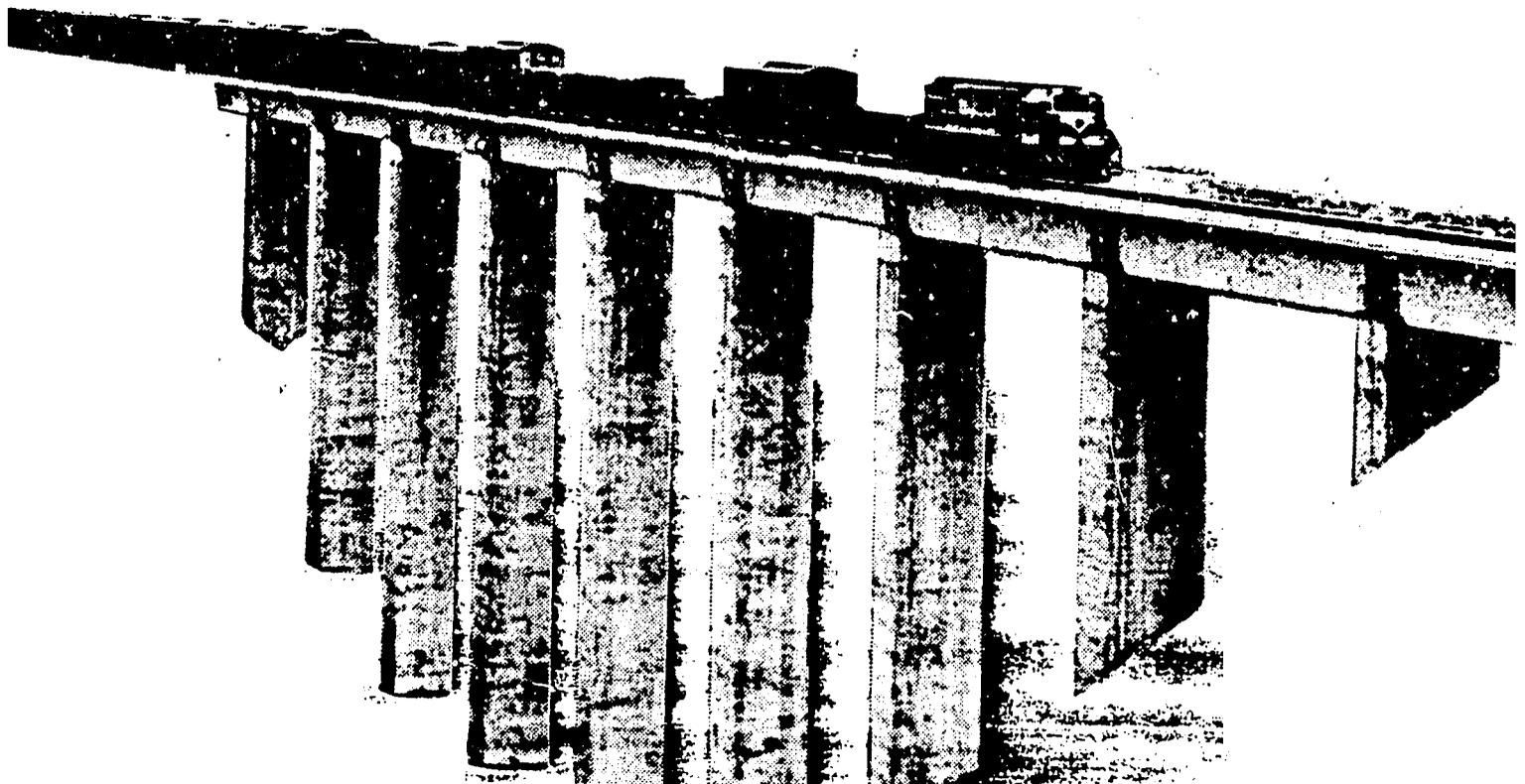
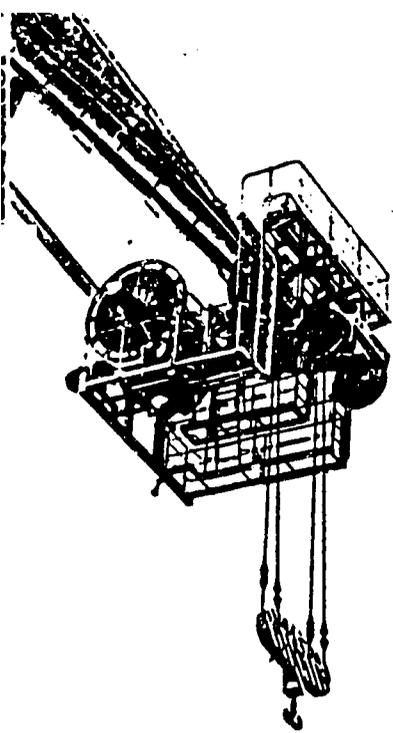


LOBITO PORT TRANSPORT SYSTEM

10-YEAR DEVELOPMENT PLAN

SATCC
Southern Africa Transport and Communications Commission
January 1988



**LOBITO PORT
TRANSPORT SYSTEM
10 - Year Development Plan**

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ABBREVIATIONS

ARM	Trunk and Tandem System
BS	British Standard
CFB	Companhia de Camino de Ferro de Benguela
DFL	Dutch Florines
DME	Distance Measuring Equipment
ENATEL	Empresa Nacional de Telecomunicacoes
ENCIME	Empresa Nacional de Cimento
EPTEL	Empresa Pública de Telecomunicacoes
ESTALNAVE	Estaleiros Navais de Angola
GE	General Electric
GHZ	Giga Hertz
HF	High Frequency
HP	Horse Power
ILS	Instrument Landing System
KWZ	Angolan Kwanza
MF	Medium Frequency
NEC	Nippon Electronic Company
PABX	Public Automatic Branch Exchange
SONANGOL	Sociedade Nacional de Combustiveis de Angola
UHF	Ultra High Frequency
USD	United State Dollar
VHF	Very High Frequency
VOR	Very high frequency omni directional range

REFERENCES

- Study of the Benguela Railway. Henderson Hughes & Busby - March 1979
- Benguela Railway Project. Interim Report and Support Papers. TRANSMARK - December 1972/July 1973.
- Lobito Route Rehabilitation Project.
(Benguela Railway - Angola). BADEA - October 1979
- Variante do Cubal. CFB Outubro 1979
Chemin de fer du Benguela
- Situation actuelle - perspectives d'avenir.
Mission de M Michel Simonel SOFRERAIL du 7 au 23 Avril 1987
- Telecommunications Ten-Year Development Plan
SATCC Maputo, HN Engineering Inc. - March 1987
- General Development Plan for the Port of Lobito. Rambo/ll & Hanneman,
Hoff & Overgaard and Skaarup & Jespersen - August 1985
- Port Staff Training Programme Angola
SATCC Maputo, Norconsult Oslo - September 1986
- Kampsax-Swederail. Study of Railway Rolling Stock, 1984.

1. INTRODUCTION

The main objective of SADCC is to reduce the economic dependence, particularly but not only, on the Republic of South Africa. Within the SADCC-region, the Southern Africa Transport and Communications Commission, SATCC, co-ordinates the development of the transport and telecommunications sectors with the aim of achieving this main objective.

Of the five principal port transport systems serving the land-locked countries, only two have regular traffic at present, namely Dar es Salaam Port Transport System via the Tanzania-Zambia Railway (TAZARA) and the Beira Port Transport System via the Beira-Machipanda railway line. This means that the land-locked countries today depend to a very large extent on South African ports and railways.

Rehabilitation works for the Nacala Port Transport System are at an advanced stage. The port is fully operational and the railway, which has been 50% reconstructed, is expected to be opened for regular traffic in the near future. The Maputo-Chicualacuála railway line serving Maputo Port is currently being rehabilitated.

The Lobito Port Transport System serves Angola, Zaire and Zambia and is of particular strategic importance to Zambia as it provides an alternative outlet to the sea. The Benguela Railway also offers a shorter route to West Europe and America due to the considerably shorter sea route from Lobito compared with the east coast ports of Africa. The rehabilitation and reopening of the Benguela Railway is thus one of the key efforts in the struggle to reduce dependence on South Africa and to improve the transport capacity within the SADCC-region.

On 16th April 1987 the Heads of State of Angola, Mozambique, Zaire and Zambia met in Luanda to initiate the reopening of the Benguela Railway. This meeting was followed by a meeting in Brussels on April 23rd and 24th of the senior officials from SATCC, Angola, Zaire, Zambia and Zimbabwe and representatives of the Société Générale de Belgique.

A declaration of intent for the rehabilitation of the Benguela Railway was signed in Lusaka on 30th April by the Heads of State of Angola, Zaire and Zambia.

The SATCC Committee of Ministers decided in Mbabane on 29th May that a 10-year Development Plan for the Lobito Port Transport System should be prepared and presented at the SADCC-annual conference at Arusha in 1988.

The 10-year Development Plan is presented in this report and includes descriptions of technical and physical assets, a traffic forecast, a development plan and detailed project descriptions. The Plan has been prepared as a guideline for the authorities in the SADCC countries served by the system and involved in its implementation, and as a background document for the international co-operating partners of SADCC.

2. BACKGROUND INFORMATION

2.1 LOBITO PORT TRANSPORT SYSTEM

In broad terms, the Lobito Port Transport System covers all transport and telecommunications links serving the hinterland of Lobito Port, the main transport link being the Benguela Railway. *See Figure 2:1.*

The hinterland in Angola includes the provinces of Benguela, Huambo, Bié, Mexico and Lunda Sul. The population of this area is about 40% of Angola's total population, or about 3.5 million.

Benguela Railway is linked to Société National des Chemins de Fer Zairois (SNCZ). The SNCZ railway network serves southern Zaire and the mining districts in Shaba province. Through this railway network Zambia Railways and the rest of the SADCC railway network are linked to Benguela Railway.

Zambia, centrally located in the SADCC region, is served by the four SADCC regional ports of Lobito, Maputo, Beira and Dar es Salaam.

Before the closure of the Benguela Railway for international traffic it played an important role in Zairean and Zambian overseas trade, especially to and from the copper belt areas.

The 10-year Development Plan includes measures for improving the operational co-ordination, manpower development and the physical assets. The Plan includes capital investment projects for development of infrastructure for Lobito town, energy supply, the Port of Lobito, the Benguela Railway, feeder roads to the port including the Benguela-Lobito Road, telecommunications and an airport for Benguela province.

2.2 ORGANIZATIONAL STRUCTURE

The overall responsibility for the transport sector within Angola rests with the Ministry of Transport and Communications. The Ministry is divided into national directorates responsible for road transport, railways, merchant shipping and ports, civil aviation, and post and telecommunications. *See Figure 2:2.*

The telecommunications services are operated by two public corporations: ENATEL (Empresa Nacional de Telecomunicações) operating national traffic and EPTTEL (Empresa Pública de Telecomunicações) which operates international traffic.

Road construction is administered by the National Directorate of Engineering Works within the Ministry of Construction.

The Port of Lobito is a state-operated enterprise under the auspices of the National Directorate of Merchant Shipping and Ports of the Ministry of Transport and Communications.

The Port organization has six departments and a total staff of 2,400, of whom about 70% are employed in the production department. *See Figure 2:3 and Table 2:1.*

The port is well staffed and it is not envisaged that it will be necessary to increase the size of the staff in order to be able to handle the foreseen increased traffic.

Benguela Railway, (CFB) Companhia do Caminho de Ferro de Benguela is a private company owned to 10% by the Government of Angola and to 90% by private shareholders. The main private interest rests with TANK's Consolidated Investment Ltd in London, a subsidiary of Société Générale de Belgique.

Table 2:1 Manning of the various port departments in 1983

Department	Managers, supervisors foremen etc	Technicians	Drivers & workers	Administrative personnel	Total
Personnel	14	1	3	71	89
Technical	15	10	512	8	545
Production	41	3	1,828	119	1,991
Procurement	9		10	18	37
Financial	8	14	1	33	56
Administration	8	1	36	55	100
Total	95	29	2,390	304	2,818 ¹⁾

1) The total staff was in end of 1986 2,428.
Source: Personnel Department Lobito Port

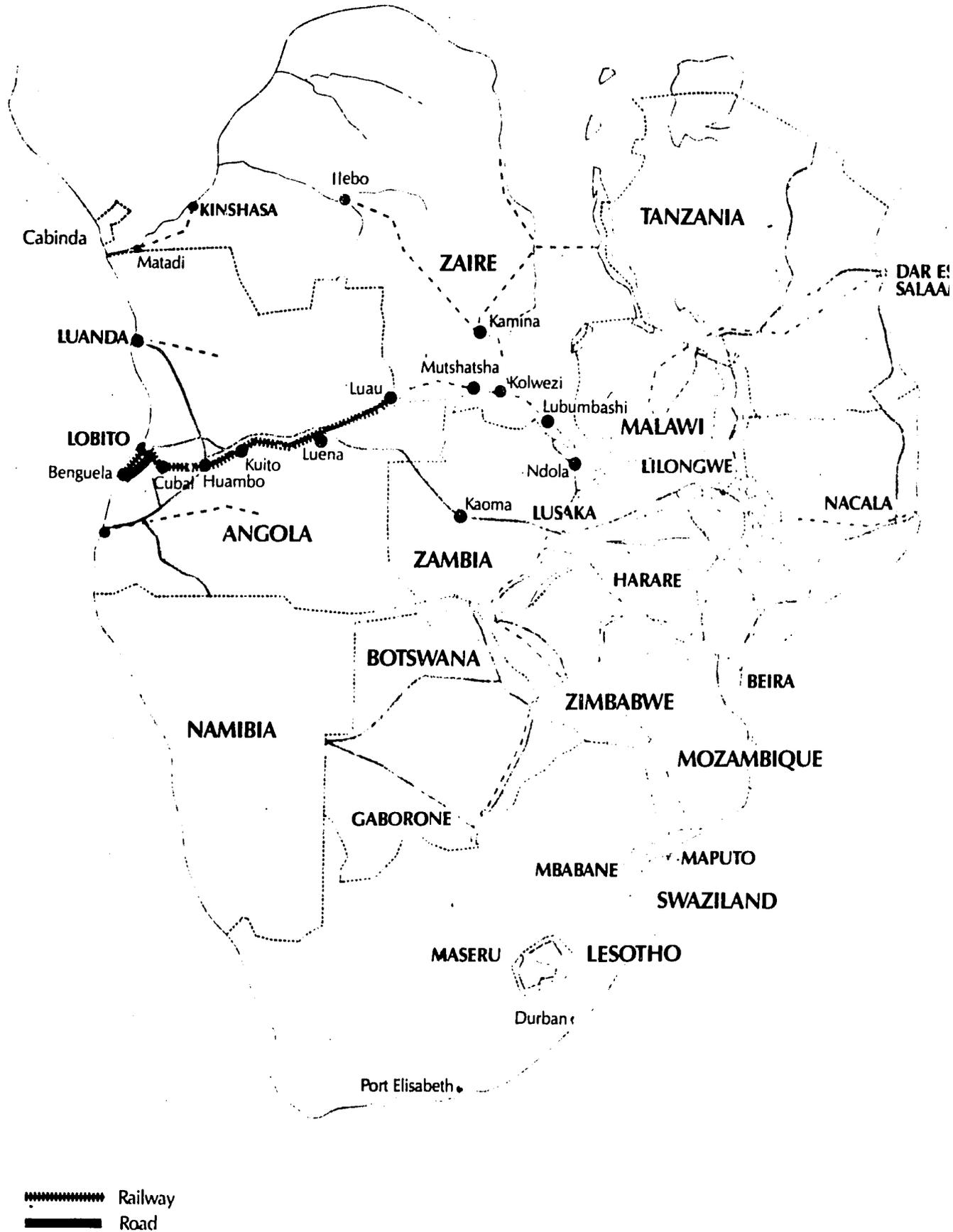


Figure 2:1 Lobito Port Transport System, Railways and Roads

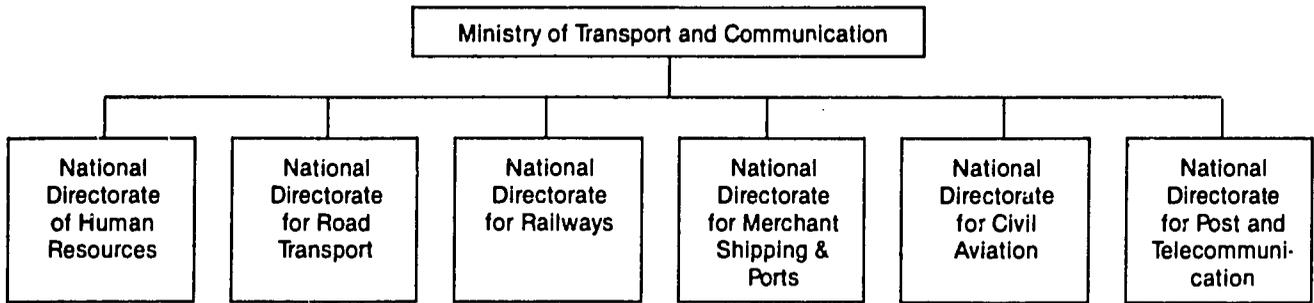


Figure 2.2 Organization Chart for the Ministry of Transport and Communication

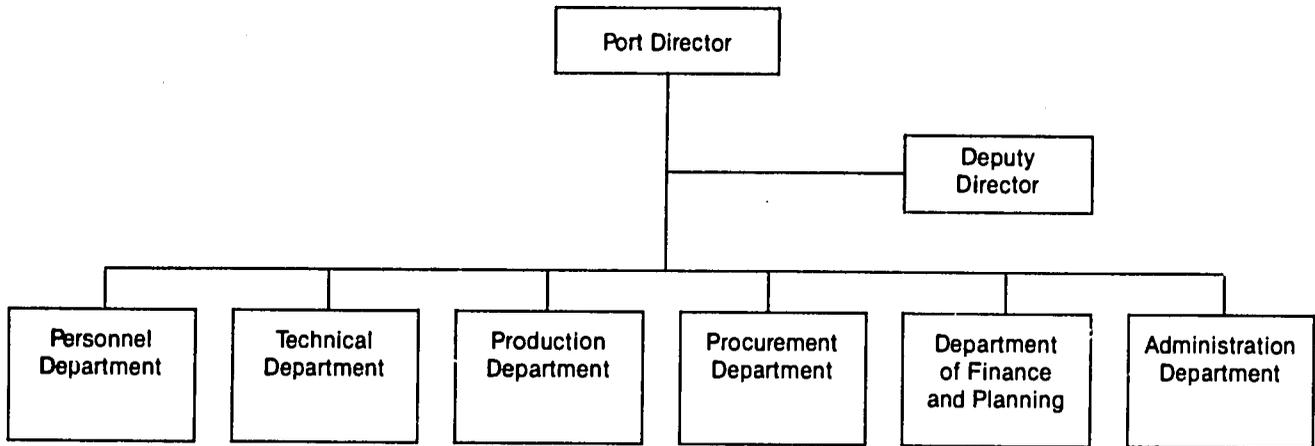


Figure 2.3 Organizational Main Structure for the Port

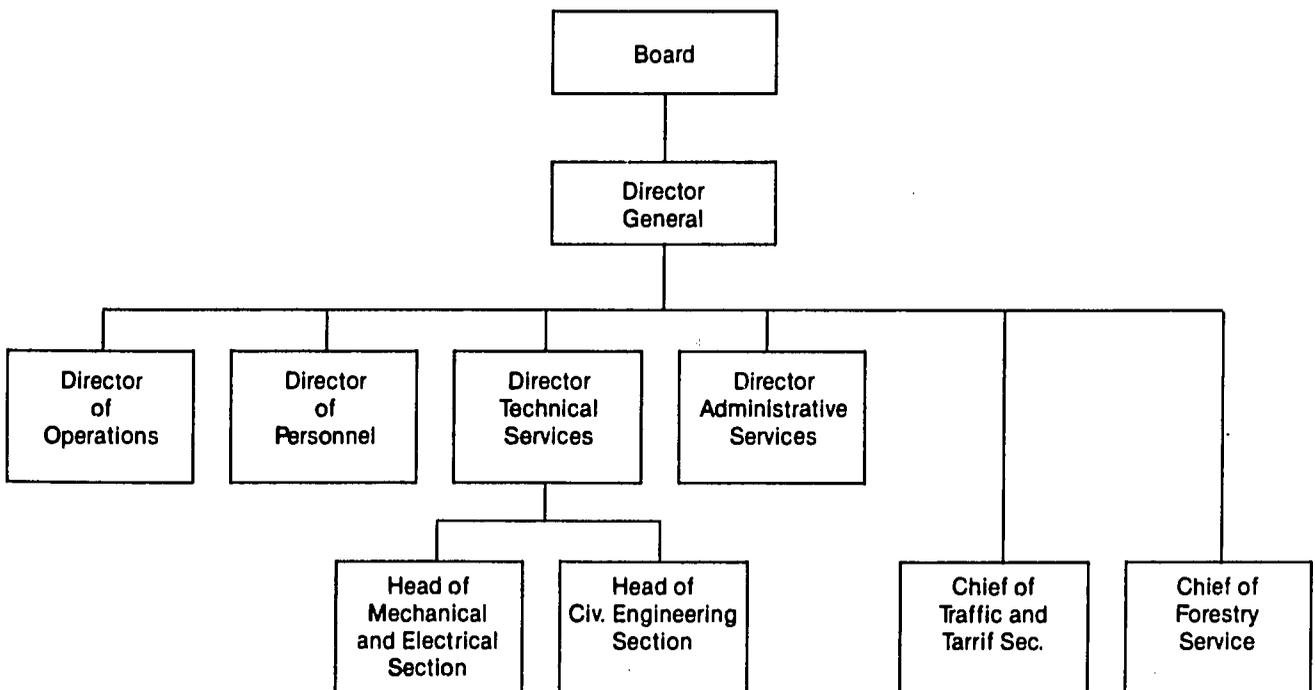


Figure 2.4 Organizational Main Structure for Benguela Railway

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The board of CFB comprises representatives appointed by the Government of Angola and TANK's in London. The board also includes a delegate of the Angolan government who is based at CFB's headquarters at Lobito.

The organization of CFB includes departments for operations, personnel, technical services and administration and two sections: one for commerce (traffic and tariffs) and one for forestry service. The Department of technical Services is the main department responsible for the implementation of the railway investment projects. This department is divided into two sections: one for the Permanent Way and Works and one for the Mechanical/Electrical Engineering, the latter including all railway workshops. See Figure 2.4. Several key positions in the organization are currently vacant, e.g. The Director of Operations, the Head of Mechanical and Electrical Engineering, and the Head of Permanent Way and Works.

It is necessary to strengthen the organization on all levels in order to be able to carry out the rehabilitation works and operate international services. See Table 2.2. The total workforce is at present 5,700. In order to operate the railway about 50 more personnel are needed at management and supervisor levels. The labour force needs to be increased by about 1,000, including foremen to carry out the rehabilitation programme.

Table 2.2 Benguela Railway Staff September 1987

Age	Board of Directors	Super-visors ¹⁾	Technicians and Skilled Labour	Clerks & Workers
under 30	—	5	33	814
31-40	1	33	48	934
41-50	1	98	28	1,801
51-60	2	108	27	1,367
over 61	1	27	10	403
Total	5	271	143	5,319

Total number of employees - 5,737

1) Managers 3, Heads of Department 12, Station Masters 87

Source: Personnel Department CFB

2.3 PROJECT IMPLEMENTATION ORGANIZATION

For the purpose of project implementation, the Government of Angola is establishing a Lobito Corridor Authority using the Beira Corridor Authority as a model. This means that responsibility for coordinating and implementing projects in the 10-year Plan will rest with one body.

Technical assistance is needed to support the Lobito Corridor Authority. Thus the establishment of a Project Co-ordination Unit staffed with experts financed by external funding is proposed. (See Chapter 8, Project G-M-1.)

3. TECHNICAL DATA AND PHYSICAL ASSETS

3.1 LOBITO PORT

Lobito is one of the best natural harbours on the west coast of Africa, offering a large protected anchorage in the Lobito Bay and a wide, deep entrance channel from the Atlantic Ocean.

The bay is 5 km long and between 1 and 2 km wide. It is protected from the Atlantic Ocean by the 5 km long sand spit, Restinga de Lobito, which has a very steep slope towards the bay. (10 m water depth, 20 to 80 m from the coastline, 20 m water depth 40 to 130 m from the coastline). The south-east shore of the bay, towards the mainland, has a much flatter bottom slope, the 10 m depth contour lying 600 to 1000 m from the coast. Consequently, the navigable section of the bay is the part nearest the Restinga, where the maximum water depth is almost 40 m. Ships are allowed to anchor in an area about 3.5 km long and up to 500 m wide on the south-east side of the navigable water, while a 500 m wide navigation channel is always kept free along the coast of the Restinga.

The entrance channel at the end of the Restinga is 23 m deep in the middle and sufficiently wide to permit an easy approach for the ships. The entrance is constantly narrowing due to sedimentation at the end of the Restinga sand spit. At present the minimum width between the -12 m contours is approximately 300 m.

Coastal protection works are in progress with Dutch assistance, which comprise the extension of 17 groins to stop the littoral drift and narrowing of the channel. This work will be completed by May 1988. The long term plan includes the construction of a total of 28 groins.

The quays of the port are located in the south-west corner of the bay, and a floating platform for unloading/loading of oil and gas (Sonangol) is located in the middle of the south-east shore of the bay, adjacent to the anchorage area. Approximately 100 m south-west of this platform, a narrow channel leads to the ESTALNAVE floating dock and shipyard, allowing the passage of vessels of up to 2,200 BRT.

3.1.1 Quays

The Port of Lobito has a total deep water quay length of 1,122 m, equivalent to 6 berths, and a 155 m long coastal quay. The main port area comprises 208,000 m² with 55,500 m² behind the 570 m long North Quay and 125,000 m² behind the 552 m long South Quay. (See Figure 3.1).

The design sea bed level for the deep water quays is -10.5 m or approximately 11.5 m below mean water level. Actual sea bed levels vary between -8.2 m and -10.5 m.

The design load is 3 tonnes/m² covering all loads including loads from railway and quay cranes. Berths Nos. 4 and 5 are pillar quays with pillars/caissons at 15 m spacings, which are bridged by a relatively weak reinforced concrete superstructure. These berths are consequently heavily overloaded when the 22 tonnes quay crane

operating on the South Quay is fully utilized. Only 10 tonne cranes should be allowed to be used on the present structure.

The quays have sufficient bollards and fenders, although ladders are generally missing. Water outlets are available along the quays.

The state of repair of the visible quay structures is with some reservations generally good. However, it is suspected that the undersides of the pillar quay structures may have deteriorated.

Quay aprons are about 17 m wide with pavements, which for some areas are strongly deteriorated. The aprons are provided with railway tracks and crane tracks.

3.1.2 Storage Facilities

Sheds and warehouses contain approximately 27,640 m², of covered storage area for ordinary general cargo, 14,110 m² of which along the South Quay.

About 1,914 m² of storage area is located on top floors and 1,048 m² in open sheds.

The sheds and warehouses are generally in a good state of repair, although some have steps and gutters in front of doors, restricting the use of mechanical equipment. The interior lighting in some of the sheds and warehouses needs to be improved to facilitate night-shift work.

Although there are ten reasonably well maintained cold stores with a holding capacity of 1,000-1,200 m², they are non-operational due to a lack of spare parts and freon.

One well-maintained grain silo with a capacity of 20,000 tonnes is available. Conveyor belts with a capacity of 400 t/h and two loaders on the quay are also operational.

A bulk mineral storage area for exports with a storage capacity of 90,000 tonnes is located behind berth No. 6. The area is served by a railway wagon tilting facility, one stacker, two grab cranes, various conveyor belts and a loader at the quay with a capacity of 400 t/h. The facility is generally well maintained.

Oil tanks are located outside the port area in the Sonangol petroleum company area, and connected by pipes to two outlets at the South Quay.

A total of 69,315 m² of open storage is available with 6,220 m² behind the North Quay and 63,095 m² behind the South Quay.

Most of the storage areas are paved, although, some of the pavements are in need of repair. Drainage of the storage areas is sparse but sufficient, and lighting of the areas is generally adequate.

