Republic of Mozambique

Mozambique Communications Sector Reform

Environmental Pre-Audit of Public Enterprises
(Selection of Facilities for Audits)

prepared for

The Ministry of Transport And Communications

Malick A. K. John
124
Immeuble Sohna Anta, Dakar, Senegal
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Executive Summary

The Government of Mozambique (GOM) has decided to launch a Communications Sector Reform program to create an enabling environment to improve access to efficient communications services. Under the proposed project, two public enterprises, Linhas de Mozambique (LAM), and Telecommunicacoes de Mozambique (TDM) are due to be privatized. The major airports, in particular Maputo International Airport (MIA) currently managed by Aeroportos de Mozambique (ADM), are due for a concession.

A task force team under the direction of Mr. Joao Jorge will be assisting the GOM for the execution of the project. As part of the reform process, at project preparation, a pre-audit is being carried out to identify potential environmental liabilities resulting from companies’ past operations and to assess responsibilities of each party in meeting environmental compliance. Hence, this pre-audit, prepared for the Ministry of Transport and Communications (MTC), is the result of environmental analysis carried out to rank and prioritize the facilities to determine those requiring full, partial or no audits.

The assignment was carried out in two phases with first phase involving a review of existing and historic information and legislation on environment as well as visual inspection of selected sites. The second phase comprised assessment of risks, prioritization of pollution concerns, and ranking of sites according to the need for auditing at divestiture.

The following are the findings of the pre-audit:

For Maputo International Airport, a partial pre-audit will be required to deal with the following issues:
1. Solid waste disposal. Waste is presently dumped in the airport precinct prior to collection by the municipality creating habitats for rodents, snakes and flying species, the latter being of concern to Pilots.
2. Treatment of water. The water from the airport terminal and other facilities is not treated and simply pumped to the river systems in the vicinity.
3. Fire equipment. The fire station have come towards the end their life-span and a program of decommissioning should be envisaged during the partial audit.
4. VOA equipment. Concern was also expressed at the meetings at the lack of a back-up system for the VOA. This issue should be addressed by an ICAO-IATA team which was on mission in Maputo during the duration of this mission.

The pre-audit found the main risk factors to the physical and aquatic environment from the airport are solid and liquid waste management. These issues will be addressed under the partial audit.

For Linhas Aeras de Mozambique (LAM), no audit is required since the current fleet being operated by LAM, a Boeing 767 for its international route, and two 737s and a fokker, does not pose any environment concerns. However to prepare for an upcoming legislation in the SADC region to regulate noise, ultra-sound and hydrocarbon emission in about four years time, it would be prudent for Mozambique to start monitoring these levels.
For Telecommunicacoes de Mozambique (TDM), no audit is required since TDM has been able to resolve the main concerns relating to the decommissioning of cross-bar exchanges and other analog equipment with a Zimbabwean enterprise. However, certain equipment in the other provinces outside Maputo need to be decommissioned after the de-mining program is completed.

As MICOA, the Ministry for the Environment may require institutional strengthening, which is outside the scope of this program, it is proposed to monitor compliance to environmental guidelines through the recruitment of a consultant for 12 months after each divestiture. The cost for monitoring and compliance under the project is estimated to be $US 141,940.00.
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List of Acronyms

ADM  Aeroportos de Mozambique
BOD  Biological Oxygen Demand
COD  Carbon Oxidation Demand
CO2  Carbon Dioxide
CO   Carbon Monoxide
DP   Decommissioning Plan
EAT  Environmental Audit Team
EET  Environmental Evaluation Team
EIA/S Environmental Impact Assessment or Statement
EMP/S Environmental Management Plan/System
GIS  Geographical Information System
GOM  Government of Mozambique
INAC Civil Aviation Authority
INCM Instituto National das Comunicacoes de Mozambique
IDA  International Development Agency
ISO  International Standards Organization
MICOA Ministry of the Environment
MP   Monitoring Protocol
TDM  Telecommunicacoes de Mozambique
LAM  Linheas Aeras de Mozambique
MIA  Maputo International Airport
NEAP National Environmental Action Plan
NGO  Non Governmental Organization
NO2  Nitrous Oxide; Nitrogen Dioxide
ODC  Other Direct Costs
O&M  Operation and Maintenance
PCD  Project Concept Document
PE   Public Enterprise
PPD/E Personal Protective Device/Equipment
PPM  Parts Per Million
RAP  Resettlement Action Plan
SO2  Sulfur Dioxide
TAM  Turn-Around Maintenance
TOR  Terms of Reference
TSRI Telecommunications Sector Reform Implementation
TTL  Task Team Leader
USEPA United States Environmental Protection Agency
VOC  Volatile Organic Compounds
WB   The World Bank
WHO  The World Health Organization
1. Introduction

