
<td>David Moffat</td>
<td>46 58 43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Institute for Rural Development (INDER)</td>
<td>João Carrilho</td>
<td>46 50 41</td>
<td>46 54 07</td>
<td><a href="mailto:prinder@zebra.uem.mz">prinder@zebra.uem.mz</a></td>
</tr>
<tr>
<td>Ministry of Agriculture and Fisheries - National</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directorate of Hydraulic and Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Trade and Tourism - Department of Tourism (DINATUR)</td>
<td>Arlindo Langa</td>
<td>42 71 49</td>
<td>42 11 66</td>
<td><a href="mailto:dinatur@zebra.uem.mz">dinatur@zebra.uem.mz</a></td>
</tr>
<tr>
<td>Ministry of Natural Resources and Energy - National</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directorate of Geology ?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UEM - Department of Geology - GIS Unit</td>
<td>Daude Jamal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UEM - Department of Biology</td>
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<td></td>
<td></td>
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<tr>
<td>Ministry of Civil Works and Housing - National</td>
<td></td>
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<tr>
<td>Directorate of Water Affairs</td>
<td></td>
<td>42 21 91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Institute for Physical Planning (INPF)</td>
<td>Erasmo Nhanchungue</td>
<td>46 54</td>
<td>05/07</td>
<td></td>
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<td>National Demining Commission</td>
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<td>Maputo Council - Projecto Enderecamento (Urban - French financed)</td>
<td>Taoufik Lahlou El Outtassi</td>
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<td>John Hatton</td>
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<td>Henny Matos</td>
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<td>José Olivares</td>
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### 10.6 List of Restitution Meeting’s Participants

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<td>- Sustainable Development Network Program - SDNP</td>
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<td>CENACARTA (Remote Sensing Centre)</td>
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<td>Boutolomeu Soto Maria Regina Cruz</td>
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2. DNFFB Transfrontier Conservation Areas and Institutional Strengthening Project - Terms of Reference for the Etablissement of a GIS Unit


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