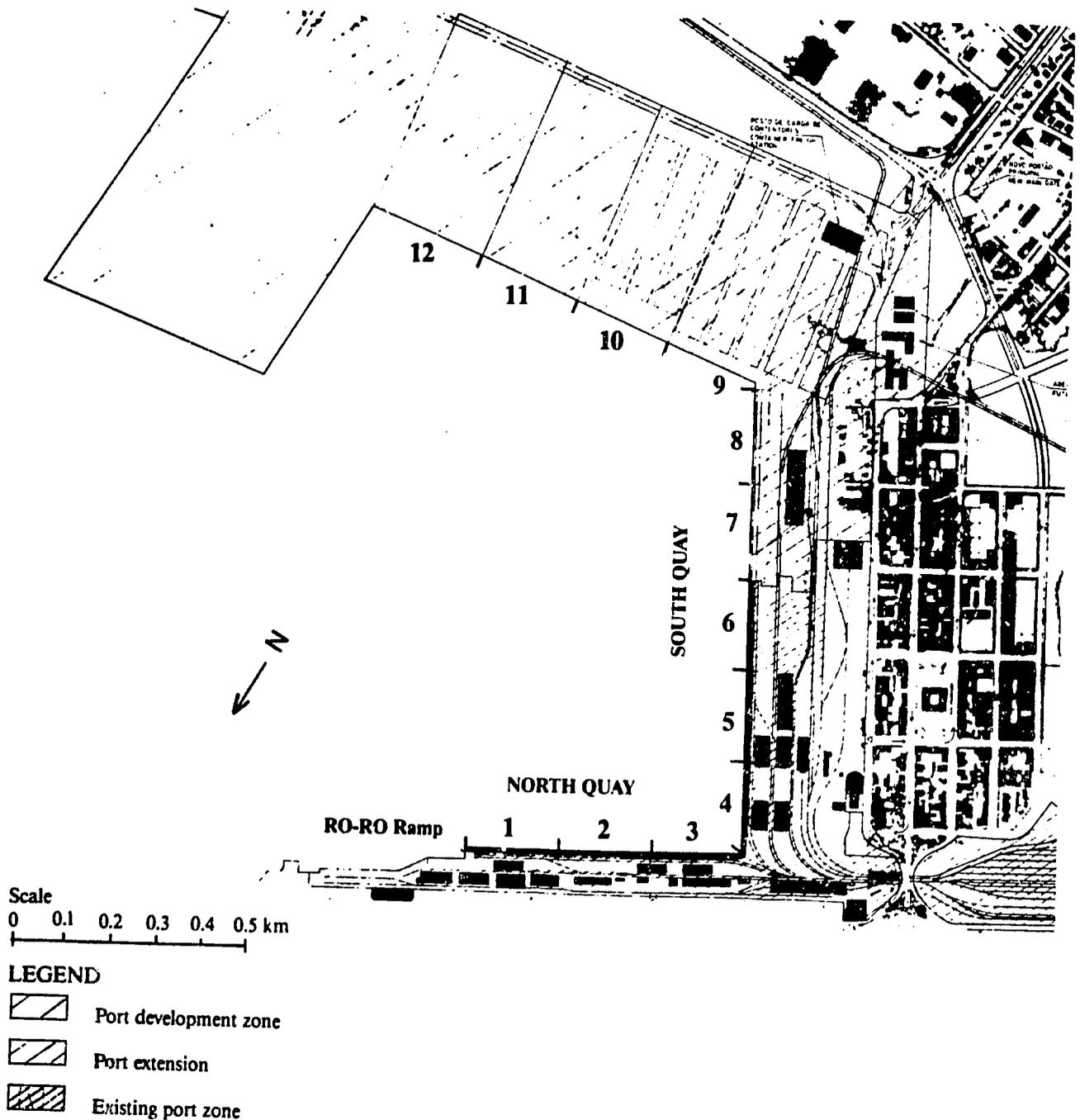


Figure 3.1 Lobito Port

3.1.3 Office Facilities

The port administration has about 5,700 m² of office space in a new building outside the port area. In addition to this, about 700 m² of office space is located within the port area.

3.1.4 Traffic Access

The main access gate is Gate No. 4 on the Restinga, and the main departure gate is Gate No. 7 in the central city area. The adjoining city roads are not suitable for heavy port traffic. Other gates are only used for pedestrians and bicycles.

3.1.5 Port Equipment

The port has quay cranes and mobile equipment as shown below.

Description	Capacity	Nos.
Quay cranes	3 - 22 tonnes	28
Mobile cranes	3.5-150 tonnes	38
Forklifts	2.4- 27 tonnes	111
Tractors		28
Frontloaders		1
Trailers	Approx. 2.5 tonnes	75-100
Trucks	5.5- 8 tonnes	8
Caravans, cars etc.		9
Buses		5

Various attachments such as grabs, spreaders, lifting frames, pallet forks, drum forks, wires, shackles, clamps for steel plates etc. are also available.

The general state of repair is good in the case of the quay cranes, acceptable to bad in the case of the mobile cranes and the older forklifts, but good as far as 34 new forklifts are concerned.

The port has 3 operational tugboats (2308 HP, 2100HP and 480 HP) as well as 2 line boats, a pilot boat, three barges and a floating crane with a capacity of 100 tonnes.

The port owns eight shunting locomotives and 41 railway wagons, however, only two shunting locomotives are operational.

3.1.6 Ancillary Facilities

The port has the following maintenance workshops and stores:

Description	Area m ²
Garages for mobile equipment (with tyre repair, lubrication, etc.)	1,767
Main workshop (mechanical, electrical, joinery, painting, building works)	2,880
Spare parts stores (mechanical and electrical spares)	172
General stores (paper, cables, pipes, building materials, etc.)	996
Special workshops, stores (electrical, cranes, silo, ore facility, etc.)	380

The workshop and stores areas are considered sufficient for the present and future port requirements.

A 535 kVA emergency power plant is available at the port. Welfare facilities are inadequate, the number of toilets and showers being very low for a working force of about 2,400.

There is no internal telephone network. No land-based radio system is used, and only a few walkie talkies are available.

The port is served by 6 substations supplying a total of 3,200 kVA, which is sufficient to operate the existing facilities. The future development plans for the electricity supply in the area should secure sufficient power for future port extensions.

The water supply system for the city and port is at present inadequate. However, implementation of plans for improvement and development of the facilities should improve the situation and secure long term need for supply.

The sewerage system for the city and port is based on septic tanks and seeping wells, or direct discharge into the harbour basin. No general sewerage system exists.

The port area is served by a refuse collection system which is operated satisfactorily.

Fire-fighting equipment is virtually non-existent in the port, apart from the water jets on the two big tugs.

General land use in Lobito town area surrounding the port is shown on *Figure 3:2*.

3.1.7 Project for new 995 m Quay

In 1973, work started on the construction of a new 995 m block quay. 775 m was to be at a level of -10.5 m and 220 m at -12.5 m. The idea was to build 392 m of quay as a continuation of the South Quay, 42.6 m in a corner section and 560 m protruding into the bay at an angle of 112°.5 to the existing South Quay line.

The project was stopped in 1975 with almost all the blocks for 97.5 m of quay already in position and 63% of the dredging carried out. Some of the stone fillings had also been carried out and concrete blocks for another 106 m quay at -10.5 m had been cast.

Dredging of 2.85 million m³ and a major drainage system for stormwater from the reclaimed area and hinterland was also included in the project. It was planned to use the dredged material for reclaiming new port areas. About 1.8 million m³ had been dredged before the project was interrupted.

The project is considered generally sound, although a certain amount of updating, due to the latest developments in shipping, must be carried out before work can continue. Also, additional soil investigations are needed.

3.2 BENGUELA RAILWAY

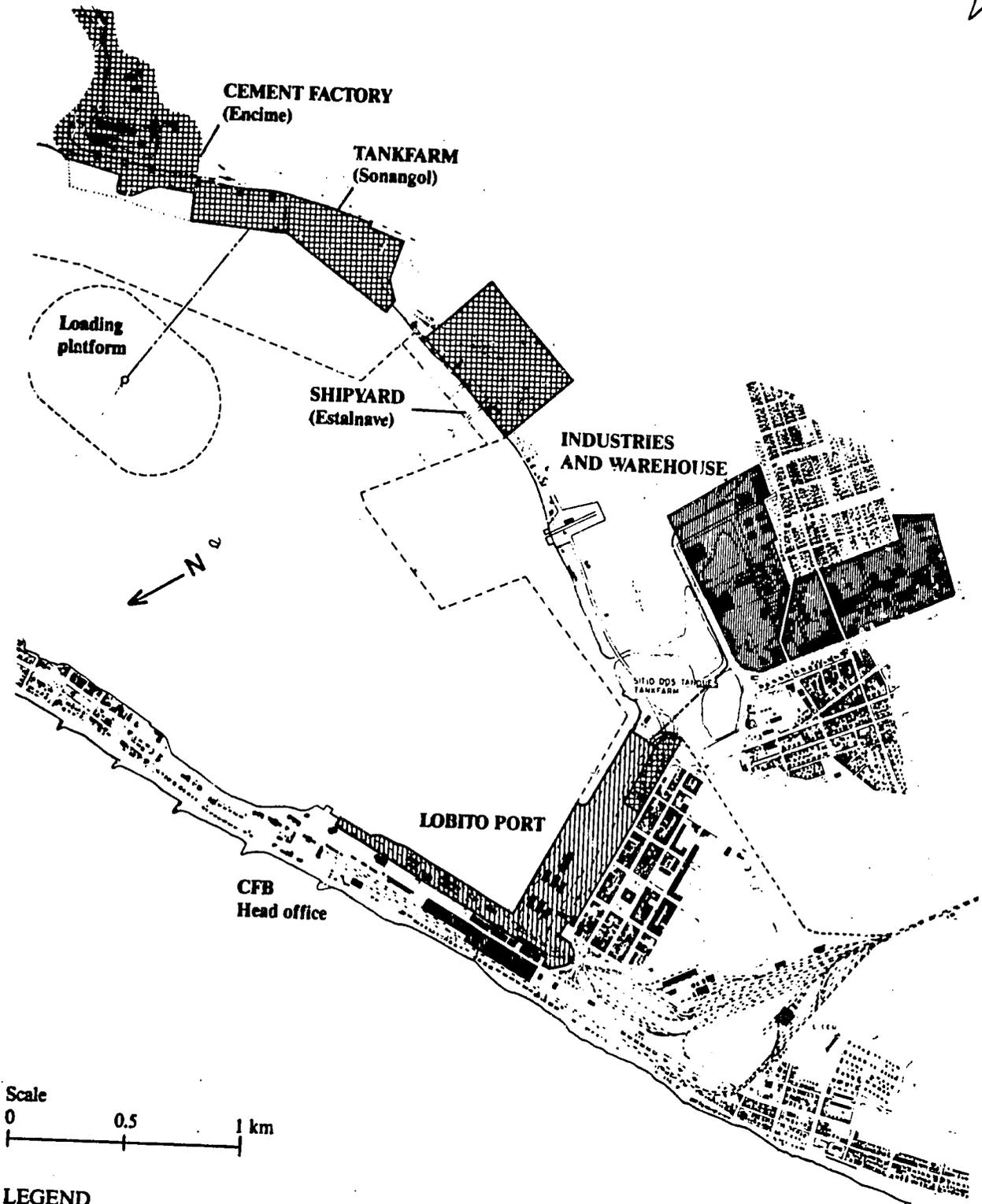
3.2.1 Route

The construction of the Benguela Railway commenced in 1903 with the 33 km section along the coast from the Port of Lobito to Benguela. At Benguela the line turns inland and climbs steeply to Cubal, situated at an altitude of 905 m above sea level on the flat central plateau of Angola. This necessitated crossing the Coreteva mountain range, and for the first 45 years of the railway's existence a rack railway on a 1 in 16.5 gradient was used to climb the steepest 3 kilometres of the route. The track reached Cubal in 1906 and Huambo in 1912. Huambo was chosen as the site for the main locomotive and carriage workshops. The First World War interrupted the construction of the line and the extension through to the border was not completed until 1928. In 1931 a connection was made with the railway network in Zaire and the countries to the south.

In 1974 a new cut-off route was opened from the coast to Cubal, known as the Cubal Variant. From Negrao, 14.6 km south of Lobito, the new line runs almost directly to Cubal thereby reducing the route length by 40 km and the journey time by up to 4 hours.

The ruling gradients on the line are:

Section	Ruling gradient
Lobito-Cubal	1:80 (1.25%)
Cubal-Bongo	1:60 (1.66%)
Bongo-Calenga	1:50 (2.0%)
Calenga-Huambo	1:60 (1.66%)
Huambo-Border	1:80 (1.25%)



Scale
0 0.5 1 km

LEGEND

-  Commercial and Industrial areas
-  Port area
-  Major enterprises

Figure 3:2 Lobito Town area and Port

3.2.2 Track

The railway is built to African Standard gauge 1.067 m (3ft-6in) and is single line throughout with crossing loops and block posts at each of the stations.

There are three different weights of rail section used on the track: 30 kg/m, 40 kg/m and 45 kg/m. The 30 kg/m rail is of three different types, namely CFB60 lb/yd, BS60A and BS60N rail. There are only minor differences between the BS60A and BS60N rail and for all practical purposes the BS60A rail can be considered identical to the BS60N rail.

The in-track quantities of the different types of rail are as follows:

CFB60	-	838 km
BS60A/N	-	254 km
BS80A	-	98 km
BS90A	-	138 km

The BS60, BS80 and BS90 lb/yd rails are welded into lengths ranging from 120 to 363 metres, as are the CFB60 lb/yd rails on the section from Lobito to Benguela. The locations of the different rail sections is shown on *Figure 3:3*.

The CFB60 rail is the original material which was laid when the railway was constructed and therefore some lengths are more than 80 years old.

The following table sets out the age of the rail:

Age of Rail	Length kms
70 - 85 years	118
60 - 70 years	176
50 - 60 years	550
20 - 30 years	250
Less than 20 years	240

Originally steel sleepers were used for much of the route but these suffered from cracking and have been replaced over the years by timber sleepers, the rail being fastened to the sleepers by coach screws or elastic spikes. For 31 kilometres of sharp curves steel sleepers are still in use.

The line is ballasted, to varying depths, with local granite stone supplied from quarries operated by contractors.

3.2.3 Main-line Steam Locomotives

Prior to the disruption of international services on the line a total of 64 main line steam locomotives were in use, mainly on the section of the line between Huambo and the border.

The steam locomotives in operation in August 1987 were as follows:

No.	Class	Tractive effort kg	Axle load tonne	Date in service
5	10 D	18,000	13.0	1956
2	10 C	18,000	13.0	1952
2	10 E	18,000	13.5	1929/38
2	9	10,500	13.0	1930

Only 11 locomotives remain serviceable but since many of the water supply facilities are now destroyed, the sections of the line on which steam locomotives can be used is limited. Steam trains occasionally operate on the sections between Huambo (Km 382) and Kuito (Km 584) and between Luena (Km 992) and Mucussueje (Km 1,238).

3.2.4 Main-line Diesel Electric Locomotives

The Benguela Railway has in the past standardised its fleet of diesel electric locomotives on the General Electric (USA) U-20-C locomotive. The unit is a six axle 2,150 H.P. locomotive with a maximum axle-loading of 15.35 tonnes when fully loaded. This is a heavy loading for the old 60 lb/yd rail and therefore these locomotives have to be used with caution on sections of track laid with the CFB60 lb/yd rail.

Ten locomotives entered service in 1973, twelve in 1975 and a further twelve during 1983. Following the sabotage of several locomotives, eight additional U-20-C locomotives were transferred to the Benguela Railway from the Moçamedes line in Southern Angola.

The situation regarding availability of main line locomotives in November 1987 was: In service 10, under repair 4, stopped awaiting repair 17 and out of service 11. Those out of service are severely damaged and may have to be withdrawn from service.

The diesel locomotives are only used on the coastal section between Lobito and Benguela and on the main line as far as Huambo, but it is the intention of CFB to extend the area covered by diesel traction to the Zaire border as quickly as track upgrading and the availability of new locomotives would permit.

3.2.5 Shunting Locomotives

Shunting duties are carried out by a mixture of diesel shunting locomotives and steam locomotives. It was the policy of the CFB to phase out the use of steam shunting locomotives by 1985 and increase the size of the fleet of diesel shunting locomotives.

Details on availability of the diesel shunting locomotives are as follows: Of the four 425HP North British locomotives supplied in 1961/62 one is in operation, one withdrawn in 1976 and two are awaiting repair.

Of the two 425HP Andrew Barklay locomotives supplied in 1972 one is in service. Two 420HP Moyses are on hire from the Port, one of which is in service and the other awaiting repair. Six 650HP twin engine Bo-Bo diesel electric locomotives are being delivered from GE in Brazil during 1987.

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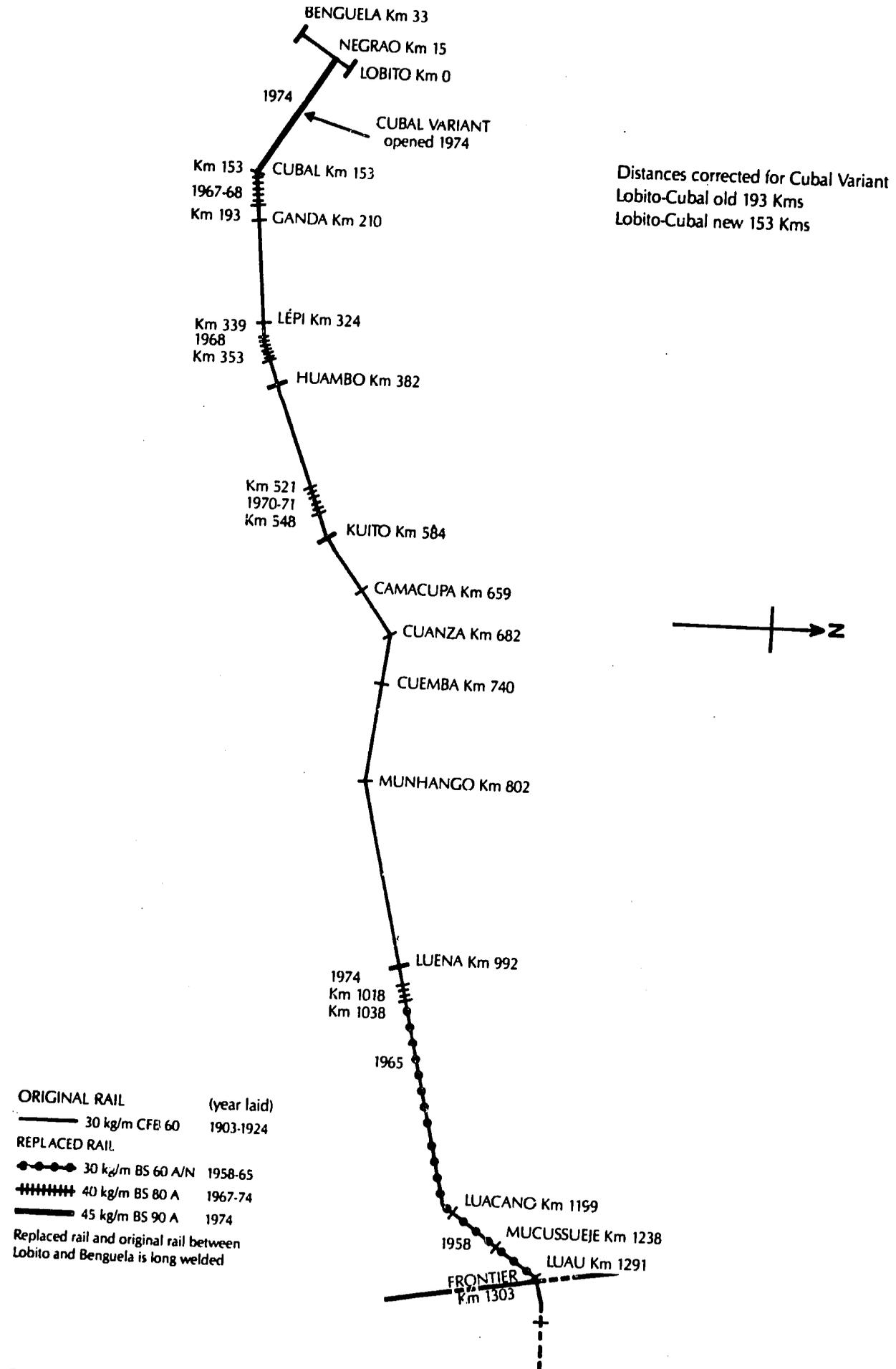


Figure 3:3 Rail Section Diagram

3.2.6 Rolling Stock

Freight wagons

The current (1987) situation regarding the availability of freight wagons is shown in the table below:

Type	Max load (tonnes)	Age		Total	In use
		Less than 35 year	More than 35year		
High sided	22.5/40	367	130	497	460
Low sided	35/40	411	355	766	557
Covered	35/40	328	336	664	615
Other	18/50	23	35	58	40
Tank	22/40	110	11	121	82
Service	10/40	6	12	18	9
Total		1,245	879	2,124	1,763

Passenger vehicles

The Railway owns a fleet of 48 passenger coaches of various types, and 72 other vehicles as indicated in the following table. 26 vehicles are available for service.

Class	Type	Number
A	1st class day/night	6
AB	1st/2nd class day/night	4
B	2nd class day	11
C	3rd class day	25
R	Restaurant	2
D	Brake vans	60
E	Sleeping coaches (staff)	4
S	Service saloons	7
DP	Ambulance/Mail	1

3.2.7 Workshops

The main workshops are located at Huambo where a large, well-equipped facility has been developed for the repair and rebuilding of steam locomotives, passenger coacher, wagons and other railway equipment. Following the introduction of main line diesel-electric locomotives a new diesel repair workshop was designed to be built alongside the main workshops. This new workshop has not yet been completed.

There is an apprentice training school at Huambo which is well equipped for technical training in all disciplines.

At Lobito there is a diesel locomotive maintenance shop designed for the maintenance of 10 main-line locomotives and diesel shunting locomotives. There is also a passenger coach and wagon maintenance shop of sufficient capacity. This facility was extended in 1986 to incorporate inspection pits, overhead cranes and washing facilities.

3.2.8 Train working methods

Prior to the disruption in through services, various systems of train control were used on the line, as shown below:

Section	Control System
Lobito-Cubal	Radio to drivers and stations
Cubal-Huambo	Telephone/key token
Huambo-Border	Telephone/paper line clear

Operating instructions are issued from the control centre for the radio controlled section between Lobito and Cubal. Radio hand sets are fitted on the trains and the drivers and guards are able to keep in direct touch with the train controller.

On the Cubal-Huambo section tokens are issued by station masters at manned stations. At unmanned stations the train crews obtain the key token themselves from instruments located in locked huts.

3.2.9 Telecommunications on CFB

On the Lobito to Cubal section communication is via the UHF/VHF radio link. the VHF link is reserved for train control and the UHF is used for telecommunications via the PABX at Lobito control centre.

From Cubal to the border the route was connected by land line telephone, but this has been sabotaged.

3.3 TELECOMMUNICATIONS

Telecommunication facilities currently serving the port of Lobito and its hinterland to and from the towns of Benguela, Cubal, Huambo, Kuito and Luena consist of short haul analogue microwave systems and long range troposcatter systems. The reliability of the troposcatter transmission system is rather poor due to recurrent outages of power systems and lack of security.

There is a 960 channel microwave link between Benguela and Lobito and also on the Lobito-Pedroso link which is being used as an approach link to the troposcatter terminal at Pedroso.

The telecommunications transmission system to and from Lobito is via a single 300 channel troposcatter link from Conde. The system splits at Conde with one branch going to Luanda and the other to Huambo and a 24 channel troposcatter system from Huambo to Kuito. Luena is connected to the national network by a 60 channel troposcatter link through Saurimo onto Malange and Luanda.

The existing troposcatter equipment was provided by NEC of Japan.

Most other localities along the line are connected by open wire lines which are of poor standard and reliability with inherent maintenance problems.

Local telephone exchanges in Lobito, Benguela, Huambo, Kuito and other localities along the Lobito corridor use old Strowger equipment, the reliability and performance of which is not up to standard due to poor maintenance and lack of spares. Transit switching is provided by Ericsson ARM crossbar equipment at Lobito and Huambo.

Telex service along the line is provided at Benguela and Lobito by telex concentrators parented to the Luanda central telex exchange. Service at Huambo, Kuito, Luena and other Southern Angolan cities is provided by the telex exchange at Huambo which is inter-linked to the central telex exchange in Luanda.

International communication is via Luanda and the earth station at Cacuaco. Among the SADCC countries, only Mozambique has direct international communications (two circuits) through the earth station in Luanda.

3.4 ROADS

The roads serving the hinterland of Lobito Port are the main roads Lobito-Wama-Huambo and Wama-Katchiungo-Kuito and onwards to Luena and Zambia. These roads are asphalted to Kuito and Huambo and of fairly good standard.

From Luena the road continues via Lucusse and Zambezi to Kaoma in Zambia. Only the Luena-Lucusse section is of reasonably good standard.

Of the rest of the road, some sections such as Kuito-Luena and Lucusse-Zambezi need considerable upgrading or reconstruction. For the section Zambezi-Kaoma the construction of an entirely new road is needed. (See SATCC Project 1.8.1.)

3.5 CIVIL AVIATION

Benguela airport has two to four daily connections with Luanda by Focker 27 aircraft.

The airport has a 1,600 m long and 25 m wide runway.

The runway is too short and the structure is not strong enough for use by Boeing 737 aircraft, which are usually used for national and regional traffic by Angola Airlines. Furthermore, it is not equipped with landing lights or an instrument landing system.

4. OPERATIONAL PERFORMANCE

4.1 LOBITO PORT

4.1.1 Port Traffic

Total traffic through the port of Lobito grew from around 320,000 tonnes at the end of World War II to a peak of 2.6 million tonnes in 1973.

For most of the period from 1945 up to the closure of the Benguela Railway to through traffic, transit-traffic was the single most important category of traffic passing through the port. Transit-traffic had overtaken Angolan international traffic in importance as early as 1952. After stagnating at around 700,000 tonnes between the mid 1950s and mid 1960s there was a period of exceptionally rapid growth in transit traffic brought about largely by the increase in Zambian transit-movements through the port.

In 1976, transit-traffic virtually ceased and Angolan export traffic declined to only 10 per cent of the early 1970 levels. Only rising Angolan imports and coastal petroleum traffic enabled total traffic through the port to recover to around 600,000 tonnes in 1979. Since then, imports have declined and total traffic in 1982 was only 527,000 tonnes. If coastal petroleum traffic is excluded, current traffic in the port amounts to only 390,000 tonnes. *See Table 6.2.*

4.1.2 Current Cargo Handling Operations

The main activities in cargo handling consist of the ship cargo handling system and the onshore handling system. The latter is divided into direct handling to rail and road transport, and indirect handling through storage.

In Lobito Port, use of quay cranes is compulsory and each berth is equipped with 4-5 quay cranes. Furthermore, the port has the use of several mobile cranes. The onshore work is carried out by forklift trucks and tractor-trailers. The amount of equipment is considerable, much more than is needed to handle the current amount of cargo. This is also the case as far as labour is concerned, although there is no way of reducing the labour force apart from natural retirement. At present there appears to be a surplus of non-skilled labourers and operators in comparison to skilled personnel.

From an operational point of view the following main cargo classes are considered:

Imports: General cargo (conventional and unitized), bagged cargo and dry bulk (grain).

Exports: (until 1975) Ingots, dry bulk (ore) and containers (mainly empty).

Coastal: General and bagged cargo, petroleum products and passengers.

Deep sea vessels are served at all 6 berths. Coastal vessels primarily use Berth 1. Oil products are handled at Berth 5 where there are pipe connections to the oil storage. Bulk grain is handled at Berths 4 and 5 (near the silo). The mechanical bulk handling facilities can at present only load grain into ships, so vessels are offloaded by means of grab cranes and rail wagon transport to the silo.

4.1.3 Cargo Handling Performance

During recent years general and bagged cargo has amounted to approximately 90% of the total dry cargo, while the remainder includes grain in bulk and small volumes of ingots. About 50% of the dry cargo is handled directly. The productivity per gang hour is recorded for general and bagged cargo, but individual commodity data within the general cargo class are sketchy.

The productivity per gang hour is about 8 tonnes for general cargo and 11 tonnes for bagged cargo. The data for grain in bulk and ingots are not very representative, but appear to range between about 23-25 tonnes per gang hour.

These rates do not vary very much from corresponding rates in other African ports.