The Government of Mozambique has decided to embark on a Communications Sector Reform project to create an enabling environment to improve access to efficient and affordable communications by opening the air transport, telecom, and postal sectors to competition and participation. As part of this reform process, private participation will be sought for the major airports, currently managed by Aeroportos de Mozambique (ADM), Linheas Areas de Mozambique (LAM), and Telecommunicacoes de Mozambique (TDM).

2. Project objectives

In an effort to address telecommunications, postal and air transport sector-wide issues effectively, the Government of Mozambique intends to adopt a:

- Telecommunications policy which will include (i) the establishment of a comprehensive pro competitive, legal, regulatory and institutional framework; (ii) increased private sector participation to operate mobile licenses;
- Postal sector development strategy to enable the postal operator to become more commercially oriented;
- Air transport strategy which will include (i) air transport liberalization policy formulation and development of related legislation (ii) strengthening of regulatory capacity in particular the development of economic regulation in the context of the imminent entry of private operators in the sector; (iii) restructuring and privatization of the national airline and (iv) master plan for privatization of the major airports starting with Maputo International Airport (MIA).

The proposed project will support the Government’s efforts to address sector-wide issues. More specifically, the proposed project will:

- Establish a modern regulatory framework to lay the foundation for open, market-driven telecommunications, postal and air transport sectors;
- Implement a liberalization policy in the telecommunications sector starting with the award of two new mobile licenses to private investors; and in the air transport sector by implementing an open skies policy;
- Restructure existing institutions to promote competition and to assure clarity and consistency of rules applied by the autonomous regulators (INCM for telecommunications and post; and the INAC for air transport);
- Design and implement a privatization strategy for Telecommunicacoes of Mozambique (TDM), the incumbent telecommunications operator; and Linheas Aéreas de Mozambique (LAM), the national airline; as well for the concessioning of the airport system; and
- Develop a strategy for postal services.

The project is expected to benefit the economy and the population not only through creating an enabling environment for private sector entry into the sectors, but also through designing a strategy to increase access to air services, telecommunications and postal sectors in rural areas. This reform process will have a positive impact on the employment in these sectors as several new
operators enter the market, as well as in other sectors relying on improved access and services. However, skill-mix readjustment may be necessary and may lead to some retrenchment.

2.1 Objectives of the environmental pre-audit

The objective of the environmental pre-audit is to assist the Government of Mozambique to:
- Identify the extent of the existing environmental liabilities of Public Enterprises (PEs) and rank them accordingly as to which needs Full Audit or No Audit. Where a full audit or partial audit is required, the team may want to conduct it close to divestiture but the agreement on who will be held accountable for any remedial measures should be determined much earlier;
- Broadly assess the environmental conditions at the enterprises to be privatized against the risk of being held responsible for damages after privatization;
- Use the environmental pre-audit as a starting point for assessing the enterprise’s environmental and health status prior to privatization; and
- Assess the responsibility of monitoring and compliance of each party to meet the internationally accepted environmental standards.

2.2 Scope of work

The environmental pre-audit to be conducted in two phases, will focus on the GOM’s efforts to privatize the telecommunications company (TDM), the national airline LAM, and to concession the Maputo International Airport (MIA).

In order to determine which of the facilities of the PEs require a full and comprehensive audit to be undertaken, rankings have been carried out of the facilities based on risk characterization. The risk characterization is a process of estimating the probable incidence of adverse impacts to potential receptors under various exposure conditions, including an elaboration of uncertainties associated with such estimates.

3. Environmental settings

3.1 Initial conditions

Mozambique is situated in the south-east corner of Africa bordered by Tanzania, Malawi, Zambia, Zimbabwe, Swaziland, and South Africa. The country is divided into 10 provinces, with a total population of about 17 million and a surface area of about 800,000 sq km. The topography is accented with the highest point in Binga (Manica) province at 2436 meters and the lowest at 233 meters in Mazengue (Inhambane) province. The country is covered by several lakes and rivers which in effect have a significant effect on the physical environment.

