10. Short-term Rehabilitation Plan

10.1 The Port of Luanda

10.1.1 Rehabilitation Needs

In the Port of Luanda, the general cargo terminal was conceded to the Multi Terminal Co. and the multi purpose terminal was conceded to UNICARGAS, a state owned company. The concession of the container terminal will be granted to a consortium consisting of the APM Terminal Co. subject to the approval of the Supreme Court. In this connection, it is the responsibility of concessionaires to repair, improve and develop port facilities. In addition, SONILS terminal was developed by an affiliate of SONANGOL, national oil company, and managed by themselves. Figure 10-1 shows the layout of each terminal, concessionaires and berth numbers.

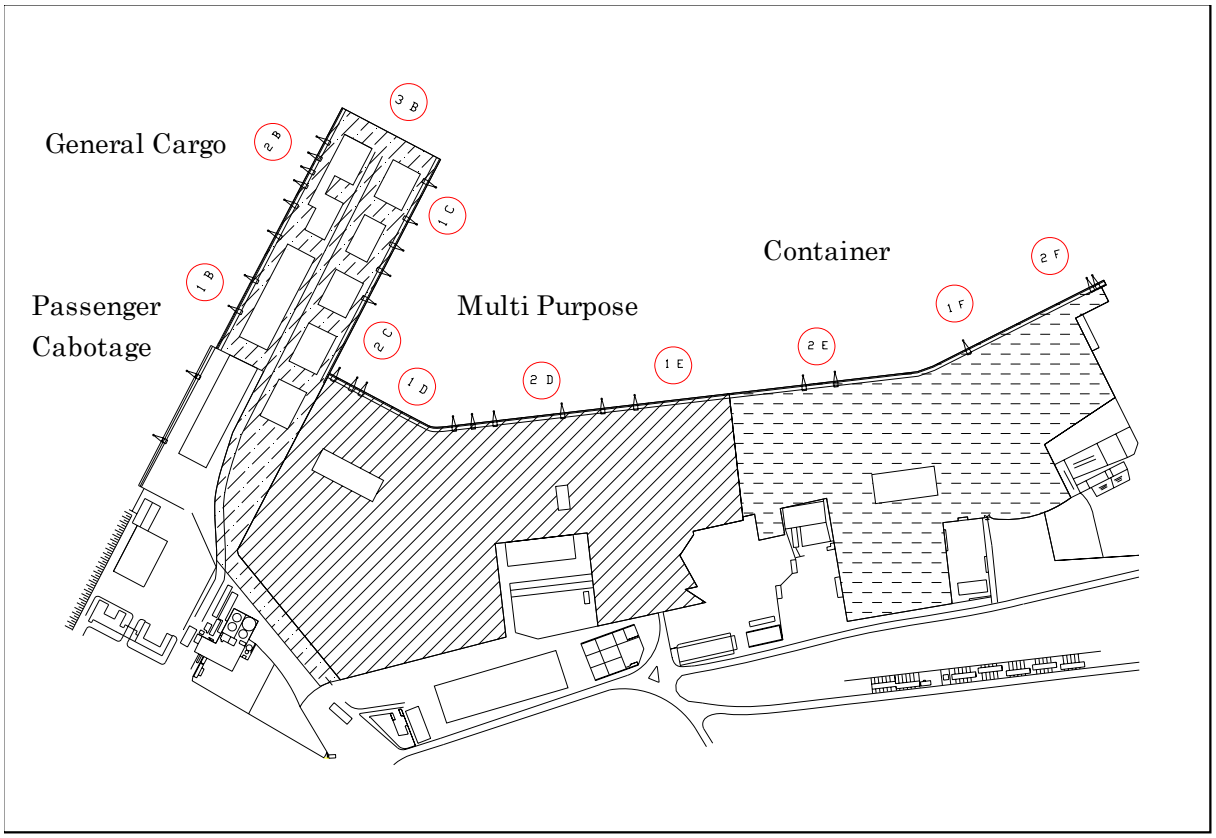

Figure 10-1 Terminals in the Port of Luanda

General Cargo Terminal: Multi Terminal Co. (A consortium consisting of NDAL (Netherlands) and NDAL Luanda (Angola)49%, and COPINOL(Angola)51%)

Multi purpose Terminal: UNICARGAS (Angola)

Container Terminal: A concession to a consortium consisting of A.P.Moller Terminal Co. and local companies

SONILS: Dedicated terminal for SONILS, a logistics company affiliated by the national oil company, SONANGOL.

Passenger Terminal: A concession will be granted to a private company

Cabotage: No liner service available. Berth is used for mooring tug boats.

The port authority of Luanda is therefore responsible for the control of ship entrance and departure, administration of port waters and land areas, and coordination of port development. The port authority will not intervene in the operation of each terminal. At the suggestion of the port authority, the Study excludes the rehabilitation of terminals and instead considers the problem of navigational aspects.

Table 10-1 shows navigational necessities envisaged in the Port of Luanda, in which items marked V have an urgent need for implementation in the short-term rehabilitation plan from the view point of safe, efficient and prompt operation. Appropriate measures for items not marked V shall be taken in the next phase of rehabilitation.

Table 10-1 Navigational Necessities in the Port of Luanda

Necessities	Appropriate Measures	Short-term Plan
Bathymetric survey; Revision of Chart	Survey area: 15.63 km^2	V
Removal of sunken ships and obstacles in port waters	Removal of 5-7 sunken/broken ships *1	
Maintenance dredging	Dredging sediments under water basin	
Oil and Garbage collection on the surface water	Deposition of an oil/garbage collection ship	
Navigational aids	Repair of two light buoys and a beacon tower	V
Water quality in the bay	Periodical monitoring of water pollution	

*1 "Study and Physical Project in the Port of Luanda" by the Ministry of Transport in 1996 identified 36 sunken and broken ships in the bay.

About 36 sunken/wrecked ships were identified in 1996. Many of them were wrecked or attacked during the civil war, and still remain in the port waters. Removal of those ships is necessary from the environmental view but with the exception of seven ships they are not so obstructive from the navigational point of view. Nautical Chart No.3448 indicates that 7 sunken ships are obstacles. Three sunken ships in front of the SONILS quay were a big obstacle to the dredging of the basin. However, they were sunken before the development of the SONILS quay, and shall be removed as part of the development of the SONILS terminal. Since a few other sunken ships are an obstacle to expanding the anchorage, it will be necessary to remove them in the mid-term or long-term development range.

The depth of water in front of the berths from No.1D to 2F has a design depth of 10.5 meters, but echo sounding revealed 1-2 meters of sedimentation or obstacles in some areas. The chart of Luanda indicates the depth of those berths is 9.8 meters. It is necessary to make a detailed bathymetric survey in the Bay of Luanda. Based on the result of the survey, the port authority shall make a dredging plan and take the necessary action.

Water pollution is a problem in Luanda Bay and The National Institute of Fishery Research has forbidden fish consumption from the Bay since December 2005. Oil film is frequently observed on the port water. It is therefore necessary to recover oil and garbage on water. However, there is no sufficient system to treat oil and garbage from the port, so that the procurement of oil/garbage recovery ship shall be considered in accordance with the progress in the civic garbage treatment. It is also necessary for the port authority of Luanda to monitor water quality from the environmental point of view.

10.1.2 Rehabilitation of Port Facilities

1) Required Port Facilities in 2010

Due to the increase in cargo throughput and vessels, a wider basin will be needed. To calculate the basin area, simulation of waiting ships that reflects the expected improvement in loading and unloading productivities should be done. Bathymetric survey is necessary to clarify the basin area.

2) Rehabilitation of Anchorage, Basin and Buoys

The original bathymetric survey of the nautical chart No.3448 was made from 1967 to 1969 under the Portuguese administration and since then several small corrections have been made. Entering ships are required to collect new information by their own efforts. It will be necessary to revise the chart and provide recent information for calling ships. Information on water depth, sunken ships, obstacles and new reclamation is vital for safe navigation and anchorage. Proposed area for the bathymetric survey is shown in Figure 10-2.

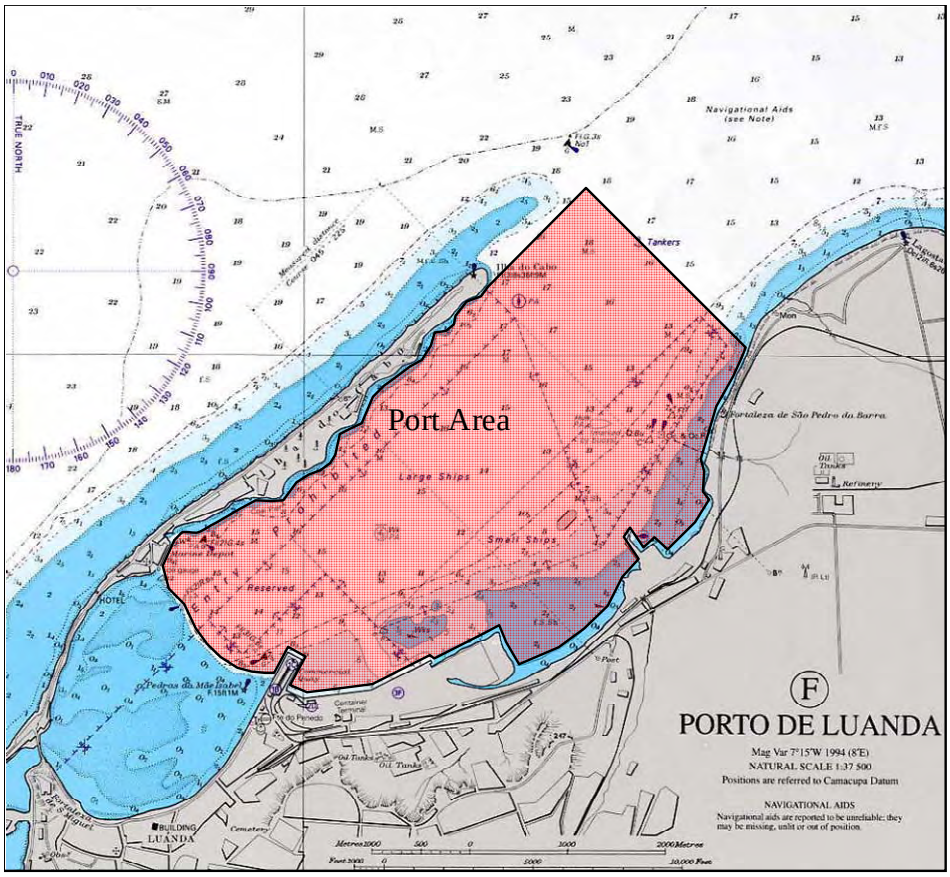

Figure 10-2 Proposed area for Bathymetric Survey

There are two light buoys and one beacon tower in the Port of Luanda, all of which are deteriorated for lack of maintenance (see Appendix). It is recommendable to repair the two buoys and beacon tower.

The shallow water area in the port as shown in Figure 10-3 is a great hindrance to the maneuvering of ships to Berths No. 1F, 2F and Oil Berths. Together with the increase in ship calls, it will become indispensable to dredge the shallow water area of 203,000 m^2 up to a depth of 10.5 meters. However, the dredging is not so urgent and can be carried out in the mid-term or long-term development.

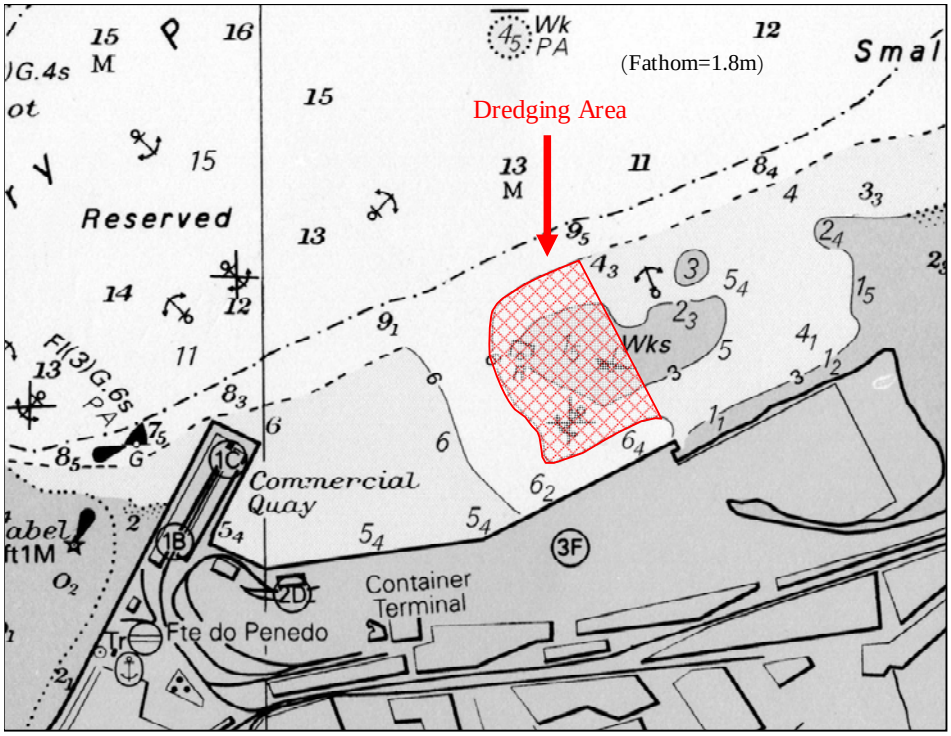

Figure 10-3 Proposed Dredging Area

3) Rehabilitation of Concessionaires' Terminals

As shown in Figure 10-1, the general cargo terminal and multi purpose terminal were already conceded to Multi Terminal Co., and UNICARGAS. However, it may be necessary for both companies to find financial resources to move forward with the rehabilitation of each terminal. If concessionaires find it difficult to raise sufficient funds, it may be necessary for the port authority of Luanda to find foreign official development assistance.

Table 10-2 shows problems identified in each terminal and measures to be taken immediately. All terminals require the rehabilitation of pavement, fenders and coping concrete of the quay wall. Some terminals require the removal of quay cranes and the procurement of cargo handling equipment.