The port is operated on a one shift basis from Monday to Friday, but overtime is possible to a limited extent.

On average, 3.5 gangs work on deep sea vessels and one gang on coastal vessels, giving the following productivity in tonnes per ship berth day:

	Deep sea	Coastal
General cargo	240	65
Bagged cargo	336	80

Prior to 1975, ore from Zaire was exported through the specially designed ore terminal. The productivity appears to have been more than 3,000 tonnes per berth day as a result of 3 shift-operation.

Present productivity for container handling varies significantly from 1 to 10 units per hour depending on the ship type and equipment.

4.2 BENGUELA RAILWAY

4.2.1 Railway Traffic

In the mid-1970s, the railway was operating at peak service level with more than 3 million tonnes annually. After the closure of the railway to international traffic, movements have been limited to the Lobito-Benguela and Lobito-Huambo-Kuito sections. In 1986, the total traffic was about 250,000 tonnes. Regular traffic has been operated between Lobito and Benguela, while traffic between Lobito-Huambo has been on the basis of convoys of up to five double-headed trains once a month.

Long-distance passenger traffic was over 1 million passengers in 1974, but since 1986 there has been no long-distance passenger traffic. On the other hand, passenger traffic between Lobito and Benguela has increased sharply from about 700,000 in 1973 to over 4 million passengers in 1986. Five pairs of passenger trains are currently operated between Lobito and Benguela daily.

4.2.2 Operational Capacity

Section timings in hours, for freight trains based on the 1975 operational pattern, are shown below. These timings relate to the use of diesel-hauled trains in the section from Lobito to Huambo and steam hauled trains between Huambo and the border.

Timing for freight trains in hours:

Section	Down	Up
Lobito-Cubal	4	4.5
Cubal-Huambo	9 - 10	10 - 11
Huambo-Kuito	6 - 7.5	6 - 7
Kuito-Munhango	7 - 8.5	7 - 7.5
Munhango-Luena	7 - 7.5	6.5 - 7.5
Luena-border	10 - 10.5	8 - 10
Total	43 - 48	42 - 47.5
Major station time	4 - 5	4 - 5
Total journey time	48 - 53	46 - 52.5

Source: CFB graphic timetable.

The capacity along the line was eight to twelve pairs of trains per day and the maximum traffic volume recorded was 3,281,000 tonnes in 1973.

When the line has been upgraded and diesel motive power is used throughout the length of the line the capacity will be increased.

On the basis of single diesel locomotive hauled trains of 1,000 tonnes (gross), section timings will be approximately:

Section	Down	Up
Lobito-Cubal	4	4.5
Cubal-Huambo	9	10
Huambo-Kuito	6	6
Kuito-Munhango	7	7
Munhango-Luena	5.5	5.5
Luena-border	8.5	9
Total	40	41
Major station time	2.5	2.5
Total journey time	42.5	43.5

Based on the above timings, section lengths and previous operational control standards, a figure for maximum theoretical line capacity can be calculated. It is estimated that capacity along the line is between eleven and fourteen pairs of trains per day, representing a maximum annual capacity of approximately 2.5 million tonnes in each direction.

4.3 ZAIRE TRANSPORT ROUTES

Traffic to and from SADCC landlocked countries, using Lobito port for its overseas trade, has to transit Zaire and use SNCZ on a 975 km long section between Dilolo and the Zambian border.

Due to the closure of Benguela Railway to international traffic, the use of this section of SNCZ is currently limited to one train per week between Dilolo and Kolwezi. The Kolwezi-Lubumbashi-Zambia border section has more frequent traffic however, as it is used both for exports/imports routed via South African ports and via the National Route (Voie National).

The SNCZ railway network is electrified between Mutshatsha, and Lubumbashi and Kamina. The western section of the line needs upgrading before it can take heavy transit traffic, but has a sufficiently high standard for the limited traffic expected at the beginning of the Short-Term Phase.

Of Zaire's mineral exports, about 65% is currently planned to be routed via the National Route, 25% via South Africa and 10% via Dar es Salaam.

The distances from Lubumbashi to the national port of Matadi is 2,750 km, to South African ports 3,450 km and to Dar es Salaam 2,750 km via Lake Tanganyika and 2,255 km via TAZARA. The distance to Lobito Port is 2,100 km. The 2,750 km journey via the National Route takes about two months to complete and involves two transshipments. The first leg is a 1,600 km rail journey to the rail head at Ilebo on the Kasai river. Barges take the freight on to Kinshasa, where a second transshipment takes place for the 366 km rail journey to the port of Matadi. At the beginning of the 1980's the annual capacity on the Kamina-Ilebo rail section was limited to about 400,000 tonnes and on the river transports to 200,000 tonnes upstream and 250,000 tonnes downstream.

The port capacity at Ilebo was about 500,000 tonnes. Rehabilitation programmes are ongoing to increase the railway capacity through rehabilitation of diesel locomotives, purchase of wagons and improved maintenance. The capacity of the river transport will be increased through the purchase of 12 new barges and 12 new powered units.

Thus it can be assumed that traffic via the National Route will be 350,000 to 400,000 tonnes annually, which corresponds to about 65% of the current mineral export.

The remaining mineral export is assumed to be routed via Benguela Railway although some small quantities may be routed via other ports.

All manganese exports are assumed to be routed via Benguela Railway however, since the manganese mines are located only 28 km from Dilolo on the Angolan border.

5. FINANCIAL AND ECONOMIC REVIEW

5.1 HISTORICAL IMPACT ON THE REGION

The Benguela Railway (CFB) went through a construction period of approximately 27 years, including some interruptions caused by political events before it was connected to the Central and Southern African railway systems in 1931. The incentive to embark on this immense project was the intentions of the British investors in the mining industry in the Belgian Congo and Northern Rhodesia of providing a feasible and economic outlet for the minerals in the region, in which they had vested interests themselves.

The CFB was founded as an enterprise in 1902, a concession to own and operate the railway for 99 years was given by the Portuguese Government, and construction commenced in 1903. CFB was jointly owned by Tank's Consolidated Investments Ltd., private shareholders and the Portuguese Government which held 10 per cent of the shares. Today the original concession is still adhered to and the Government of The People's Republic of Angola owns the 10 per cent, and the Tanks Group, which is now a subsidiary of Société Générale de Belgique, owns the remainder.

In Angola, the railway passes through the provinces of Benguela, Huambo, Bié and Moxico, where the population in 1972 was estimated to be 2 million. At an early stage of the construction period, the forces behind CFB also became involved in the development of the Angolan Plateau as an agricultural area. In 1913, Sir Robert Williams, the founding father of CFB, acquired a lease on 625,000 acres of agricultural land. These rights were later transferred to the Zambesia Exploring Company as compensation for financial support for the construction of the railway. Later, this land was transferred to Angola Estates Company, and developed for agricultural production. To make this process viable, the colonial authorities agreed to revise and adjust the lease and tenure agreements in favour of the investors. Thus agricultural production was boosted, and subsequently also complementary industries such as flour mills, sawmills, tile works, etc. were established, and urban centres and villages developed along the line. This gave rise to an increase in the volume of national traffic on the railway, which reached a total of approximately 1 million tonnes at its peak.

The Benguela Railway was originally constructed to serve the mining areas of Shaba (Katanga in Zaire) and Zambia (Northern Rhodesia). Due to the policy, of the Belgian Government, the exploiters of the mineral sources in Shaba began to concentrate on using the domestic transport route to Matadi, even though both the distance and the transport costs were significantly higher than through Lobito. Subsequently, it was not until sanctions against Rhodesia were imposed in 1965, that the CFB began to operate on the basis of the anticipated capacity utilization and for which it was constructed, with respect to transit goods.

The railway gave the initial impetus for the establishment of the port of Lobito, and benefited from a special agree-

ment with the port authorities regarding the utilization of rolling stock as well as for tariffs.

During the colonial period the company was granted full exemptions from taxes and duties on imports for their construction and operations.

At most, the CFB employed 13,000 persons. In the years following the closure of the international traffic, this figure declined to a large extent due to the departure of more than 2,000 Portuguese who had worked with the CFB.

Although the CFB and the port have a close historical relationship, and the railway has benefitted from this through special handling rates, etc., the two institutions have always been separate financial entities.

5.2 PAST PERFORMANCE

The figures in *Tables 5:1 to 5:5* show the physical movements of cargo and passengers by the CFB and the Port, and provide an indication of their financial performance. The figures cover the last ten years of normal operations, and data on more recent years is given whenever available. They show that the financial perfor-

Table 5:1 National Railway Traffic and Revenues

Goods (excluding service transport)			
Year	Tonnes	Tonne km (thousand)	Revenue (KWZ thousand)
1972	833,753	335,848	105,547
1973	927,152	356,107	113,599
1974	789,896	292,616	117,857
1979	391,350	129,146	197,293
1981	390,059	128,719	278,112
1986	249,491	24,611	148,082
Passengers - Long Distances			
Year	Number of passengers	Passenger km thousand	Revenue (KWZ thousand)
1972	792,088	117,717	26,192
1973	862,046	134,855	30,117
1974	1,135,655	185,346	42,186
1979	493,212	51,392	26,100
1981	468,360	86,647	38,687
1986	--	--	--
Passengers - Short Distance (Lobito-Benguela)			
Year	Number of passengers	Passenger km thousand	Revenue (KWZ thousand)
1972	620,737	14,724	1,995
1973	728,556	17,215	2,294
1974	847,458	20,375	2,782
1979	1,912,668	45,904	12,036
1981	2,766,084	66,386	35,124
1986	4,118,321	98,840	138,499

Source: CFB

Table 5:2 Railway Transit Traffic and Revenues

Year	Zaire Import			Zambia Import		
	Tonnes	Tonne km (thousand)	Revenue (KWZ thousand)	Tonnes	Tonne km (thousand)	Revenue (KWZ thousand)
1972	219,077	295,317	188,882	119,115	160,567	74,680
1973	204,818	276,095	184,862	417,280	562,493	196,100
1974	192,065	257,518	186,251	450,410	606,854	223,584
Zaire Export						
	1972		1973		1974	
	Tonnes	Revenue (KWZ thousand)	Tonnes	Revenue (KWZ thousand)	Tonnes	Revenue (KWZ thousand)
Manganese	302,749	78,780	298,157	78,916	218,445	61,878
Copper	85,105	152,369	137,851	208,064	204,429	179,105
Zinc	71,915	41,915	66,206	41,589	55,130	36,225
Cobalt	12,658	18,110	17,993	26,472	16,642	28,125
Other	24,266	10,211	83,186	28,615	1,191	43,852
Total	496,693	301,385	603,393	383,656	495,837	349,185
Zambia Export						
	1972		1973		1974	
	Tonnes	Revenue (KWZ thousand)	Tonnes	Revenue (KWZ thousand)	Tonnes	Revenue (KWZ thousand)
Copper	160,952	135,775	351,709	240,501	371,011	260,992
Cobalt			249	269	46	86
Lead			7,345	4,688	17,217	9,570
Zinc			21,556	13,829	41,332	29,232
Total	160,952	135,775	380,859	259,287	429,606	299,880

Source: CFB

Table 5:3 Railway Revenues, Costs, Profits and Losses 1972-84 in thousand Kwanza.

Revenue:	1972	1973	1974	1975	1981	1982	1983	1984
Passengers Traffic	32,663	36,541	49,729	45,747	73,811	66,670	75,059	130,520
Goods Transport	822,538	1,154,421	1,195,565	717,803	204,301	167,084	108,054	196,780
Interest & Land Lease	3,564	14,931	18,844	1,577	798	195	1,299	33
Miscellaneous	17,766	19,793	28,811	40,167	32,617	61,434	52,112	38,855
Total	876,531	1,225,686	1,292,949	805,294	311,527	295,393	236,524	366,188
Costs	1972	1973	1974	1975	1981	1982	1983	1984
Personnel	427,461	488,487	670,531	594,565	606,564	669,295	665,018	648,158
Material	143,973	156,039	180,875	111,736	63,376	59,784	54,690	71,195
Finance	35,304	242,269	216,155	125,743	397,794	452,230	427,791	564,055
Depreciation	130,540	51,540	30,540	154,465	30,540	30,540	282,940	318,740
Miscellaneous	114,639	162,711	169,883	260,537	166,459	145,651	121,740	97,197
Total	851,917	1,101,046	1,267,984	1,247,046	1,264,733	1,358,500	1,552,179	1,699,345
Profit (Loss)	24,614	124,640	24,965	(441,752)	(953,206)	(1,063,107)	(1,315,655)	(1,333,157)

Source: CFB

Table 5:4 Port Traffic in thousand tonnes

	1972	1973	1974	1975	1981	1982
Zaire Exp./Imp.	779.3	870.7	665.0	439.6		
Zambia Exp./Imp.	269.2	706.7	778.9	475.7		
Angola Exp./Imp.	586	777	638	396	358	337
Cabotage	211	192	172	92	176	190
Transshipment	26	43	63	44		
Total	1,871.5	2,589.4	2,316.9	1,447.3	534	527

Source: Lobito Port

Table 5:5 Port - Financial Result in thousand Kwanzas

	1972	1973	1974	1984	1985	1986
Cost recorded	122,243	166,446	233,024	389,528	369,835	378,733
Revenues recorded	215,156	335,312	396,088	380,028	517,601	526,891
Profit (Loss)	92,913	168,866	163,064	(9,500)	147,766	148,158

Source: Lobito Port

Table 5:6 Loans and Grants given in 1979/80 to Benguela Railway

	BADEA	OPEC	Holland	Belgium	Sweden
Amount in USD thousand	10,000	3,000	2,600	780	1,660
Amortization period, years	10	15	23	grant	grant
Period of grace, years	5	5	8		
Interest, %	4	0	2.5		

Source: CFB

mance of both the CFB and the port was profitable up to 1974, but that from then on the railway has suffered substantial losses, whilst the port has continued to make a yearly profit.

In 1979/80 there was a move to rehabilitate the transport system, and finances were made available in the form of loans and grants as shown in *Table 5.6*.

5.3 ECONOMIC IMPACT OF THE PROJECT

5.3.1 Angola

The Benguela Railway played a fundamental role in the economic development of Central Angola. The CFB was a major employer, and contributed to the development of urban centres, housing, tourism, health services and education. The revenues directly earned by the Government as a shareholder in the CFB and through direct taxation, import and export fees, etc., were small as the CFB benefited from several privileges granted to them in 1902. It should also be remembered that most of the revenue for the transit transportation was collected in Europe, and that the Angolan currency was not considered convertible. Thus the value for which it was traded was some 10-20 per cent lower than the official rate in the early 1970's.

Implementation of the project is expected to have a substantial economic impact in the provinces of Benguela, Huambo, Bié and Moxico.

The cities of Huambo, Lobito and Benguela represent some of the largest industrial and commercial urban centres in Angola apart from Luanda.

The Central Plateau around Huambo is a major agricultural region. The temperate climate of the plateau and adequate rainfall make the area highly suitable for the cultivation of maize. In the beginning of the 1970's the region also accounted for a substantial part of Angola's cassava production, most of the countries potato crops and almost all the output of the arabica variety of coffee. Along the railway line large areas have been planted with eucalyptus, originally to furnish fuel for locomotives. These forest resources as well as the savanna woodlands in Moxico have previously been exploited.

The closure of the central part of the railway and the difficult security situation has resulted in the fact that agricultural production and timber export diminished drastically in the late 1970's, *See Table 5:7*.

It must be assumed that the reopening of the railway will contribute considerably towards reestablishing the former level of production within agriculture, forestry, industry

Table 5:7 Production of Principal Crops in Angola sold through government channels in 1977 and 1981 and marketed produce in 1973. (Production in tonnes).

Crop	1973	1977	1981
Wheat	11,210	3,450	210
Maize	333,780	36,788	23,649
Potatoes	68,500	1,703	9,104
Coffee	210,000	68,350	23,877
Cassava	61,800	1,141	19,027

Source: Angola's Political Economy 1975-85.
The Scandinavian Institute of African Studies,
Uppsala, Sweden.

and commerce, and thus have a significant impact on the economic performance of Angola.

5.3.2 Zaire

Shaba province which forms a part of the hinterland of Lobito Port, contains the main mineral resources within Zaire.

Zaire's five year plan covering the period 1986-90 provides for investment to maintain the annual production of minerals at not less than 470,000 tonnes of copper, 65,000 tonnes of zinc and 10-12,000 tonnes of cobalt.

The mining of manganese at Kisenge was interrupted in the late 1970's due to the closure of Benguela Railway. A co-operation contract was signed at the beginning of June 1986 between Kisenge Manganese Mining Co. and the Rumanian firm Geomine to build a factory at Kisenge to produce dioxide from electrolytic manganese.

This should permit a resumption of the mining. The capacity of the factory is not known. However, before the mines were closed the output was 300,000 tonnes per year. Assuming the same mining capacity the output of dioxide could well be in the range of 200,000 tonnes per year.

The total export volumes from Shaba province in the mid 1990's can on the basis of these figures be estimated to be in the range of 0.8 million tonnes annually. The import to the province was in the 1970's about 0.6 million tonnes.

The reopening of the Benguela Railway will provide a cheaper transport route than those currently being used through South Africa, and thus make it easier for Zaire to compete on the world market. A low estimate indicates that the total exports will be at least 1.0 million tonnes by about the year 2000 and imports not less than 0.9 million tonnes.

The alternative routes for these goods would be southwards or eastwards. The distances from the alternative ports in Southern or Eastern Africa are on average approximately 1,500 nautical miles longer for transport to Europe and America. The transport distances by rail to these ports are in most cases substantially longer than to Lobito. It is thus assumed that the economic benefits to Zaire of reopening the Lobito Transport System will be significant. Even if consideration is only given to rerouting the current goods volume of about 0.4 million tonnes shipped via South African ports, it will give an annual saving

of about USD 10 million based on a marginal transport cost of 2 cents per tonne kilometre.

5.3.3 Zambia

In the case of Zambia it is quite sure that despite the innumerable factors which determine routes competition (e.g. political, economical, technical, etc) from a geographical point of view, the Lobito Port Transport system offers obvious advantages in the transportations between the copper belt and the greatest minerals and ores import markets. In the event of a closure of alternative routes, the Zambian traffic via Lobito may reach a level of 1.0 million tonnes.

5.4 CONCLUSION

Implementation of the Lobito Port Transport System 10-year Development Plan will benefit Southern Africa in three main ways.

- (i) Angola will benefit from the rehabilitation of the Benguela Railway and the Port of Lobito in that it will have a strong socio-economic impact on the central part of Angola.
 - Job opportunities will be created,
 - Development in the urban areas of Benguela, Lobito, Huambo, Kuito and Luena will be initiated,
 - There will be an increased market for agricultural and forestry products along the line, and
 - Mineral resources along the line can be exploited.
- (ii) The SADCC member states will have access to the sea on the western side of the continent. This will mean that:
 - The availability of railway and port capacity will increase,
 - The possibility of keeping alternative routes open for overseas trade to and from SADCC landlocked countries will increase. This is especially important for Zambia in that the country is centrally located in the region with the longest distance to the sea ports. This strategic advantage may be extended to other countries in the region, namely Zimbabwe, for political and economical reasons,
 - A sea port offering a shorter distance to trading partners in western Europe and America will be available, and
 - Trade between Angola and other SADCC member states will improve.
- (iii) Zaire will benefit through obtaining a direct and short route for its products to sea.
 - It will be possible for the rail transport now being routed via South Africa to be re-routed via the Benguela Railway, thereby resulting in a saving of 1,000 kilometres, and
 - The lower cost of transporting mineral products via Lobito compared with other routes will make it easier for Zaire to compete on the world market.

It is not possible to quantify all the benefits of reopening Benguela Railway. Implementation of the project will, however, lead to increased revenue for the SADCC Region including Zaire since opening of the Benguela Railway will contribute to reduced use and ultimately to complete avoidance of South African Railways.

6. TRAFFIC FORECAST

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The traffic on the Benguela Railway and in Lobito Port reached its peak in 1973 when the rail traffic was 3.3 million tonnes and the port traffic 2.6 million tonnes, as shown in *Tables 6:1 and 6:2*.

Table 6:1 Past traffic on the CFB (1,000 tonnes)

		1967	1970	1971	1972	1973	1974
Transit traffic:	Up	331	439	550	380	652	664
	Down	578	683	679	686	988	930
National traffic:	Up	248	363	402	405	438	383
	Down	655	454	431	428	489	407
Service traffic ¹⁾ :	Up	420	413	421	418	403	439
	Down	332	306	363	383	310	347
Total traffic:	Up	999	1,215	1,374	1,204	1,494	1,486
	Down	1,565	1,443	1,473	1,498	1,787	1,683
Grand total		2,564	2,658	2,847	2,702	3,281	3,169

Source: Henderson, Hughes and Busby, Study of the Benguela Railway, 1979.

1) Service traffic is the internal CFB traffic supplying the whole of the railway with fuel, spare parts, ballast, sleepers, etc. It is anticipated that there will be some reduction in this tonnage when the railway is fully dieselized.

Table 6:2 Past traffic through Lobito port (1,000 tonnes)

		1967	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Transit traffic	In	327	400	564	373	594	541	328	—	—	—	—	—	—	—
	Out	465	586	594	676	983	903	587	62	1	—	—	—	—	—
Angolan traffic	Imp	208	256	274	276	422	396	270	71	163	269	378	371	330	295
	Exp	501	326	290	310	355	243	126	24	34	33	42	39	28	42
Cabotage	In	79	146	143	183	175	159	87	32	95	92	113	100	126	154
	Out	48	36	34	28	17	12	5	18	34	52	58	45	50	36
Other traffic		15	9	14	26	43	63	44	—	26	8	12	—	—	—
Grand total		1,653	1,759	1,913	1,872	2,589	2,317	1,447	207	354	454	603	555	534	527

Source: Hoff & Overgaard, Lobito Port Study, 1983

The railway is at present closed for international traffic. The national traffic continued, however, on a smaller scale between the port of Lobito and the provinces of Huambo and Bié (about 70 thousand tonnes) and within the Benguela province (about 180 thousand tonnes).

After rehabilitation the railway it is expected that the national traffic will increase to a level somewhat lower than it was before the closure of the central part of the line. See *table 6:3*.

Table 6:3 Forecast Angolan traffic on the CFB (1,000 tonnes)

		1995	2000
National traffic	Up	548	659
	Down	131	169
Service traffic	Up	400	400
	Down	325	325
Total		1,404	1,553

Source: SATCC/TU Forecast

The total export of minerals and metals from Zaire in 1973 was 0.8 million tonnes. The export dropped to about 0.5 million tonnes in 1980 mainly because the export of manganese ore was halted due to the closure of the international traffic on the Benguela Railway. There are at present plans to re-open the manganese mines, as mentioned above, and to produce dioxide from electrolytic manganese. This will reduce the quantities to be exported about 30% compared with export of manganese ore. Assuming an export of 200,000 tonnes of manganese dioxide annually the total export from Shaba province can be estimated at 850,000 tonnes in 1995. See *Table 6:4*.

The Zambian overseas traffic is at present primarily routed via Dar es Salaam although some traffic is routed via South African ports.

Lobito Port and the Benguela Railway will form an alternative route for this traffic and it is for strategic reasons important that the routes via TAZARA and Benguela Railway each have sufficient capacity to handle the majority of Zambia's overseas trade.

It is expected that all Zambian traffic will use SADCC ports in the future and that the routing will depend on the transport costs, capacity, services offered by the different ports and railways as well as the location of the trading

Table 6:4 Zaire (Shaba Province) Annual Trade Flows
(1,000 tonnes)

Imports	1972-74	1977-79	1984-86	1995	2000
Total	588	597	600*	700	900
Exports	1972-74	1977-79	1984-86	1995	2000
Copper	464	432	462	470	
Manganese	300	—	—	200	
Zinc	69	45	60	65	
Cobalt	17	12	12	12	
Other	56	66	70*	103	
Total	906	555	604	850	1,000

Sources: Port of Lobito General Development Plan (1972-79)
Mining Annual Review 1987 (1984-86)
SATCC/TU Estimates (*) (1995, 2000)

partners for external trade. As shown in Table 6:5 the rail distances from the copper belt of Zambia to the main SADCC sea ports do not differ significantly, which makes it difficult to foresee the routing pattern in the long term.

Table 6:5 Distances to ports (km) from Lusaka and Kitwe in Zambia

Route	Lusaka	Kitwe
Rail to Dar es Salaam	2,045	2,050
Road to Michinji, then rail to Nacala	1,705	2,060
Rail to Maputo	2,020	2,395
Rail to Beira	2,020	2,395
Rail to Durban via Botswana	2,761	3,126
Rail to Lobito	2,605	2,240

Table 6:7 Zambia Imports/Exports excluding crude oil by route 1981-1984 (1,000 tonnes)

Route	1981		1982		1983		1984	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Export
Zaire		24	0.1	26		33		36
Tanzam Highway	112	124	96	103	27	25	29	28
Tazara	228	306	271	351	272	318	293	431
Malawi	3				11		12	0.5
Mozambique	12	0.4	8		1		1	0.1
Kazungula	0.6		0.7		2	0.2	2	0.2
Zimbabwe (road)	52		44		48		49	
Zimbabwe (rail)	683	154	377	223	309	155	379	221
Air freight	13	4	12	5	7		8	5
Other				0.5				
Total	1,105	613	809	708	677	533	773	721

Source: Transport Planning Unit MPTC Zambia

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The total Zambian annual imports/exports during the first half of the 1980's was about 1.5 million tonnes, see Table 6:6. Of this about 70% was overseas traffic. In 1984 about 0.8 million tonnes of the traffic was routed via the Dar es Salaam Port Transport System, as shown in Table 6:7. Dar es Salaam's share is even higher today.

Table 6:6 Zambia Imports/Exports excluding crude oil in 1980-1984 (tonnes)

Year	Imports	Exports	Total
1980	880,387	790,508	1,670,895
1981	1,105,249	612,585	1,717,834
1982	808,597	707,957	1,516,548
1983	676,822	532,905	1,209,727
1984	773,108	721,421	1,494,529

Source: Transport Planning Unit MPTC Zambia

Zambia's total import/export traffic is expected to grow to about 1.9 million tonnes in the year 2000 of which about 1.5 million tonnes will be overseas trade. See Tables 6:8 and 6:9.

Table 6:8 Zambia total imports/exports excluding crude oil. Forecast for 1995 and 2000 (1,000 tonnes)

Year	Imports	Exports	Total
1995	890	826	1,716
2000	1,021	841	1,862

Source: SATCC/TU Forecast

Table 6:9 Zambia overseas imports/exports excluding crude oil. Forecast for 1995 and 2000 (1,000 tonnes)

Year	Imports	Exports	Total
1995	458	506	964
2000	505	475	980

Source: SATCC/TU Forecast

Traffic to and from Shaba province is at present using three different routes:

- (i) The "national route": Railway to Ilebo river transport Ilebo-Kinshasa and railway Kinshasa-Matadi,
- (ii) Dar es Salaam via Kalemie and Kigoma,
- (iii) South Africa via Zambia and Zimbabwe.

When the Benguela Railway is opened, the line will be the most convenient and shortest route to the sea.

However, it is expected that after the reopening of the Benguela Railway, the "national route" which is currently being improved will also play an important role. The total export traffic via Benguela Railway is assumed to be about 450,000 tonnes in 1995 and 550,000 tonnes in the year 2000.

The total import to Shaba province is estimated at 0.7 million tonnes in 1995 and 0.9 million tonnes in year 2000. About 50% is imported from other African countries. Of the goods imported from overseas about 50% is assumed to be routed via the Benguela Railway, i.e. 175,000 tonnes in 1995 and 225,000 tonnes in the year 2000.

Based on the figures presented above, it can be assumed that the total traffic on the Benguela Railway in about the year 2000 will be in the order of 2.5 to 3.4 million tonnes. *Table 6:10*. The lower figure is based on the assumption that about 20% of Zambia's overseas trade will be routed via the Benguela Railway. The higher figure is based on the assumption that all overseas trade is routed via the Benguela Railway. This latter figure is only of strategic interest since under normal conditions, the Zambian traffic would be divided between several of the SADC routes, including Dar Es Salaam, Beira and Maputo.