Without being able to conduct an exhaustive study of the topography of the country, it appeared from the documentation obtained that the country forms a natural drainage basin for the East and Southern Africa regions resulting in a fragile environment because of the hydrograph. The recent floods in the country provide adequate proof of the problem, which will recur unless a sustainable disaster management framework is implemented.
3.2 Environmental concerns

The major concern relates to the effects of the hydrograph of the country with drainage of several major rivers of the east and southern African regions and the consequences of the absence of a emergency disaster management plan. An absence of a protection plan could have major economic, health and social impacts. The consultant assumed that the major concern of the Mozambique authorities remains the problems associated from flooding and its impact on the economic, health and social structures.

Regarding the proposed Communications Sector Reform Project, any impact from the flooding on the facilities presently being pre-audited would be relatively insignificant compared to the larger issues. The issues addressed in the pre-audit are really those that are relevant to the project and have a direct implication towards possible contingent liabilities, subsequent monitoring and compliance.

4. Ranking

The ranking process applied in this assessment involves the qualitative estimation of the potential risks and/or hazards due to activities at the facilities of the PEs.

An adequate characterization of risks and hazards at a potentially contaminated site allows for a comprehensive (full) environmental audit to be performed during which the site remediation process can be focused better, and cleanup criteria can be developed based on the acceptable level of risks to potential receptors. Furthermore, during the comprehensive audits the greatest risk can be identified and the site mitigation measures selected to address those issues.

The ranking procedure was similar to the scoring using the DRASTIC index (Aller and Others, 1987; Atobrah, 1990; Atobrah and Others, 1989), and was based on risk characterization of hazardous wastes (Asante - Duah, 1993; Asante - Duah and Others, 1996). The ranking approach provided indication on whether the site was located in a generally sensitive or vulnerable area and has a significant pollution to the environment.

4.1 The Environment pre-Audit evaluation criteria

The facilities of the enterprises were assigned scores on the basis of the Audit Index Factors (AIF) developed for the various sites. The AIF is a degree of pollution potential for a facility by which assessment for comprehensive audits can be determined. The criteria considered to have little impact on the environment were ranked by assigning the lowest score of one, and the criteria with significant impact on the environment were assigned the highest score of ten. The scores for each facility were then added and the site with the highest score was assigned the most likely site to have full audit.

4.1.1 Rating Components

The rating components for evaluating and characterizing the audit potential of a site were as follows:
4.1.2 Weighing components

The weighing was assessed on the overall effects on pollution potential for the sites and facilities by considering the weighing components as follows:

- Depth to water
- Soil and aquifer media
- Topography
- Impact on land-use and planning
- Impact on wetlands and water bodies
- Impact on workers

Each audit factor was assigned a relative weight ranging from one (1) to five (5); the least significant with a weight of 1 and the very significant with a weight of 5. For example, a rating component such as Air Emission was assigned a weight of 5 if the impact to the environment was very significant and a weight of 1 if the impact to the environment was of least significance.

To obtain the number for each Audit Index Factors (AIF) that determined the degree of the pollution potential, the weight was multiplied by the rating. The total of the product for individual Audit Factor gave the Audit Index. Evaluation of the Audit Index for the Facilities of the PEs provided the relative significance of each facility or site with respect to the pollution potential.

Based on the cumulative Audit Index Factors derived for the different sites, the Facilities of the PEs have been ranked into categories of those that required comprehensive (full) audits, those that required partial audits and those that did not need any audits to be undertaken at this moment.

The rankings were categorized as follows:

- Facilities with Audit Index Factors of cumulative scores above 140 were considered high risk that would require comprehensive (full) audits.
5. Results of rankings

5.1 Facilities Requiring Full Audits

None

5.2 Facilities requiring partial audit

5.2.1 Maputo International Airport AIF 138

5.3 Facilities requiring no audits

5.3.1 Telecommunicacoes de Mozambique (TDM) AIF 90

5.3.2 Linhas Aeras de Mozambique (LAM) AIF 88

6. Sectoral analyses

This chapter attempts to provide a broad indication of the main concerns intrinsic to this sector with regard to the environment.