Table 10-2 Rehabilitation to be implemented by Concessionaires

Problems/Measures	Terminal
To repair/improve the pavement of apron and yard	GT, MT, CT
To repair the coping concrete of quay wall and install car stoppers	GT, MT, CT
To install/replace fenders	GT, MT, CT
To demolish unused sheds or reform some sheds to refrigerator warehouses	GT
To build Container Freight Station	MT, CT
To install Gantry Cranes, to increase Reach Stackers and Forklifts	MT, CT
To remove unused quay cranes	GT: 17, MT: 8, CT: 3
To establish Electronic Data Interchange between Customs, Immigration, Shipping lines and Port authority	GT, MT, CT

GT: General Cargo Terminal	No.1B, 2B, 1C, 2C
MT: Multi Purpose Terminal	No.1D, 2D, 1E
CT: Container Terminal	No. 2E, 1F/2F

i) Rehabilitation Plan of the General Cargo Terminal

Multi Terminal Co. was granted a concession in August, 2005, with a plan to rehabilitate the terminal in 5 years. Terminal concession has an area of 80,000 m2 with a berth length of 900 m. Concessionaire is responsible for the repair of quay wall, yard/apron pavement, the rehabilitation of warehouses, water drainage pipes, yard lighting, the conversion of warehouses into refrigerator warehouses, and the installation of silo with a capacity of 100,00 ton. As security measures, automated gate and inspection cameras will be installed. Total cost is estimated at US$19.2 million. In addition, the company plans to procure one mobile crane, a weighing machine, two forklifts and one ambulance. The capital structure of Multi Terminal Co. is COPINOL (US$1.53 million), Nile Dutch Africa line BV (US$1.05million), NDS (US$0.42 million) and the total capital is US$3 million.

10.1.3 Conceptual Design and Cost Estimate

1) Conceptual Design

It is recommended that the upper part of the navigational aids be replaced by a lantern with power supply as shown in Figure 10-4.

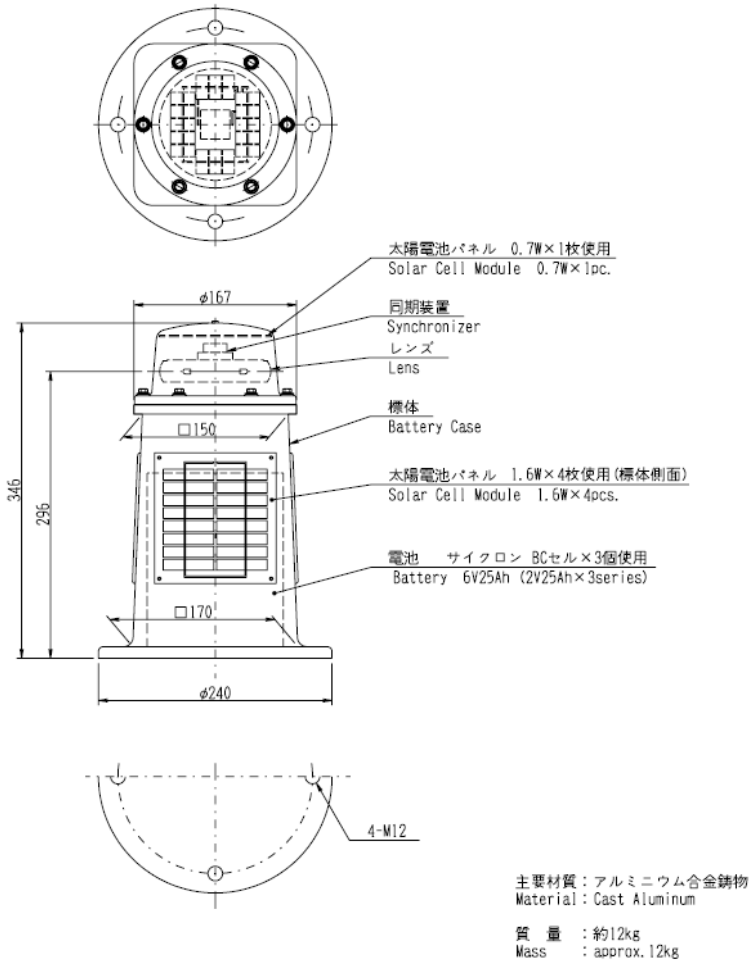

Figure 10-4 Lantern with Power Supply

2) Cost Estimate

Based on the result of field survey, the construction plan and approximate cost estimate will be compiled as follows.

Basic condition for cost estimate;

The construction cost has been estimated based on the result of material survey cost on October 2005 at Angola.

Exchange rate of currency is fixed as follows (Oct. 2005): US$1.0=Kz.87.6= ¥116

Physical contingency is estimated at 5 %.

Engineering services fee is estimated at 5 %.

Indirect cost is estimated at 20 %.

Price escalation is not included for construction, and equipment.

The direct cost of construction is classified into the foreign and local currency component, the percentage distribution of major items is shown below.

No.	Work Item	Foreign (%)	Local (%)
1	Concrete Pavement	60	40
2	Asphalt Pavement	70	30
3	Wharf Repair	50	50
4	Electrical, Water, Repair	90	10
5	Cargo Handling Equipment	100	0

Table 10-3 Port of Luanda Short-Term Rehabilitation Plan Construction Cost

Facility	Unit	Quantity	Unit Price US$	Construction Cost (1,000 US$)		
				Total	Foreign	Local
1.Bathymetric Survey	km^2	15.63	24,000	375	300	75
2.Repair Navi. Buoy	set	3	14,000	42	21	21
Total				417	321	96
3.Engineering Services	L.S	1		21	15	6
4.Physical Contingency	L.S	1		21	6	15
5.Tax	L.S	1		19	0	19
Grand Total				478	342	136

Table 10-4 Port of Luanda Short-Term Rehabilitation Plan Working Schedule (Month)

Work Item / Month	1	2	3	4	5	6	7	8	9	10	11	12
Preparatory Works												
Bathymetric Survey												
Navigation Buoy												
Data Processing												
Miscellaneous Works												

10.1.4 Draft Economic Analysis and Financial Analysis

1) Draft Economic Analysis

As the proposed short-term rehabilitation plan aims to improve the safety level of

navigation in Luanda port. So it is difficult to calculate its economic impact. But the increase in navigation speed and reduction of accidents due to the improvement of the safety level will be positive economic impacts.

2) Draft Financial Analysis

The purpose of the economic analysis is to appraise the economic feasibility of the short-term rehabilitation plan of Luanda port. The revenue of Luanda port authority in 2004 is 3.1 billion AKZ while its expenses totaled 2.3 billion AKZ. According its profit before taxation is about 0.8billion AKZ. On the other hand, the cost of short-term rehabilitation plan will be US$478,000. Therefore the plan is feasible because the cost of the plan is within the profit margin of a single year for the Luanda port authority.

3) Investment Plan

The general cargo terminal was conceded to a private company and the multi cargo terminal was conceded to a state owned company. The concession of the container terminal will be granted to a private company subject to the approval of the Supreme Court. The cost to repair, improve and develop port facilities of the land area will be borne by the concessionaires. It is estimated that a investment of US$ 19 million for the general cargo terminal and US$ 55million for the container terminal will be required. The investment plan of the multi purpose terminal is not clear but the investment between general cargo terminal and container terminal seems to be required. Those investments should be made by the concessionaires as soon as possible.

10.1.5 Draft of Initial Environmental Examination

1) Analysis of Alternatives (including without Project option)

The comparison between With and Without Project targeted in the year of 2010 is as per Table 10-5 shown below. In this study, “With Project” is called as “Proposed Project”.

Without Project Alternative: It will be more difficult than now to secure the safety of navigation for ships to meet with the increasing demand in case the project is not implemented.

With Project: Safer navigation will be secured at night time in Luanda Bay where many sunken and abandoned ships are there.

Table 10-5 Comparison of With and Without Project (Luanda)

Comparison Item		Current state (2004)	Without Project (2010)	With Project (2010)
・Quay length		2,162m	2,162m	2,162m
・Yard dimension		430,000 ㎡	430,000 ㎡	430,000 ㎡
Social	Traffic	**D**	**D**	**D**
	Economy	**D**	**D**	**D**
	Living	**C**	**C**	**C**
	Safety	**D**	**D**	**C**
	waste	**D**	**D**	**D**
Natural	Fauna & Flora	**D**	**D**	**D**
	Landscape	**D**	**D**	**D**
Pollution	Air	**C**	**C**	**C**
	Water	**D**	**D**	**D**
	Noise & Vibration	**C**	**C**	**C**

Note) Highly Positive: A Positive: B
Not Significant: C Negative: D
Highly Negative: E

2) IEE

i) Survey Method

The purpose of IEE as first step of EIA is to find environmental impacts with the project through retrospective data and site surveys. After this, it is required to judge whether detailed EIA is necessary and find the priority environmental impacts if EIA is judged necessary and clarify the priority issues of Detailed EIA. The proposed short term rehabilitation program has been conducted with the following procedures together with MINTRANS. The assessment of IEE has been done according to "Guidelines for Environmental and Social Considerations (April 2004)" made by JICA.

Review of natural and social environmental conditions which may be influenced by the implementation of the proposed Short term Rehabilitation Program (draft);

Selection of the sensitive and valuable items for environment in order to minimize environmental impact generated by the alternatives; and

Preliminary assessment for the selection of negative impact at the time of construction and operation (SCOPING) and the mitigations

ii) Key Impacts Identified:

As the results of the IEE of Port of Luanda is shown in Table 10-6, the negative impacts by the improvement of existing navigation aids were not found.

Table 10-6 Result of IEE (Port of Luanda)

Evaluation Item	Possible Adverse Impacts		Evaluation		Mitigation
	Construction	Operation & Subsistent	Rank	Reasons	
Social Environment					
1. Resettlement			D	This study aims at the installation of safe navigation facilities in existing port area therefore, resettlement is not expected.	
2. Economic Activities			D	Adverse impacts are unlikely. Also the work is assumed to have little impacts on extending vessels' waiting hours at anchor.	
3. Traffic and public facilities			D	The negative impacts to land and marine traffic during construction and operation are not expected since this project is the improvement of existing navigation aids.	
4. Split of Communities			D	No new site development is planned, so any social separation is not expected.	
5. Cultural Heritage			D	There is no new site development plan.	
6. Water and Common Rights			D	The project is to improve existing navigation aids therefore, existing water and common rights will be unchanged.	
7. Public Health Condition			D	The project is the improvement navigation aids for enhancing the safety of ship navigation in the port and the influence to public health condition is very limited.	
8. Wastes			D	There is little possibility of substantial waste as no dredging or large scale land construction work is planned.	
9. Hazards (Risks)			D	The purpose of the project is to enhance the safety of port navigation by improving navigation aids the hazards is more likely to be mitigated.	
Natural Environment					
1. Topography and Geology			D	The construction work on coastal and land area accompanying the topographical change is not planned.	
2. Soil Erosion			D	There is no new site development plan like land reclamation.	
3. Groundwater			D	Large scale discharge of groundwater is not required.	
4. Hydrological situation			D	Not relevant.	
5. Coast and Sea			D	Construction work on coastal and land area including topographical change is not planned.	
6. Fauna and Flora			D	Construction work on coastal and land area including topographical change is not planned.	
7. Landscape			D	No new land preparation nor large scale construction are planned	
Pollution and Public Hazards					
1. Air Pollution			D	No impact on air	
2. Water Pollution			D	No impact on water	
3. Soil Contamination			D	No impact on soil	
4. Noise and Vibration			D	There will not be serious impact although ships and access vehicles will increase as a result of the safe waterway.	
5. Land Subsidence			D	Construction work on coastal and land area which could include land subsidence is not planned.	
6. Offensive Odor			D	No impact on offensive odor	

Assessment; A: High Negative Impact, B: Low Negative Impact, C: Unknown Impact, D: No impact

10.2 The Port of Lobito

10.2.1 Rehabilitation Needs

The Port of Lobito also suffers from the deterioration and degradation of port facilities. In view of increasing cargo throughput, it is urgently required to rehabilitate/improve port facilities. Table 10-7 shows problems of the Port of Lobito and measures to be taken in the near future, in which items marked V have an urgent need for implementation in the short-term rehabilitation plan. Rehabilitation of items not marked V shall be taken in the next phase of rehabilitation.

Table 10-7 Problems and Necessary Measures for the Port of Lobito

Problems	Appropriate Measures	Short-term Plan
Pavement in the apron and yard	To repair the apron and yard behind the Berths No.1 - No.8	V
Coping concrete of the quay wall and car stopper	To repair the coping concrete including car stopper; Berths No.1 - No.8	V
Rubber fenders	To install/replace rubber fenders on the quay front; Berths No.1 - No.8	V
Railroad in the port	Rehabilitation of railroad tracks in the port; about 20 km	
Warehouses	Repair work of warehouses is carried out by own efforts	
Reefer plugs and power supply	To install reefer plugs and power generator in the yard behind the Berths No.7、8	V
Gantry cranes Unused quay cranes	To install gantry cranes and foundations on a new berth next to the Berth No.8, and remove unused quay cranes	
Cargo handling equipment	To increase mobile cranes, reach stackers and forklifts	V
Water and fuel oil supply	To repair water pipes and fuel oil supply facilities laid in the apron and yard	V
Yard extension	To extend container yard behind the Berth No.9 to be built in the future	
Revision of nautical chart; Bathymetric survey	To make bathymetric survey for the revision of Chart No. 57282（Port of Lobito）	
Light buoys	To repair a light buoy on the channel	
Oil and Garbage collection on the surface water	Deposition of an oil/garbage collection ship	
Maintenance dredging	To dredge 1-2 meters in the front basin of the quay wall; and to deepen the entrance of channel to the bay	
Electronic Data Interchange	To establish EDI system between Customs, Immigration, Shipping lines and others	
New modern container terminal	To develop a new container terminal next to Berth No.8 and install gantry cranes	

Apron/yard pavement was deteriorated at all wharves from No.1 to No.8 or was unpaved. It is therefore urgently necessary to make/repair pavement to improve the productivity of cargo handling. All rubber fenders were broken or had disappeared, therefore, moored ships directly touched the quay wall and damaged the coping concrete. Repair of rubber fenders is also necessary for mooring ships and quay structure.

While railroad tracks in the port are damaged and not serviceable, it is necessary to repair the railroad in accordance with the rehabilitation of Benguela Railroad. As mentioned in Chapter 8.3.2, railroad tracks on the quay front are not required any more, so that it is recommended to rehabilitate railroad tracks in the middle and rear of the yard and remove the tracks on the quay front.