Table 6:10 Benguela Railway Annual Goods Traffic, 1972-74 and forecast for 1995 and 2000 (1,000 tonnes)

	1972-74	1995	2000
Angola national			
Up	400	548	659
Down	450	131	169
Service traffic			
Up	420	400	400
Down	345	325	325
Zaire (Shaba)			
Up	235	175	225
Down	535	450	550
Zambia			
Up	330	100-450	100-500
Down	325	100-500	100-550
Total			
Up	1,355	1,225-1,575	1,380-1,780
Down	1,655	1,000-1,400	1,140-1,590
Grand total	3,040	2,225-2,975	2,520-3,370

Source: SATCC/TU Forecast 1987

The traffic volumes indicated for 1995 and the year 2000 can only be reached after complete rehabilitation of the railway. Before this, the traffic volumes will be restricted by the availability of motive power and rolling stock and the progress of the track rehabilitation.

The total traffic in Lobito Port is estimated at 1.3-2.0 million tonnes in 1995 and 1.5-2.4 million tonnes in 2000. See *Table 6:11*.

Table 6:11 Lobito Port Traffic 1995 and 2000 (1,000 tonnes)

	1995		2000	
	Exp.	Imp.	Exp.	Imp.
Angola national	86	265	133	337
Zaire	450	175	550	225
Zambia	100-500	100-450	100-550	100-500
Cabotage (out/in)	80	295	80	360
Total	716-1,116	835-1,185	833-1,313	1,022-1,422

Source: SATCC/TU Forecast 1987

7. DEVELOPMENT PLAN

7.1 DEVELOPMENT OBJECTIVES AND STRATEGIES

At present, considerable quantities of overseas goods to and from SADCC member states are transported via South African ports.

Strong efforts are being made to divert this traffic towards SADCC ports. The primary objectives of the rehabilitation of the Benguela Railway and thus the re-opening of Lobito Port for international traffic is to eventually completely avoid the use of South African ports and transport network by SADCC member states.

The primary implementation strategy should be to programme the rehabilitation work of the Benguela Railway so that it can be opened for international traffic in as short a time as possible and to improve the ability of the Port of Lobito to handle international traffic.

Besides projects considered as essential for the achievement of the above mentioned objectives as well as some others that are likely to contribute for the improvement of living and working conditions in Lobito and along the line are included in the implementation programme.

On this basis the 10-year Development Plan has been divided into three phases:

Phase 1:	Emergency phase	(1988-1989)
Phase 2:	Short-Term	(1989-1992)
Phase 3:	Long-Term	(1993-1997)

The emergency phase aims at repairing the railway so that a limited amount of through traffic can be carried and at carrying out minor improvements to the Port of Lobito to allow for international traffic. The length of the emergency phase is estimated to be about one and a half years.

The Short-Term Phase primarily aims at rehabilitating the Benguela Railway so that at the end of the period it can be in full operation for international traffic.

Within the Short-Term Phase, port projects, road projects and other projects needed for handling international traffic and improving the town infrastructure should also be carried out.

The Long-Term Phase mainly aims at upgrading the port and railway to a competitive international standard. It is proposed that the port projects should be implemented in accordance with the General Development Plan for the port.

7.2 ARRANGEMENT OF THE DEVELOPMENT PROGRAMME

The projects are divided into the following groups:

- General Projects
- Lobito Port and Water Transport Projects
- Benguela Railway Projects
- Road Projects

- Telecommunications Projects
- Civil Aviation Projects

The projects are all interrelated and their implementation should be phased so that the most efficient use can be made of them. Although some projects are directly linked to each other and must be implemented consecutively, a large number can be implemented independently.

The 10-year Development Plan is briefly summarized below. Detailed project descriptions and justifications for the projects are presented in *Chapter 8*.

The projects have been given the following codes:

First letter(s):

- G = General
- P = Port
- R = Railway
- RD = Road
- T = Telecommunications
- CA = Civil Aviation

Second letter(s):

- CE = Civil Engineering
- M = Manpower Development and Technical Assistance
- ME = Mechanical Engineering
- E = Energy
- MS = Maritime Security
- S = Shipping
- PT = Public Telecommunications
- MC = Maritime Communications
- TR = Road Transport

7.3 IMPLEMENTATION COSTS

The total cost for implementing the three phases is estimated at USD 575 million in 1987 prices. Costs for local labours are not included. The costs for the Emergency Phase are estimated at USD 114 million, the Short-Term Phase at USD 305 million and the Long Term Phase at USD 156 million. *See Table 7.1*. Detailed project descriptions and cost estimates are presented in *Chapter 8*.

7.4 EMERGENCY PHASE

The Emergency Phase projects should be implemented within the period 1988-1989. The timing is dependent on the work needed to repair the Benguela Railway to allow initially for engineering trains to pass along the entire line and, at the end of the Emergency Phase, to allow for through going diesel freight trains. In the port of Lobito minor work has to be carried out in order to allow for increased traffic. Furthermore, technical assistance for implementing and co-ordinating the projects will have to start in this phase, together with general projects necessary in order to be able to carry out the emergency work and to start the work on Short-Term Phase projects.

Table 7.1 Implementation Costs in USD million

Type of Project	Emergency	Phase		Total
		Short-Term	Long Term	
General	34.3	47.6	—	81.9
Port and Water Transport	15.3	56.5	10.7	82.5
Benguela Railway	53.2	154.1	138.9	346.2
Telecommunications	3.9	24.8	6.4	35.1
Road and Road Traffic	6.8	12.4	—	19.2
Civil Aviation	0.1	10.0	—	10.1
Total	113.6	305.4	156.0	575.0

7.4.1 General Projects (Emergency Phase)

As a first priority it is necessary to establish a Project Co-ordination Unit to assist the Lobito Corridor Authority in their contacts with the donors and to assist with the co-ordination of the implementation. In addition, accommodation for the technical assistance staff has to be arranged.

The following general projects are included in the Emergency Phase or should commence during this phase. See also Figure 7.1.

G-M-4: Rehabilitation of Hotel Terminus. Hotel Terminus is the only high standard hotel in Lobito. The hotel is in urgent need of being upgraded in order to meet the increased need for accommodation during the Emergency Phase.

G-E-1 Repair and Extension of Lumaum Hydroelectric Power Plant. The Lumaum Hydroelectric Power Plant was sabotaged in 1983 and 1984. Repair of sabotaged equipment and installation of two generators will start in 1988 with financing from Portugal and West Germany.

Figure 7.1 Implementation Schedule and Costs for General Projects

Code	Project	Costs USD million				Phase									
		Emergency	Short Term	Long Term	Total	Emergency		Short Term			Long Term				
						88	89	90	91	92	93	94	95	96	97
G-M-1	Project Coordination Unit	2.0	3.0	—	5.0	[Gantt chart bars for G-M-1: Emergency 88-89, Short Term 89-92]									
G-M-2	Support to Workers and their Families	—	7.0	—	7.0	[Gantt chart bars for G-M-2: Short Term 89-92]									
G-M-3	Housing for Technical Assistance Staff in Lobito and Huambo	4.7	4.7	—	9.4	[Gantt chart bars for G-M-3: Emergency 88-89]									
G-M-4	Rehabilitation of Hotel Terminus	1.8	1.7	—	3.5	[Gantt chart bars for G-M-4: Emergency 88-89]									
G-E-1	Repair and Extension of Lumaum Hydroelectric Power Plant	13.8	28.2	—	42.0	[Gantt chart bars for G-E-1: Emergency 88-92]									
G-CE-1	Development of Lobito Town	9.0	—	—	9.0	[Gantt chart bars for G-CE-1: Emergency 88-92]									
G-CE-2	Rehabilitation of Cement Factory	3.0	3.0	—	6.0	[Gantt chart bars for G-CE-2: Emergency 88-89]									
Total		34.3	47.6	—	81.9										

G-M-1: Project Co-ordination Unit. The Project Co-ordination Unit should assist in the overall co-ordination of project implementation and in contacts between financiers and the Lobito Corridor Authority. The unit needs to be established as a first step in the Emergency Phase. It is foreseen that it will be needed for at least five years.

G-M-3: Housing for Technical Assistance Staff in Lobito and Huambo. A number of houses have to be constructed in order to provide the technical assistance staff with suitable accommodation both in Lobito and Huambo.

G-CE-1 Development of Lobito Town. Work on securing the water supply and plans for electricity supply should be carried out in the Emergency Phase.

G-CE-2 Rehabilitation of Cement Factory. The railway and port rehabilitation works will result in a considerable increase in cement consumption. The cement factory should be rehabilitated in order to meet this increased need.

Figure 7.2 Implementation Schedule and Costs for Port and Water Transport Projects

Code	Project	Costs USD million				Phase														
		Emergency	Short Term	Long Term	Total	Emergency		Short Term			Long Term									
						88	89	90	91	92	93	94	95	96	97					
P-M-1	Welfare and Office Facilities	—	3.5	—	3.5															
P-M-2	Technical Assistance to the Port	1.0	2.0	—	3.0															
P-M-3	Port School at Lobito	1.0	4.3	—	5.3															
P-CE-1	Inspection and Reinforcement of Quays	—	15.8	—	15.8															
P-CE-2	Grain Bulk Facilities Improvement	1.0	—	—	1.0															
P-CE-3	New Coastal Terminal and Service Port Facilities	6.5	—	—	6.5															
P-CE-4	Rehabilitation of Port Railways	2.5	—	—	2.5															
P-CE-5	Study on Rehabilitation of Existing Ore Bulk Facilities	0.5	—	—	0.5															
P-CE-6	New Multipurpose Terminal	—	—	1.0	1.0															
P-CE-7	New Container Terminal	—	—	1.0	1.0															
P-CE-8	Coastal Protection Works	1.3	—	—	1.3															
P-ME-1	Rehabilitation of Power and Lighting System	—	2.5	—	2.5															
P-ME-2	Purchase of General Port Equipment	—	2.6	—	2.6															
P-ME-3	Port Maintenance Workshops and Stores	—	3.5	—	3.5															
P-ME-4	Mobile Cranes, Rehabilitation and Scrapping Programme	1.0	2.0	—	3.0															
P-ME-5	Floating Equipment	—	—	5.0	5.0															
P-ME-6	Shipyards Rehabilitation	—	11.3	3.7	15.0															
P-S-1	Improvement of the Capacity of the Coastal Shipping Company	—	8.0	—	8.0															
P-MS-1	Maritime Security Programme	0.5	1.0	—	1.5															
Total		15.3	56.5	10.7	82.5															

7.4.2 Lobito Port Projects (Emergency Phase)

The Emergency Phase improvements comprise a number of small projects estimated at a foreign currency component of USD 3.4 million (1983 prices). Some of these projects are included in the port budget and will be carried out without donors' assistance.

In addition the following projects should be implemented during the Emergency Phase or commence during this phase with donor's assistance.

For costs and phasing of implementation, see Figure 7.2.

P-M-2: Technical Assistance to the Port. The Project shall provide management assistance for the port. The project should start as soon possible and continue over a five-year period.

P-M-3: Port School at Lobito. A programme for training, provision of trainers and software and construction of school facilities should be carried out during this phase and be implemented during the Short-Term Phase.

P-CE-2: Grain Bulk Facilities Improvement. The improvements aim at making the silos suitable for the import of grain in bulk.

P-CE-3: New Coastal Terminal and Service Port Facilities. To avoid the use of deep water quays for cabotage purposes, the construction of a new quay and a ro-ro ramp for coastal traffic is needed.

P-CE-4: Rehabilitation of Port Railways. The projects include repair work on the railways needed for the handling of increased traffic and purchase of shunting locomotives.

P-CE-5: Study on Rehabilitation of Existing Ore Bulk Facilities. An evaluation should be made of the operational layout of existing ore bulk facility and modification of same for allow for better use of the port area.

P-CE-8: Coastal Protection Works. A coastal protection scheme is at present being carried out financed by the Netherlands. Additional funds are needed to complete the work as a continuation of the ongoing work.

P-ME-1: Rehabilitation of Power and Lighting System. A new emergency generator has to be installed. Work also has to be carried out on the protection of lighting poles against collision.

P-MS-1: Maritime Security Programme. A crash programme should be carried out in order to install equipment already available at Lobito.

P-ME-4: Mobile Cranes Rehabilitation and Scrapping Programme. An evaluation should be made of existing mobile cranes in order to establish a programme for rehabilitation/scrapping and technical assistance and training.

7.4.3 Benguela Railway Projects (Emergency Phase)

The Emergency Phase work includes, as a first step, the installation of crushers for supplying of ballast and securing the production of wooden sleepers. As soon as ballast and sleepers are available, work will start on emergency repairs to the track and bridges.

Figure 7.3 Implementation Schedule and Costs for Benguela Railway Projects

Code	Project	Costs USD million				Phase										
		Emergency	Short Term	Long Term	Total	Emergency		Short Term			Long Term					
						88	89	90	91	92	93	94	95	96	97	
R-M-1	Manpower Development Plan Study	0.5	1.0	—	1.5											
R-M-2	Upgrading and Extension of Computer Facilities	—	0.9	—	0.9											
R-M-3	Railway Training Assistance	3.0	8.0	4.0	15.0											
R-M-4	Technical Assistance for Operation of the Railway	2.0	5.5	5.0	12.5											
R-M-5	Improvement of the Railway Hospitals	6.0	—	—	6.0											
R-OP-1	Motive Power, Rolling Stock and Operation Plan	0.4	—	—	0.4											
R-CE-1	Track Repair and Upgrading	7.2	55.0	97.7	159.9											
R-CE-2	Establishment of Quarries	6.4	—	—	6.4											
R-CE-3	Sleeper Production Plants	2.5	0.5	—	3.0											
R-CE-4	Track Maintenance Equipment	6.2	5.3	4.5	16.0											
R-CE-5	Realignment Design - Cubal to Huambo	0.6	—	—	0.6											
R-CE-6	Realignment Study - Huambo to Luau	0.4	—	—	0.4											
R-ST-1	Train Control System and Telecom.	3.0	8.8	2.7	14.5											
R-ST-2	Telephone Exchanges, CFB and Lobito Port	0.3	0.3	—	0.6											
R-ME-1	Rehabilitation and Acquisition of Locomotives	2.5	17.5	—	20.0											
R-ME-2	Rehabilitation and Acquisition of Rolling Stock	7.0	33.0	25.0	65.0											
R-ME-3	Completion of Diesel Workshop and re-equipment of Wheel Shop at Huambo	3.0	4.0	—	7.0											
R-ME-4	Conversion of the Steam Depot at Luena to Diesel Maintenance Depot	1.0	—	—	1.0											
R-ME-5	Workshop Facilities at Lobito	0.6	—	—	0.6											
R-ME-6	Review and Acquisition of Spares Parts and Reorganization of Main Stores	0.3	10.0	—	10.3											
R-ME-7	Rescue Equipment and Accident Prevention Programme	—	1.1	—	1.1											
R-ME-8	Installation of 21 Automatic Barriers	—	1.6	—	1.6											
R-ME-9	Study on Improvement of Specialist Workshops in Huambo	—	0.1	—	0.1											
R-E-1	Electrical Supply and Distribution Systems for Lobito, Huambo and Luena	0.3	1.5	—	1.8											
Total		53.2	154.1	138.9	346.2											

In the long term the line should be upgraded using 45 kg/m rail and preferably concrete sleepers. At an early stage, a determination should be made of the benefits of constructing a concrete sleeper factory and the most appropriate period for constructing the factory taking into account the timing of the availability of funds for financing relaying of the line with 45 kg/m rail.

The need for training should be established and training of staff commence as soon as possible.

For costs and phasing of implementation, *see Figure 7.3*.

The following emergency work will have to be carried out:

R-M-1: Manpower Development Plan Study. The project aims at defining the present resources and need for staff and training. The specific need for staff and training for implementation of the Emergency Phase projects should be determined as a matter of urgency.

R-M-3: Railway Training Assistance. The training centre in Lobito and other training facilities should be upgraded what regards to buildings and the provision of training equipment. Training assistance staff should be provided for a five year period.

R-M-4: Technical Assistance for Operating the Railway. This project consists of supplying technical assistance needed for operating the railway, until the new staff have been recruited and trained.

R-M-5: Improvement of the Railway Hospitals. Benguela Railway has three hospitals serving the staff and their families. Due to the very limited health service available, these hospitals play an important role. A supply of medicines, equipment and medical assistance is needed in the Emergency Phase.

R-OP-1: Motive Power, Rolling Stock and Operation Plan. The project shall comprise a survey of alternative methods for train operation and establish need for motive power and rolling stock, and identify the need for and length of crossing loops taking into consideration dieselization of the entire line.

R-CE-1: Track Repair and Upgrading. During the Emergency Phase, sabotaged bridges will have to be provisionally repaired, worn out sleepers and rails replaced and reballasting carried out to the extent that through traffic can be established.

R-CE-2: Establishment of Quarries. A semi mobile crusher plant shall be purchased and the production of ballast started within the first six months of the Emergency Phase.

R-CE-3: Sleeper Production Plants. A plant for producing wooden sleepers has to be established in Cabinda within the first six months of the Emergency Phase. At Luena the sawmill should be rehabilitated and a treatment plant established. The benefit of constructing a concrete sleeper factory should be studied, taking into consideration the timing of replacing light weight rail by 45 kg/m rail.

R-CE-4: Track Maintenance Equipment. Hand-held tools should be purchased. Tamping machines for the maintenance work are available at CFB.

R-CE-5: Engineering Design for Realignment Cubal to Huambo. The need for realignment of the section between Cubal and Huambo has been studied previously. Engineering design for implementing the work is needed.

R-CE-6: Realignment Study Huambo to Luau. The feasibility of realigning certain sections of the line between Huambo and Zaire border should be studied during the Emergency Phase so that, when feasible, realignments can be carried out at the same time as resleepering and reballasting are made.

R-ST-1: Train Control System and Telecommunications. The sabotaged parts of the telecommunications links on the Lobito-Cubal section are to be repaired. The link also needs to be extended to Huambo and an automatic exchange centre installed in Lobito.

R-ST-2: Telephone Exchanges, CFB and Lobito Port. This project comprises the replacement and expansion of the existing old telephone exchanges using the latest digital PABX technology.

R-ME-1: Rehabilitation and Acquisition of Locomotives. The rehabilitation of seventeen main line locomotives has to be completed during the Emergency Phase in order to have sufficient motive power for international traffic at the beginning of the Short-Term Phase.

R-ME-2: Rehabilitation and acquisition of Rolling Stock. During the Short-Term Phase all rolling stock should be inspected and a rehabilitation programme prepared. Iron ore wagons on the Mocamedes line should be inspected to ascertain their suitability for use as ballast wagons. If the iron ore wagons are not suitable, 40 ballast wagons should be provided.

R-ME-3: Completion of Diesel Workshop and re-equipment of a Wheel Shop at Huambo. The project comprises completion of the diesel workshop and equipment for the wheel shop including wheel lathes, wheel press, vertical lathe and induction tyre heater.

R-ME-4: Conversion of the Steam Depot at Luena to Diesel Maintenance Depot. As dieselization of the line moves eastwards, a facility for the servicing and maintenance of diesel locomotives should be provided at Luena.

R-ME-5: Workshop Facilities in Lobito. The Lobito workshop is used for repair, inspection and servicing of diesel locomotives and track maintenance equipment. Upgrading of the locomotive workshop and construction of a new workshop for heavy track maintenance equipment is urgently needed.

R-ME-6: Review and Acquisition of Spare Parts and Reorganization of Main Stores. A detailed review of requirement for spare parts and cost estimates should be carried out during the Emergency Phase.

R-E-1: Electrical Supply and Distribution Systems for Lobito, Huambo and Luena. The aim of the Emergency Phase of the project is to analyse the need for renewal of electricity supply and distribution systems in order to obtain sufficient capacity for the modernization and extension of the workshops.

Figure 7.6 Implementation Schedule and Costs for Civil Aviation Projects

Code	Project	Costs USD million				Phase														
		Emer-gency	Short Term	Long Term	Total	Emer-gency		Short Term				Long Term								
						88	89	90	91	92	93	94	95	96	97					
CA-CE-1	Upgrading of Benguela Airport	—	10.0	—	10.0															
CA-CE-2	Study on new Airport between Lobito and Benguela	0.1	—	—	0.1															
Total		0.1	10.1	—	10.1															

7.4.6 Civil Aviation Projects (Emergency Phase)

In the Emergency Phase the following study should be carried out:

CA-CE-2: Study on new Airport between Lobito and Benguela. Construction of a new airport started in the 1970's. A preliminary study should be carried out to determine the feasibility of restarting this work. This study is needed at an early stage as work to be carried out on Benguela Airport has to be made taking future construction of a new airport into consideration.

For costs and phasing of implementation, see Figure 7.6.

7.5 SHORT - TERM PHASE

The Short-Term Phase should be implemented during the period 1989-1992.

General projects serving the town of Lobito, the transport industry and construction activities should be implemented during this phase.

Work on improvement of the port of Lobito shall be carried out in accordance with the General Development Plan taking into account that full capacity for handling international goods should be achieved by the end of the Short-Term Phase.

The repair of the railway will continue as needed. As soon as 45 kg/m rail is made available new rail will be laid on concrete sleepers (if it is found feasible) to replace 30 kg/m rail. This work will also continue during the Long-Term Phase.

A number of telecommunications, civil aviation and road projects should also commence during this period.

7.5.1 General Projects (Short-Term Phase)

During the beginning of the Short-Term Phase the projects started within the Emergency Phase will be completed. See Figure 7.1.

Major projects to be implemented during this phase are:

G-M-2: Support to Workers and their Families. This project will provide assistance to workers employed in the port and on the Benguela Railway and their families with the

objective of satisfying their most essential need for food, housing and transport.

G-E-1: Repair and Extension of Lumaum Hydroelectric Power Plant. Further repair and extension of the power station should be carried out during the Short-Term Phase in order to obtain a satisfactory level of electricity supply.

7.5.2 Lobito Port Projects (Short-Term Phase)

The majority of the port projects are foreseen to be implemented during the Short-Term Phase. Implementation of some projects started within the Emergency Phase will also continue during the Short-Term Phase. See Figure 7.2. This refers to the following projects:

P-M-2: Technical Assistance to the Port **P-M-3** Port School at Lobito, **P-ME-1:** Rehabilitation of Power and Lighting System, **P-ME-4:** Mobile Cranes, Rehabilitation and Scrapping Programme, and **P-MS-1:** Maritime Security Programme. In the Short-Term Phase, the latter project includes the installation of navigational aids equipment available at Benguela, and a technical assistance and training programme.

The following projects should be implemented or started during the Short-Term Phase.

P-M-1: Welfare and Office Facilities. A canteen with 1,000 seats and a medical centre are the most essential components of this project.

P-CE-1: Inspection and Reinforcement of Quays. The project includes inspection of quays, engineering design and implementation of reinforcement works.

P-ME-2: Purchase of General Port Equipment. In order to establish a better working environment and reduce the risk of accident, fire-fighting equipment, warning systems, oil pollution combat equipment and refuse collection equipment should be provided.

P-ME-3: Port Maintenance Workshop and Store. A development programme for workshop facilities, equipment and technical assistance should be prepared and implemented.

P-ME-6: Shipyard Rehabilitation. Rehabilitation and upgrading of the shipyard ESTALNAVE should start.

P-S-1: Improvement of the Capacity of the Coastal Shipping Company. The need for fleet, new vessels, repair of existing vessels should be determined. The provision of assistance to the shipping line with commercial, operational and technical personnel is also included in the project.

7.5.3 Benguela Railway Projects (Short-Term Phase)

Due to the urgency attached to repairing the railway line, it is proposed that almost all projects should be started within the Emergency Phase. Most of the projects will continue during the Short-Term Phase, however, and some also during the Long-Term Phase.

For phasing of implementation and costs see *Figure 7.3*.

The following implementation work should be carried out during the Short-Term Phase:

R-M-1: Manpower Development Plan Study. Completion of the study during the first year of the Short-Term Phase.

R-M-2: Upgrading and Extension of the Computer Facilities. The project includes replacement of existing computers at Lobito, the installation of computers at main stations, introduction of the use of computers for workshop and store management and for wagon control.

R-M-3: Railway Training Assistance. Continued assistance on training will be needed throughout the Short-Term Phase.

R-M-4: Technical Assistance for Operating the Railway. It is foreseen that assistance in operating the railway will be needed throughout the Short-Term Phase and also be extended over the first few years of the Long-Term Phase.

R-CE-1: Track Repair and Upgrading. After the emergency work has been carried out the track repairs will have to continue with the replacement of sleepers, laying of ballast, permanent repairs to bridges and the replacement of old light rail with 45 kg/m new rail.

R-CE-3: Sleeper Production Plants. Spare parts and technical assistance for operating the timber sleeper factories should be provided throughout the Short-Term Phase. If the use of concrete sleepers is found to be advantageous to the CFB, a plant should be constructed as early as possible to supply concrete sleepers for sections to be relaid with 45 kg/m rails. Technical assistance should be provided for setting up and operating the factory.

R-CE-4: Track Maintenance Equipment. During this phase, additional heavy plant equipment and technical assistance should be provided.

R-ST-1: Train Control System and Telecommunications. During the Short Term Phase the train control and telecommunications system should be extended to all main station between Huambo and the Zaire border.

R-ST-2: Telephone Exchanges, CFB and Lobito Port. The work started during the Emergency Phase should be completed during 1990.

R-ME-1: Rehabilitation and acquisition of locomotives. Ten U-20-C diesel electric locomotives and six shunting locomotives will be needed in addition to the existing fleet

to handle the foreseen traffic at the beginning of the Long-Term Phase.

R-ME-2: Rehabilitation and Acquisition of Rolling Stock. It is foreseen that technical assistance and spare parts for the rehabilitation of about 800 wagons will be required during the Short-Term Phase. Supply and commissioning of about 200 freight wagons and 52 passenger coaches should start in this phase and continue in the Long-Term Phase.

R-ME-3: Completion of Diesel Workshop and re-equipment of a Wheel Shop at Huambo. Technical assistance for staff training and workshop practices should continue during the Short-Term Phase.

R-ME-6: Review and Acquisition of Spare Parts and reorganization of Main Stores. The project includes the provision of spare parts and technical assistance for the review, updating and operation of the stock recording system.

R-ME-7: Rescue Equipment and Accident Prevention Programme. In addition to rescue equipment, technical assistance should be provided to an accident prevention team in order to institute safety and accident prevention proceedings.

R-ME-8: Installation of 21 Automatic Barriers. To improve the safety at open level crossings in urban areas automatic barriers should be installed.

R-ME-9: Study on Improvement of Specialist Workshops in Huambo. With the completion of the diesel workshop and supply of new equipment it will be necessary to re-assess the use of the workshop facilities previously used for steam locomotives and rolling stock. A study to establish the future use and layout of the workshop should thus be carried out.

R-E-1: Electricity Supply and Distribution Systems for Lobito, Huambo and Luena. Electricity supply equipment should be supplied on the basis of the study carried out during the Emergency Phase.

7.5.4 Telecommunications Projects (Short-Term Phase)

During the Short-Term Phase projects aiming at increased capacity and network standard should be implemented as described below. The phasing and costs of these projects are shown in *Figure 7.4*.

T-M-1: Technical Assistance to ENATEL at Benguela/Lobito. Technical assistance of about six manyears should be provided over a two year period for maintenance and operation of microwave links, external plant network and for training technicians and operators in English.

T-PT-1: Microwave Link Benguela/Lobito-Huambo-Luau along the Benguela Railway. A microwave link should be provided between Benguela and Kuito by 1990. The link should be extended to Luena and Luau by 1992 and equipment should be provided for the extension of the services to Zambia and Zaire.

T-PT-2: Spur Routes along the Benguela/Lobito-Luau Corridor. The purpose of the project is to provide main villages along the railway line with telecommunication ser-

vice. Small capacity VHF/UHF radio system, concentrators, remote subscriber stages and/or multi access radio systems should be provided connecting the villages to the railway trunk network.

T-PT-3: Extension/Rehabilitation of Switching and outside Plant along the Corridor. Switching and outside plant at 18 centres and localities along the railway line should be rehabilitated, replaced and/or expanded by 1995.

7.5.5 Road and Road Traffic Projects (Short-Term Phase)

During the Short-Term Phase, work is planned to start on the implementation of one road project and reinforcement of the capacity of the road transport company. The implementation schedule and costs are shown in *Figure 7.5*. The following work should be carried out:

RD-CE-1: Benguela-Lobito Road and Access Roads to the Port and Railway in Lobito. The existing road between Benguela and Lobito should be upgraded to a width of 7.2 m with 2.5 m shoulders.

RD-TR-1: Reinforcement of the Capacity of the Road Transport Company. Five hammer lift trucks should be purchased and funds should be provided for spare parts and maintenance.