In the past these concerns might have been addressed at the conception stage of the enterprise under review/audit and environmental management and mitigating measures incorporated in the design/construction and the operation of the enterprise hence the present emphasis on EIAs prior to approval of projects as embodied in national legislation's and the world bank safeguard policies.

6.1 Air Transport

For the purposes of this pre-audit, the brief relates to air transport specifically MIA and LAM. With historical and present data, the pre-audit will evaluate the status of these enterprises dealing among others with infrastructures and development, rehabilitation and/or expansion, their operations. These elements generate a certain number of environmental impacts, notably in terms of infrastructure development:

a) The social impacts relate to the riparian communities:

- Creation of temporary employment
- Acquisition of traditional lands for construction and expansion resulting in migration and resettlement as well as encroachments one way or the other

b) The biophysical impacts are varied:

- Creation of quarries
- The location and alignment of infrastructures on soils and the hydrography of the environment
- Effects on protected areas and species

The concerns relate to operation of airlines in particular:

- Noise, vibrations, ultrasonic booms
- Gaseous emissions
- Health of operational personnel and riparian communities and their animal husbandry.
- Transportation and storage of:
  - Toxic materials
  - Dangerous materials (explosives, nuclear materials etc)
  - Storm and wastewater dispose
  - Solid and liquid waste (oil spills)

The Pre-audit will address all these elements, determine the AIFs and formulate Audit Action Plans or mitigating measures where appropriate.

### 6.2 Telecommunications

Whilst this sector comprises several sub-sectors, the pre audit will essentially limit itself to Mozambique telecom and its infrastructure/network, transmission systems, frequency monitoring systems, and equipment in use. With reference to the environment, telecommunications does not present major risks.

The primary concern relates to the decommissioning/replacement of equipment and the disposal of the obsolete equipment and materials notably:
- Cross bar exchanges and obsolete analogue equipment
- Other Telecom equipment and batteries.
- Solid and liquid waste disposal
- Emissions and air quality inside the telecom facilities,
- Health and safety
- Personal protection equipment (PPE)
- Waste disposal
  - Solid
  - Liquid
- Environmental Management
- Regulatory framework
- Capacity Building.

### 7. Description of Key Pre-Audit Findings

#### 7.1.1 Telecommunicacoes de Mozambique (TDM)

#### 7.1.2 Background
Telecomunicações de Moçambique (TDM) was incorporatized in 1992 following the separation the Postal and Telecommunications department.

7.1.3 Network

In the end of 2000, the fixed network had a switching capacity of about 128,000 lines from which 86,000 were in service. Teledensity in the country has increased 50% since 1993, but is still one of the lowest in the region illustrating the difficulty of the public incumbent in keeping up with demand and population growth. The network currently extends to 102 (80%) of the 128 districts (the administrative units below provinces). However, it mainly covers major cities and their surroundings and in Tete province only half of the 12 districts have a telephone. 99% of lines are in urban areas while only 1,000 lines are available in rural areas with population of about 11 million. Due to lack of terrestrial backbone transmission network, provincial cities have been connected via satellite to Maputo. To develop the backbone, a 1,000 km long submarine cable is being laid connecting the second largest city Beira to Maputo, eventually connecting Zimbabwe with Africa One1. For mobile/cellular network coverage is limited for the moment to the central core area around Maputo.

7.1.4 Transmission

The core transmission system is by national and international satellite stations as shown in the attached map. An extension program to cover the more remoter areas is being envisaged in the framework of the proposed privatization program. The new link between Maputo and Beira using a submarine fiber-optic cable is now under study.