Conventional quay cranes are incapable of lifting containers or cargoes heavier than 5-6 tons. They are also a hindrance to cargo operations. It is therefore recommended to remove those quay cranes with small capacity. However, there is no urgent requirement for the clearance of quay cranes. The Study will not include the removal in the Short-term Rehabilitation plan.

As reefers will considerably increase together with economic restoration, it will be necessary to install more reefer plugs and to secure a power supply for reefers. More container handling equipment is also necessary to cope with increases in containers. Expansion of container yard will become necessary in the near future, but the Study proposes to increase the productivity through the rehabilitation and modernization of the present port facilities. Yard expansion will therefore be included in the mid-term or long-term development plan.

Sedimentation may be going on at the entrance of the bay and in the basin dredged in front of the quay wall, where some points have a depth of 1-2 meters shallower than planned. It will be necessary to make a bathymetric survey and dredge the shallow area in the channel and basin. It is also necessary to introduce Electronic Data Interchange in the near future. Since the priority shall be given to rehabilitating the hardware of terminals, maintenance dredging and the installation of EDI system will follow in the mid-term development plan.

10.2.2 Rehabilitation of Port Facilities

1) Required Port Facilities in 2010

i) Berth Capacity

The capacity of each terminal is calculated based on berth occupancy ratio and productivity of cargo handling. Berth capacity is calculated as follows,

Berth Capacity= working days per year×working hours per day×berth occupancy ratio
/ cycle time of quay cranes×loading or unloading weight×number of cranes×berth length

Adjustment was made if the yard is narrow or uneven because this affects the berth capacity. The improvement of the cargo handling operation due to the facility's rehabilitation also should be reflected in the berth capacity (see Table 10-8). When comparing the berth capacity and yard capacity, the smaller one is adopted as the capacity of terminal.

Table 10-8 Berth Capacity

			General Cargo		Container Cargo	
			off-peak	peak	off-peak	peak
Working days per year	A		360	360	360	360
Working hours per day	B		12	18	12	18
Berth occupancy ratio	C		0.65	0.65	0.65	0.65
Number of quay cranes per length	E	/m	0.0167	0.0167	0.0125	0.0125
Cycle time of quay crane	F	/hour	0.0667	0.0667	0.0667	0.0667
Loading / unloading weight	G	ton	2	2	10	10
Annual working hours	AxBxC	hours/year	2,808	4,212	2,808	4,212
Number of cycles of loading / unloading	AxBxC/F	times	42,120	63,180	42,120	63,180
Annual cargo volume	AxBxC/FxG	ton/crane	84,240	126,360	421,200	631,800
Annual cargo volume	AxBxC/FxGxE	ton/m	1,404	2,106	5,265	7,898
		box/m			527	790
		TEU/m			790	1,185
Length of berth		m	240	240	240	240
Annual cargo volume capacity		ton/m	336,960	505,440	1,263,600	1,895,400
		box/m	-	-	126,360	189,540
		TEU/m	-	-	189,540	284,310

Yard Condition		ton/m		TEU/m	
		off-peak	peak	off-peak	peak
Good + operation improvement	1.5	2,106	3,159	1,185	1,777
Good	1.0	1,404	2,106	790	1,185
Narrow	0.7	983	1,474	553	829
Uneven	0.7	983	1,474	553	829
Both	0.49	688	1,032	387	580

ii) Container Yard Capacity

Yard area, container handling method and time for documentation such as customs procedure affect the capacity of the container yard. In Angola, all ports adopt the same cargo handling method, using folk lifts or reach stacker. Yard condition is almost the same. Therefore the yard capacity of each port is calculated by multiplying the yard area by unit capacity. In Luanda Port, container yard is used fully to its capacity. Yard area and container throughput of Luanda Port is shown in Table 10-9. Container throughput per 1ha yard is 8,757 TEU. After the rehabilitation of container yard, yard capacity will increase by 50% and container throughput per 1ha will reach 13,136 TEU.

Table 10-9 Container Yard Capacity

	Yard Area	Annual Throughput	
	ha	TEU	TEU/ha
Multi Purpose Terminal + Containers Terminal	33	288,981	8,757

iii) Required Capacity of Lobito Port in 2010

The berth capacity and the yard capacity for conventional cargo are shown in Table 10-10. Future yard capacity is estimated at 1,250,000 tons per year.

Table 10-10 Cargo Handling Capacity of Lobito Port (Conventional Cargo)

Conventional		Lobito
Berth Length	m	887
Present Productivity	ton/m	1,032
Present Capacity	ton	915,384
Future Productivity	ton/m	3,159
Future Capacity (Berth)	ton	2,802,033
Future Capacity (Yard)	ton	1,250,000
Future Capacity	ton	1,250,000

The berth capacity and the yard capacity for container cargo are shown in Table 10-11. Current container cargo handling capacity of Lobito port is calculated at 61,000 TEU per year and that of the future is calculated at 92,000 TEU per year after the completion of rehabilitation.

Table 10-11 Cargo Handling Capacity of Lobito Port (Container Cargo)

Container Berth Capacity		Lobito
Berth Length	m	240
Present Productivity	TEU/m	829
Present Capacity	TEU	198,960
Future Productivity	TEU/m	1,185
Future Capacity	TEU	284,400
Container Yard Capacity		**South Quay**
Area	ha	7
Present Productivity	TEU/ha	8,757
Present Capacity	TEU/Year	61,000
Future Productivity	TEU/ha	13,136
Future Capacity	TEU/Year	92,000

Current and future cargo handling capacity and demand forecast are shown in Table 10-12. Future cargo throughput exceeds the present capacity. Rehabilitation is necessary to cope with future cargo throughput. Lobito port has a rather narrow yard, improvement of yard capacity will be a key factor exterminating the terminal capacity after the rehabilitation.

Table 10-12 Cargo Handling Capacity and Demand Forecast (Lobito Port)

	Conventional Cargo		Container Cargo	
Present Capacity	915,384	ton	61,000	TEU
Cargo Throughput (2004)	582,849	ton	28,950	TEU
Future Capacity	1,250,000	ton	92,000	TEU
Cargo Throughput (2010,high)	2,013,000	ton	120,000	TEU
Cargo Throughput (2010,low)	1,195,000	ton	92,000	TEU

2) Rehabilitation of Terminals

To meet the estimated demand in 2010, it will be necessary to utilize the North Wharf and South Wharf. As shown in Table 10-7, items marked V are proposed for the Short-term Rehabilitation Plan in terms of time and effectiveness. Urgent requirements to be completed by 2010 are 1) to repair the apron and yard behind the Berths No.1 - No.8; 2) to repair the coping concrete; 3) to install/replace

rubber fenders; 4) to install reefer plugs and power generator; 5) to increase mobile cranes, reach stackers and forklifts; and 6) to repair water pipes and fuel oil supply facilities laid in the apron and yard. Figure 10-5 shows the proposed area for the Short-term Rehabilitation Plan.

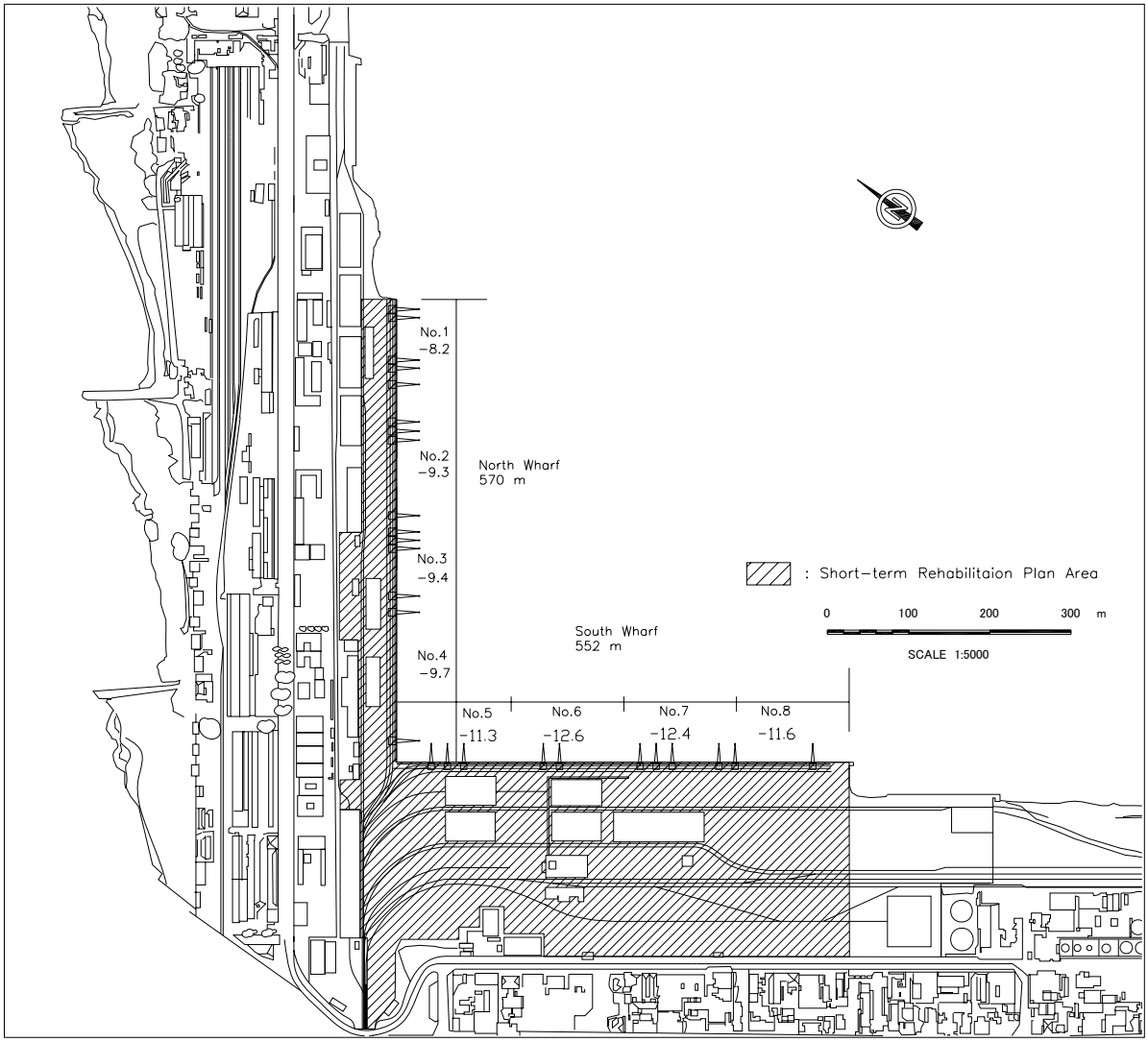

Figure 10-5 Short-term Rehabilitation Area in the Port of Lobito

3) Quay wall, Apron, Yard, Rubber fender and Mooring bollard

As for the quay, damage to coping concrete over the entire length of both the North and the South quay and concrete spalling in the South quay side were observed (see Appendix). In addition, because coping concrete is not equipped with car stops, the cargo handling equipment and the workers are in danger of falling into the sea. Therefore, the following measures are proposed:

To repair coping concrete over the entire length of both North Quay (570m) and South Quay (552m) and installation of car stops

To repair the South quay where the concrete is spalling

As for the apron and yard pavement, unevenness and cracks were found in many places as well as bumps stretching more than 30cm. In the South quay, large portion of the apron and yard is unpaved (see Appendix). Therefore, the following measure is proposed:

To pave the apron and yard behind the North Quay (570m) and the South Quay (552m).

As for the rubber fenders, large truck tires used as shock absorbers over the entire length of both the North and the South quay seem to be entirely inadequate to cope with vessel's berthing energy (see Appendix). In addition, there are some occasions where a vessel's rolling motion during cargo landing and loading crushes the truck tires, then the vessel's hull smashes against the quay wall. The port of Lobito says that the tires need frequent replacement because they are damaged easily. Therefore, the following measure is proposed:

To install rubber fender appropriate for the incoming vessel along both the North Quay (570m) and the South Quay (552m).

As for the mooring bollards, the load capacity of existing ones is 50 t. Some bollards are missing due to the tractive force by the moored vessel (see Appendix). Considering the maximum size of the incoming vessel, the mooring bollards having a load capacity of at least 100t are required. Therefore, the following measure is proposed:

To install mooring bollards appropriate for the incoming vessel along both the North Quay (570m) and the South Quay (552m).

4) Cargo Handling Equipment and Warehouse

i) Cargo Handling Equipment

Bulk cargo and empty containers are handled by quay crane. But in the case of other containers, ship's gear is used because of the quay crane's low capacity. To transport cargo in the yard forklift is used for bulk cargo and reach stacker or top lifter is used for containers. But ship's gear and chassis are waiting for containers which reach stacker carries. We expect that cargo handling volume at the port of Lobito will increase in future. Therefore, we recommend the introduction of the following cargo handling equipment to enhance port service.

Mobile Crane (60t)	1
Reach Stacker (40t)	2
Top lifter (40t)	2

ii) Warehouse

There are many warehouses, and some are used partly for office space. It will be possible to cope with the increase in cargo in future using these warehouses.

5) Reefer Facilities

There is no reefer facility. However, the handling of foodstuffs is expected to increase. Therefore, the study team recommends the installation of reefer plugs to cope with the increase of reefer containers at the Port of Lobito.

10.2.3 Conceptual Design and Cost Estimate

1) Conceptual Design

i) Repair of coping concrete and quay wall including installation of car stop

General classification of repair works is presented in Figure 10-6. A suitable repair method generally depends on degrees of cracking; area of deteriorated concrete surface, location of

repair member, and expected residual life of structure.