7.5.6 Civil Aviation Projects (Short-Term Phase)

Benguela Airport should be upgraded during the Short-Term Phase as stated below. As mentioned under 7.4.6 a preliminary study should be carried out during the Emergency Phase to determine the feasibility of continuing the construction of a new airport at Catumbela. The outcome of this study should be taken into account for determining the upgrading of the airport to be carried out.

The phasing of the implementation and the costs are shown in *Figure 7.6*.

CA-CE-1: Upgrading of Benguela Airport. The runway should be extended, widened and strengthened so that Boeing 737 type aircraft can land. The terminal should be upgraded or renewed. Landing lights, ILS and VOR/DME should be installed.

7.6 LONG-TERM PHASE

The Long-Term Phase covers the five year period 1993-1997.

During this period the traffic will resume a volume comparable with the traffic at the beginning of the 1970s.

Almost all 10-year Plan projects will have been implemented or will be being implemented in the beginning of the Long-Term Phase. See *Figure 7.1-7.6*.

Major projects to be started and/or completed during the Long-Term Phase are:

P-CE-6: New Multipurpose Terminal and **P-CE-7:** New Container Terminal. These two port projects comprise feasibility studies for construction of new berths Nos 7 and 8 for the multipurpose terminal and berths Nos 9 and 10 for the container terminal and supply of handling equipment.

P-ME-5: Floating Equipment. The project includes the establishment of a maintenance and replacement scheme and the purchase of new floating equipment as needed.

R-CE-1: Track Repair and Upgrading. All light weight rail should be replaced by 45 kg/m rail by the end of 1995.

R-ME-2: Rehabilitation and Acquisition of Rolling Stock. Additional rolling stock should be provided in accordance with requirements.

T-PT-5: Microwave Link Luanda-Benguela/Lobito. A large capacity microwave link should be constructed between Luanda and Benguela/Lobito to replace the troposcatter system.

8. PROJECT DESCRIPTIONS

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8:1 GENERAL PROJECTS

Projects which support two or more transport sectors or are of general importance to the functioning and development of the Lobito Port Transport System are described under this heading.

For this reason, although it is an energy related project, Repair and Extension of Lomaum Hydroelectric Power Plant, has been included in the plan.

The infrastructure of Lobito urban area needs to be considerably improved.

Detailed description of the general projects are given below.

PROJECT G-M-1 Project Co-ordination Unit

Description

The Project Co-ordination Unit shall coordinate the implementation of the projects, function as liaison body between financiers and executing agencies, update and revise project documents, inform financiers on implementation status and work as an integral part of Lobito Corridor Authority.

Background to and need for the Project

Experience has shown that the financing and implementation of a large number of projects which are interdependent need to be co-ordinated by a unit with an overall coordinating responsibility. Units with these functions have, for example, been established for implementation of the Tazara 10-year Development Plan and the Beira Port Transport System 10-year Plan.

Project Components

The work of the Project Co-ordination Unit will comprise:

- Responsibility for the overall coordination of the projects included in the 10-year Plan,
- Information on project status and progress to financiers,
- Arrangement of regular donor meetings,
- Responsibility for defining the need for counterparts and other staff for project implementation,
- Assistance in evaluation of tender documents, and
- Providing the Lobito Corridor Authority with any assistance they may require.

Implementation and Costs

The Project Co-ordination Unit should commence operations at the beginning of the emergency phase.

It is foreseen that a group of four experts will be needed for about five years at a cost of USD 5 million (USD 20,000 per month).

PROJECT G-M-2 Support to Workers and their Families

Description

The aim of the project is to provide the workers employed in the port and on the Benguela Railway, and their families, with the kind of support they need to satisfy their most essential needs, i.e. food, housing and transport.

Background to and need for the Project

Due to the prevailing situation in Angola, the possibilities to provide the employees in the port and on the railway with food, housing and transport are limited.

The total staffs of the railway and port are currently about 5,700 and 2,400 respectively. It will be necessary to employ additional railway staff as soon as the rehabilitation work and traffic commence, thereby increasing the need for support to workers and their families.

Project Components

The Project includes the following components;

- Assistance in establishing farming and fishing co-operatives in Lobito and Huambo,
- Transport services for the workers,
- Assistance in implementing "site and service" housing areas, and
- Rehabilitation of social, sports and cultural facilities.

Implementation and Costs

It is foreseen that implementation of the project will start at the beginning of the Short-Term Phase.

The costs are estimated as follows:

- Technical assistance, to farming and gishing co-operatives, three persons, three years USD 2.0 million,
- Costs for implementation to be estimated,
- Workers' transport: 5 buses at a total cost of USD 0.8 million,
- Technical assistance in developing "site and service" housing areas is estimated at USD 1.0 million. Additional assistance will be needed for implementation of the infrastructure, and
- Costs for rehabilitation of social, sports and cultural facilities to be estimated.

The tentative total cost is estimated at USD 7.0 million.

PROJECT G-M-3 Housing for Technical Assistance Staff in Lobito and Huambo

Description

The project comprises the construction and rehabilitation of houses for technical assistance staff required for project implementation in Lobito and Huambo.

Background to and need for the Project

The possibilities of finding appropriate accommodation for technical assistance staff is almost non existent in Lobito and Huambo due to an overall shortage of housing and lack of maintenance during recent years.

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Project Components

Construction and rehabilitation of about 60 houses in Lobito and 15 houses in Huambo.

Implementation and Costs

The project must be initiated early in the Emergency Phase.

The total cost is estimated at USD 9.4 million.

PROJECT G-M-4 Rehabilitation of Hotel Terminus in Lobito

Description

Hotel Terminus was built in 1932 by Benguela Railway. The hotel has been well preserved and is a good example of the architecture from that time. The building has 20 rooms, and the restaurants can seat a total of 350 persons. A modernization and extension of the hotel is included in the project.

Background to and need for the Project

There is a general lack of hotel facilities in Lobito, and Hotel Terminus is at present the best hotel in the town. There is however, an urgent need to modernize and re-equip the building with modern sanitary installations, air-conditioning etc. and to extend the hotel to facilitate the increasing need for hotel rooms, which will occur in connection with the implementation of the 10-year Plan and increased international traffic.

Project Components

The following renovation work and building installations should be carried out:

- Installation of:
 - New kitchen equipment and laundry
 - New sanitary equipment
 - New electricity supply network
 - New air-conditioning system
 - New telephones
 - Radio, television and video
- Upgrading of the catering facilities,
- Construction of conference/banquet facilities through extensions within the existing complex,
- General repairs to the building and purchase of new furniture,
- Extension of the hotel to 50 rooms,
- Reconstruction of the manager's flat,
- Purchase of vehicles, and
- Assistance in operating the hotel.

Implementation and Costs

Implementation should be started in the Emergency Phase.

The costs are estimated as follows:

	USD million
• Improvement of existing facilities and assistance in operating the hotel	1.5
• Construction of conference/banquet facilities	0.6
• New hotel wing with 30 rooms	1.4
Total	3.5

PROJECT G-E-1 Repair and Extension of Lomaum Hydroelectric Power Plant

Description

The project comprises the installation of two sets of turbines and generators (IV and V), the repair of tubes and dam gates, and the replacement of three sabotaged turbines and generators. (I, II and III).

Background to and need for the Project

The Benguela and Huambo provinces are supplied with electricity from Lomaum and Biopio hydroelectric plants and from Biopio and Huambo thermal plants.

At present only Biopio hydroelectric plant is in operation at reduced capacity (7.2 MW). Temporary supply is to be obtained from four sets of 5 MW railborne diesel generators recently provided by France. Two generators are in operation, (Nov 1987).

Additional capacity is currently supplied from small generators distributed throughout the urban areas.

Lomaum hydroelectric plant has been sabotaged twice. In January 1983 the dam gates and tubes were damaged resulting in a complete production stop. In July 1984, generators, turbines and other electrical installations were sabotaged beyond repair.

The power plant was originally designed for five sets of generators, three of which were installed at the time of the sabotages. The two additional generators have been delivered and are ready for installation.

When five generators are in operation the capacity of the plant will be 65 MW.

The full capacity of Biopio hydroelectric plant is 14.4 MW. The two thermoelectric plants have capacities of 21.0 MW (Biopio) and 10 MW (Huambo) and are mainly used to provide reserve capacity in the dry season.

The mobile generators will be kept in reserve for power supply along the railway line.

With the full hydroelectric capacity installed the supply will be sufficient to meet requirements throughout the 10-year Plan period.

Project Components

The project comprises the following components:

- Repair of dam and mechanical equipment (dam, gates),
- Installation of generators and turbines IV and V,
- Repair and renewal of turbines and generators I, II and III inclusive of transformers and other electric equipment,

Implementation and Costs

Repair of dam, installation of generators IV and V and repair of sabotaged equipment and generators will start in 1988 with financing from Portugal (USD 10.8 million) and West Germany (USD 3.0 million). Other work should be initiated in 1988.

The total costs are estimated at USD 42 million.

PROJECT G-CE-1 Development of Lobito Town

Description

The project comprises a general upgrading and extension of the infrastructure of Lobito urban area. Items of highest priority are improvements of the water supply and the electricity distribution system. There is also a need to construct a sewage treatment plant, and to improve the sewerage network. Refuse collection and disposal systems, the maintenance of streets and the telecommunications network are other items to be dealt with.

Background to and need for the Project

The population of Lobito Urban area is at present (1987) 400,000, and the current growth rate is 10 to 15% per year. This has resulted in the fact that a large proportion of the population has settled in areas which have not been properly planned and have little or no infrastructure.

At present the most urgent project is to secure the distribution and supply of water for the town area.

In general it is necessary to upgrade and extend the entire infrastructure in order to improve the preconditions for developing residential and industrial areas, port, railway, public and commercial facilities.

Although a master plan was prepared in 1972, it was based on a population of 100,000. Consequently a new plan should be prepared taking into account the increased population.

Project Components

(i) Water supply and distribution

The total need for potable water within a five year period is estimated at 2,500 m³/h. The current supply capacity is below 1,000 m³/h. Engineering design for increasing the capacity to 1,000 m³/h as a first step has been completed and the following project components are included:

- Drilling of new boreholes and construction of a treatment plant,
- Completion of a 500 mm water main, already partly completed
- Three new pumps with a total capacity of 750 m³/h,
- Fencing of installations,
- New 500 mm water main from Barrio Africano to Bairro de Luz (3.5 km), and new reservoir and pumps for Bairro de Luz,
- Supply of water for Bairro 27 de Marco,
- Administration building and maintenance workshops, and
- Spare parts and materials.

(ii) Electricity supply

The project comprises the following components:

- Master plan for Lobito electricity supply,
- Implementation plan for short and medium term rehabilitation and upgrading of the network,
- Preparation of tender documents for equipment and implementation works,
- Implementation of the project.

Implementation and Costs

Implementation is urgently needed and should start as soon as possible.

(i) Water supply and distribution

Work on securing water supply should be carried out in the Emergency Phase.

The cost of implementing the project is estimated at USD 8.0 million.

(ii) Electricity supply

A master plan for electricity supply should be prepared within the Emergency Phase, and implemented during the Short-Term Phase.

The cost of the planning work is estimated at USD 1.0 million. Implementation costs are to be determined.

PROJECT G-CE-2 Rehabilitation of Cement Factory

Description

The Lobito cement factory, was built in 1952 and has an installed annual production capacity of about 120,000 tonnes.

The project comprises rehabilitation of the factory.

Background to and need for the Project

The cement factory is operated by ENCIME (Empresa Nacional de Cimentos) and at the beginning of 1970's produced about 125,000 tonnes annually for domestic use. The production has declined over the years, and the total production in 1986 was only 18,560 tonnes.

The rehabilitation projects included in the 10-year Plan will result in an increased demand for cement, and consequently rehabilitation of the factory to at least the original capacity is needed.

Project Components

- Study of need for rehabilitation of the factory to provide high quality cement,
- Study of raw materials, quality and availability, and
- Implementation of study proposals.

Implementation and Costs

Since cement will be needed at the beginning of the Short-Term Phase, the implementation work should be carried out the Emergency Phase period.

The costs have been estimated by ENCIME at USD 6 million. This estimate will have to be revised based on the results of the studies.

8.2 PORT AND WATER TRANSPORT PROJECTS

Included under this heading are in addition to the Lobito Port Projects also Rehabilitation of Lobito Shipyard, Improvement of the Capacity of the Coastal Shipping Company and a Maritime Security Programme.

PROJECT P-M-1 Welfare and Office Facilities

Description

The project comprises the design and construction of offices a canteen to seat 1,000 staff and cooking facilities sufficient for preparing meals for 2,000 persons per day.

The rehabilitation of 18 showers and 30 toilets and the construction of new ones at suitable locations in the Port is also included in the project.

Completion of the welfare facilities, currently under construction in an old masonry silo building, is also included in the project. It is planned that these welfare facilities should comprise a fully-equipped 210 m² medical centre with 170 m² for shower rooms and toilets on the ground floor, offices for the production department on the first floor, and meeting rooms on the second floor.

Background to and need for the Project

The welfare facilities for the port workers at present consist of a 340 m² festival hall at the top of Shed 3 and a labour union office in Building 13. There is also a very basic first aid station in Building 13.

A limited number of showers and toilets are available for port workers in various parts of the port. There are only 30 toilets and 18 showers for about 2,500 workers, figures that are far below the desirable standard.

Production department offices are also needed close to the production areas. Civil engineering works for such facilities, carried out by the port authorities, are in progress.

Project Components

The project comprises the following components:

- Design and construction of a canteen with 1,000 seats and cooking facilities sufficient to prepare meals for 2,000 persons per day, including sanitary facilities,
- Evaluation of progress on new welfare and office facilities. Drafting of plans and construction of buildings to contain a fully-equipped 210 m² medical centre, a 170 m² facility containing 42 shower rooms, 4 toilets and 10 urinals on the ground floor, and office facilities for the production department and meeting rooms etc. on the 1st and 2nd floors of the old silo,
- Rehabilitation of 18 showers and 30 toilets at different locations in the port,
- Installation of additional toilets, urinals and showers as feasible, and
- Evaluation, design and installation of the water supply and sewerage systems needed for above facilities.

Implementation and Costs

The project should be carried out during the Short-Term Phase.

The costs are estimated at:

	USD million
• Canteen	1.3
• Welfare facilities	0.9
• Showers and toilets	0.1 x)
• Water supply and sewerage	1.2 xx)
Total	3.5

x) including furniture, equipment, electrical supply

xx) including renewal of approximately 8 km of pipes

PROJECT P-M-2 Technical Assistance to the Port

Description

The project shall provide the port with management assistance for the purpose of improving operational performance, especially in the field of container handling and the handling of general cargo and maintenance.

Background to and need for the Project

The experience gained in connection with management assistance, where expatriate staff have been allocated to assist the top level management, has not been particularly good. Instead the assistance should be activity-oriented. Since there is a lack of experienced staff at all levels, the assistance is urgently needed.

Project Components

The following assistance is envisaged:

- One expert serving as the leader of a team of Angolans who are to be concerned with marketing, public relations, prices, tariff structures and other commercial and financial matters,
- A team responsible for port operation of the overseas berths consisting of:
 - One Operational Manager,
 - Two Operational Supervisors and,
 - One Electrical/Mechanical Engineer for maintenance.
- One Operational Manager for the coastal terminal,
- One Harbour Master for port operation,
- One Manager for the purchase/supply sector of the port, and
- One Expert for manpower development planning and training who will work in close contact with authorities and consultants for Project P-M-3 Port School in Lobito.

Implementation and Costs

Implementation of this programme should start as soon as possible. It is foreseen that the project should cover a five-year period with successive handing over to local staff. During this period the expert staff shall provide on-the-job training.

Towards the end of the Short-Term Phase it is envisaged that the Port School in Lobito, will give staff training courses. These courses will cover the training needs for middle managers and supervisors.

The project includes the assistance of 9 experts for a period of four to five years. The estimated costs amount to about USD 3.0 million.

PROJECT P-M-3 Port School at Lobito

Description

A proposal for a port school project is being worked out by the Angolan authorities.

The project should be divided into two phases, namely:

- 1) Establishment of a study team to assist the Angolan authorities in preparing project documents concerning both the hardware and the software part of the project.
- 2) Implementation.

Background to and need for the Project

The need for professional training of staff and workers in the port is indisputable. SATCC has carried out a study on Port Staff Training Programmes (P.3.0.2) completed in 1985. The study established the basis for port schools in Tanzania, Mozambique and Angola. Port schools have already been financed in Tanzania (Dar es Salaam) and in Mozambique (Maputo) and implementation is ongoing.

A similar school is to be established in Lobito.

Project Components

The project comprises the following components:

- Evaluation of training needs in order to establish the proper profile and duration of courses and training to be given,
- Design of school facilities, including classrooms, dormitories and equipment,
- Establishment of a management assistance team and provision of instructors, and
- Implementation.

Implementation and Costs

It is envisaged that the study phase should start within the Emergency Phase and be completed within one year, and that the school premises will be established within three years.

Management assistance and provision of instructors, are foreseen to be necessary for a period of three years after the school facilities have been made ready for use.

- The overall cost of the project is estimated at USD 5.3 million. It is expected that about half this sum will be needed for development of the software part of the project, including management assistance and provision of instructors. The other half is expected to be used for the design and construction of school facilities.

PROJECT P-CE-1 Inspection and Reinforcement of Quays

Description

The project comprises the inspection of all deep water quays, plans for repair and reinforcement as needed, and the implementation of any such repair and reinforcement work.

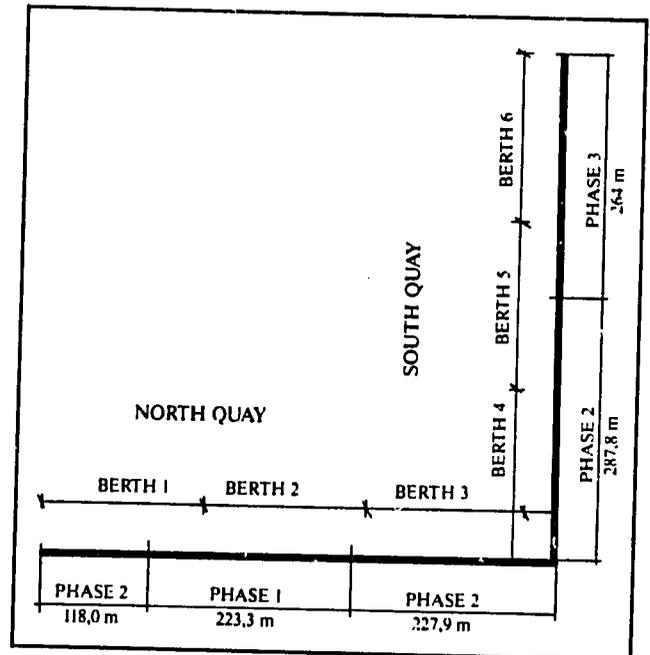
Background to and need for the Project

The design load on the quays is 3 tonnes/m², which covers all loads from railway and quay cranes.

The port has a total deep water quay length of 1,122 m, composed of a 570 m long North Quay and a 552 m long South Quay. The quays are divided into 6 berths; Berths

Nos 1, 2 and 3 along the North Quay, and Berths Nos 4, 5 and 6 along the South Quay, each berth having a length of about 180 m.

The deep water quays were built in three phases: 1922-1928, 1930-1934 and 1954-1957 respectively, as shown on the figure below, which illustrates the berth configuration and construction phases.



All the deep water quays are designed for a sea bed level of -10.5 m below hydrographic datum, which is approximately 1.1 m below mean water level, and approximately 0.4 m below lowest astronomic tide. Actual depth today varies between -10.5 m and -8.2 m.

All quays are assumed to have been occasionally subjected to heavy overloading.

The Phase 1 quay was built of 8.4 m wide rectangular concrete caissons placed side by side with a foundation level of -14.4 m. Overloading has seldom proved to be critical for such structures.

The Phase 2 quay was built as a pillar quay with concrete pillars or caissons spaced 15 m c-c. The superstructure consists of a 3 m wide strip constructed in the form of two reinforced concrete arches spanning between the pillars. A detailed inspection and possible strengthening of this quay section is recommended.

The Phase 3 quay is constructed in the form of a concrete block front structure with backfill.

Project Components

The project comprises the following components:

- Inspection of all quays,
- Design and implementation of reinforcement of pillar quays,
- New ladders, apron pavement, slabs over cable trenches and rail switches to be covered on all berths,

- Rail tracks to be repaired on Berth 4,
- Cover for oil pit to be repaired on Berth 5,
- Minor dredging works to establish design depth along all berths, and
- Proper fendering of all quays.

Implementation and Costs

Implementation should take place in the Short-Term Phase.

Project costs are estimated at:

	USD million
• Inspection of quays	0.1
• Design and rehabilitation of quays, paving, quay rail tracks etc.	15.0
• Dredging along quays	0.2
• Fendering of all quays	0.5
Total	15.8

PROJECT P-CE-2 Grain Bulk Facilities Improvement Description

The grain silo in Lobito, with a capacity of 20,000 tonnes was originally intended for export purposes, but is today only used for imports.

The objective of the project is to modify the present grain bulk handling system between quay and silo so that it becomes suitable for bulk import, using the two existing Vigan pneumatic unloaders and/or grab cranes.

Background to and need for the Project

Modifying of the existing grain bulk handling system between quay and silo will greatly reduce berthing time for grain import ships and thereby lower the berth occupancy to the general benefit of the deep sea traffic.

The silo has a capacity of 20,000 tonnes, distributed between 53 cells with tonnage varying between 160 tonnes and 550 tonnes.

Original loading equipment consists of two rail-mounted loaders running along Berth No. 5, each with a capacity of 200 tonnes/h. The equipment is in a good state of repair, and can be modified to serve import purposes.

The loaders were originally fed by two 800 mm wide belt conveyors, each with a capacity of 200 tonnes/h, running one above the other in a conveyor bridge from the silo to the quay, and then along the quay.

Today the loaders and conveyors are not in use, and unloading of grain for the silo is carried out by quay cranes with grabs, loading rail-wagons and trucks which feed an underground hopper equipped with chain conveyor and bucket elevators.

Project Components

The project comprises the following components:

- Inspection and evaluation of silo loading/unloading equipment,

- Design and implementation of a method by which the system can be alternated to serve the need for importing grain in bulk for both the Emergency and Short-Term Periods,
- Study and evaluation of the need for facilities for future imports and exports of grain in bulk, bearing in mind that import requirements can probably be satisfied by amending existing facilities, and that growth in local consumption will limit export volumes for a considerable period of time.

Implementation and Costs

The project should be implemented during the Emergency Phase.

The cost is estimated at USD 1.0 million.

PROJECT P-CE-3 New Coastal Terminal and Service Port Facilities

Description

The project consists of establishing a coastal terminal that shall occupy part of Berth No. 1 and the areas behind, which shall be expanded northwards by the construction of a 80 m long coastal quay with a ro-ro ramp.

The design depth for the new quay should be -6.0 m. The coastal terminal should be separated from the international port, and incorporate sufficient land and equipment for handling the non-petroleum coastal traffic, including offshore cargo and passenger traffic.

The project also includes the rehabilitation of the present small cabotage berth, a 150 m long bridge quay on pillars with an 8 m wide timber apron, to be used as a service berth for tugs and other floating equipment.

Background to and need for the Project

There are no special facilities or quays for the coastal traffic in Lobito. The coastal quay, a bridged quay with an 8 m wide timber apron, is not suitable for cargo handling, due to lack of space behind the apron.

The coastal traffic, made up of ships with a draught of 4.5-5 m and a length of 75-100 m, use quays with a sufficient water depth for overseas traffic.

In order to avoid the use of deep water quays for cabotage purposes the Master Plan recommends the construction of a coastal quay and a ro-ro ramp at the top of the North Quay and the establishment of a special coastal terminal fenced off from the international port.

The existing small cabotage berth, outside the port offices, will, when rehabilitated, serve as a service quay for pilot boats, line boats, tugs and other floating equipment.

Project Components

The project comprises the following components:

- Design and operational layout of the coastal terminal,
- Design and construction of new coastal quay and ro-ro ramp,

- Inspection and rehabilitation of minor part of Berth No. 1 to be included in the coastal terminal,
- Civil works on coastal terminal areas, including paving, sewerage, and lighting,
- Rehabilitation and purchase of cargo handling equipment for the operation of the coastal terminal, including purchase of pallets etc, and
- Rehabilitation of the old coastal quay to be used as a service berth for tugs and other floating equipment.

Implementation and Costs

The project is scheduled to be implemented as an Emergency Phase Project, intended for implementation within the period 1988-1989.

The costs are estimated at:

	USD million
• Coastal terminal	4.0
• Service port facilities	2.5
Total	6.5

PROJECT P-CE-4 Rehabilitation of Port Railways

Description

The project comprises repair work on the port railways needed for the handling of increased traffic, excluding tracks on quay aprons, which are included in Project P-CE-1, Rehabilitation of Quays. It also comprises purchase of 5 shunting locomotives and new railway wagons for the port, as well as the repair of weighbridges.

Background to and need for the Project

The port of Lobito has considerable shunting areas and sidings at its disposal outside the port area. These have a total track length of approximately 18 km of which 70% is administered by CFB and 30% by the port authority. Additionally there are a number of rails at the maintenance workshops, etc.

The port area has a total track length of approximately 16 km, of which 8.5 km are quay tracks and 7.5 km are approach, departure and connection tracks. These tracks are in need of maintenance, particularly the track at the edge of the quay.

The port maintenance staff has started with a certain amount of track relaying and there is a need to continue this work.

The port owns eight shunting locomotives and 41 railway wagons, and has two weighbridges with a capacity of 100 t each for railway wagons. Only two of the shunting locos are operational. The master plan envisages the purchase of 5 new shunting locos.

Project Components

The project comprises the following components:

- Evaluation of the need for port railway tracks in cooperation with the port authority,
- Determination of the amount of tracks to be repaired in cooperation with the port authority,

- Implementation of repair and maintenance of port railway tracks excluding track repair included in P-CE-1,
- Maintenance and repair of weighbridges, and
- Purchase of shunting locomotives and railway wagons.

Implementation and Costs

The project should be implemented during the Emergency Phase.

The cost is estimated at USD 2.5 million.

PROJECT P-CE-5 Study on Rehabilitation of Existing Ore Bulk Facilities

Description

A study on the rehabilitation of existing ore bulk facilities should be prepared as a separate item.

An evaluation should be made of the operational layout of existing ore bulk facility and modification of same to allow for better use of the port areas.

Background to and need for the Project

The present Berth No. 6 is equipped for the handling of ore, in particular manganese. The mechanical facilities permit a high loading capacity and a large annual throughput. The ore facilities appear to be in satisfactory working order.

The forecasts in the Master Plan indicate a throughput far below the capacity of the facilities, and the berth will have spare capacity for handling, for example, grain. If further studies conclude that it will be feasible to retain the ore facilities at Berth No. 6, minor changes to the ore facilities in the form of a relocation of the wagon tilting station and reduction of the storage area will be needed in order to clear the areas behind the new Berth 7, towards the end of the 10-year Development Plan period.

If it is decided not to resume ore handling, the ore handling facilities can be removed completely to clear Berths Nos 6 and 7.

Project Components

The project comprises the following components:

- Evaluation of the present and future needs for ore bulk handling facilities in the port of Lobito,
- Proposal for Emergency Phase rehabilitation requirements for existing ore bulk facilities,
- Evaluation of the layout of existing ore bulk facilities, and proposal for changes in order to achieve a higher degree of flexibility for the port traffic in general. Consideration should in this context be given to the situation that can be expected towards the end of the Development Plan period in the light of proposals put forward in the Master Plan, and
- Implementation.

Implementation and Costs

The rehabilitation of existing facilities is scheduled for implementation in the Emergency Phase period of the 10-year Development Plan, while layout modifications, if needed, are scheduled for implementation in the Long-Term Phase.

Project costs for Emergency Phase rehabilitation are estimated at USD 0.5 million.

Costs for Long-Term Phase modification to be estimated.

PROJECT P-CE-6 New Multipurpose Terminal

Description

The project comprises a feasibility study and preliminary design for new multipurpose berths.

Background to and need for the Project

According to the Port Master Plan a new multipurpose terminal will have to be established as a long term project. Part of the land to be used for the multipurpose terminal is at present occupied by the port ore bulk facilities. Depending on developments in traffic it is envisaged that, Berths Nos 7 and 8 will be arranged as flexible multipurpose berths with one shed of 6,000 m² at a distance of 60 m from the quay line.