7.1.5 Key pre-audit findings

- The network is relatively new and has been converted to a digital system completely;
- The last two of the cross bar exchanges are presently being dismantled and as with previous cases will be sold as scrap. In this regard in particular for the analog components an enterprise in Zimbabwe has offered the best option of disposal of these obsolete equipment for the benefit of TDM;
- For its expansion program, TDM has decided as a matter of policy that based on the scope and extent of its program on its network, these will be the subject of EIAs to determine the environmental impact of each program using consultants in consultation with MICOA. The Consultant noted that this is the case with the submarine optic-optic cable telecom link for the Maputo-Beira extension. Subsequently, a post project monitoring program will be undertaken to ascertain the adequacy of any mitigating measures stipulated by the EIAs. With reference to the mobile/cellular network, TDM regretted the damage to equipment and materials due to the civil war and that some of these are presently to be found in the hinterland;
- For occupational health and safety, TDM has embodied in its statutes several codes of conduct for personnel and obligations on its part for the health and safety of its personnel and

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1 Africa One will be a 35,000 kilometers optical fiber network operating at 2.5 gigabits (billion)-per-second with landing points in 41 African countries plus Saudi Arabia and Italy.
communities in proximity with its facilities. The consultant noted that, apart from one fatal accident, these precautions are being clearly observed by both personnel and management, in particular:

- The provision of safety equipment/attire to personnel;
- Dietary supplement such as milk for personnel;
- Instructions relating to high voltage precincts embodied in the statutes; and
- The establishment of a health and safety unit in the management of the enterprise.

7.1.6 Decommissioning

From discussions with management, the consultant surmised that little or no decommissioning exercise is required for TDM for the moment. For the fixed telecom system and the obsolete system, TDM has resolved the disposal method, as stated earlier with a Zimbabwe enterprise. For the mobile system, there are various other factors to be addressed at a point in time and circumstances related to its expansion program of the network and disposal of obsolete equipment.

7.1.7 Environmental management

From the discussions with management and from the consultants own perception of the management requirements, it is more cost effective for TDM to maintain its present practices of EIAs for its projects and programs in consultation with MICOA.

- Contract out where possible especially before and after divestiture to MICOA or private consultants, the monitoring of key environmental concerns related to its operations or expansion;
- Designate a liaison officer in management to oversee these aspects of environmental management; and
- Offer training to the designated officer on environmental issues related or generated by telecommunications projects/programs.

From the foregoing, the consultant, with an audit index factor calculated at 90 recommends *no audit* for TDM.

7.2 Linhas Aeras de Mozambique (LAM)

LAM, SARL was created by decree 69/98 of December 23, 1998, transforming the legal status of the company, from a public company to a limited liability company (SARL). On this occasion the first privatization phase of the company took place, by means of the sale of 20% of the share capital to the current managers, technical staff and employees. LAM SARL integrates several business areas, with different profiles of strategic positioning and critical factors of success such as passenger transport, cargo transport, light aviation, maintenance, and handling. The airlines is relatively small and has acquired through leasing arrangements the following fleet:

- One Boeing 767 essentially for international flights to Europe;
- Two Boeing 737s mainly for the international African routes;
- One Fokker African route and internal 28-100 for both African and internal flights.
The meeting took place at the airline technical directorate near Maputo airport. The discussions centered around the key environmental concerns of:

- Noise levels from their fleet,
- Emissions of hydrocarbons from their aircraft,
- Their cargo handling operations, in particular, toxic cargo, dangerous cargo (nuclear, explosives etc) and expired unclaimed cargo,
- Oil and lubricant spills from their maintenance operations
- Health and safety standards in force in the enterprise,
- Environmental management practices in place.

7.2.1 Key Pre-audit findings

The management indicated that for the international fleet, the noise and emission levels as stipulated by regulations of their destinations are strictly adhered to and the relevant certificates obtained. For the internal flights however, no standards have been set and noise and emission levels are not monitored. The consultant was informed that for cargo handling, a new joint venture between LAM, a Mauritian company Tri-handling and Maputo International Airport has been formed with shareholdings of 51%, 29%, and 21% respectively. All handling is now being handed over to TRI-handling. Management had in effect claimed that LAM had not in effect handled dangerous or toxic cargo before. The consultant can only assume that with the new arrangements cited above, any concerns about the types of cargo in question will be dissipated.

A visual inspection of the maintenance facilities of LAM indicated that oil spills do not constitute a problem with all discarded oil or spill recovered and sold in the artisanal market. It was also observed that protective wear and other equipment were used routinely and called for no comments. International safety standards were rigorously applied. Management did state that no specific environmental management practices were in place. They did state however that, as regards noise and emission levels, legislation envisaged in South Africa in year 2004 could well impose conditions on noise and emissions which they will have to adhere to.

The consultant, from the foregoing considerations concluded that with an audit index factor of 88 LAM did not require any audit.