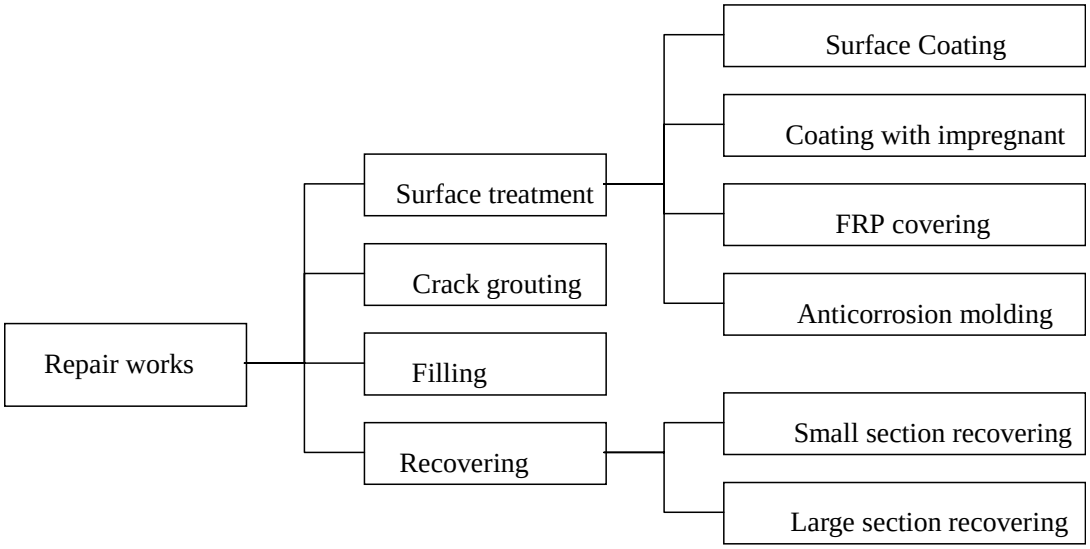

Figure 10-6 Classification of Repair Works

Surface treatment

The method of surface treatment is to cover concrete surface with a protective film or to upgrade concrete surface layer in order to prevent infiltration from air, water, salt and any foreign matters, so that the concrete may keep water tightness and durability.

Surface coating: This method uses coating materials, being applied for local repair of cracked areas and overall repairs, as well as to painting for such surfaces as already repaired by mending material.

Coating with impregnate: This method is to impregnate with silicon or acryl monomer on concrete surface to fill up fine pores on the surface layer.

FRP (fiber reinforced plastic) covering: After repairing of damaged concrete section, FRP sheets are adhered to concrete surface. The procedure is firstly to smooth unevenness of concrete surface, then applying glue such as epoxy resin on it, the first FRP layer covers the surface followed by overlaying with necessary numbers of FRP sheets.Since FRP has smaller modulus of elasticity than of concrete, use of FRP to a member requiring rigidity should be avoided. In many cases FRP has been used on tension side of bending member, and to prevent development of concrete deterioration. Carbon or aramid fiber without resin has been occasionally applied for reinforcing the existing concrete structures after the Hanshin Great Earthquake in 1995.

Anti-corrosive forming: Anti-corrosive forming method uses forms made of the following materials for repair. After mounting these forms, a mending material fills the clearance between the form and the surface to be repaired for integration with concrete.

- FRP (Fiber reinforced plastic)
- PIC (Polymer impregnated concrete)
- GRC (Glass fiber reinforced cement)

Crack grouting

A material of resin or cement is grouted into cracks in order to make it watertight and durable by preventing the concrete surface from infiltration of air, water, salt, etc. This method can also be available where finishing material is delaminated from concrete body.

Crack filling

Filling method is suitable when crack width is comparatively large (0.5 mm or more) or water is leaking. This method makes V-notch or U-notch along concrete crack and the notch is filled with a resin or cement material.

Recovering

The recovering is used with the filling method to repair wide range cracking, corrosion of reinforcing steel, concrete delamination, and spalling. The procedure is firstly to chip concrete off till reinforcing steel is exposed, then after applying anti-corrosive treatment to the steel, finally to recover cross section of the structure. In case that cross sectional area of the reinforcing steel bar is considerably reduced, a new or additional bar is provided after anti-corrosive treatment. The materials of recovering should produce neither a little bleeding nor a large shrinkage to achieve high reliability. Depending on the size of repairing area, small or large section recovering is selected.

Small section recovering (see Figure 10-7)

When repair is comparatively small, a mending material of resin or cement is applied with trowel, after damaged part is removed by chipping. No mold is generally used. A primer on chipped concrete surface is necessary to secure adhesion, if a mending material is required. In case of vertical surface or ceiling surface, such a mending material that does not fall down should be used, and special care should be taken during the repair work. Resin lining is normally installed on the mending material to prevent infiltration of water, oxygen and chlorides.

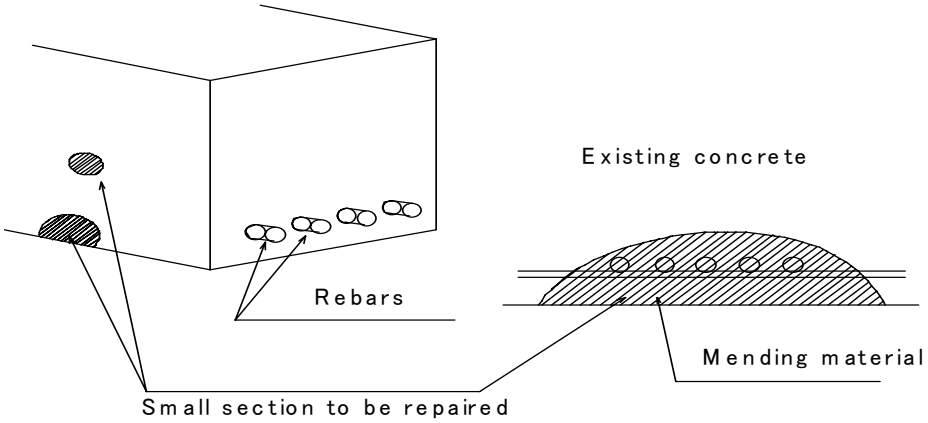

Figure 10-7 Small section recovering

Large section recovering

When wide covering is required, for instance the whole area, firstly concrete is chipped off to expose reinforcing bars (see Figure 10-8), and after applying anti-corrosive treatment, recovering is carried onto. Anchor bolts are required to fix reinforcing bars at the designed locations. The three major methods of applying mending materials are explained hereafter.

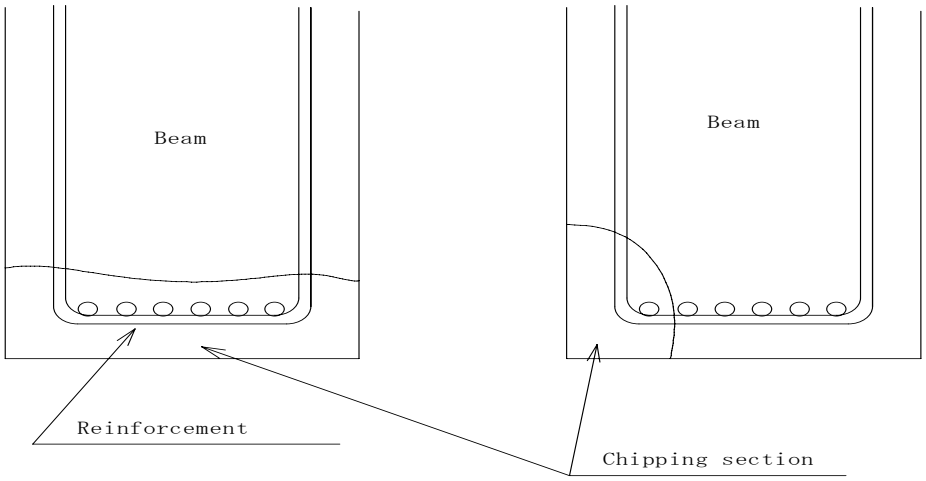

Figure 10-8 Chipping for large section recovering

Pre-packed concrete method: Forms to the design concrete surface are fixed after anti-corrosive treatment on reinforcing bars. Coarse aggregates fill the clearance between the concrete and the form, and then a mending material is grouted to secure integration with the existing concrete.

Pouring concrete method: The same procedure in (1) is followed, but without pre-installed aggregate, to fill the clearance with a mending material. Pouring work should be carefully carried out by a small batch while giving vibration to the form.

Concrete splaying method: A mending material such as polymer cement concrete is sprayed on the damaged part using high-pressure under dry or wet conditions. In case of vertical or ceiling surface, the mending material should not fall down after repair work. Special care, for example setting a preventive metallic net, should be taken during the repair work.

Among the above mentioned repair methods, considering the deterioration extent of the coping concrete and quay wall and material availability in Angola, the following repair methods are proposed for each damaged portion:

Cracks on the concrete surface: Crack filling

Chipped off portion of concrete: Small section recovering

The concrete floating portion: Pouring concrete method of Large section recovering

The concrete spalling portion: Pouring concrete method of Large section recovering

In addition, car stops made by wood fiber reinforced plastic with 25 cm in height are recommended to be placed on the coping concrete by anchor bolts (see Figure 10-9)

Figure 10-9 Car Stops

ii) Apron and yard pavement

Applied Design Code:

Technical Standards for Port and Harbor Facilities in Japan is applied to the design.

Design Load on Concrete Pavement:

The design load of CP4 is determined by the values listed in Table 10-13.

Table 10-13 Design Loads by Classification

Classification of design load	Type of load	Load (kN)	Radius of contact area (cm)
CP1	Forklift (2t)	25	9.8
	Tractor-trailer (for 20ft – 40ft)	50	17.8
	Forklift (3.5t)	45	12.6
CP2	Tractor-trailer (for 40 ft)	70	17.8
	Forklift (6t)	70	16.0
CP3	Truck (T-25)	100	17.8
	Forklift (10t)	110	21.1
	Straddle carrier	110	19.5
	Forklift (15t)	170	27.1
CP4	Transfer carne (20t)	200	17.6
	Truck crane (20t)	200	20.0
	Forklift (20t)	240	31.7
	Truck crane (25t)	250	21.6

Concrete Slab Thickness

Concrete slab thickness of 35 cm is determined by the values listed in the standard 28-day bearing strength of concrete of 450 N/cm^2 is assumed. In addition, the concrete slab is reinforced with reinforcing bars.

Table 10-14 Concrete Slab Thickness

Design load classification	Slab thickness (cm)
CP1	20
CP2	25
CP3	30
CP4	**35**
On the deck slab of open-type wharf	10

Design Load on Asphalt Pavement

The design load of AP4 is determined by the values listed in Table 10-15.

Table 10-15 Classification of Design Load

AP1	Tractor-trailer	For 20ft, 40ft
AP2	Forklift	2t, 3.5t, 6t
AP3	Forklift	10t, 15t
	Truck	T-25
	Transfer crane	20t
	Straddle carrier	
	Truck crane	20t
AP4	Truck crane	25t
	Transfer crane	25t

Material of Asphalt Concrete:

The type and material of asphalt concrete is as listed in Table 10-16.

Table 10-16 Type and Quality of Asphalt Concrete

Type	AC I	AC II	AC III	AC IV
Use	For surface course		For binder course	
Number of blows for Marshall stability test	50	75	50	75
Marshall stability (kN)	4.9 or greater	8.8 or greater	4.9 or greater	8.8 or greater
Flow value (1/100cm)	20 – 40	20 – 40	15 – 40	15 – 40
Porosity (%)	3 – 5	2 – 5	3 – 6	3 – 6
Degree of saturation (%)	75 – 85	75 – 85	65 – 80	65 – 85

Composition of Pavement

Asphalt pavement normally comprises a surface course, a binder course, which is constructed on the subgrade. The base course is normally constructed in two stages (base course and subbase course). According to the result of the soil investigation during the first visit to Angola, the design CBR of subgrade is assumed as “equal to of above 8 and less than 12”. Therefore, the total pavement thickness of 75 cm is selected. Here, “grading adjusted material” is selected as the type of base course. The composition of asphalt pavement is as follows:

Surface course: Type AC II, thickness of 5cm

Binder course: Type AC IV, thickness of 15cm

Base course: Type “grading adjusted material”, thickness of 25 cm

Subbase course: thickness of 30 cm

Total thickness: 75 cm

iii) Rubber fenders

Applied Design Code

The following standards are applied to the design:

Technical Standards for Port and Harbor Facilities in Japan

The International Navigation Association (PIANC)

Japanese Industrial Standards (JIS)

Tidal Condition

Tidal conditions of the port of Lobito are as follows:

High Water Level : +1.70 m
Low Water Level : +0.50 m
Mean Water Level : +1.10 m

Structural Condition

Structural conditions of the port of Lobito are as follows:

Length : 570 m (North Quay), 552 m (South Quay)
Crown Height : +3.50 m (North Quay, South Quay)
Water Depth : -10.36 m (North Quay, South Quay)

Target Vessel

Based on the vessels list as shown in Table 9-37 and usage of the quay, the target vessel for the North quay is determined as “Bulk Carrier”, and for the South quay is “Container carrier”. In the course of calculating the berthing energy, vessel’s draft which ensures the keel clearance of 10% of the water depth at the high water level (HWL) is applied. In addition, in order to check the validity of fender spacing, small bulk carrier is also taken into account. Table 10-17 shows the main dimensions of the target vessels.

Table 10-17 List of Target Vessels

Item	Quay No.1	Quay No.2	Smallest Vessel
Name of Vessel	Liberty Grace	MSC Carina	
Type of the Vessel	Bulk Carrier	Container Ship	Bulk Carrier
Gross Tonnage (GT)	28,836 t	42,260 t	
Dead Weight Tonnage (DWT)	50,601 t	45,725 t	2,503 t
Length Overall (LOA)	190.00 m	249.00 m	80.00 m
Length between Perpendiculars (LBP)	182.00 m	231.60 m	73.10 m
Molded Width (B)	32.30 m	32.30 m	11.00 m
Molded Depth (D)	16.70 m	18.20 m	6.20 m
Draft (Full Loaded) (df)	11.90 m	12.50 m	4.50 m
Draft (At Berthing)	10.80* m	10.80* m	
Block Coefficient Cb	0.792	0.517	1.071

Berthing Condition

Because the port of Lobito is completely enclosed by the sand bank, the sea condition inside harbor is very calm. Therefore, ship approaching velocity of 0.10 m/s is applied to the calculation. The berthing conditions are as follows:

Berthing Velocity: 0.10m/s
Berthing Angle: Maximum 10 degrees
Hull Pressure: 250 kN/m^2

Berthing Energy

Effective berthing energy is calculated as follows:

$E = (Ms / 2) \times V^2 \times Cm \times Ce \times Cs \times Cc$

Ms= Mass of vessel (tons)

V = Berthing velocity (m/sec)

Cm = Hydrodynamic mass coefficient

$CM = 1 + (\pi/2Cb) \times (d/B)$
where;
Cb: Block Coefficient
d: Draft of Vessel (m)
B: Breadth of Vessel (m)

Ce = Eccentricity Coefficient

$Ce = 1 / \{1+(l / r)^2\}$
where;
r: Radius of gyration around the vertical axis passing through the center of gravity of the vessel(m)
l: Distance from the point where the vessel touches the mooring facilities to the center of gravity of vessel as measured along the face line of the mooring facilities(m)

Cs = Softness coefficient (Generally accepted the value 1.0)

Cc = Berth configuration coefficient (Generally accepted the value 1.0)

Table 10-18 shows the calculation result of berthing energy for each target vessels.