The crane rails from Berth 6 will be extended on to Berths 7 and 8 in order to allow utilization of the existing cranes along the entire length of the South Quay.

However, railway loading tracks should not be extended in order to allow for unrestricted cargo handling with mobile equipment on the quay apron. One railway loading track will be available in front of the shed and two behind. These tracks are parts of the existing system, or extensions to it.

Project Components

The project comprises the following components:

- Feasibility study, and
- Preliminary engineering design

Implementation and Costs

The project is scheduled to be carried out within the Long-Term Phase.

Total costs are estimated at USD 1.0 million.

PROJECT P-CE-7 New Container Terminal

Description

The project comprises a feasibility study and preliminary design for a new container terminal.

Background to and need for the Project

The Master Plan envisages the construction of two new berths Nos 9 and 10 for establishing of a new container terminal. The quay length of berth No. 9 is proposed to be 190 m, and 200 m in the case of berth No. 10. The water depth alongside is envisaged to be -10.5 for both berths.

Project Components

The project comprises the following components:

- Feasibility study, and
- Preliminary engineering design.

Implementation and Costs

The project is scheduled to be carried out within the Long-Term Phase.

The costs are estimated at USD 1.0 million.

PROJECT P-CE-8 Coastal Protection Works

Description

The project comprises the construction of additional groins to stop the littoral drift along the sand spit, and the northward expansion of the Restinga.

Shore protection works in the bay of Lobito, especially on the harbour side of the Restinga, are also included.

Background to and need for the Project

A coastal protection scheme is currently being implemented in accordance with approved plans by the Angolan company Eciben, with technical assistance from the Netherlands. The plan involves the construction of 28 groins, 17 of which will be completed when the present financial agreement terminates in May 1988.

It is estimated that the work carried out under the agreement will have established proper shore protection on the outside of the sand spit for a period of 25 years.

A quarry producing high quality materials is situated 23 km from the construction site, and the transport of blocks and filter material by road is running smoothly.

Additional work including shore protection works on the bay-side of the sand spit, should be carried out as a continuation of the ongoing project.

Project Components

The project includes the following components:

- Construction of 11 groins according to approved plan, and
- Shore protection works on the bay side of the Restinga.

Implementation and Costs

The project should be carried out as a continuation of the ongoing works, in the Emergency Phase.

The present work has been financed by the Netherlands based on a DFL 2.5 million grant, and a contribution of DFL 8.9 million, of which 75 per cent is in the form of soft loans and 25 per cent grants.

An additional DFL 2.5 million is needed for the completion of the works.

Project costs for completion are estimated at USD 1.3 million.

PROJECT P-ME-1 Rehabilitation of Power and Lighting System

Description

The project comprises the protection of lighting poles against collision, the installation of a new emergency generator for the port and various rehabilitation works for the power supply system, in the Emergency Phase. A more comprehensive plan should be prepared for implementation in the Short-Term Phase.

Background to and need for the Project

The port and city of Lobito are supplied by a 150 KV overhead mast line from the power plants at Lomaum and Biopio.

Distribution in the city and port area is by underground cables.

The port is served by 6 substations, of which substation PT10 serves the main workshop area. From the underground substations, 3x380 V, 50 Hz cables supply the different facilities in the port.

The distribution system in the port is in a bad state of maintenance and needs a general overhaul.

The illumination of the open storage areas in the port is generally adequate, but this is not the case for the warehouses.

The emergency power station only has sufficient capacity to supply up to 8 cranes and a certain amount of illumination. This is not sufficient if night-shifts are being worked, and an increase in the emergency power capacity is recommended.

Project Components

The project comprises the following components:

- Evaluation of existing port lighting system and implementation of emergency improvements,
- Protection of all higher lighting poles against collision,
- Doubling of emergency generator capacity from 550 KVA to 1,100 KVA, and
- Drafting of plans for a more comprehensive improvement in the electrical system in the old port section, including renewal of transformers, new lighting towers, etc., and the implementation of such improvements in the Short-Term Phase.

Implementation and Costs

The implementation of the three first mentioned components above should be carried out in the Emergency Phase, and a more comprehensive plan should be prepared for implementation in the Short-Term Phase.

The cost is estimated at USD 2.5 million.

PROJECT P-ME-2 Purchase of General Port Equipment

Description

The project incorporates several minor projects recommended in the Master Plan in order to establish better order and working environments in the port, such as equipment for accident prevention, including a minimum package of fire-fighting equipment and warning systems, basic oil pollution combat equipment, and the establishment of a refuse collection system.

Background to and need for the Project

The port of Lobito only has a limited number of pallets, and pallets are rarely used for storing cargo. Cargo is stored by manual, time-consuming labour, and both port users and workers will benefit from the acquisition of more pallets. The Master Plan recommends the purchase of material for production of 10,000 pallets.

The port has some 80-100 trailers with a 5 tonne capacity, and the Master Plan recommends the reinforcement and replacement of trailers. The purchase of 30 new trailers is envisaged. The Master Plan also recommends the pur-

chase of equipment for accident prevention, a minimum package of fire-fighting equipment, a basic package for oil pollution combat equipment and the establishment of a refuse collection system.

Project Components

The project comprises the following component:

- Evaluation of the need for the above mentioned equipment in the Short-Term Phase,
- Purchase of equipment, and
- Technical assistance during implementation.

Implementation and Costs

The project is scheduled for implementation in the Short-Term Phase.

The total cost is estimated at USD 2.6 million.

PROJECT P-ME-3 Port Maintenance Workshops and Stores

Description

The project comprises the implementation of a development scheme for workshop facilities, equipment and technical assistance.

Background to and need for the Project

Along with the recommendations for procurement of cargo-handling equipment to the port, it is also necessary to strengthen maintenance workshop facilities.

The existing workshop areas are sufficient for the present operations, and are also generally in a good state of repair.

The port maintenance workshops are distributed throughout several buildings both inside and outside the port area. The location and status of workshops and stores are described in the Port Master Plan as follows:

One building, with an area of 940 m² is used as a garage for forklifts, mobile cranes and rolling equipment in general. Lubrication, oil change, fuelling, tyre changing and washing are carried out here.

The main workshops are located 550 m south of the road-bridge crossing the railway to the port and comprise a central workshop, a blacksmiths shop, a electrical workshop, a joinery workshop, a plumbing workshop, a spare parts store and a store for building materials. In addition, there is a garage for buses and a building with technical drawing offices, toilets, lockers and shower rooms.

The port has general stores in two buildings, located outside the port area, used for storage of supply cables for the cranes, spare parts for trucks and passenger cars, conveyor belts for the silo and wires for straps, etc.,

A minor electrical workshop, especially for cranes, is equipped with electrical welding material, drilling and grinding machines.

The bulk storage facilities have their own workshop with equipment necessary for maintenance of the bulk facilities. This workshop is also used in maintenance of the floating equipment.

Project Components

The project comprises the following components:

- Evaluation of existing workshop facilities,
- Elaboration of a development scheme for workshop facilities and spare parts storage management to cope with the development of the port,
- Purchase of equipment needed for the workshops development, and
- Provision of technical assistance and training for the workshops.

Implementation and Costs

The project is scheduled for implementation during the Short-Term Phase.

Project costs are estimated as follows:

	USD million
• Tools and equipment	1.0
• Workshops rehabilitation	1.0
• Basic stock of spare parts	0.5
• Technical assistance with training, including office equipment	1.0
Total	3.5

PROJECT P-ME-4 Mobile Cranes, Rehabilitation and Scrapping Programme

Description

The project comprises the evaluation of existing mobile cranes in order to establish a scrapping/rehabilitation programme, and the need for purchase of new mobile cranes. Technical assistance and training should be included in the project.

Background to and need for the Project

The Port of Lobito has 38 mobile cranes, with lifting capacities from 3.5 tonnes to 150 tonnes. All mobile cranes are diesel-powered, and about 14 units were out of use in 1985. The majority of the cranes were purchased in 1975 or earlier, and their state of repair is only acceptable to bad.

A rehabilitation/scrapping programme should be introduced along with a programme for replacement.

The Master Plan envisages the purchase of 4 new mobile cranes.

Project Components

The project comprises the following components:

- Evaluation of existing mobile cranes,
- Establishment of a rehabilitation/scrapping programme,
- Purchase of new mobile cranes, and
- Technical assistance on the operation and maintenance of mobile crane park.

Implementation and Costs

Implementation and costs are scheduled as follows:

	USD million
• Investment during Emergency Phase	1.0
• Investment during the remaining part of the development plan	2.0
Total	3.0

PROJECT P-ME-5 Floating Equipment

Description

The project comprises the development of a scheme for the maintenance of floating equipment and a programme for replacement. Purchase of equipment shall be included in the project, as well as technical assistance.

Background to and need for the Project

The port has three tugs, two line boats, one pilot boat, three barges and one floating crane. The floating crane, manufactured in 1965, has a lifting capacity of 100 tonnes at a 12 m extension.

A small dredger has sunk but the general state of maintenance of the remaining boats and floating equipment is good.

It is envisaged that there will be a need for one new tug, one new small dredger, and a major overhaul of the floating crane during the Master Plan Period.

Project Components

The project comprises the following components.

- Evaluation of the condition of the floating equipment,
- Establishment of a maintenance and replacement scheme, taking into consideration the possible use of ESTALNAVE Shipyard (See P-ME-9),
- Evaluation of the need to acquire new equipment, and purchase of such, and
- Provision of technical assistance.

Implementation and Costs

The project is scheduled to be implemented in the Long-Term Phase

The total cost is estimated at USD 5 million.

PROJECT P-ME-6 Shipyard Rehabilitation

Description

It is envisaged that a rehabilitated shipyard could conduct maintenance work and construct vessels for the fleet owned and operated by the coastal shipping company Cabotang, as well as for other coastal trading vessels.

Rehabilitation work has already started. Additional assistance is needed for its completion.

Background to and need for the Project

The shipyard is located on the south shore of the bay, approximately 2 km east of the city centre. It is the only major service industry related to the port, and the major shipyard in Angola.

At present ESTALNAVE repairs national vessels and fishing vessels from other nations.

The shipyard occupies an area of approximately 12 hectares and employs a labour force of 720, of whom 150 are casual labour.

In addition to a number of permanent buildings and installations, the shipyard has 4 slipways up to 75 m long with a capacity of up to 1,000 tonnes and a floating dock with a capacity of 2,200 tonnes.

The shipyard has all kinds of mechanical workshops, a computerized stock, salary and cost control system, and is operating its own school for the training of workers and specialists. At present, the technical assistance to ESTALNAVE consists of 28 Portuguese, technicians and specialists, and a team of 12 persons financed by the USSR.

Project Components

The project comprises the following components:

- Rehabilitation and extension of the shipyard in order to increase;
 - Maintenance capacity for the fleet operated by the coastal shipping line Cabotang, other coastal vessels and vessels for offshore activities,
 - Capacity for construction of new vessels for the coastal trade.
- Evaluation of the requirements of deep sea vessels for shipyard assistance in Lobito, and proposals for measures to be taken in order to enable the shipyard to meet such demands,
- Implementation including the preparation of tenders for rehabilitation and extension works.

Implementation and Costs

Implementation should start within the Short-Term Phase. The costs are estimated at:

	USD million
• Purchase of a second-hand floating dock with a capacity of 10,000 tonne	8.5
• Construction of deep water quay	2.0
• Housing facilities for workers	2.8
• Repair of existing floating dock	0.2
• Completion of ongoing quay construction	0.1
• Dredging on site for new floating dock	0.7
• Paving of 7,000 m ²	0.1
• Rehabilitation of mechanical workshop	0.2
• Safety equipment	0.1
• Production equipment	0.2
• Purchase of additional computer and miscellaneous	0.1
Total	15.0

PROJECT P-S-1 Improvement of the Capacity of the Coastal Shipping Company

Description

The purpose of this project is to upgrade the services provided by the Angolan coastal shipping company, Cabotang. The project includes a technical and commercial assistance scheme for the adequate use of present tonnage as well as the supply of a proper tonnage for the coastal trade.

Background to and need for the Project

Most of the inter-port traffic in Angola is operated by Cabotang. The coastal trade primarily takes place between Lobito and Luanda. Coastal tankers supply Lobito with petroleum products from Luanda. Other coastal traffic through Lobito consists mainly of the small scale inward movement of manufactured and processed products from Luanda. The outward movement from Lobito is far less than the inward movement, and consists of salt, cement and some redistribution of international imports to the

coastal communities mainly located to the south. During the 1970's, the coastal traffic was around 300,000 tonnes annually. The Angolan authorities expect Lobito to play an important role as a base for international routes with feeder shipments to/from minor ports along the coast, and special consideration should therefore be given to the coastal shipping.

In 1982 the coastal traffic through Lobito was 170,000 tonnes, of which 50% was petroleum products shipped from Luanda.

The project is supported by Project P-CE-3 New Coastal Terminal and Service Port Facilities.

The biggest coastal ship, "Lenine", that used to account for 30% of the volume shipped from Lobito, is no longer in operative condition and the need for proper vessels is urgent. It is envisaged that vessels for the coastal trade could be constructed at the ESTALNAVE shipyard in Lobito. Rehabilitation of the shipyard is included as Project P-ME-6, in order to provide both repair and construction facilities.

The Cabotang coastal fleet, as per 1984/85, consisted of the following vessels:

Name	GRT	NRT	DWT	Max length m	draft m	Construction year
Lenine	3359	1798	4388	104	6.5	1961
Karl Marx	1156	534	1570	79	4.6	1960
Engels	1179	547	1785	75	4.0	1961
10 de Dezembro	500	410	575	53	2.1	1980
11 de Novembro	500	410	575	53	2.1	1980
Huila	569	249	870	59	3.7	1972
Cabang I	495	238	630	56	3.4	1967
Lunda	498	248	870	59	3.7	1972
Kalua	199			51	2.4	1956
Kahama			500			1984
Albano			500			1984

"Lenine" is no longer in operation. "10 de Dezembro" and "11 de Novembro" are equipped with bow ramps which facilitate ro-ro operation. The passenger ship "Kalua", takes up to 500 passengers, but the facilities on board are not designed to accommodate this number of passengers. The ship is at present out of operation, but in a repairable state.

In 1984/85 two ships, Kahama, and Albano, each of about 500 dwt, were put into operation, mainly for the transport of petroleum products.

The purchase of additional ferries for passenger/ro-ro traffic is envisaged in order to replace the ships, Lenine, Karl Marx, Engels and Kalua. Two ferries have been bought in the Netherlands and will start to operate passenger traffic along the coasts in December 1987 and March 1988, respectively.

Projects Components

The project comprises the following elements:

- Evaluation of the fleet size needed for coastal shipping,
- Assistance to the shipping line by providing commercial, operational and technical personnel, and training.
- Evaluation of the need for and execution of repair work on existing fleet.
- Evaluation and implementation of fleet extension either by chartering vessels or constructing new ones.

Implementation and Costs

Implementation should take place in the Short-Term Phase.

The project costs are estimated to be USD 8 million.

PROJECT P-MS-1 Maritime Security Programme

Description

The project comprises the rehabilitation and renewal of the navigational aids for the port of Lobito and the approaches to the port.

The initial stage of the project should consist of an evaluation of existing equipment, workshop, and acetylene plant, in order to establish a crash programme to be implemented in the Emergency Phase as well as the planning of a permanent system to be implemented in the Short-Term Phase.

A comprehensive plan for the system layout should be worked out and implemented as a second step. The plan shall take into account, the need for rehabilitation of fixed and floating structures, hydrographic survey works in order to identify and mark navigational hazards and proper positions of buoys for the entrance, for the anchorage area, and for approaches to factories situated in the bay.

Background to and need for the Project

The proper functioning of navigational aids is essential for reliable navigation and marine safety. The need for proper marking of the entrance to the port is emphasized by reports from the pilots of ships which have run or nearly run aground.

The approach to the port of Lobito is guided by the Lobito Lighthouse, the Restinga beacon and four buoys in the bay.

All the lights are powered by acetylene gas and are out of order most of the time due to lack of gas supplies. Two buoys mark the anchorage area, and another is situated at the entrance to the channel leading to the shipyard. The first two are only lit for certain periods owing to shortage of gas supplies, while the channel buoy has been replaced by a smaller buoy without a light.

Fixed installations for loading/unloading petroleum products have been established in part of the former anchorage area.

At the Sonangol oil berth, five mooring buoys are equipped with battery powered lights, but which are not operational due to lack of batteries.

The navigational aids are the responsibility of the National Directorate for Merchant Shipping and Ports, and the local executive authority is the Capitania do Porto do Lobito, which is responsible for the navigation aids in the three southern provinces. The Capitania has office in Lobito and operates a workshop and an acetylene gas factory in Benguela.

The gas factory is in operational condition, and sufficient gas bottles for the existing installations exist. Lack of raw material and transport, however, make supplies to the installations irregular.

Nine new buoys, sufficient for a crash programme for navigational aids in the port of Lobito, have been supplied from Cuba. These buoys are stored in the port.

As part of the national plan for rehabilitation of navigational aids, new lighthouses for the fixed installations along the coast, complete with batteries and solar panels, were purchased from Sweden in the early 1980's, along with a new acetylene-powered lighthouse for the Lobito Lighthouse. This purchase forms part of the national plan for rehabilitation of navigational aids.

The equipment for the Lobito area is stored in the workshop in Benguela and is apparently in good condition, but has not yet been installed due to lack of technical capacity.

Project Components

The project comprises the following components:

- Collection of available hydrographic data and performance of necessary additional survey works in order to establish the basis for a new plan for navigational aids in the bay of Lobito,
- Identification of new installations and hazards to navigation in order to update the information available on existing sea charts,
- Establishment and implementation of an emergency plan for the navigational aid system by means of equipment already existing, and supply of spare parts and technical assistance needed for such implementation,
- Establishment and implementation of a permanent plan for navigational aids, taking into consideration the existing equipment and installations,
- Recommendations on organization of the services needed for operation of installations serving the port of Lobito, including requirements for transportation, workshops, training, technical assistance, spare parts and social conditions for the workers, and
- Implementation of a comprehensive plan for navigational aids, including training and technical assistance.

Implementation and Costs

A crash programme based on available equipment, purchase of spare parts and supply of technical assistance should be implemented in the Emergency Phase, at a cost of about USD 0.5 million.

A comprehensive plan for the rehabilitation should be prepared and implemented during the Short-Term Phase, at an estimated cost of about USD 1.0 million.

Total costs: USD 1.5 million

8.3 BENGUELA RAILWAY PROJECTS

PROJECT R-M-1 Manpower Development Plan Study

Description

The project covers a study aimed at establishing the present manpower resources of the CFB and identifying the manpower requirements during the different phases of rehabilitation and the future requirements in order for the network to be operated efficiently and economically. The project comprises a study to formulate the best manpower development plan in order to meet the above requirements, and a strategy for implementing the plan. This includes identifying the level of training of the present staff, the strategy for hiring educated staff (locals when possible) and training them, and establishing the technical assistance needed to operate the railway until the new staff is gradually brought into the organization.

The Manpower Development Plan should be implemented through projects R-M-3 Railway Training Assistance and R-M-4 Technical Assistance for Operation of the Railway.

Background to and need for the Project

Before the closure of the line there was a staff of about 11,500, including about 4,000 supervisors and skilled labourers (or 35% of the staff), many of whom were foreigners. The training was carried out by the training centre at Lobito and the apprentice school at Huambo. Since the interruption of international traffic, many engineers, graduates, supervisors and skilled labourers have left.

By September 1987 the composition of the staff was as follows:

Age	Board of Directors	Super-visors ¹⁾	Technicians and Skilled Labour	Clerks & Workers
under 30	—	5	33	814
31-40	1	33	48	934
41-50	1	98	28	1,801
51-60	2	108	27	1,367
over 61	1	27	10	403
Total	5	271	143	5,319

Total number of employees - 5,737

1) Managers 3, Heads of Department 12, Station Masters 87

Source: Personnel Department CFB

It appears that 69% of the staff are over 40 years old, and that there are only 400 Supervisors and Skilled Labourers. In addition, 60% of the workforce has no schooling at all, and only 20% have received more than one year of primary education.

The descriptions of the other projects included in the 10-year Development Plan make it clear that the railway is going to be thoroughly rehabilitated. It is expected that

with mechanized maintenance and dieselization the total staff will be kept lower than it was before the closure of the railway.

Project Components

The project is composed of the following items:

- Studies of how the work force was organized before the closure of the line for international traffic, and the strategy of hiring, training, and promotion that was applied in the past,
- Studies of the present resources, their evolution, the ability of the current staff to carry out the tasks they are expected to perform and their ability to-follow a course of training successfully,
- Estimation of the staff needed to implement the Emergency Phase, rehabilitation work, operation and train working order for the work trains, and subsequently the number and proficiency of staff needed to implement the other two phases,
- Estimation of the staff needed to start the operation of limited international traffic (89-92) and, subsequently, full service,
- Estimation of the final number and proficiency of staff needed to operate and maintain the network after its full rehabilitation. Definition of the final organization, and the different positions,
- Preparation of a plan for training the present staff and recruiting and training the complementary skilled staff needed. This plan shall take into account the normal aspiration of educated staff to make a career. Therefore the evolution of the staff in the long run shall also be estimated,
- Preparation, together with the managers, of a proposal for management organization, the position and responsibility of each manager, the need to recruit qualified engineers, selection of the present supervisors who could be trained to become managers, definition of the training of the future managers. Introduction of measures to involve present and future managers in the implementation of the manpower development project,
- Definition of the different training courses, their objectives and number of trainees. Preparation of plans for how training shall be undertaken, including the need for facilities, equipment and technical assistance. As it will take time to implement the Manpower Development Plan the study shall include a proposal on the need for technical assistance staff to be assigned in order to operate the railway during the three rehabilitation phases and beyond until the future staff is able to take over fully, and
- Estimation of the annual costs for staffing the railway.

Implementation and Costs

It is especially important that the staff required for implementing the 10-Year Development Plan and for starting the international traffic is known at an early stage. Thus related items shall be undertaken as a priority study in the Emergency Phase. It is assumed that it will be possible to carry out the Emergency Phase over a period of six months and that the entire project can be completed in two years.

The total cost is estimated at USD 1.5 million.

PROJECT R-M-2 Upgrading and extension of Computer Facilities

Description

The project includes replacement of the existing computer in Lobito by new equipment and the purchase of computers to be used in Huambo and at main stations along the line.

Background to and need for the Project

The head office of the Benguela Railway was once well equipped with computer facilities used for accounting, personnel management, project co-ordination and recording of stocks. The computer used at that time and still being used is an IBM 360 installed at the beginning of the 1970's. Data processing is currently carried out by a staff of six persons concerned with programming and hardware maintenance.

The computer is now old and outdated and needs to be replaced by modern equipment. There is also a need to extend the use of computers to railway operation and especially wagon control. The Huambo workshop and store need to be computerized. Furthermore, computer facilities need to be installed in main stations along the line.

Project Components

The project comprises the following components:

- Purchase of computers for the central data processing unit at the head office to be used for accounting, salaries, personnel management, project coordination and for servicing the port of Lobito,
- Installation of a message switch with 50 lines for internal telex operations along the line,
- Study on implementation of a computerized wagon control system and the need for computer equipment for this purpose,
- Study on the use of and need for computers to be installed in Huambo for workshop and store management and at main stations along the line,
- Supply, installation and commissioning of the computers, and
- Technical assistance as needed for the development of software and staff training for operation and maintenance of the system.

Implementation and Costs

The implementation will start during the Short-Term Phase. The wagon control system and other parts of the computer operation that are dependent on the extension of railway telecommunications should be phased with Project R-ST-1, which is foreseen to be implemented at the end of the Short-Term Phase.

The costs are estimated at:

	USD million
• 20 PCs and support equipment	0.3
• Message switch for 50 lines	0.2
• Technical assistance, 2 manyears	0.4
Total	0.9

PROJECT R-M-3 Railway Training Assistance

Description

Based on the results of Project R-M-1, this project includes upgrading of the present training centre, construction of

new training facilities with equipment and supply of the training assistance staff in order to train part of the present staff and all the new staff to be hired in the coming years. In addition, this project includes the training of instructors.

Background to and need for the Project

The Lobito Training Centre has sufficient capacity to train and accommodate 80 trainees, but most of the buildings are in a very poor condition. Even at present — with very limited services — there is a lack of skilled staff for the overhaul of rolling stock (locomotives and wagons) and for maintenance of the track.

The implementation of the 10-year Plan and the reopening of the line for international traffic will result in a considerable need for training and employment of staff. This project facilitates to a large extent the implementation of Project R-M-1, which will determine the need for railway training and assistance.

Project Components

The project comprises:

- Upgrading and improvement of the railway training centre in Lobito, and the construction of new facilities.
- Construction of new training centres that will be decided on the basis of the results Project R-M-1,
- Supply of training facilities and equipment to these centres, as well as the other training facilities used by the railway,
- Technical assistance for training of the staff and for implementing training schemes,
- Scholarships, and
- Training of local instructors with the aim that they should be able to take over gradually and as soon as possible.

Implementation and Costs

The project will start in the Emergency Phase.

The costs are estimated at:

	USD million
• Upgrading and Improvement of the Lobito School	1.8
• Construction of new training facilities	2.2
• Training equipment and scholarships	2.0
• Training of supervisors and executives	5.0
• Education of training instructors	4.0
Total	15.0

PROJECT R-M-4 Technical Assistance for Operation of the Railway

Description

The aim of this project is to provide technical assistance for the operation and management of the railway through the allocation of funds for recruiting staff to fill vacant posts in the CFB organization and for continuing the hiring of technical assistance staff currently provided by Portugal.

The technical assistance support needed for rehabilitation works is included in the capital investment projects and is thus not covered by this project.

Background to and need for the Project

Since 1974, the CFB has lost half its staff. Several key positions are at present vacant in the head office administration. This is especially the case in the Technical Department, in which the posts as Head of the Mechanical Section and Head of the Section for Permanent Way and Works are vacant.

The Technical Department will have the overall responsibility for the implementation of the capital investment projects and the long term integration of these projects in the railway's normal activities. Consequently it is important that this department should be fully staffed in the Emergency Phase and that Angolan nationals are trained to eventually take over from the technical assistance staff. The Traffic Department also needs additional staff to operate the increased traffic that is foreseen.

In addition several supervisory posts are vacant for operation and maintenance of the railway.

Project Components

The detailed need for management and supervisory staff will be studied in Project R-M-1, the recommendations of which should serve as the basis by which this project, i.e. R-M-4, should provide funds for technical assistance. The recruitment of staff will be made by CFB in agreement with the financier. A preliminary estimate made by CFB indicates that 40-50 persons are needed. The staff will include Engineers, Managers and Supervisors for traffic operation, supply and workshops.

In addition to the normal tasks the technical assistance staff shall train and introduce Angolan staff to the work so that they can take over gradually and efficiently as soon as possible.

Implementation and Costs

The assistance should start during the Emergency Phase and is foreseen to continue over a six year period.

Based on the CFB's previous experience on costs for expatriate personnel from Portugal the manyear cost is assumed to be USD 40-50,000. Assuming a total of 250 manyears, the cost is estimated at USD 12.5 million.

PROJECT R-M-5 Improvement of the Railway Hospitals

Description

The project includes upgrading and extension of the railway hospitals in Lobito, Huambo and Luena, and provision of medicine, equipment and medical staff.

Background to and need for the Project

Benguela Railway has its own health service for the use of the railway staff and their families. This service is planned to be extended to include the port staff and their families. The population served by these hospitals will be about 60,000 persons including all family members. Since the closure of the railway for international traffic, the hospitals have only a very limited supply of medicine and equipment. Also the medical staff has decreased; there is only one doctor at Lobito and none at all at Huambo and Luena.

Taking into account the very limited health service provided by the government and the need to serve an even larger staff as soon as the railway and port are opened for international traffic, it is clear that there is a need to improve the existing health service.

Project Components

The Emergency Phase comprises the following components:

- Medical assistance;
 - Three medical doctors and one surgeon for Lobito hospital,
 - One medical doctor for Huambo hospital,
 - One medical doctor for Luena hospital,
- Assistance to the pharmacy at Lobito Hospital;
 - Technical staff,
 - Medicine,
- Assistants and nurses for Lobito hospital,
- Medical equipment for all hospitals,
- One ambulance,
- Air-conditioning,
- Kitchen, laundry, bedclothes, etc., and
- An assessment of the long-term need of staff, medicines, buildings and equipment.