7.3 Maputo International Airport (MIA)

It should be understood that the airport authority (ADM) is responsible for Maputo International Airport, Beira and Nampula airports in addition to other smaller airports in the country.

The present pre-audit relates mainly to Maputo International Airport being the international airport although the concerns for the other airports are essentially the same but to different scales. The consultant had preliminary meetings at the Department of Civil Aviation with Mr. Furtunato H. Saraiva, Chief of Air Navigation Department and Mr. Masinga, Head of Civil Aviation Unit. The meeting was essentially a briefing session on both LAM and the airport authority (ADM) and dealt more with aviation policy issues and concerns related in particular to encroachments at the various airport by migrant communities. These issues were subsequently discussed at length at
the meeting at the airport. The meeting took place at the main airport headquarters and in attendance were:

Mr. Vitorino Suege, Director of the Airport,
Mr. Diogo Magaia, Airport Operations Manager,
Mr. Jose Jacinto David, Division of Electronics.

The meeting discussed the issues of significance to the environment as far as the airport infrastructure and operations were concerned namely:

- The terminal building, control tower and other related structures,
- The runways and aprons,
- Fire and met services,
- Airport security especially encroachments by riparian communities.

The main areas of environmental concern in relation to these were identified as follows:

- Potable water and sanitation facilities,
- Sewage disposal,
- Liquid waste disposal,
- Solid waste disposal,
- Toxic waste disposal,
- Handling of dangerous materials (explosives, nuclear materials etc),
- Expired unclaimed cargo.

### 7.3.1 Pre-audit findings

**Potable Water supply and Sanitation.** The supply for water is mainly from boreholes, the airport not being connected to the municipal system. Whilst the quality appears to be good, it was inadequate for the needs of the airport. Sanitary facilities left a lot to be desired and a major rehabilitation and improvement of the water supplies and sanitation facilities will be required before or after concessioning;

**Sewage disposal.** The consultant noted the information to the effect that all airport sewage goes to the municipal system;

**Liquid Waste disposal.** Waste water from the airport infrastructure except runways is pumped to four settling tanks in the airport precinct from where the liquid effluent is pumped to the river systems in the vicinity of the airport. The consultant noted that the quality of the water entering the settling tanks nor the effluent from these is known by the airport authority, a major source of concern. The impact on the riverine ecology could be disastrous. The consultant could not surmise also why the tanks were completely closed as well as the fate of the solid residues;

**Solid Waste disposal.** The consultant visited the waste pit in airport where waste is held temporarily prior to collection by the municipal cleansing services. It was noted that the dump was a haven for rodents, snakes and birds amongst other animal species, a source of diseases, contamination of the soils and the aquifers. The birds present a major hazard to navigation by aircraft as is known too well by pilots;
Toxic waste, Dangerous materials etc. None of these materials come under the responsibility of ADM for handling or storage as disclosed in the text on Mozambique Airlines;

Safety. The consultant reviewed the state of the fire services, the met services, navigation aids. The fire tenders were 15 years old and their continued serviceability should be reviewed. The met services appear to be adequate. As regards navigation aids, the presence of only one VOA is not re-assuring with the possibility of a break-down. The need for a back-up system should be evaluated; and

(a) Environmental Management. This is completely non-existent and within the framework of an audit, this aspect must be dealt with.

From all of the foregoing considerations an audit index factor of 138 was assigned to Maputo International Airport and hence the need for a Partial Audit.

7.3.2 Audit action plan

In carrying out the partial audit the consultant should first review historical data on the three airports of Maputo, Beira and Nampula with the view to determine, in particular the settlements that were in place at the time of construction of the airports. From this preliminary study to determine the extent of any encroachment that might have occurred over the years:

- Solid waste disposal. The pre-audit should carry out probes to determine the level of pollution if any from the Waste Pit in the airport precinct by undertaking the following:
  - Drilling of sampling wells within the pit and just outside to allow for sampling of both the soils encountered and waters of the aquifers in the wells;
  - The number of wells required and their distance from the pit center will be determined by taking samples of soils and water at a point well away from the waste pit to serve as reference data;
  - Analyses of the samples will be carried out for both chemical and microbial composition and the results compared with the reference well data;
  - The auditor will then draw a map showing the extent of pollution that might have taken place; and
  - The consultant should even at this stage propose a better collection and holding system such as containerization compatible with the collection facilities of the municipality.