Table 10-18 Calculation Result of Berthing Energy

Item	North Quay	South Quay
Name of Vessel	Liberty Grace	MSC Carina
Type of the Vessel	Bulk Carrier	Container Ship
Dead Weight (ton)	50,601	45,725
Displacement (ton)	51,792	43,022
Berthing Velocity (m/s)	0.10	0.10
Hydrodynamic Mass Coefficient (Cm)	1.663	2.016
Eccentricity Coefficient (Ce)	0.599	0.598
Softness Coefficient (Cs)	1.0	1.0
Berth Configuration Coefficient Cc)	1.0	1.0
Berthing Energy (kN-m)	258	259

Proposed Fendering System

Based on the berthing energy as shown in Table 10-18, the following fender system is proposed. Here, performance tolerance of 10 % is considered. Figure 10-10 shows the drawing of the proposed fender system.

Required Energy Absorption: 258 / 0.9 = 287 kN-m

Height of Fender: 900 mm

Energy Absorption: 303 kN-m > 287 kN-m O.K

Reaction Force: 644 kN (Tolerance: +10%)

Frontal Frame: 1800mmW × 2000mmL

Hull Pressure: 644×1.1/ ((1.8-0.2) × (2.0-0.1)) =233 kN/m² < 250 kN/m^2 O.K.

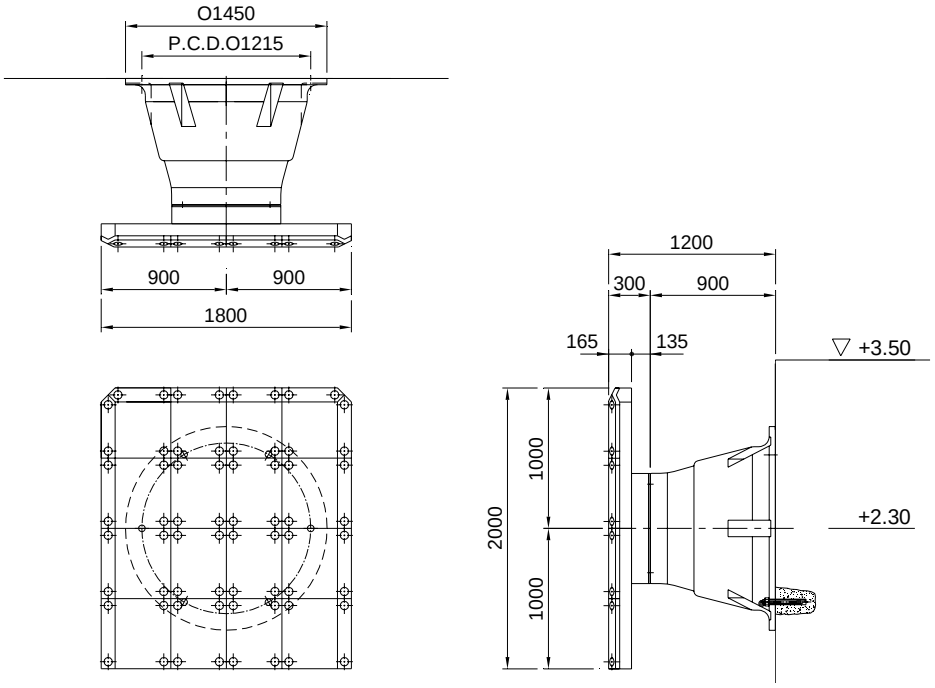

Figure 10-10 Proposed Fender System

Fitting Interval of Fender

Fitting interval of fender is calculated by the following equation (refer to Figure 10-11).

$$L = 2 \times \sqrt{r^2 - (r-h)^2}$$

L: Maximum spacing of fender (m)

r: Bent radius of bow side of ship (m)

Container Ship, General Cargo Log r = -1.055+0.650×Log(DWT)

Bulk Carrier Log r = -0.113+0.440×Log(DWT)

h: Height of fenders when effective berthing energy absorbed (m)

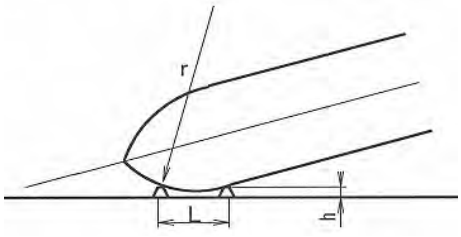

Figure 10-11 Calculation Concept of Fender Spacing

Based on the calculation result, the fender spacing of 12m is applied. Table 10-19 shows the calculation result of the fender spacing.

Table 10-19 Calculation Result of Fender Spacing

Vessel Type	Bulk	Container	Bulk
Vessel DWT (ton)	50,601	45,725	2,503
Bent Radius : r (m)	90.5	94.2	24.1
Total Fender Height : H(m)	1.200	1.200	1.200
Fender Deflection : def(m)	0.630	0.630	0.270
Height of Fender System after Deflected (Total Height - Deflection) : h (m)	0.570	0.570	0.930
Fender Spacing : L(m)	20.3	20.7	13.3
Max. Proposed Spacing : Lf(m)		12.0	

iv) Mooring bollard

Mooring bollards are determined by the gross tonnage of the target vessel. Table 10-20shows the standard values of tractive forces of vessels acting on mooring bollards and Table 10-21 shows the standard interval of bollards.

Table 10-20 Tractive Force of Vessels

Gross tonnage (GT) of vessel (tons)	Tractive force acting on a bollard (kN)
200 ＜ GT ≦ 500	150
500 ＜ GT ≦ 1,000	250
1,000 ＜ GT ≦ 2,000	250
2,000 ＜ GT ≦ 3,000	350
3,000 ＜ GT ≦ 5,000	350
5,000 ＜ GT ≦ 10,000	500
10,000 ＜ GT ≦ 20,000	700
20,000 ＜ GT ≦ 50,000	1,000
50,000 ＜ GT ≦ 100,000	1,000

Table 10-21 Intervals of Bollards

Gross tonnage of vessel (tons)	Maximum interval of bollards (m)
2,000 ＜ GT	10 – 15
2,000 ＜ GT ≦ 5,000	20
5,000 ＜ GT ≦ 20,000	25
20,000 ＜ GT ≦ 50,000	35
50,000 ＜ GT ≦ 100,000	45

According to Table 10-17, the maximum gross tonnage of target vessel is 42,260 tons, therefore the tractive force of 1,000 and the maximum interval of 35 m can be derived from the above tables. The proposed mooring bollard as follows and Figure 10-12 shows the drawing of the 1,000 kN type bollard.

North Quay

Maximum Gross Tonnage of Target Vessel: 28,836 t

Proposed size of bollard: 1000 kN type

Proposed spacing of bollard: 35 m

South Quay

Maximum Gross Tonnage of Target Vessel: 42,260 t

Proposed size of bollard: 1000 kN type

Proposed spacing of bollard: 35 m

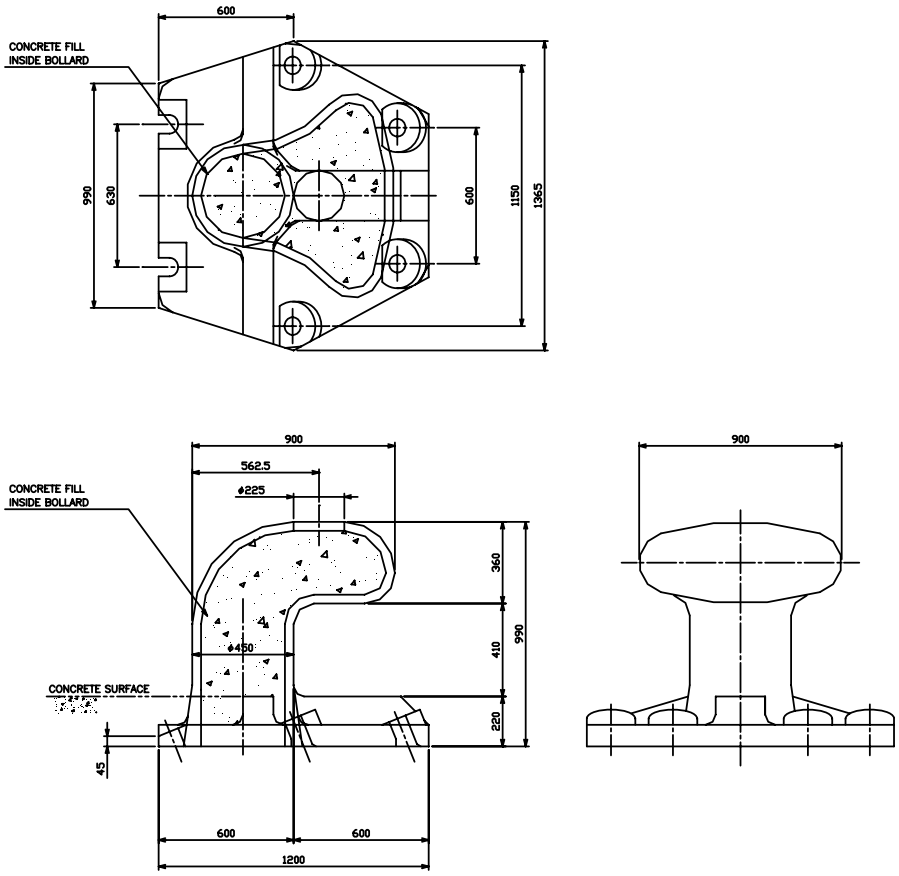

Figure 10-12 Proposed Bollard of 1000 kN Type

2) Cost estimate

Based on the result of field survey, the construction plan and approximate cost estimate will be compiled as follows.

Basic condition for cost estimate;

The construction cost has been estimated based on the result of material survey cost on October 2005 at Angola.

Exchange rate of currency is fixed as follows (Oct. 2005): US$1.0=Kz.87.6= ¥116

Physical contingency is estimated at 5 %.

Engineering services fee is estimated at 5 %.

Indirect cost is estimated at 20 %.

Price escalation is not included for construction, and equipment.

The direct cost of construction is classified into the foreign and local currency component, the percentage distribution of major items is shown below.

No.	Work Item	Foreign (%)	Local (%)
1	Concrete Pavement	60	40
2	Asphalt Pavement	70	30
3	Wharf Repair	50	50
4	Electrical, Water, Repair	90	10
5	Cargo Handling Equipment	100	0

Table 10-22 Port of Lobito Short-Term Rehabilitation Plan Construction Cost

Facility	Unit	Quantity	Unit Price US$	Construction Cost(1,000US$)		
				Total	Foreign	Local
1.Apron,Yard Pavement	m^2	153,100	120	18,372	11,023	7,349
2.Repaire Wharf	m	1,122	680	763	382	381
3.Rubber Fender	set	93	82,000	7,626	6,863	763
4.Bollard	set	33	9,760	322	290	32
5.Repair Water, Oil supply pipes	L.S	1		138	69	69
5.Refer Facilities	L.S	1		384	346	38
Total				27,605	18,973	8,632
7.Cargo Equipment*	L.S	1		3,675	3,675	0
8.Engineering Services	L.S	1		1,380	966	414
9.Physical Contingency	L.S	1		1,380	414	966
10.Tax	L.S	1		1,242	0	1,242
Grand Total				35,282	24,028	11,254

* Mobile Crane: 1 unit, Reach Stacker: 2 units, Top Lifter: 2 units

Table 10-23 Port of Lobito Short-Term Rehabilitation Plan Working Schedule (Month)

Work Item	2	4	6	8	10	12	14	16	18	20	22	24
1.Preparatory Works												
2.Apron Yard Pavement												
3.Repair Wharf												
4.Rubber Fender, Bollard												
5.Refer Facilities												
6.Repair Water Pipes												
7.Cargo Handling Equipment												
8.Miscellaneous works												

10.2.4 Preliminary Economic Analysis and Financial Analysis

1) Preliminary Economic Analysis

The purpose of the economic analysis is to appraise the economic feasibility of the short-term rehabilitation plan for Lobito Port from the viewpoint of national economy. An economic analysis was carried out applying the following method. Short-term rehabilitation plan was defined and it was compared to the without case. All the benefits and costs accruing from the difference between 'with' and 'without' cases were calculated. The economic internal rate of return (EIRR) based on a cost-benefit analysis was used to appraise the feasibility of the project. The EIRR is a discount rate which makes equal the costs and the benefits of the project during the project lifel. Taking into consideration the depreciation period of the facilities of 30 years and the construction period of 5 years including detail design, the project life period of calculation in the economic analysis is assumed to be 35 years from the beginning of construction. The exchange rate adopted for this analysis is US$1=AKZ87.6. Low case of demand forecast is adopted for this analysis.

i) Costs of the Project

The items that should be considered as costs of the project are construction costs, maintenance costs, and renewal investment costs.

ii) Construction Costs

Construction costs and investment schedule are shown in Table 10-24.

Table 10-24 Construction Costs (unit: US$1,000)

2009			2010			Total
Total	Foreign	Local	Total	Foreign	Local	
8,827	4,710	4,117	26,455	19,318	7,137	35,282

iii) Maintenance Costs

The costs of maintaining port facilities and equipment per year are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of original construction costs. Maintenance costs are shown in Table 10-25.

Table 10-25 Maintenance Costs

Unit: 1,000US$

	Construction Cost	Maintenance Cost
Civil Works	27,605	276
Machine & Equipment	3,675	147

iv) Renewal Investment Costs

The renewal costs for cargo handling equipment after their economic service lives should be considered. The economic service lives of equipment are planned in Table 10-26. This investment will be done by foreign portion.