The components to be included in the Short-Term and Long-Term Phases should be based on the assessment made in the Emergency Phase. It is envisaged however, that the following main components will have to be included;

- Additional medical staff at Lobito, Huambo and Luena,
- Extension of Lobito hospital from 100 to 200 beds in order to cover the need of the Lobito port staff,
- General upgrading of hospital buildings,
- Modernization of medical equipment, and
- Ambulances and other vehicles.

Implementation and Costs

Taking into account the limited resources available for public health services the project should be given priority.

The cost of the very limited supply of medicine is currently USD 0.5 million per year.

The cost of obtaining an adequate supply of medicine will be about USD 1.0 million per year.

A tentative cost estimate for the Emergency Phase is USD 6.0 million.

The Short and Long-Term costs are to be estimated.

PROJECT R-OP-1 Motive Power, Rolling Stock and Operation Plan

Description

The project consists of a survey of alternative methods of train operation and motive power and rolling stock requirements to achieve the most efficient and economic operation of the forecast traffic.

The project shall also identify crossing loops which will be in excess of the operating requirements when diesel traction is used and determine which loops will require lengthening.

Background to and need for the Project

A Regional Study of Railway Rolling Stock has already been carried out under SATCC Project No. 2.0.1, Project R-ME-1 includes the rehabilitation of locomotives and acquisition of locomotives for the forecast traffic while Project R-ME-2 comprises the rehabilitation of rolling stock. The operation plan aim at providing a long-term plan for the acquisition of locomotives and rolling stock.

Taking into consideration the above developments, a comprehensive operation plan shall be made based on diesel traction throughout the line. The plan shall include proposals on improvements to the yards, crossing loops and a programme for the acquisition of locomotives and wagons based on the operation plan, taking into consideration the track spot realignments and regradings as proposed in projects R-CE-5 and R-CE-6.

Projects Components

The Motive Power, Rolling Stock and Operation Plan shall cover the following aspects:

- Train plans, working timetables, crewing rotas etc. based upon the use of diesel traction throughout the length of the line,
- Optimum loads and lengths of trains,
- Assessment of the number of manned stations and intermediate crossing loops required and identify surplus loops and loops which should be lengthened or relocated,
- Determination of the costs and benefits of local realignments and regrading,
- Assessment of required motive power and rolling stock, with phased plan for new acquisitions, taking into account the rehabilitation programmes, and
- Carry out site surveys and design loop extensions.

Implementation and Costs

The project should be implemented in the Emergency Phase.

The cost is estimated at USD 0.4 million.

PROJECT R-CE-1 Track Repair and Upgrading

Description

The implementation of this project is to be carried out over the three project phases.

During the Emergency Phase sufficient repairs will be carried out to enable the line to be opened to through freight traffic, using diesel locomotives.

Before the Emergency Phase work can commence the quarries (Project R-CE-2) and timber sleeper plants (Project R-CE-3) will have to be in operation. It is understood that financiers for these projects have already been contacted, negotiations are in hand and it is envisaged that a contract for the supply and installation of the required plants will be signed in the near future.

The upgrading programme will commence during the Short-Term Phase, the primary task being to replace all substandard timber sleepers and 60 lb/yd rails. It may be preferable to upgrade the track using concrete sleepers, in which case it will be necessary to examine the cost benefits of establishing a concrete sleeper production plant capable

of producing 300,000 sleepers per year. The alternative is to continue with the production of timber sleeper at a rate of approximately 200,000 per year.

By the end of the Short-Term Phase, it is envisaged that the line will have been rehabilitated to a sufficiently high standard to permit at least four pairs of trains to pass along the line, at a reasonable speed, every day.

During the Long-Term Phase, the first objective will be to upgrade the line to a sufficiently high standard to facilitate the movement of 3.0 million tonnes of traffic per annum by 1995. By the end of this phase all sleepers and all remaining light weight rails will have been replaced by 45 kg/m rail and badly curved sections realigned and/or regraded.

Background to and need for the Project

The line is constructed from a mixture of BS 60A/N (254 km), CFB 60 (838 km) BS 80A (98 km) and BS 90A (138 km) rails, and most of the line is laid on timber sleepers. As no maintenance work or sleeper replacement has been carried out during the period of disruption, the vast majority of sleepers will need replacement before the track is usable. The 60 lb/yd rail is too light to carry the proposed 20 tonne axle load traffic and in many sections, particularly on curves, the rails are worn to an unacceptable degree even for light axle load traffic.

A review of the alignment and gradients on the line will also be necessary to determine which sections can be economically realigned and/or regraded. In this context the section between Sambu and Huambo (189 km) has already been identified as a section which would benefit from realignment. Other sections will require detailed survey and careful analysis to determine the benefits which can be achieved from realignment and the total cost of the work involved.

Project Components and Implementation

Emergency Phase (1988-1989)

This phase will be carried out in the shortest possible time by using materials which are already available in Angola and maintenance equipment which can quickly be repaired and put into service. (See Project R-CE-4).

The phase comprises the following components:

- Recovery of serviceable material from the old Benguela to Cubal line and from the Cuima branch line,
- Emergency repairs to bridges and culverts,
- Replacement of worn out rails where necessary by laying serviceable 60 lb/yd and new 80 lb/yd rails ex stock. Total length approximately 100 km,
- Installation of 350,000 new sleepers,
- Installation of 40,000 sleepers ex stock or recovered,
- Laying of 100,000 m³ of ballast
- Laying of 40 new turnouts ex stock,
- Welding of 70 km of relaid rail,
- Investigation and, if essential, strengthening of piers on the viaduct at Cubal,
- Supply and installation of 200,000 rail fastenings (to timber sleepers),
- Clearance of overgrowth from formation and drainage channels,

- Replacement of defective rail lubricators (approximately 50),
- General lining and levelling with particular regard to curves and rail joints, and
- Provision of technical assistance to supervise the work (40 manyears).

Short-Term Phase (1989-1992)

During the Short-Term Phase the upgrading work will concentrate on the worst sections of the track. The replacement of the CFB 60 lb/yd rail with 45 kg/m rail will be carried out in parallel with resleepering, using either concrete or timber sleepers. The programme of spot resleepering will continue in order to maintain the other sections of the line in a reasonable state of repair.

The Short-Term Phase comprises the following components:

- Laying of 350,000 m³ of ballast,
- Supply, installation of and weld 1,085 km of 45 kg/m rail, (equal to 542.5 km of track),
- Spot resleepering of 175,000 timber sleepers,
- Supply and laying of sleepers, either (a) 752,000 timber or (b) 1,032,500 concrete.
- Supply and laying 70 turnouts in 45 kg/m rail,
- Permanent repairs to bridges, lineside buildings and staff quarters,
- Continued programme of lining, levelling and rehabilitation of drainage channels etc.,
- Provision of technical assistance to supervise the work (125 man-years), and
- Execution of minor realignment/regrading projects. (See Project R-CE-6.)

Long-Term Phase (1993-1997)

Within this phase the relaying of the track will be completed to a high standard and realignment and/or regrading will be carried out on the section of the line between Cubal and Huambo. (See Project R-CE-5.)

The Long-Term Phase includes the following components;

- Laying of 350,000 m³ of ballast,
- Supply, installation and welding of 1,085 km of 45 kg/m rail,
- Supply and laying of sleepers, either (a) 752,000 timber or (b) 1,032,500 concrete.
- Supply and laying of 70 turnouts in 45 kg/m rail,
- Realignment and regrading of Cubal-Huambo section (approx. 75 kms), and
- Provision of technical assistance to supervise works (80 manyears).

Project Cost

The project costs are estimated to be as follows:

	USD million
Emergency Phase	
• Repair work	4.0
• Technical assistance	3.2
Total	7.2
Short-Term Phase	
• Upgrading work (timber sleepers used)	45.2
(concrete sleepers used)	77.4

• Technical assistance	9.8
Total	
(timber sleepers used)	55.0
(concrete sleepers used)	87.2

Long-Term Phase

• Upgrading work (timber sleepers used)	39.8
(concrete sleepers used)	72.0
• Realignment Cubal-Huambo	50.0
• Technical assistance	8.0
Total	
(timber sleepers used)	97.7
(concrete sleepers used)	130.0

Total costs for all phases

(timber sleepers used)	159.9
(concrete sleepers used)	224.4

PROJECT R-CE-2 Establishment of Quarries

Description

The project comprises the establishment of ballast quarries in order to provide a supply of ballast for the rehabilitation of the line.

Background to and need for the Project

During the construction and for the subsequent maintenance of the line ballast was provided to the Railway by contractors. The majority of the route has been ballasted to a depth of 210 mm below sleepers and shoulder ballast is adequate. Due, however, to the severe climatic conditions, rapid growth of weeds and lack of maintenance in recent years, the existing ballast is badly contaminated and requires cleaning and supplementing with new ballast.

Good quality granite is available from various sites adjacent to the railway between Lobito and Kuito. It is estimated that approximately 750,000 m³ of ballast is required during the repair and upgrading phases.

For the basic requirements of the project two semi-mobile crushing plants will be needed, each with an output of at least 30 m³/h (50-60,000 m³/year). Similar capacity could be achieved using a larger fixed crusher but semi-mobile crushers will allow greater operational flexibility in that they can be sited at intervals along the route or moved progressively as rehabilitation of the track proceeds, thus reducing the problems of transporting ballast over long distances.

It is envisaged that at the peak of the rehabilitation work the output from the railway quarries will have to be supplemented by supplies from contractor owned and operated quarries.

The provision of the required ballast hopper wagons is included in Project R-ME-2.

Project Components

The project comprises the supply etc. of the following:-

- Two semi-mobile crushing plants including conveyors, screens and power plants,

- Drills, compressors, loading shovels and dump trucks,
- Spare parts for eight years' operation, and
- Technical assistance to install, operate and maintain the equipment and to train local staff. (5 manyears.)

Implementation and Cost

The semi-mobile plant and support equipment should be supplied as soon as possible and the second as soon as the emergency phase commences.

The project cost is estimated to be

	USD million
Plant and spares	6.0
Technical assistance	0.4
Total	6.4

PROJECT R-CE-3 Sleeper Production Plants

Description

The purpose of this project is to establish sleeper production plants with a sufficient capacity to produce a total of 2 million sleepers during the repair and upgrading phases.

The option of constructing a concrete sleeper factory for the supply of concrete sleepers to be phased with rerailing of the line with 45 kg/m rail, as a long term development, is to be considered.

Background to and need for the Project

In the past, timber sleepers have been produced from local forests. The sawmills were located in the Luena region and the cut sleepers were transported to Huambo for treatment. The quality of the timber varies but a minimum sleeper life of 12 years has been achieved in the past.

It is intended that the main source of timber sleepers during the repair and upgrading phase will be Cabinda. With the support of local contractors, plans have been prepared for the establishment of a sawmill in Cabinda capable of producing 200,000 timber sleepers per annum and other semi-finished timber products and furniture. The sleepers will be shipped from Cabinda to Lobito and then transported to Huambo for treatment.

The Luena plant is well located for the supply of sleepers for the eastern end of the line and it will supplement the output from Cabinda. After the repair and upgrading phases the Luena mill will provide sleepers for routine maintenance of the line if the concrete sleeper plant is not built. The treatment plant at Huambo has limited output and for the repair and upgrading of the eastern end of the line, the need to transport large numbers of sleepers to Huambo for treatment is uneconomic. It is therefore proposed that a treatment plant should be established at Luena.

Project Components

1. Timber sleeper plants

The project comprises the following components:-

- Supply of equipment to facilitate production of sleepers in Cabinda Province,
- Rehabilitation of buildings and infrastructure, overhaul of machinery and installation of a new saw at Luena sawmill,
- Supply and installation of a sleeper treatment plant at Luena,

- Overhaul of the sleeper treatment plant at Huambo,
- Provision of spare parts for 4 years' operation of the sawmills and treatment plants, and
- Technical assistance to overhaul/install equipment and train staff in the operation of the plants (6 manyears).

2. Concrete sleeper factory

As a supplementary project, a review is to be made of the viability of constructing and operating a concrete sleeper factory. If the use of concrete sleepers, instead of timber sleepers, is found to be financially advantageous to CFB the project will include the following components:

- Evaluation of the best location of the factory,
- Design of the factory,
- Construction of the plant and the setting up of the factory,
- Supply and commissioning of the necessary machinery and equipment, and
- Technical assistance during the setting up phase and during the first seven years of production.

Implementation and Cost

The installation of the Cabinda sawmill and the rehabilitation of the Luena sawmill and Huambo treatment plant should commence as soon as possible.

If the concrete sleeper option is shown to be advantageous the new factory should be commissioned in time to commence the supply of concrete sleepers concurrent with the start of the re-railing project.

The estimated project costs are:-

	USD million
1. Timber sleeper plants	
• Equipment and machinery for Cabinda sawmill	1.5
• Overhaul of Huambo treatment plant	0.1
• Rehabilitation of Luena sawmill	0.5
• Installation of new treatment plant at Luena	0.25
• Spare parts for four years of operation	0.15
• Technical assistance (6 manyears)	0.5
Total	3.0
2. Concrete sleeper factory	
• Study, design and construction of factory	4.0
• Technical assistance	1.3
Total	5.3

PROJECT R-CE-4 Track Maintenance Equipment

Description

The project provides for the supply and commissioning of track maintenance equipment and for the appointment of personnel to maintain the equipment and train operatives.

Background to and need for the Project

Due to the prevailing situation in Angola very little track maintenance has taken place over the last 10 years and some of the maintenance machinery and plant has been lost or is now life expired.

Three large Matisa tamper machines and a ballast regulator are owned by CFB. These are in fairly good condition and only minor overhaul is needed. Initially the

three tampers will be sufficient, but as the length of rehabilitated track increases and the traffic grows, one new tamer will be required. When sufficient depth of ballast has been laid in the track and the track has been upgraded, a ballast cleaner will be required.

Project Components

There will be a requirement in all phases for heavy plant such as traxcavators, bulldozers, lorries, dump trucks, backhoes, loaders and weed sprayers.

Technical assistance will be required to overhaul the plant already owned by CFB, to operate the specialized equipment and to train staff. (25 manyears.)

Emergency Phase

- Overhaul of the three Matisa tamping machines and the ballast regulator,
- General repairs to recovered, re-usable plant.
- Supply and commissioning of:

- 15 Platelayers power-driven trollies with trailers
- 10 Rail saws
- 6 Rail drilling machines
- 6 Sleeper drilling machines
- 50 Heavy duty track jacks
- 2 Handling cranes (on track)
- 3 Hand tamping units
- 20 Rail benders (jim-crows)
- 20 Hand trollies
- 20 Sets rail welding equipment
- 3 Ultrasonic rail testers

- General supply of shovels, forks, tools for removing-/replacing nuts, coach-screws, etc.

Short-Term Phase

The requirements for the full rehabilitation and long term maintenance of the line will necessitate an enhancement of the basic requirements quoted above;

- The principal additional equipment is as follows:
 - 1 Tamping machine
 - 5 Platelayers power-driven trollies with trailers
 - 6 Rail threaders/rollers, etc.
 - 2 Accelerometers
- General increase in the supply of small plant and tools.

Long-Term Phase

- 1 Ballast cleaner

Cost and Implementation

The supply of spare parts for the urgent repair and supply of equipment required for the Emergency Phase should be commenced as soon as possible, plus technical support to supervise and assist in the overhaul of equipment.

The total project cost is estimated to be:

	USD million
Emergency Phase:	
• Track maintenance equipment	1.5
• Overhaul plant	1.5
• Heavy plant	2.0
• Technical assistance	1.2
Total	6.2
Short-Term Phase:	
• Track maintenance equipment	2.0
• Heavy plant	2.0
• Technical assistance	1.3
Total	5.3
Long-Term Phase:	
• Heavy plant and track maintenance equipment	2.0
• Technical assistance	1.3
Total	4.5
Total Costs all Phases	16.0

PROJECT R-CE-5 Realignment Design - Cubal to Huambo

Description

A study of the potential for realignment of the section between Cubal and Huambo has been carried out. The section between Sambu (234 Km) and Huambo (382 Km) was identified as a section which would benefit from realignment. This project is for the engineering design of the realignment works.

Background to and need for the Project

In 1974 a new cut-off route was opened from the coast to Cubal, known as the Cubal Variant. From Negrao, 14.6 km south of Lobito, the new line runs almost directly to Cubal. The ruling gradient on this line is 1.25%. However, along the section from Cubal (Km 153) to Huambo (Km 382) the ruling gradient is up to 2% (between Bongo and Calenga) and there are 150 curves with a radius less than 200 metres. Regrading and realignment will make it possible to increase the trailing loads, reduce the journey time and the wear on rails, tyres and brake blocks.

Project Components

The project components are:

- A review and evaluation of the previous studies on the proposed realignment,
- Ground survey and identification of optimum alignment, and
- Engineering design of the sections to be reconstructed. (implementation will be carried out within Project R-CE-1.)

Implementation and Costs

It is proposed that the review and design work should be carried out during the Emergency Phase.

The cost is estimated to be USD 0.6 million.

PROJECT R-CE-6 Realignment Study - Huambo to Luau

Description

The purpose of this project is to determine the justification for realignment or regrading of sections of the line between Huambo and the Angola/Zaire border.

At selected sites, where the alignment or gradient imposes a constraint on line speed, studies should be carried out to determine the cost and subsequent benefit of realignment or regrading. The annual savings and the rate of return should be identified and where civil engineering works are justified, a detailed realignment design should be prepared.

Background to and need for the Project

The line has already been realigned between Lobito and Cubal and, under Project R-CE-5, it is proposed that the improved alignment and grade should be extended to Huambo.

Between Huambo and the border the ruling gradient does not exceed 1:80 (1.25%) but there are over 350 curves with a radius of less than 400 m, with a cumulative length of approximately 19 km. These curves necessitate speed restrictions which lead to excessive fuel consumption, longer journey times, reduced line capacity etc.

Project Components

The study comprises the following components:

- Review of alignment by utilizing the line construction plans, line sheets and available mapping to carry out a desk exercise to identify curves which place a constraint on train operations,
- Carry out a detailed survey of the relevant curves and the surrounding topography, by means of either land or aerial surveying,
- Prepare realignment schemes in sufficient detail to establish construction costs,
- Establish the benefits of the realignment and carry out a cost benefit analysis, and
- Where realignments are justified, carry out detailed realignment designs and prepare contract documents.

Implementation and Cost

The project should be carried out during the Emergency Phase in order that the realignments can be completed at the same time as the upgrading works during the Short and Long-Term Phases.

The project cost is estimated at USD 0.4 million.

PROJECT R-ST-1 Train Control System and Telecommunications

Description

The purpose of this project is to re-establish a system of train control throughout the length of the line by means of a VHF/UHF microwave system serving selected major stations and providing a direct link to all train drivers. Subsequently the system would be extended to include all stations, with the potential for further upgrading.

Background to and need for the Project

The existing train control, radio and land line telecom-

munications systems are either in a poor state of repair or have been totally destroyed.

The VHF/UHF system of radio control which operated via microwave transmitter/receiver on the Cubal Variant section of the line proved to be very successful and a highly reliable service. The only constraint on this system of train control is that it relies on the train driver obeying the instructions of the controller and there is, therefore, room for human error. This system of control does, however, work quite successfully on many railways where the density of traffic is low and therefore does not justify the introduction of more sophisticated systems.

There have been many technological advances in railway radio control systems in recent years and it is therefore proposed that any replacement or new microwave system should be suitable for upgrading in the future to a full radio electronic token block system.

Project Components

The Project includes the following measures and partial renewal of facilities in order to re-establish a train control system.

Emergency Phase

- Survey of communications in order to establish the extent of damage and potential for temporary reinstatement. Repair of the VHF/UHF link on Lobito-Cubal section,
- Establishment of an automatic exchange central at Lobito,
- Establishment of an additional control centre at Huambo,
- Between Cubal and Huambo:
 - Supply and erection of microwave aerials/repeaters at strategic locations for VHF/UHF system,
 - Supply and installation of receiver/transmitter equipment at selected stations,
 - Repair or replacement of electricity supply to select stations possibly utilizing solar panels,
 - Provision of technical assistance to train staff in the use and maintenance of the equipment, and
 - Repair or replacement of the radio sets on board the locomotives working on the Lobito-Huambo section.
- Provision of technical assistance.

Short-Term Phase

- Completion of the works undertaken in the Emergency Phase,
- Between Huambo and Luau (Zaire Border):
 - Supply and erection of microwave aerials/repeaters at strategic locations (main stations),
 - Supply and installation of receiver/transmitter equipment at those stations,
 - Repair or replacement of electricity supply at those stations, and
 - Repair or replacement of the radio sets on board the remaining locomotives.
- Provision of technical assistance.

Long-Term Phase

The Long-Term Phase of the Project is to extend the control system to all stations.

- Supply and installation of receiver/transmitter equipment at additional stations.

- Installation of electricity supplies to all stations, possibly by means of solar panels.
- Provision of technical assistance.

Cost and Implementation

The project should be commenced as soon as the security situation permits in order to provide communications with, and control of, engineering trains and the re-established commercial traffic.

The project costs are estimated to be:

	USD million
Emergency Phase	
• Establishment of microwave VHF/UHF to all main stations between Lobito and Huambo	2.2
• Technical assistance	0.8
Total	3.0
Short-Term Phase	
• Extension of the microwave VHF/UHF to all main stations between Huambo and the border	7.1
• Technical assistance	1.7
Total	8.8
Long-Term Phase	
• Upgrade the VHF/UHF links to serve all stations	1.7
• Technical assistance	1.0
Total	2.7
Total costs all Phases	14.5

PROJECT R-ST-2 Telephone Exchanges, CFB and Lobito Port

Description

The purpose of this project is to replace and extend the existing old telephone exchanges using the latest digital PABX technology. To be connected to the national and/or the railway telecommunications network.

Background to and need for the Project

There is existing Strowger and crossbar telephone exchange (PABX) equipment at Lobito, Caimbambo, Cubal, Huambo, Kuito, Luena and Luau which is old and in need of extension and replacement. Lobito port has an old small manual switchboard.

The service provided is very unreliable due to the obsolescence of the equipment and lack of spare parts for maintenance. Furthermore, the staff lacks the expertise to maintain the service as the equipment is unavailable for training courses.

The Strowger equipment has reached beyond its working life and needs constant attention.

There are also a number of small manual switchboards at lineside stations used for local telephone extensions. These switchboards and telephone sets are fairly old and need replacement.

The existing and proposed size of automatic telephone exchanges is as per the following table.

CENTRE	EXISTING TYPE	EXISTING CAPACITY	PROPOSED CAPACITY
Lobito Port	Manual	10	150
Lobito CFB			
Headquarter	Crossbar	180	300
Lobito Control			
Centre	Manual	30	80
Cubal	Manual	30	50
Huambo	Strowger	100	200
Kuito	Manual	10	50
Luena	Strowger	50	100
Luau	Manual	10	50

It is proposed that digital PABX's be provided making use of the latest proven technology.

Project Components

The project involves the supply, installation and commissioning of new digital PABX at Lobito, Cubal, Huambo, Kuito, Luena and Luau with the provision of small exchanges catering for telephone extensions to the Port and stations along the railway consisting of:

- Switching equipment and telephone extensions,
- Power system and appropriate air conditioning,
- Installation and commissioning,
- Spares for maintenance, and
- Technician training.

Implementation and Costs

The cost estimate for the project is USD 0.6 million, and implementation is required to be completed by 1990.

PROJECT R-ME-1 Rehabilitation and Acquisition of Locomotives

Description

The purpose of this project is to complete the rehabilitation of seventeen damaged and out-of-service U-20-C main line diesel electric locomotives by the end of the Emergency Phase and to provide additional main line and shunting locomotives in the Short-Term Phase.

Background to and need for the Project

The total traffic along the line is assumed to be in the order of 3 million tonnes in 1995. For this traffic, assuming 1,5 million tonnes of international traffic, 30 to 34 locomotives will have to be in operation. Thus the total fleet should be at least 40 locomotives.

Many of the main line locomotives are damaged or out of service due to lack of spare parts. In the Emergency Phase, CFB has to put into service main line locomotives both to provide motive power for the service trains and for any available traffic. Some of the locomotives are so severely damaged that they will have to be withdrawn from service. However, it is possible, provided sufficient materials, repaired assemblies and technical assistance are made available, for the less severely damaged locomotives to be repaired at Lobito, notwithstanding the limited workshop facilities. This will give a sufficient number of locomotives for service traffic and limited international services at the beginning of the Short-Term Phase.

In the Short-Term Phase, an order will be placed for the supply of ten U-20-C main line diesel electric locomotives to replace those which cannot be economically repaired and to ensure adequate motive power for full-scale international traffic at the beginning of the Long-Term Phase. In addition, six diesel shunting locomotives will be required to undertake the duties now performed by the steam locomotives at Huambo and the older diesel shunting locomotives.

Project Components

Emergency Phase

Rehabilitation of seventeen locomotives has commenced but financing is required for the following components to complete the project:

- Supply of spare parts,
- Shipment from GE (Brazil) of supply of spare parts,
- Machines and assemblies for repair and refurbishment, and
- Provision of technical assistance for repair of locomotives.

Short-Term Phase

- Supply and delivery of ten U-20-C diesel electric locomotives,
- Supply and delivery of six shunting locomotives.

Costs and Implementation

	USD million
Emergency Phase	
• Technical services, spares and repair of equipment	2.5
Short-Term Phase	
• Supply of ten main line locomotives	13.5
• Supply of six shunting locomotives	4.0
Total	20.0

PROJECT R-ME-2 Rehabilitation and Acquisition of Rolling Stock

Description

The purpose of this project is to carry out a detailed inspection of the rolling stock fleet, establish a rehabilitation/scrapping programme and supply new wagons, passenger coaches and service vehicles as required for the traffic.

Background to and need for the Project

The railway administrations of Angola, Zambia and Zaire have an agreement that a nil imbalance in the interchange of wagons should be maintained. Based on the above agreement and the anticipated traffic levels in 1990, the SADCC Rolling Stock Study of 1983 determined that there was an overall demand for nearly 1,000 new wagons on the CFB as shown below:

Wagon type	New wagons required	Replacement of scrapped wagons	Total
High sided	535	109	644
Low sided	—	22	22
Covered	—	23	23
Container	230	—	230
	765	154	919

259 new wagons have been supplied to the CFB since this study was made.

The existing fleet will have to be examined to determine which wagons can be economically maintained, and a revised scrapping/rehabilitation programme drawn up. It is anticipated that over 500 units will require modernization and a further 300 major rehabilitation.

40 ballast wagons will be required for Project R-CE-4 Track Maintenance. Iron ore wagons are available, surplus to requirements, from the Mocamedes Railway. If these are considered satisfactory for ballast work, they can quickly be transhipped to Lobito.

A similar inspection of the passenger and service vehicles is required. It is anticipated that the majority of the passenger stock fleet will be beyond economic repair and will have to be replaced. The CFB has provisionally estimated the need for 52 coaches and 6 parcel/brake vans.

The current availability of rolling stock is given in Paragraph 3.2.6.

Project Components

Emergency Phase

- Technical assistance to inspect all rolling stock and prepare a rehabilitation programme,
- Inspection of iron ore wagons on Mocamedes line (CFM) to ascertain condition and suitability for operation as ballast wagons, and
- Supply of 40 ballast wagons (only if the iron ore wagons are not suitable for ballast).

Emergency and Short-Term Phases

- Technical assistance in the rehabilitation of approximately 800 wagons,
- Supply of spare parts.

Short-Term and Long-Term Phases

- Supply and commissioning of about 700 freight wagons over a 6-7 year period,
- Supply and commissioning of 52 passenger coaches,
- Supply and commissioning of 6 parcel/brake vans.

Costs and Implementation

The project should be commenced as soon as possible in order to ensure that sufficient rolling stock is available to transport the anticipated increase in traffic during the 10-year Plan Period.

The estimated cost of the project is:

	USD million
• Spares	1.0
• Freight wagons	39.0
• Coaches	20.0
• Brake vans	1.4
• Technical assistance	3.6
Total	65.0

PROJECT R-ME-3 Completion of Diesel Workshop and re-equipment of a Wheel Shop at Huambo

Description

The objective of this project is to complete the construction of the new diesel workshop at Huambo and to provide equipment for the wheelshop, including wheel lathes, wheel press, vertical lathe, and induction tyre heater.