- Liquid Waste. Waste water cited earlier in the pre-audit findings discharged into the river systems will require analyses as to chemical and microbial composition before entering the settling tanks as well as at the exit from them prior to discharge into the rivers.
  - The audit should determine any negative impacts on the communities in the vicinity as well as on riverine species;
  - A more appropriate treatment option shall be proposed by the consultant; and
  - Although there was hardly any evidence of oil/lubricant spill in the repair workshop, the consultant should verify this.

7.3.3 Health and safety
Whilst the pre-audit could not identify the health hazards associated with the airport operations, it took note of the state of such services as the existence of only one VOA navigation system, the absence of a backup being a safety lapse in the event of failure of the existing one. The age of the fire tenders (15 years) calls for a renewal plan and the pre-audit should review this if it has not already been done by the ICAO/IATA mission. The costs for the pre-audit are contained in the overall estimates.

7.4 Decommissioning

Decommissioning exercises are a specialized task and should be carried out separately. In the case of this pre-audit, decommissioning only in Maputo International Airport might be required.

8. Legal framework for environment

Three meetings were held at MICOA to review the statutory framework in place for Environmental Protection. The first meeting was held with Mr. Andre Da Silva, Head of the Legal department at MICOA. The discussions centered around the framework legislation approved by parliament in 1997. This framework document and legislation defines in nine chapters and thirty four Articles a broad outline of the scope, content or dispositions to be put in place by subsequent enabling acts, decrees and setting out:

- Environmental management organs at central and local levels;
- Environmental pollution, essentially pollution levels and standards;
- Special measures for protection of assets, bio diversity zones and species and the locations of infrastructures;
- Preventive measures for environmental damage notably EAS, licensing and subsequent auditing; and
- The use of Consultations, in particular:
  - The diffusion of information;
  - Awareness programs and education;
  - Right of access to legal recourse and infractions at all levels of society for potentially unfriendly programs/projects; and
  - liabilities emanating from such programs and projects and the infractions there off including insurance required as well as penalties to be encountered.

The meeting dealt at large with issues related to environmental management at sectoral levels, including specific legislation related to these sectors of development as well as post project / program auditing.

8.1 Pre-audit findings

The consultant observed however that apart from EA requirements for some programs and projects in which hydrocarbons and mining are excluded, none of the remaining enabling legislation have been enacted. A certain number of enabling acts, decrees and other specific legislation have been drafted but yet to be promulgated. MICOA or the PEs do not have, the capacity to undertake the requisite pre-conditions for managing or regulating the environmental protection measures envisaged in the 1997 act of Parliament. There is a marked lack of
awareness / education / resources to implement environmental protection measures nationally or at local level. It was evident to the Consultant that a significant reinforcement of MICOA and some of the PES was required before or during the divestiture process of the latter. The relevant recommendations and related cost estimates are contained below.
9. Recommendations

On the basis of the pre-audit findings, the following recommendations are put forward for consideration:

- A partial audit is required for Maputo International Airport (MIA) as well as other airports at Beira and Nampula;
- No audits are required for Telecommunicacoes de Mozambique (TDM) and Linheas Aeras de Mozambique (LAM);
  - Mozambique telecom should set up a small unit (one person) possibly within the health and safety unit to be trained in assuring safety measures to avoid future mishaps resulting in a death to one of the personnel;
- Civil Aviation Authority should be adequately equipped to monitor noise levels and emissions from aircrafts;
- Maputo International Airport (MIA) should establish an Environmental Management Unit (EMU) with the requisite personnel, equipment and logistics and an EMP formulated. The partial audit should define:
  - The areas of competence required for the Unit;
  - The scope and content of the programme in an EMP;
  - The capacity required in terms of personnel, equipment and logistic support as well as the related costs;
  - Its relationship with MICOA;
  - Training requirements of the EMU.
- For monitoring compliance to environmental guidelines the use of a Consultant for the period prior and after divestiture to assess both liabilities and subsequent compliance requirements is recommended;
- Decommissioning Plans: It is recommended that undertaking actual decommissioning plans for each site must be evaluated and the costs be determined during the comprehensive audits;
- Legal Framework and Contingent Liabilities: It is recommended that agreement be reached between the former owners and the new owners prior to transfer of assets to clearly assign the responsibility for potential environmental liabilities resulting from past operations and for compliance to new sectoral standards;
- Guidelines and Environmental Performance Indicators: The Ministry of the Environment (MICOA) must be responsible for determining and preparing guidelines and environmental performance indicators which are measurable for monitoring sites and facilities of the enterprises being privatized or concessioned.
- It is recommended that the MICOA set up a monitoring and accountability protocol that would require either monthly, quarterly or annual reports with respect to addressing significant mitigation measures and meeting the environmental management demands due to the activities and operations of enterprises. The monitoring protocol would require working in partnership with the leading agencies, such as the Ministry of Agriculture, non-governmental organizations (NGOs), community-based organizations (CBOs), and other relevant government institutions;
- Guidelines for Environmental Management in Divestiture: As part of the divestiture of public enterprises, a “road map” should be used by the Task Team and MICOA to assist
in supporting the integration of environmental management within the privatization processes for the current and future candidates; and