Table 10-26 Renewal Investment Costs

	Durable Period	Cost (1,000US$)
Mobile Crane, Reach Stacker, Top Lifter	10 Years	3,675

v) Benefits of the Project

As benefits brought about by the short-term rehabilitation plan of Lobito port, saving in land transportation costs is identified. Cargo is assumed to deliver to Luanda port in case that Lobito port cannot afford to handle its cargo. Increased port capacity through the rehabilitation saves land transportation from Luanda to Lobito or its hinterland. Based on the land transport cost from Luanda to Lobito (US$ 110 per ton), the unit benefit is assumed as US$ 16.5 per ton. This is 15% of the land transport cost.

vi) Evaluation of the Project

EIRR of the project at Lobito Port is calculated as 28%. It is generally recognized that a project is feasible if the EIRR exceeds the opportunity cost of capital. Usually, the opportunity cost of capital is considered to range from 8% to 10% according to the degree of development in each country. It is acceptable that a project with an EIRR of more than 8% is economically feasible for infrastructure or social service projects. As for this project, even though the economic calculation only takes into account the items that are easily quantified, the EIRR is still 28%. Therefore, this short-term development project is feasible from the viewpoint of the national economy.

2) Preliminary Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the short-term rehabilitation plan for Lobito port from the viewpoint of the financial soundness of the port management body during the project life. A financial analysis was carried out applying the following method. Short-term rehabilitation plan was defined and compared to the without case. All the benefits and costs accruing from the difference between 'with' and 'without' cases were calculated. The financial internal return (FIRR) based on a cost-benefit analysis was used to appraise the feasibility of the project. The FIRR is a discount rate which makes the costs and the benefits of the project during the project life equal. Taking into consideration the depreciation period of the facilities of 30 years and the construction period of 5 years including detail design, the project life period of calculation in the financial analysis is assumed to be 35 years from the beginning of construction. The exchange rate adopted for this analysis is US$1=AKZ87.6. Low case of demand forecast is adopted for this analysis.

i) Costs of Project

The items that should be considered as costs of the project are construction costs, maintenance costs, renewal investment costs and operating costs including other port facilities.

ii) Construction Costs

Construction costs and investment schedule are shown in Table 10-27

Table 10-27 Construction Costs (unit: US$1,000)

2009			2010			Total
Total	Foreign	Local	Total	Foreign	Local	
8,827	4,710	4,117	26,455	19,318	7,137	35,282

iii) Maintenance Costs

The costs of maintaining of port facilities and equipment per year are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of original construction costs. Maintenance costs are shown in Table 10-28.

Table 10-28 Maintenance Costs

Unit: 1,000US$

	Construction Cost	Maintenance Cost
Civil Works	27,605	276
Machine & Equipment	3,675	147

iv) Renewal Investment Costs

The renewal costs for cargo handling equipment after their economic service lives should be considered. The economic service life of equipment is planned in Table 10-29. This investment will be done by foreign portion.

Table 10-29 Renewal Investment Costs

	Durable Period	Cost (1,000US$)
Mobile Crane, Reach Stacker, Top Lifter	10 Years	3,675

v) Operating and Maintenance Costs

Operating and maintenance costs are separated between variable portion and fixed portion. The variable portion is calculated by multiplying cargo volume and unit cost per ton which is calculated using the financial data of Lobito port in 2004. In 2004, share of the variable portion is assumed as 80% and that of the fixed portion is assumed as 20% or US$ 3,000milion. The unit cost is also assumed as US$ 22 per ton.

vi) Benefits of the Project

Operating revenues are estimated from the difference in revenues between the 'with case' and the 'without case'. All revenues are calculated by multiplying cargo volume and unit revenue per ton which is calculated using the financial data of Lobito port in 2004. The unit revenue is assumed as US$ 28 per ton.

vii) Evaluation of the Project

FIRR of the short- term rehabilitation plan for Lobito port is 6.7%. In case of using Japanese ODA loan for infrastructure development in LDC, the interest rate is under 2% in 2005. Judging from the above, this project is regarded as financially feasible under the assumptions in this chapter.

10.2.5 Draft of Initial Environmental Examination

1) Analysis of Alternatives (including without Project option)

The comparison between With and Without Project targeted in the year of 2010 is as per Table 10-30 shown below. In this study, "With Project" is called as "Proposed Project".

Without Project Alternative: Less efficiency of ships berthing and cargo handling, confusion of container yard, more damages to quay and ships and a lot of dust from unpaved yard are assumed if the project is not implemented.

With Project: It is secured the safety of ships navigation and berthing. Inland neighboring countries can utilize the port as their main ports in addition to the industrial recovery of inland areas in Angola by this project. The availability of refer cargo, the possible reduction of port charge and the improvement of dust control will lead to enrich the people's living conditions.

Table 10-30 Comparison of With and Without Project (Lobito)

Comparison Item		Current state (2004)	Without Project (2010)	With Project (2010)
・Quay length		1,112m	1,112m	1,112m
・Yard dimension		80,000 ㎡	80,000 ㎡	80,000 ㎡
Social	Traffic	**C**	**D**	**C**
	Economy	**D**	**E**	**B**
	Living	**C**	**D**	**B**
	Safety	**C**	**D**	**A**
	waste	**C**	**C**	**C**
Natural	Fauna & Flora	**C**	**C**	**C**
	Landscape	**C**	**C**	**C**
Pollution	Air	**D**	**D**	**C**
	Water	**C**	**C**	**C**
	Noise & Vibration	**C**	**C**	**C**

Note) Highly Positive: A Positive: B
Not Significant: C Negative: D
Highly Negative: E

2) IEE

i) Survey Method

The purpose of IEE as first step of EIA is to find environmental impacts with the project through retrospective data and site surveys. After this, it is required to judge whether detailed EIA is necessary and find the priority environmental impacts if EIA is judged necessary and clarify the priority issues of Detailed EIA. The proposed short term rehabilitation program has been conducted with the following procedures together with MINTRANS. The assessment of IEE has been done according to “Guidelines for Environmental and Social Considerations (April 2004)” made by JICA.

Review of natural and social environmental conditions which may be influenced by the implementation of the proposed Short term Rehabilitation Program(draft)

Selection of the sensitive and valuable items for environment in order to minimize environmental impact generated by the alternatives

Preliminary assessment for the selection of negative impact at the time of construction and operation (SCOPING) and the mitigations

ii) Key Impacts Identified:

As the IEE result of Port of Lobito is shown in Table 10-31, the generation of construction waste, the impact to front water area at the time of removal of existing quay, and the dust influence can be assumed as three negative impacts. In the environmental assessment including the mitigation “Waste”, “Topography and Geology”, “Air Pollution” are ranked C and D for other items.

Environmental Impact during construction and operation phases

“Generation of Construction Waste” There is no waste treatment facility in present Lobito. Therefore, there is a possibility to have negative impact from generated volume, transportation method, treating method for concrete blocks and waste, industrial waste like a construction waste soil during

construction period. The impact level by waste is assumed minor since the construction itself is not large scale and hazardous substances are not included however, these may be found at the time of future detailed design stage or the construction planning stage.

"Water pollution of quay front" "The change of water depth": The discharged water channel is connected between Lobito Bay and valuable estuarine water area where is the feeding ground for Flamingoes and Salt Pans. Fishery activities are prohibited in Lobito Bay to protect fishes decreased during civil war. Therefore, the impacts on water pollution and spreading turbidity have to be taken care when concrete wastes by removing existing quay using concrete cutters or breakers is generated. And also it possibly changes the water depth in front of the quay by falling concrete waste during construction period. The degree of impacts will be found during detailed design and construction planning stages however, the project is limited to the partial improvement of existing quay and the installation of rubber fenders and bollards therefore, the impact may be very minor.

"Dust": Local port people has requested to pave existing yard not only for driving function and safety of cargo handling machines but also for health maintenance of port labors protecting from dust generated when the cargo handling machines work. In this respect, the dust generated by the improvement of existing yard and the quay is to be considered as a main item. However, the impact may not be so serious judging from the facts that south wind is dominant around port of Lobito and there is the concrete wall with the height of about 3m at the boarder of port district and the urban area located at south and back side of the port.

iii) Mitigations

As mitigations against the negative impacts during construction period which were mentioned in the previous article the following methods are considered.

Generation of construction waste

In case that the generated volume of industrial waste is not a lot, the dumping area of waste disposal in the port area is possible. However, in case that the generated volume is a lot, dumping to open space located at out side of the port area have to be considered. In that case, it is necessary to apply and get the approval for its transportation and treating plan from city of Lobito.

The recycling is possible to use as construction materials such as sub-base material for road, back filling material, filling material of structures, reclamations material in order to minimize the impact. The artificial fish shelter is another possible mitigation.

"Water pollution of quay front" "The change of water depth"

The mitigation is possible by installing safety net in order not to fall concrete blocks and concrete waste in front of the quay during quay removable works. The mitigation is possible to enclose working area by silt protection curtain. As Lobito bay is closed water area if the construction work is carried out at the time of ebb current the water volume to discharged water channel can be automatically controlled to the estuarine water area and salt pans. In case that water depth in front of the quay became shallow by accumulation of falling concrete waste it is possible to mitigate it by removing them after the works completed.

"Dust"

The sand removable in yard can mitigate the impact from the dust. It is possible to mitigate the impact by washing wheels before construction vehicles getting into the yard or watering on the removal area. It is also possible to mitigate by limiting the speed of construction vehicles in the port.

Table 10-31 Result of IEE (Port of Lobito)

Evaluation Item	Possible Adverse Impacts		Evaluation		Mitigation
	Construction	Operation & Subsistent	Rank	Reasons	
Social Environment					
1. Resettlement			D	The plan is to repair facilities in the existing sites, so resettlement due to construction is not expected.	
2. Economic Activities			D	The influence to economic activity is believed to be minor since the objective plan is the construction within the area of existing facility.	
3. Traffic and public facilities			D	The width of access road to the port is wide and the traffic is not heavy. The utilization of port railway will be more increased by recovery of Benguela Railway at the operation time.	
4. Split of Communities			D	Separation of society is not expected since the work is limited within port area.	
5. Cultural Heritage			D	Cultural heritage is not an issue since the work is limited within port area.	
6. Water and Common Rights			D	The repair work inside existing port facilities would not generate any new problems for those rights. However, in case that land reclamation for the extension work of seawall and quay is required it is necessary to pay special consideration to neighboring private properties and water concession.	
7. Public Health Condition			D	The project is limited to rehabilitation of existing quay and yard the polluted material is not possible to be brought from outside.	
8. Wastes	Generation of construction waste		C	The removal of existing warehouses which asbestos insulated structures have been used and the dredging work are not planned. However, construction waste or soil generated by removal of existing quay and yard are likely.	・Recycle as construction materials ・Reuse as the material of Artificial Fish Shelters ・Transportation, treatment and disposal of wastes have to be planned
9. Hazards (Risks)			D	The safety of ship navigation is to be enhanced by improving navigation aids. The overturning risk of construction machines will be mitigated by pavement of land bumpy area.	
Natural Environment					
1. Topography and Geology	removal of existing quay		C	The facilities constructions are not planned to lead topographic change at sea and land areas. However, it is possible to make change of water depth in front of the quay by rehabilitation work of existing quay.	・the protection for falling of construction waste ・removal construction waste after falling down
2. Soil Erosion			D	Assumed to be no impact on agricultural land and salt pan.	
3. Groundwater			D	The site originates from a wetland, so groundwater depletion is unlikely.	
4. Hydrological situation			D	The project is limited to the improvement of existing facilities so the current condition in the bay area will not be	
5. Coast and Sea			D	The extension of the quay, reclamation and dredging are not scheduled and the normal line of existing port facilities will not be changed.	
6. Fauna and Flora			D	As the project is limited to land facilities in existing port area the impact to marine organisms is minor. Also the impact to the estuarine water area located at south east of the port where flamingoes visit is minor since the distance is about 1km from the project site and the wind to north direction is predominant.	
7. Landscape			D	The plan is to repair facilities in the existing sites.	
Pollution and Public Hazards					
1. Air Pollution	Dust		C	There is no plan to lead to air pollution. Resident area and school have good distance from the project site. However, the commercial area is relatively closer and may be influenced by the dust from the project site during construction period.	・Cleaning of yard and washing wheels of construction vehicles ・Watering on project site ・Speed limitation of construction vehicles
2. Water Pollution	Removal of existing quay		C	Water turbidity generated from the construction work for rehabilitation of quay is likely.	・Installation of silt protection curtain and the protection for falling of construction waste ・Construction at the time of ebb current
3. Soil Contamination			D	The handling item is containers after completion of yard rehabilitation work therefore, there is no room for any hazardous chemical substance is contained. Turnover rate of cargo handling will be improved therefore there will be no pollution to soil caused by long term storage of container boxes.	
4. Noise and Vibration			D	The commercial area is closed to project site though it is about 500m from the site and removal working period which is most noisy period is relatively short therefore, the impact will be minor.	
5. Land Subsidence			D	Land subsidence of ambient surrounding is not considered under this study.	
6. Offensive Odor			D	Facilities which generated odor are not planned.	

Assessment; A: High Negative Impact, B: Low Negative Impact, C: Unknown Impact, D: No impact

3) Terms of Reference (TOR) for EIA

i) Outline

IEE previously studied in 1) and 2) is composed as a part of EIA and it is utilized as data whether the project is acceptable in view of the impact to social environment and natural environment as well as clarifying key impacts of EIA. As the result of IEE, It is judged that there will be no major impact since the project is limited to rehabilitation works of existing land facilities without changing the existing normal lines and the existing utilization method however, some minor impacts have been assumed by the implementation of rehabilitation works. These impacts will be found through the future detailed design and detailed construction plan. The mitigations at the construction period and the monitoring are more significant than the prediction of these impacts.

The execution of EIA is required for any port project by EIA law of Angola. From this time, MINTRANS have to get approval of MINUA according to EIA concerned laws when the detailed design (facility design, construction method, construction material and etc.) will become apparent.

It is necessary to have common understanding between the persons of Angola Government in charge of EIA and Design Consultant provided the data obtained through the study of natural environmental survey, social environmental survey and stakeholders meetings.

It is recommended that the implementation of EIA and the detailed design of the project are executed at the same time. By so doing the design information is transferred to environmental team and the extent of the impacts and the mitigations can be feedback to design team immediately.

The public consultation including MINUA is required when the EIA is executed in order to get opinions from the representative of residents who are living in the vicinity and the area having impacts, the area representative of NGO and local governments. It is also recommended that the meeting is held among MINUA, residents and project related group commencing from initial stage of execution of EIA in order to make the plan understood well.