Background to and need for the Project

Facilities to carry out repairs to diesel locomotives were being provided at Huambo and a new repair shop was being constructed alongside the main workshops. Construction work was interrupted and the delay in completion of this work is putting a very heavy load on the diesel maintenance shop at Lobito, which is now providing both repair and maintenance facilities for which it was not designed or equipped.

Although Lobito will be able to rehabilitate diesel locomotives which are not too severely damaged (Project R-ME-1) and will be upgraded (Project R-ME-5), it is necessary for the Huambo diesel shop to become fully operational at an early stage of the programme, to relieve Lobito of its workload and to use the diesel shop for stripping locomotives and removing assemblies. All heavier work such as wheel turning will be carried out in the main workshops, which will need to be reequipped with complete wheel and axle repair equipment to replace that sabotaged.

In order to reduce the time during which the locomotives are out of services and to ensure the quality of repairs, the diesel shop will not carry out more than the minimum repairs but will replace and fit repaired assemblies and spare parts. The main workshop will be responsible for the repair of heavy and light assemblies.

There is an adequate technical training facility in Huambo and this will need to be restaffed, modernized and re-equipped.

Project Components

The project comprises the following components:

- Completion of diesel workshop construction,
- Supply and installation of machinery in diesel workshop
- Supply and installation of machinery in wheel shop,
- Recommissioning of training school, and
- Provision of technical assistance to train staff in workshop practices.

Costs and Implementation

The project should be commenced as soon as possible, particularly in view of the urgent need for the major repair and rehabilitation of many of the locomotives.

The project cost is estimated to be:

	USD million
• Workshop and equipment	3.6
• Training school	0.5
• Technical assistance	2.9
Total	7.0

PROJECT R-ME-4 Conversion of the Steam Depot at Luena to a Diesel Maintenance Depot

Description

The steam depot building at Luena is to be converted into a facility for the checking, servicing and maintenance of diesel locomotives.

Background to and need for the Project

As dieselization of the line moves eastward, a facility will be required between Huambo and the Zaire border for the servicing and maintenance of diesel locomotives.

It is proposed that the existing steam depot be converted. A study will be necessary in the first instance to establish the layout and facilities required, taking into consideration the number of locomotives which will eventually be allocated to the depot.

Project Components

The project covers:

- Study to determine conversion layout, facilities and costs, and
- Implementation.

Costs and Implementation

The project should be implemented prior to the extension of dieselization to the region during the Short-Term Phase.

Cost estimate

	USD million
• Fuelling facility	0.2
• Maintenance depot	0.5
• Machinery	0.3
Total	1.0

PROJECT R-ME-5 Workshop Facilities at Lobito

Description

The project comprises the expansion of the workshop facilities in Lobito to maintain the enlarged fleet of diesel locomotives and the new track maintenance equipment.

Background to and need for the Project

The facilities in Lobito were designed for the maintenance and servicing of 10 main line and 5 diesel shunting locomotives.

Instead of the work being confined to inspection, servicing and scheduled maintenance of the locomotives operating in the coastal regions, heavy repairs and other duties are being carried out for which the shop is not adequately equipped and does not have suitable capacity.

Extensions to the depot and workshops will be required to cater for the additional workload and the projected increase in the number of locomotives operating in the region. A new workshop will also be required for the maintenance of existing and the new track maintenance equipment being provided under Project R-CE-4.

Project Components

The project components comprise:

- Completion of the rehabilitation and modification of the existing Lobito locomotive depot, and

- Provision of a new workshop for the repair, inspection and servicing, etc. of track equipment.

Costs and Implementation

This project should be commenced in the Emergency Phase and be completed as soon as possible.

Cost estimate

	USD million
• Lobito depot expansion	0.3
• Track maintenance plant depot	0.25
• Machinery	0.05
Total	0.6

PROJECT R-ME-6 Review and Acquisition of Spare Parts and Reorganization of Main Stores

Description

The project provides for a detailed review of the requirement for spare parts, a stock-taking of the existing stores, updating of the recording system, acquisition of the necessary spare parts, not included in projects R-ME-1 and 2, and reorganization of the main store buildings in Lobito and Huambo.

Background to and need for the Project

The two main stores are located at Lobito and Huambo. Since 1975, very few stores have been purchased and the level of stocks is not adequate for the efficient operation of the railway.

Project Components

Within Projects R-ME-1 and 2, reviews of the requirement for spare parts will be carried out. This requirement will be compared with a full inventory of the spares in stock and a purchase schedule will be prepared. In addition to the short term requirements, for Project R-ME-1 and 2 it will be necessary to acquire a stock of spares for future maintenance.

Technical assistance for review, updating and operation of the stock recording system, and also for the reorganization of the main stores buildings in Lobito and Huambo, should be provided.

Costs and Implementation

The project should be implemented in the Short-Term Phase. An estimate of the cost of the project will be made during the Emergency Phase, but a notional estimate is USD 10.3 million of which the cost for technical assistance and training is about USD 1.7 million.

PROJECT R-ME-7 Rescue Equipment and Accident Prevention Programme

Description

The project comprises the acquisition of four sets of re-railing equipment and the establishment of an accident prevention team.

Background to and need for the Project

The emergency repairs and rehabilitation of the track will take time to accomplish and before this is completed, it is anticipated that there will be a higher than average number of minor derailments.

It is proposed that four sets of re-railing equipment be purchased and that each set be carried in a fully equipped rail/road vehicle to enable access to the site with the minimum of delay. The equipment will include a powered hydraulic unit, control panel and connecting hoses to the hydraulic jacks. Each set of equipment will be strategically situated along the line.

In an endeavour to reduce the number of accidents, it is proposed that an accident prevention team be established, whose particular task will be to examine all accidents, determine the causes and institute the necessary actions or precautions to reduce the possibility of similar accidents being repeated.

Project Components

The project comprises the following:

- Supply of four sets of re-railing equipment, and
- Technical assistance to establish an accident prevention team and to institute safety and accident prevention proceedings.

Costs and Implementation

The project should be implemented within the Short-Term Phase.

The costs are estimated to be as follows:

	USD million
• Four sets of re-railing equipment	0.3
• Technical assistance for 4 years	0.8
Total	1.1

PROJECT R-ME-8 Installation of 21 Automatic Barriers

Description

Automatic barriers are to be installed at railway/road crossings in urban areas.

Background to and need for the Project

The safety at open level crossings in urban areas has to be improved to reduce crossing accidents.

A survey will be required to ascertain the local conditions at each crossing, and the most effective type of barriers to be supplied and installed.

Project Components

The project comprises the following components:

- Survey of the urban locations, and
- Supply and installation of the barriers.

Costs and Implementation

The project should be implemented in the Short-Term Phase. The cost for the survey, supply and installation is USD 1.6 million.

PROJECT R-ME-9 Study on Improvement of Specialist Workshops in Huambo

Description

With the completion of the diesel workshop and the supply of workshop equipment under Project R-ME-3, it will

be necessary to re-assess the workshop facilities previously used for the repair of steam locomotives and rolling stock, and their future use in the repair and maintenance of diesel locomotives and of old rolling stock.

Background to and need for the Project

The repair of steam locomotives and old rolling stock necessitated a wide range of activities which will no longer be needed to the same extent. It is essential that better use be made of the existing facilities in the main workshop area. The various workshops will be studied, e.g. blacksmiths, foundry, machine shop, wood working shop, and the requirements established for the repair and overhaul of diesel locomotives and modern rolling stock.

Project Components

A study should be carried out covering all sections of the workshops to establish facilities to be retained - new machinery and equipment deemed necessary, the layout of areas for the individual workshops and the costs.

Costs and Implementation

The implementation shall follow the completion of Project R-ME-3.

The estimated cost for the study is USD 0.1 million.

PROJECT R-E-1 Electrical Supply and Distribution Systems for Lobito, Huambo, and Luena

Description

The study is to investigate the present distribution systems where the equipment, cables and wiring have been installed for over 40 years, to establish the extent of rehabilitation required to bring the systems up to modern standards, and to provide lighting in stations and supplies to the railway properties not connected to the national grid system.

Background and need for the Project

The ages of the electrical systems and reduced maintenance and renewals over the past years give rise to concern. The modernization and extension of the Lobito and Huambo workshops, and the conversion of the Luena depot to diesel locomotive maintenance, gives an opportunity to examine the present systems and to establish criteria for future developments, taking into account modern electrical supply and distribution practises.

Project Components

The project includes:

- Technical assistance for a study of the supply and electrical distribution systems at three centres, to establish the extent of upgrading required, together with costs, and
- Provision of electricity supply as proposed in the study.

Implementation and Costs

Since reliable electricity supply will be needed for new and extended workshop facilities provided under other projects, the study and implementation must be coordinated with the implementation of these projects.

The estimated cost of the study is USD 0.3 million. A national cost for implementation is estimated at USD 1.5 million.

8.4 TELECOMMUNICATIONS PROJECTS

PROJECT T-M-1 Technical Assistance to ENATEL

Description

The purpose of this project is to provide the ENATEL organization in the Benguela/Lobito area with technical assistance in order to improve operational co-ordination and maintenance.

Background to and need for the Project

The Lobito railway corridor covers the provinces of Benguela, Huambo, Bié, and Moxico and is served by the following telecommunication systems and plant:

- Troposcatter systems
- Analogue microwave systems
- Electromechanical Strowger type switching systems

Implementation of the following projects in the region of Benguela/Lobito and along the railway line is expected in the next five years:

- Microwave link Benguela/Lobito through Huambo onto Luau.
- Spur routes and rural exchanges along the Lobito-Luau Corridor.
- Upgrading of troposcatter links.

The operational capability of ENATEL in the Benguela/Lobito area will have to be expanded and improved in order to cope with the maintenance problems and to utilize the facilities offered by the new systems.

ENATEL is planning the establishment of a training school in Luanda (SATCC Project 5.1.6) which will provide courses for the training of technicians. Contracts with equipment suppliers provide for technician training in maintenance and operation of the new systems.

There is also a need to interface the neighbouring telecommunication administrations with regard to routine operation and maintenance in order to meet international communications standards.

Project Components

The project aims to provide manpower and logistic support to ENATEL in the Lobito area consisting of:

- One maintenance expert to assist the Regional Manager in Benguela/Lobito,
- One transmission expert to assist in the maintenance of the microwave links to and from Lobito and Benguela,
- One external plant expert to assist in the co-ordination of the maintenance and operations of external plant network in the Benguela/Lobito area,
- Training of regional and international technicians and telephone operators in the use of English, and
- Three four-wheel drive vehicles.

Implementation and Costs

The project should commence in 1989 initially for a two-year period.

The cost estimate is USD 2.5 million.

PROJECT T-PT-1 Microwave Link Benguela/Lobito-Huambo-Luau along Benguela Railway

Description

The purpose of the project is to establish direct telephone and telex circuits between Benguela, Lobito, Ganda, Huambo, Kuito, Luena, Luau and other intermediate localities along the Benguela Railway.

The project will also form part of the PANAFTEL Network to interconnect the Standard A Earth Station and International Exchange at Lobito/Benguela rail head to the SADCC countries through Luena onto Zambia.

Background to and need for the Project

At present a 960 channel microwave link is used for telecommunications between Benguela and Lobito with troposcatter connections to Huambo and Kuito via Conde. Luena is connected onto the national troposcatter network through Saurimo and Malange. Luau on the Zaire border is connected through Luena by an old HF system. ENATEL has plans to upgrade the connections through the provision of high capacity microwave radio systems linking Benguela, Lobito, Huambo and Kuito along the railway line. It is proposed to extend this link from Kuito to Luau.

Project Components

The project will be carried out in two phases. Phase I will consist of the provision of the radio equipment for the Benguela/Lobito to Kuito link. It has been surveyed and defined by ENATEL and will comprise:

- Benguela-Huambo, two terminal stations with five intermediate repeaters
- Huambo-Kuito, two terminal stations with three intermediate repeaters, and
 - provision of high capacity 960 channel microwave radio system including multiplex
 - antenna systems including towers
 - power systems
 - spares
 - civil works — buildings for terminal and repeater stations
 - access roads
 - training technicians for maintenance of the system
 - installation and commissioning

Phase II of the project will comprise the provision of a 960 channel microwave radio linking Kuito through Luena onto Luau along the railway line and will consist of a feasibility study and implementation of the project that will be defined from the study. The study will determine:

- Technical parameters and recommendations with respect to:
 - Kuito-Luena two terminal stations and six repeaters
 - Luena-Luau two terminal stations and seven repeaters
- Traffic analysis, and
- Financial assessment

This part of the project will include the provision of equipment to extend the telecommunications services on to Lubumbashi in Zaire, and an interconnection at Luena for through traffic to Zambia and the rest of the SADCC countries on the PANAFTEL network.

Implementation and Costs

The project extends from Benguela/Lobito to Luau on the Zairean border. ENATEL have plans for the provision of a microwave link up to Kuito. This will form a basis for Phase I of the project at a cost of USD 4.4 million and should be implemented before 1990.

The extension of the link from Kuito to Luena and Luau along the railway line is not fully defined by ENATEL. A feasibility study is required to determine the detailed requirements along the route before project implementation. This part of the project will cost USD 7.0 million and is to be implemented by 1992.

PROJECT T-PT-2 Spur Routes along the Benguela/Lobito-Luau Corridor

Description

The purpose of the project is to provide the main villages along the railway line with telecommunications services. The telecommunications will be for public use and will also service manned railway stations along the route.

Background to and need for the Project

The National Telecommunications Plan by ENATEL up to the year 2005 includes the provision and implementation of spur routes connecting provincial centres with surrounding districts and upgrading and replacement of the associated switching and local networks.

Currently, provincial centres are interlinked mainly by troposcatter radio systems, and most district centres are inadequately connected to the national and provincial transmission networks.

The table below provides a list of the manned railway stations related to the provision of the local network. Also indicated are the primary and secondary telephone areas.

Telephone areas and manned railway stations

Secondary	Primary	Railway stations	Local	From the railway less than km
Benguela	Benguela	Caimbambo	Caimbambo	50
		Cubal	Cubal	50
		Ganda	Ganda	50
Huambo	Huambo	Bailundo	—	50
		Ekunha	—	50
		Katchiungo	Katchiungo	50
		Longonjo	Longonjo	50
		Mungo	Mungo	50
		Tchikala—	Tchikala—	
		Tcholoha	Tcholoha	50
		Tchindjendje	Tchindjendje	50
Kuito	Kuito	Ukuma	Ukuma	50
		Camacupa	Camacupa	50
		Catabola	Catabola	50
		Chinguar	Chinguar	50
		Chitembo	—	160
		Cuamba	Cuamba	50
Luena	Luena	Cunhinga	—	50
		Luau	Luau	100

Project Components

The project will consist of a survey to determine the detailed requirements for, and installation of, small capacity VHF/UHF radio systems, concentrators, remote subscriber stages and/or multi access radio systems connecting the localities to the railway trunk network.

Implementation and Costs

Project implementation is expected during 1990-1993. The cost estimate is USD 5.9 million.

PROJECT T-PT-3 Extension/Rehabilitation of Switching and Outside Plant along the Corridor

Description

The project consists of the rehabilitation, replacement and extension of the switching and outside plant in centres and localities along the Benguela/Lobito corridor.

Background to and need for the Project

The telephone switching and outside plant in many centres and localities along the railway line need rehabilitation, replacement and expansion. The equipment to be rehabilitated and expanded consists of old Strowger equipment in most local exchanges along the route, crossbar pentaconta and Ericsson ARM equipment. A rehabilitation and expansion programme is taking place in some parts of the country and ENATEL is considering similar programmes for localities along the railway line and is currently carrying out rehabilitation and expansion at Kuito and Luena. The following table shows the switching facilities and requirements forecasts to the year 2000.

Centre	Existing capacity	Planned capacity	Junctions/trunks
Benguela	2 200	6 000	400
Lobito	3 000	6 000	300
Ganda		800	40
Cubal		700	40
Caimbambo		200	20
Boccoio		300	20
Bailundo		400	40
Katchiungo		200	18
Longonjo		150	20
Tchikala-			
Tcholoha		200	24
Ukuma		150	20
Huambo	2 200	5 000	300
Kuito	1 000	3 000	280
Camacupa		300	30
Catabola		200	20
Chinguar		150	20
Luena	1 000	1 000	74
Luau		200	18

Project Components

The first part of the project will involve the supply and installation of switching equipment for the central and local exchanges along the route comprising:

- Switching equipment,
- Power system and air conditioning equipment,
- Installation and commissioning, and
- Training of technicians.

The second part will comprise the supply and installation of local distribution outside plant including:

- All necessary foreign materials,
- Installation machinery and equipment,
- Installation and construction services, and
- Training.

Implementation and Costs

Implementation is required to be completed by 1990 for the provincial and central exchanges and the rest by 1995.

The cost is estimated at USD 9.1 million.

PROJECT T-PT-4 Rehabilitation of Troposcatter Link Malange-Saurimo-Luena-Zambia

Description

At present Angola has no terrestrial links to neighbouring countries and the proposed system would provide communication circuits through to Zambia and thus a connection to the PANAFTEL Network. The project consists of the rehabilitation of the Malange-Saurimo-Luena troposcatter system, which is out of order, and an extension of the link from Luena into Zambezi (Zambia).

Background to and need for the Project

Without microwave links to neighbouring countries or marine cable links, Angola is dependent on satellites for virtually all its international connectivity.

There is a limited amount of 960 channel microwave (6 GHz) radio linking Luanda with Malange and Uige via N'dalatando. All other provincial centres connect to the national network using tropospheric forward scatter links. The baseband capacity of the troposcatter systems range from 24 channels to 300. Many of these links are relatively new except for the Malange-Saurimo-Luena link, which is out of service and in need of rehabilitation.

The Malange-Saurimo link is vital to communication from Luanda to the Angolan interior. The existing Malange-Saurimo communication system consists of 3 troposcatter hops; a 300 channel link from Malange to Kabatukila, a 120 channel link from Cabatukila to Cacolo and finally a 120 channel link from Cacolo to Saurimo. At present the Malange-Saurimo system is not operational at either the Cabatukila or Cacolo troposcatter stations.

At present Angola has no terrestrial links to neighbouring countries. Luena is the only appropriate station on the Angolan telecommunications transmission network in close proximity to Zambia. The proposed system would provide and extend communication circuits from Luena, along the Benguela line, through to Zambia and thus a link with the PANAFTEL Network to the SADCC countries and East Africa.

Project Components

Route Feasibility Survey

In the case of the Malange-Saurimo-Luena link, rather than re-establishing the Cabatukila to Cacolo link the project will involve the survey and feasibility of two alternatives for consideration:

- A 120 channel troposcatter link from Cabatukila to Saurimo or,
- A 120 channel troposcatter link from Caculama to Saurimo.

Technical evaluations of these options will need to be made based on the relative cost and security considerations.

For the Luena (Angola)-Zambezi (Zambia) link the feasibility study is to determine:

- The technical parameters and recommendations with respect to sites which includes:
 - Radio path propagation profile between Luena and Zambezi,
 - The position of terminal stations and/or repeaters,
 - The approach links to the terminal stations,
 - Power source,
- Traffic analysis, and
- Financial assessment.

Depending on the results of the above surveys, the project implementation will include the following:

- Civil works construction including access roads where appropriate
- Provision of troposcatter equipment including the antenna systems
- Installation and commissioning of the system, and
- Training of technicians for the maintenance of the system.

Implementation and Costs

Feasibility studies are required as soon as possible and project implementation and commissioning shall be completed by early 1989.

	USD mill.
• Feasibility study for rehabilitation of Malange-Saurimo-Luena	0.05
• Feasibility study of Luena to Zambezi link	0.1
• Equipment: supply, installation and commissioning	0.8
• Civil works	0.3
• Training	0.05
• Total	1.3

PROJECT T-PT-5 Microwave Link Luanda-Benguela/Lobito

Description

The project involves the provision of a large capacity microwave link between Luanda and Benguela/Lobito and form the main backbone of the PANAFTEL link to the towns in Southern Angola.

Background to and need for the Project

At present service from Luanda to towns in southern Angola, including Benguela, Lobito and Namibe is via a 300 channel troposcatter system. The system is due for expansion to 600 channels (SATCC Project 5.1.7).

The troposcatter system has limited expansion capability up to 600 channels. This capacity expansion is not adequate to cater for growth in both national and international traffic.

Angola is also expanding the distribution network for TV transmission to the provincial centres. The troposcatter system does not provide a satisfactory level of quality and capacity for TV signal transmission.

Hence it is proposed that the troposcatter system be replaced by a large broadband capacity microwave link.

Project Components

The route via Sumbe has been surveyed. Some equipment for the link was procured by ENATEL a few years ago and is in storage. It was not installed due to security considerations. The project will initially involve:

- Survey of the stored equipment to determine its suitability for installation,
- Provision of 2 + 1,960 channel radio system, with one of the radio bearers for TV transmission,
- Antenna systems including towers,
- Power systems,
- Spares,
- Civil works,
- Access roads,
- Training technicians for maintenance of the system, and
- Installation and commissioning.

Facilities at Luanda, Sumbe, Benguela and Lobito will be required to service intermediate spurs.

Implementation and Costs

The cost of the project is estimated at USD 2.3 million and the link should be installed and ready for service by the end of 1995.

PROJECT T-MC-1 Provision of HF Radio Maritime Communication to Lobito Harbour

Description

The project involves the provision of a new maritime HF communication system linking Lobito and all main harbours and remote lighthouses.

Background to and need for the Project

There is a need to improve the reliability of communications between Lobito and four other main harbours in Angola as well as to provide a service to some seventeen manned lighthouses. At present, communication between the harbours is provided by the ENATEL network, but because of congestion and delays on this system it is proposed to install a separate HF radio system operated by the National Directorate for Merchant Shipping and Ports.

Lighthouses have no communication facilities at present.

Project Components

The project involves the supply and installation of an HF radio communication system consisting of:

- HF transreceivers and antenna systems,

- Power systems,
- Installation, and
- Training of operators and maintenance staff.

Implementation and Costs

The cost estimate for the project is USD 0.8 million and implementation is required in 1989.

PROJECT T-MC-2 Expansion of Maritime Communication Facilities

Description

The project involves the provision of maritime communication equipment for coastal stations and the installation of INMARSAT station(s) in Angola.

Background to and need for the Project

Maritime mobile communication along the Angolan coastline is handled by a single shore station near Luanda. MF, HF and VHF ship-to-shore commercial services, including telephony and telegraphy, are available from the Luanda station.

There are at present only two circuits for interconnection to the ENATEL public telephone network.

The operating agency (EPTTEL) proposes to establish three or four additional shore stations with tentative locations selected at Cabinda, Soyo, Lobito and Namibe. It is envisaged that these stations should be equipped with MF and VHF facilities and provide telephony, telegraphy and telex services.

In addition to the shore stations, an INMARSAT terminal(s) needs to be established.

Project Components

The project will comprise:

- Project definition and specification of the extent of maritime radio communication requirements to cater for the equipment provision at sites in Cabinda, Soyo, Lobito and Namibe,
- Specification and provision of an INMARSAT terminal(s),
- Implementation and commissioning, and
- Training of technicians for maintenance and operations.

Implementation and Costs

The cost of the project is estimated at USD 1.8 million. The project has a high priority and should be implemented by 1989.

8.5 ROAD AND ROAD TRAFFIC PROJECTS

PROJECT RD-CE-1 Benguela - Lobito Road and Access Roads to the Port and Railway in Lobito

Description

The project includes widening and upgrading of the road between Benguela and Lobito, improvement of the town roads serving the port of Lobito and the Railway, and design of a new bridge at Catumbela.

Background to and need for the Project

The towns of Benguela and Lobito form one region with a common labour market and economy. The provision of good communications between the towns is necessary for the development of the region. The existing 30 km of road between Benguela and Lobito is 6 m wide and has reached such a degree of deterioration that major upgrading is necessary.

The traffic is more than 5,000 vehicles per day along the whole length of the road. Apart from being the main route between Lobito and Benguela, the road serves the adjoining sugar plantations and is thus also used by slow moving agricultural vehicles. This further increases the need to widen the road.

The town roads forming the access routes to the port and railway from the Benguela and the Huambo roads, and the connecting roads between the port and railway are in very bad condition and repair work should be undertaken immediately.

Engineering design of the Benguela-Lobito road is currently being carried out by the Angolan authorities. Since this road crosses the river Catumbela on a one lane bridge, the bridge needs to be widened.

Project Components

The project comprises the following components:

- Benguela-Lobito Road;
 - Preparation of tender documents,
 - Upgrading of existing road to a width of 7.2 m and with 2.5 m shoulders.
- Access roads;
 - Completion of the work already started on the access road between the port and the Benguela Road at the town boundary,
 - Upgrading of the road connecting the port with the Huambo Road at the town boundary,
 - Upgrading of town roads connecting the port and railway.
- New bridge at Catumbela;
 - Engineering design for a new bridge.

Implementation and Costs

Improvement of the access roads should be carried out during the Emergency Phase. Other works will have to be started no later than the beginning of the Short-Term Phase.

The costs are estimated to be as follows:

	USD million
• Benguela-Lobito Road	5.0
• Access roads	6.8
• Engineering design for the new bridge at Catumbela	0.4
Total	12.2

PROJECT RD-TR-1 Reinforcement of the Capacity of the Road Transport Company

Description

The Road Transport Company ETP (Empresa Trans-

portes Publicos) is a government-owned company serving need for transport within Angola.

The project includes provision of hammer lift trucks for handling containers and funds for spare parts and maintenance assistance.

Background to and need for the Project

At present ETP has only a small fleet of 26 trucks and 7 buses in operation.

ETP has faced serious difficulties in carrying out proper maintenance of their fleet. Furthermore, the fleet has been damaged through sabotage and bad road conditions.

These factors have together resulted in that ETP no longer has sufficient capacity to handle the goods at the port and railway terminals.

Project Components

The project comprises the following components:

- Five hammer lift trucks for handling containers,
- Spare parts, and
- Funds for maintenance assistance.

Implementation and Costs

It is foreseen that the project will commence as soon as possible with the assessment of the need for support.

The cost estimated to be USD 7 million.

8.6 CIVIL AVIATION PROJECTS

PROJECT CA-CE-1 Upgrading of Benguela Airport

Description

The project comprises measures to be taken for opening Benguela Airport to Boeing 737s or similar aircraft. Consideration shall be given to the possibility that a new airport eventually will be constructed in a location between Benguela and Lobito (see Project CA-CE-2).

Background to and need for the Project

The airport has a 1,600 m long and 25 m wide runway which cannot accept a Boeing 737-type aircraft.

At present (Oct. 87) there are 21 weekly connections with Fokker 27s between Benguela and Luanda. There is a demand for a larger type of aircraft and the introduction of flight connections between Benguela, Huambo, Kuito and Luena. For these reasons an upgrading of the airport is urgently needed.

Project Components

The project comprises the following components:

- Reconstruction of the runway to a length of 2,000 m and width of 45 m,
- Reinforcement of the runway to accept Boeing 737s,
- Upgrading or renewal of terminal facilities,
- Installation of airport lighting, and
- Installation of ILS and VOR/DME

Implementation and Costs

The work should be carried out during the Short-Term Phase.

The costs are dependent on whether a new airport will be constructed at Catumbela. However an amount of about USD 10 million has to be secured for the rehabilitation work.

PROJECT CA-CE-2 Study on new Airport between Lobito and Benguela

Description

The aim of the project is to determine the feasibility of restarting the construction of the new airport at Catumbela south of Lobito, which was stopped in 1975.

Background to and need for the Project

The province of Benguela has a total population of about 1,000,000, Lobito 400,000, and Benguela 250,000. The existing airport is located immediately south of Benguela and about 40 km from Lobito.

A project for relocation of the airport on a site between the two towns was prepared in 1973, land was allocated south of Catumbela about 15 km from Lobito and work on construction of the runway was started in 1974/75 but was never completed.

Project Components

The feasibility of continuing the construction of the new airport shall be determined, taking into account the long-term need for a new airport or an extensive upgrading and reconstruction of the existing airport.

If it is decided to construct a new airport studies and engineering designs previously prepared shall be updated taking into account the latest developments.

Implementation and Costs

The volume of work to be carried out for improving the existing airport at Benguela depends on whether or not a new airport will be built and, if so, when. A preliminary study should be made during the Emergency Phase assessing whether a new airport should be constructed.

The cost of a preliminary study on these lines is estimated at USD 0.1 million.