- The partial environmental audit of Maputo Airport should ideally be completed prior to concessioning. This requirement may however be negotiated with the interested party.
10. Cost estimates of audits and capacity building

10.1 To recapitulate, the recommendations emanating from the pre-audit are as follows:

1. **Telecommunication de Mozambique (TDM)**
   - No Audit required
   - Capacity building required for scope of projects/programs, execution of mitigating measures, and post-project monitoring.
   - One Environmental engineer (Local) for 12 months $36,000
   *Costs based on present costs for training at, say the school of Environmental Science of Bristol University

2. **Linhas Aeras de Mozambique (LAM)**
   - No audit required;
   - The support required is essentially the provision of noise and emission measuring equipment (meters) $24,000

3. **Maputo International Airport (MIA)**
   - One hydro-geologist with environmental science training for
     - 4 weeks @ $650 per day $18,200
     - per diem @ $200 per day $5,600
     *Air fares (if from the US) $12,000
     - One Local environmentalist for 4 weeks @ $250 per day $7,000
     - Local transport $1,000
     - Drilling of wells say 10 wells @ $100 per wells $1,000
     - Analyses say 50 samples @ $10 each $500
     - One Social scientist for 3 weeks @ $250 per day $5,250
     - Local transport (Airfares) to Beira, Nampula etc. $400

   **Total (Partial Audit)** $50,590

4. Monitoring of compliance to environmental guidelines

   - The cost for this exercise for three weeks @ $650 per day $13,650
   - Per diem @ $200 per day $4,200
   - Air tickets—(International) $11,500
   - Local transport $2,000
   **Total** $31,350

**Total of all Audits and Capacity Building** $141,940

If support for formulation of guidelines and training for MICOA is included as contained in the recommendations, the TOTAL support comes to **$266,940**
10.2 The consultant felt it prudent at this stage not to include any costs related to air traffic control systems as these might have been dealt with by the ICAO / IATA missions and similarly the costs of establishing an Environmental Management Unit at ADM is excluded as the consultant felt that the partial audit, in consultation with MICOA and ADM should find the most appropriate and cost-effective option to adopt.

10.3 MICOA
It was clear that the GOM is unable immediately to support these costs and it is not clear whether the project will support them for a period of say 3 years allowing the GOM to absorb these costs. The consultant also felt that MICOA will be called on to develop its auditing capacity for future privatisation (ref TOR) as well as following up EMPs.

Following discussions with the team, however and given the scope of the present TA project it is more prudent to call on a Consultant for three weeks prior to divestiture to assess liabilities and subsequent compliance requirements.
11. List of People Contacted

M. Gomes de Rosario Xavier ZITA, Managing Director, TDM
Mr. Furtinato SARAIVA, Chief of Air Navigation,
Mr. MASINGA, Department of Civil Aviation.
Mr. Vitorino SUEGE, Director, Aeroportos de Maputo,
Mr. Diogo MAGAIA, Operations Manager
Mr. Jose Jacinto DAVID, Division of Electronics.
The Director of Technical Operations, Linhas Aeras de Mozambique.
12. **List of publications used**


Ministry for Scientific Research, National Research Center on the Environment July 1999- Environmental evaluation of the Transport Sector- in three volumes.