The disclosure of EIS outline, impacts prediction to environment and the mitigations are recommended in the public consultations. The opinions and the complaints regarding the project which were submitted or reported in the meeting should be feedback to the proposed project as the reconsider items. The mitigations against environmental deterioration have to be planned to proposed project.

ii) Survey, Prediction, Assessment

The following method can be considered concerning survey, prediction and assessment of EIA.

Regarding Construction waste:

It is necessary to select main source of the outbreaks of waste through detailed design and detailed construction method and figure out location of the source of outbreaks, the sort of the waste and its volume.

It is important to secure dumping site and the waste disposal plan since these are going to be big problems in the process of collection, transportation, treatment and disposal. It is the objective of assessment that makes the volume of waste small and no impact given to the environment of vicinity of disposal area upon the considerations on the sort of waste, method of disposal and social environment of disposal area.

Regarding the impact to surrounding environments it is recommended to have interviews from surrounding areas and get confirmation at the public consultations upon clarifying the waste treatment method and the disposal area.

It is recommended to conduct periodical site survey to check whether the planned waste treatment is carried out as per schedule.

Regarding Dust:

Firstly, actual survey to confirm the extent of the impact by the dust of vehicles in existing yard will be conducted. At that time, the season, the time and the wind directions shall be recorded. The consciousness survey is recommended as well as hearing of seasonal and hourly extent of the impacts to residential area when necessary.

The impact to surrounding environment is seemed minor since there is the concrete wall which also can be as windbreak and noise barrier with the height of about 3m between existing port and urban area.

It is more important to have the mitigations by the construction plan than the survey and the prediction regarding the dust generated at the time of removing existing facilities or during construction period within the existing yard.

Regarding Water Pollution and Change of Water Depth:

Firstly, to survey the impacts to water environment by removing existing concrete structure and in-situ concrete work judging from the detailed design and construction method of the rehabilitation of existing quay is necessary. It may be possible to predict the water quality through hearing and simulation since the works of quay construction, dredging work and reclamation work are carried out in SONAMET yard where is located near port of Lobito. It is necessary to check water depth in the concerned area before the construction work commenced as the water depth will be changed by falling concrete waste.

It is presumed that the impact to expansion of turbidity and water pollution will be minor since the construction works are limited to rehabilitation works of existing quay excluding dredging work, rehabilitation work of under water, marine construction work. However, there is the valuable estuarine area connected to port of Lobito in the backside of the site where flamingoes visit in the summer. It is hard to consider leaving the estuarine as long as feed is secured within their environment for usual birds. Therefore, if the construction period will be met with the important season for them like breeding time or incoming season the extent of the impacts to aquatic organism which is their bait will be the assessment vision. The extent of impacts by water pollution or change water depth caused by the factor from construction method is more significant than the survey and the prediction.

It is recommended to conduct periodical survey at water area of quay front, center of Lobito bay, discharging water channel and the estuarine area aiming to find the volume of Suspended Solids during construction period. It is recommended to check the water depth before the construction and during construction period by periodic survey in order not to change the water depth by falling concrete waste.

10.3 The Port of Namibe

10.3.1 Rehabilitation Needs

Port facilities of the Port of Namibe are severely damaged and in the worst condition among the four ports. It is urgently required to rehabilitate/improve port facilities. Table 10-32 shows problems of the Port of Namibe and measures to be taken in the near future, in which items marked V

have an urgent need for implementation in the Short-term Rehabilitation Plan. Rehabilitation of items not marked V shall be taken in the next phase of the rehabilitation.

Table 10-32 Problems and Necessary Measures for the Port of Namibe

Problems	Appropriate Measures	Short-term Plan
Pavement in the apron and yard	To repair the apron and yard behind the Berths No.1 - No.3	V
Coping concrete of the quay wall and car stopper	To repair the coping concrete including car stopper; Berths No.1 - No.3	V
Rubber fenders	To install/replace rubber fenders on the quay front; Berths No.1 - No.3	V
Internal road	To repair the internal road; 620 m	V
Railroad in the port	Rehabilitation of railroad tracks in the port	
Pavement in the marshalling yard	To pave the marshalling yard in the port; about 3.9 ha	V
Warehouses	To repair the warehouse No.2, and to remove No.1	V
Reefer plugs and power supply	To install reefer plugs and power generator in the yard behind Berth No.3	V
Container handling equipment	To increase reach stackers, top lifters, and forklifts	V
Unused quay cranes	Removal of six unused quay cranes	V
Water and fuel oil supply	To repair water pipes and fuel oil supply facilities laid in the apron and yard	V
Yard lighting	To install lighting towers in the yard behind Berths No.1 - No.3	V
Expansion of container yard	To extend container yard to the north of Terminal No.3	
RO/RO facilities	To improve the slope at the north of Terminal No.3	
Revision of chart; and Bathymetric survey	To make a bathymetric survey and prepare a detailed chart	
Maintenance dredging	Sedimentation in front of the quay wall was not identified	
Electronic Data Interchange	To establish EDI system between Customs, Immigration, Shipping lines and others	

10.3.2 Rehabilitation of Port Facilities

1) Required Capacity of Namibe Port in 2010

The berth capacity and the yard capacity for conventional cargo are shown in Table 10-33. The berth capacity and the yard capacity for container cargo are shown in Table 10-34. Current container cargo handling capacity of Namibe port is calculated at 39,000 TEU per year and that of the future is calculated at 58,000 TEU per year.

Table 10-33 Cargo Handling Capacity of Namibe Port (Conventional Cargo)

Conventional		Namibe
Berth Length	m	370
Present Productivity	ton/m	688
Present Capacity	ton	255,000
Future Productivity	ton/m	2,106
Future Capacity (Berth)	ton	779,000
Future Capacity (Yard)	ton	600,000
Future Capacity	ton	600,000

Table 10-34 Cargo Handling Capacity of Namibe Port (Container Cargo)

Container Berth Capacity		Namibe	
Berth Length	m	240	
Present Productivity	TEU/m	387	
Present Capacity	TEU	92,880	
Future Productivity	TEU/m	790	
Future Capacity	TEU	189,600	
Container Yard Capacity		No.3A	No.3A+No.1,2
Area	ha	2.68	4.4
Present Productivity	TEU/ha	7,000	7,000
Present Capacity	TEU/Year	19,000	31,000
Future Productivity	TEU/ha	10,500	10,500
Future Capacity	TEU/Year	28,000	46,000

Current and future cargo handling capacity and demand forecast are shown in Table 10-35. Future cargo throughput exceeds the present capacity. Rehabilitation will be necessary to cope with future cargo throughput, even if No.3A terminal is used as a multi purpose terminal.

Table 10-35 Cargo Handling Capacity and Demand Forecast (Namibe Port)

	Conventional Cargo		Container Cargo	
Present Capacity	255,000	ton	31,000	TEU
Cargo Throughput (2004)	209,485	ton	7,428	TEU
Future Capacity	600,000	ton	46,000	TEU
Cargo Throughput (2010,high)	624,000	ton	24,000	TEU
Cargo Throughput (2010,low)	488,000	ton	19,000	TEU

2) Rehabilitation of Terminals

In order to meet the demand for import, export and coastal shipping, it will be necessary to utilize all wharves and facilities in the Port of Namibe. As shown in Table 10-32, items marked V are proposed for the Short-term Rehabilitation Plan to increase the capacity of cargo handling. Urgent requirements to be completed by 2010 are 1) to repair the apron and yard behind the Berths No.1 - No.3, 2) to repair the coping concrete; 3) to install/replace all rubber fenders; 4) to install reefer plugs and power generator; 5) to increase reach stackers, top lifters and forklifts; and 6) to repair water pipes and fuel oil supply facilities laid in the apron and yard. Figure 10-13 shows the proposed area for the Short-term Rehabilitation Plan.

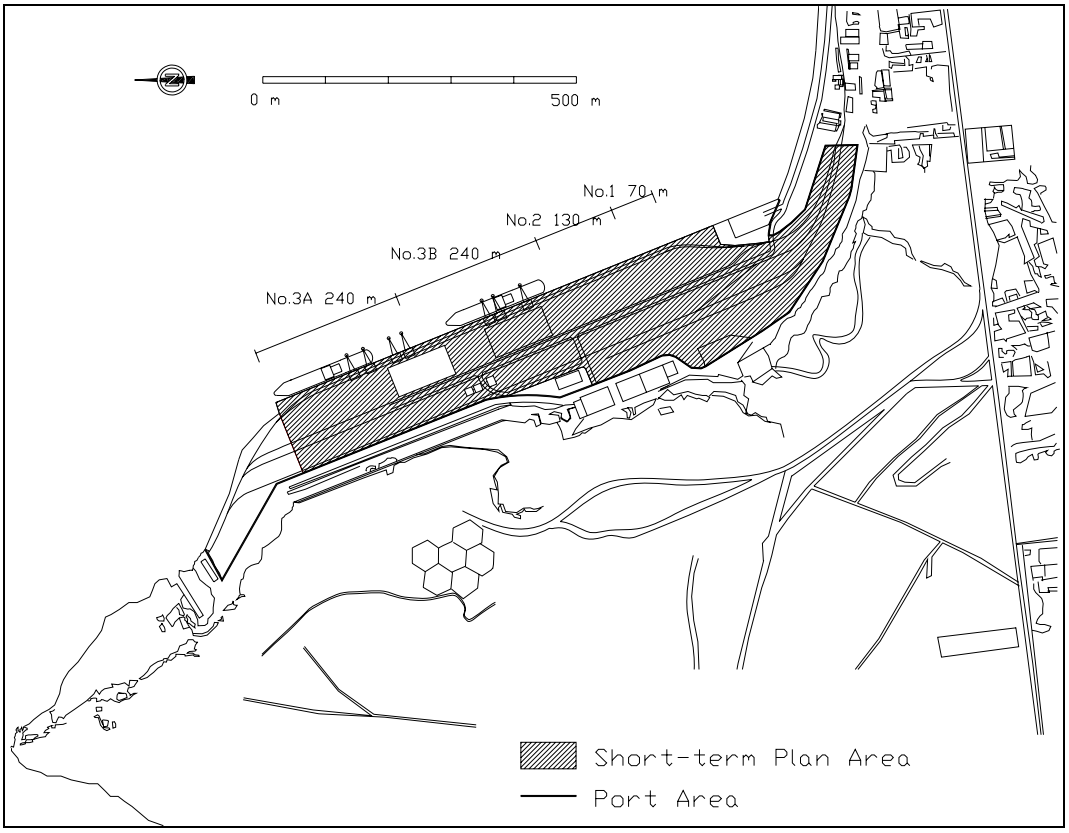

Figure 10-13 Short-term Rehabilitation Area of the Port of Namibe

3) Quay wall, Apron, Yard, Rubber fender and Mooring bollard

As for the quay, severe damage to coping concrete over the entire length of the quay and some defect of the quay wall such as partial cracks and chipping off were observed (see Appendix). In addition, because coping concrete is not equipped with car stops, the cargo handling equipment and the workers are in danger of falling into the sea. Therefore, the following measures are proposed:

To repair coping concrete over the entire length of Berth No.1 (70m), Berth No.2 (130m) and Berth No.3 (480m) and installation of car stops.

To repair quay wall where cracks were observed.

As for the apron and yard pavement, unevenness and cracks were found in many places as well as bumps stretching more than 30cm. Furthermore, large portion of the apron and yard is unpaved (see Appendix). Therefore, the following measure is proposed:

To pave the apron and yard behind Berth No.1 (70m), Berth No.2 (130m) and Berth No.3 (480m).

As for the rubber fenders, large truck tires used as shock absorbers over the entire length of the quay seem to be entirely inadequate to cope with vessel's berthing energy (see Appendix). In addition, the number of rubber fenders is small and there are some occasions where a vessel's rolling motion during cargo landing and loading crushes the truck tires, then the vessel's hull smashes against the quay wall. Therefore, the following measure is proposed:

To install rubber fender appropriate for the incoming vessel along Berth No.1 (70m), Berth No.2 (130m) and Berth No.3 (480m).

As for the mooring bollards, the load capacity of existing ones is 50 t. Many bollards are

missing due to the tractive force by the moored vessel (see Appendix). Considering the maximum size of the incoming vessel, the mooring bollards having a load capacity of at least 100t are required for the Berth No.3. Therefore, the following measure is proposed:

To install of mooring bollards appropriate for the incoming vessel along Berth No.1 (70m), Berth No.2 (130m) and Berth No.3 (480m).

4) Cargo Equipment and Warehouse

i) Cargo Equipment

Bulk cargo and empty containers are handled by quay crane. But in the case of other containers, ship's gear is used because of the quay crane's low capacity. To transport cargo in the yard forklift is used for bulk cargo and reach stacker or top lifter is used for containers. But ship's gear and chassis are waiting for containers which reach stacker carries. We expect that cargo handling volume at the port of Namibe will increase in future. Therefore, we recommend the introduction of the following cargo equipment to enhance port service.

Mobil Crane (60t)	1
Forklift (45t)	1
Reach Stacker (40t)	2
Top lifter (40t)	1

ii) Warehouse and others

No.1 warehouse is only used partly as an office. Currently the yard behind the quay is insufficient. However, the handling of containers is expected to increase. Therefore, JICA study team recommends the removal of warehouse No.1 to enhance port service at the port of Namibe.

5) Access Road

Unevenness and caving were observed on access road from the port entrance gate to the yard. Therefore, the following measure is proposed to pave the access road from the port entrance gate to the yard (620m).

6) Reefer Facilities

There is no reefer facility. However, the handling of foodstuffs is expected to increase. Therefore, the study team recommends the introduction of the installation of reefer plugs to enhance port service at the port of Namibe.

10.3.3 Conceptual Design and Cost Estimate

1) Conceptual Design

i) Repair of coping concrete and quay wall including installation of car stop

Among the repair methods described in 10.2.3, considering the deterioration extent of the coping concrete and quay wall and material availability in Angola, the following repair methods are proposed for each damaged portion:

Cracks on the concrete surface: Crack filling

Chipped off portion of concrete: Small section recovering

Section loss of coping concrete: Pouring concrete method of Large section recovering

In addition, car stops made by wood fiber reinforced plastic with 25 cm in height are recommended to be placed on the coping concrete by anchor bolts.

ii) Apron and Yard pavement including Access Road

Concrete Pavement

As described in 10.2.3, concrete slab thickness of 35 cm is proposed.

Asphalt Pavement

As described in 10.2.3, the following composition of asphalt pavement is proposed for the yard pavement and access road:

Surface course: Type AC II, thickness of 5cm
Binder course: Type AC IV, thickness of 15cm
Base course: Type “grading adjusted material”, thickness of 25 cm
Subbase course: thickness of 30 cm
Total thickness: 75 cm

iii) Rubber fenders

Applied Design Code

The following standards are applied to the design:

Technical Standards for Port and Harbor Facilities in Japan
The International Navigation Association (PIANC)
Japanese Industrial Standards (JIS)

Tidal Condition

Tidal conditions of the port of Namibe are as follows:

High Water Level	: +1.70 m
Low Water Level	: +0.50 m
Mean Water Level	: +1.10 m

Structural Condition

Structural conditions of the port of Namibe are as follows:

Length	: 480m (Berth No.3), 130m (Berth No.2), 70m(Berth No.1)
Crown Height	: +3.50m
Water Depth	: -10.5m (Berth No.3), -6.1m(Berth No.2), -3.0m(Berth No.1)

Target Vessel

Based on the vessels list as shown in Table 9-37 and usage of the quay, the target vessels for the Berth No.3 is determined as both “Bulk Carrier” and “Container Carrier”, for the Berth No.2 is “General Cargo” and Berth No.1 is “Fishery Boat”. The main dimensions of “General Cargo” and “Fishery Boat” are assumed based on the data described in above mentioned standard. In the course of

calculating the berthing energy, vessel's draft which ensures the keel clearance of 10% of the water depth at the high water level (HWL) is applied. In addition, in order to check the validity of fender spacing of the Berth No.3, "General Cargo" is taken into account. Table 10-36 and Table 10-37 show the main dimensions of the target vessels.

Table 10-36 Target Vessel for Berth No.3

Item	Berth No.3	
Name of Vessel	Liberty Grace	MSC Carina
Type of the Vessel	Bulk Carrier	Container Ship
Gross Tonnage (GT)	28,836 t	42,260 t
Dead Weight Tonnage (DWT)	50,601 t	45,725 t
Length Overall (LOA)	190.00 m	249.00 m
Length between Perpendiculars (LBP)	182.00 m	231.60 m
Molded Width (B)	32.30 m	32.30 m
Molded Depth (D)	16.70 m	18.20 m
Draft (Full Loaded) (df)	11.90 m	12.50 m
Draft (At Berthing)	10.80 m	10.80 m
Block Coefficient Cb	0.792	0.517

Table 10-37 Target Vessel for Berth No.2 and No.1

Item	Berth No.2	Berth No.1
Type of the Vessel	General Cargo	Fishery Boat
Gross Tonnage (GT)	1,623 t	30 t
Dead Weight Tonnage (DWT)	3,000 t	
Ship Displacement (DT)	4,741 t	
Length Overall (LOA)	94.00 m	20.00 m
Length between Perpendiculars (LBP)	88.09 m	
Molded Width (B)	14.60 m	4.70 m
Draft (Full Loaded) (df)	5.60 m	2.50 m
Block Coefficient Cb	0.639	

Berthing Condition

Because the port of Namibe does not have any breakwaters, the incoming vessels are affected by the sea wave. Therefore, ship approaching velocity in the port of Namibe is considered to be quicker than that in the port of Lobito. In addition, the berthing velocity of the smaller vessels tends to be quicker than that of the larger vessel. The berthing conditions are as follows:

Berthing Velocity: 0.15m/s (Berth No.3), 0.25m/s (Berth No.2), 0.40m/s (Berth No.1)
Berthing Angle: Maximum 10 degrees
Hull Pressure: 250 kN/m^2

Berthing Energy (Excluding Berth No.1)

Effective berthing energy is calculated as follows:

$E = (Ms / 2) \times V^2 \times Cm \times Ce \times Cs \times Cc$

Ms= Mass of vessel (tons)

V = Berthing velocity (m/sec)

Cm = Hydrodynamic mass coefficient

$CM = 1 + (\pi/2Cb) \times (d/B)$

where;

Cb: Block Cefficient

d: Draft of Vessel (m)

B: Breadth of Vessel (m)

Ce = Eccentricity Coefficient

$Ce = 1 / \{1 + (l / r)^2\}$

where;

r: Radius of gyration around the vertical axis passing through the center of gravity of the vessel(m)

l: Distance from the point where the vessel touches the mooring facilities to the center of gravity of vessel as measured along the face line of the mooring facilities(m)

Cs = Softness coefficient (Generally accepted the value 1.0)

Cc = Berth configuration coefficient (Generally accepted the value 1.0)

Table 10-38 shows the calculation result of berthing energy for each target vessels.

Table 10-38 Calculation Result of Berthing Energy (Berth No.3 and No.2)

Item	Berth No.3		Berth No.2
Name of Vessel	Liberty Grace	MSC Carina	
Type of the Vessel	Bulk Carrier	Container Ship	General Cargo
Dead Weight (ton)	50,601	45,725	3,000
Displacement (ton)	51,792	43,022	4,742
Berthing Velocity (m/s)	0.15	0.15	0.25
Hydrodynamic Mass Coefficient (Cm)	1.663	2.016	1.943
Eccentricity Coefficient (Ce)	0.599	0.598	0.571
Softness Coefficient (Cs)	1.0	1.0	1.0
Berth Configuration Coefficient Cc)	1.0	1.0	1.0
Berthing Energy (kN-m)	580	583	164

Berthing Energy for Berth No.1

The berthing energy of fishery boat is calculated as below.

$E = W V^2/4$

Virtual Weight(W) W=W0 +W'

W0: Displacement (ton)

$W0=3 \times GT$

W': Added Weight

$W' = (\pi/4)d2L\gamma w$

d: Draft

L: Length of fishery boat

γw: Specific weight of sea water (1.03ton/m3)

Table 10-39 shows the calculation result of berthing energy by fishery boat.

Table 10-39 Calculation Result of Berthing Energy (Berth No.1)

Item	Berth No.1
Type of the Vessel	Fishery Boat
Gross Ton (ton)	30
Displacement(ton)	90
Loa (m)	20.0
Draft (m)	2.5
Added Mass W' (ton)	101.1
Virtual Weight W (ton)	191.1
Berthing Velocity (m/s)	0.40
Berthing Mode	¼ Point
Berthing Energy (ton-m)	0.78
Berthing Energy (kN-m)	7.64

Proposed Fendering System

Based on the berthing energy as shown in Table 10-38 and Table 10-39 the following fender system is proposed. Here, performance tolerance of 10 % is considered. Figure 10-14, Figure 10-15 and Figure 10-16 show the drawings of the proposed fender system for each berth.

Berth No.3

Required Energy Absorption: 583 / 0.9 = 648 kN-m

Height of Fender: 1150 mm

Energy Absorption: 658 kN-m > 648 kN-m O.K

Reaction Force: 1093 kN (Tolerance: +10%)

Frontal Frame: 2300mmW × 2400mmL

Hull Pressure: 1093×1.1/ ((2.3-0.2) × (2.4-0.1)) =249 kN/m² < 250 kN/m^2 O.K.

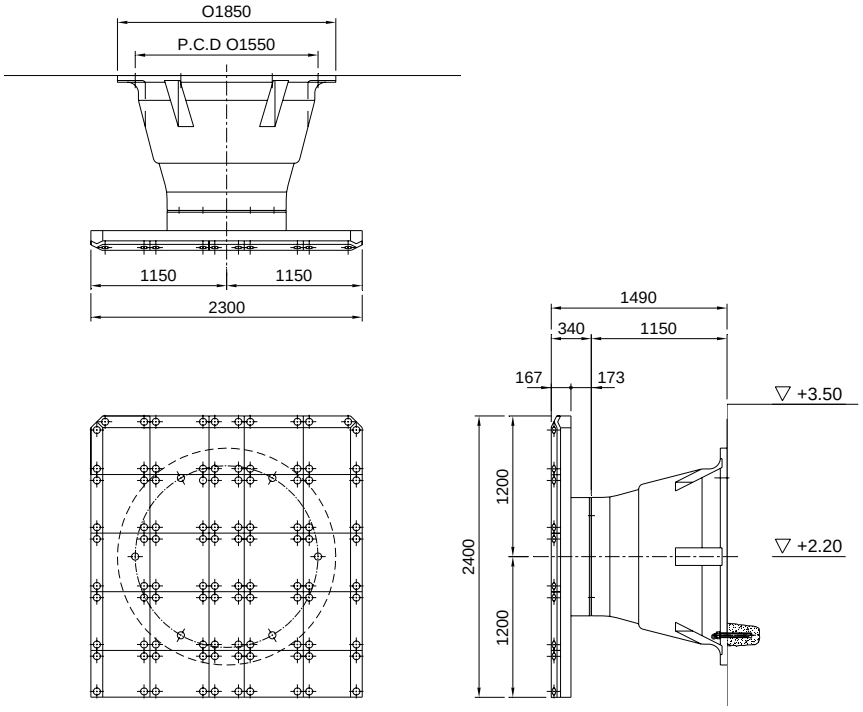

Figure 10-14 Proposed Fender System for Berth No.3

Berth No.2

Required Energy Absorption: 164 / 0.9 = 182 kN-m
Height of Fender: 800 mm
Energy Absorption: 213 kN-m > 182 kN-m O.K
Reaction Force: 508 kN (Tolerance: +10%)
Frontal Frame: 1600mmW × 1800mmL
Hull Pressure: 508×1.1/ ((1.6-0.2) × (1.8-0.1)) =235 kN/m² < 250 kN/m^2 O.K.

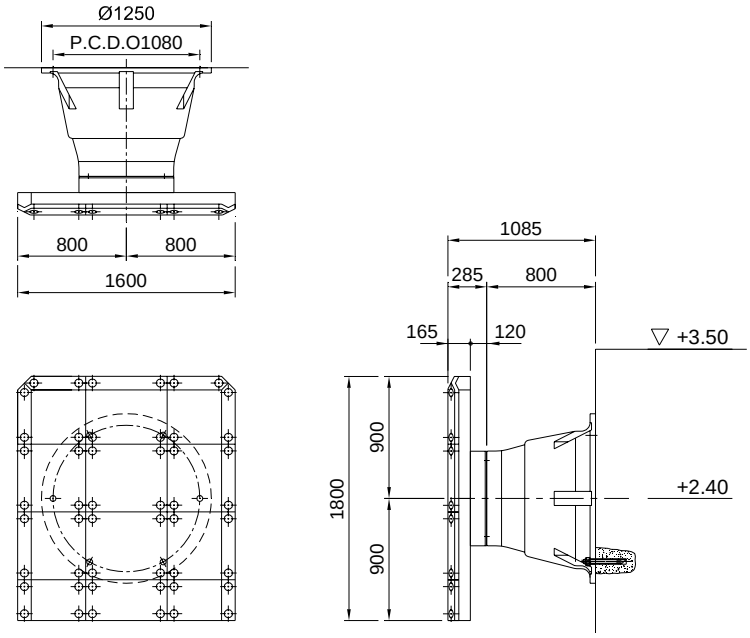

Figure 10-15 Proposed Fender System for Berth No.2

Berth No.1

Required Energy Absorption: 7.65 / 0.9 = 8.5 kN-m
Height of Fender: 200 mm
Energy Absorption: 10.8 kN-m > 8.5 kN-m O.K

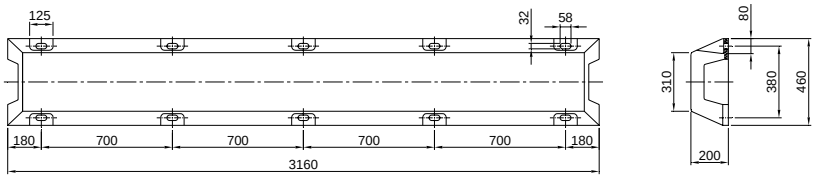

Figure 10-16 Proposed Fender System for Berth No.1

Fitting Interval of Fender (Excluding Berth No.1)

Fitting interval of fender is calculated by the following equation (refer to Figure 10-17). Based on the calculation result, the fender spacing of 12 m is applied to the Berth No.3 and 8 m is to Berth No.2. Table 10-40 shows the calculation result of the fender spacing.

$$L = 2 \times \sqrt{r^2 - (r-h)^2}$$

L: Maximum spacing of fender (m)

r: Bent radius of bow side of ship (m)

Container Ship, General Cargo Log r = -1.055+0.650×Log(DWT)

Bulk Carrier Log r = -0.113+0.440×Log(DWT)

h: Height of fenders when effective berthing energy absorbed (m)

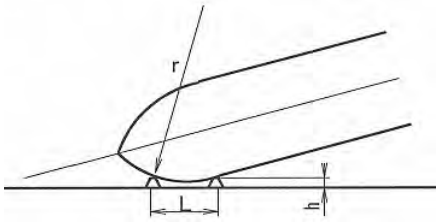

Figure 10-17 Calculation Concept of Fender Spacing

Table 10-40 Calculation Result of Fender Spacing (Berth No.3 and No.2)

	Berth No.3			Berth No.2
Vessel Type	Bulk	Container	General	General
Vessel DWT (ton)	50,601	45,725	3,000	3,000
Bent Radius : r (m)	90.5	94.2	16.0	16.0
Total Fender Height : H(m)	1.490	1.490	1.490	1.080
Fender Deflection : def(m)	0.805	0.805	0.288	0.560
Height of Fender System after Deflected (Total Height - Deflection) : h (m)	0.685	0.685	1.202	0.520
Fender Spacing : L(m)	22.2	22.7	12.2	8.1
Max. Proposed Spacing : Lf(m)	12.0			8.0

Fitting Interval of Fender for Berth No.1

Fender Spacing for Fishery boat is proposed 1/6 of Length of Boat.

L = (1/6) Loa = (1/6)×20 = 3.33m

Proposed fender spacing Lf = 3.0m

iv) Mooring bollard

Mooring bollards are determined by the gross tonnage of the target vessel. According to Table 10-20 and Table 10-21, the proposed mooring bollards are as follows and Figure 10-18 shows the drawing of the 1,000 kN type bollard:

Berth No.3

Maximum Gross Tonnage of Target Vessel: 42,260 t

Proposed size of bollard: 1000 kN type

Proposed spacing of bollard: 35 m

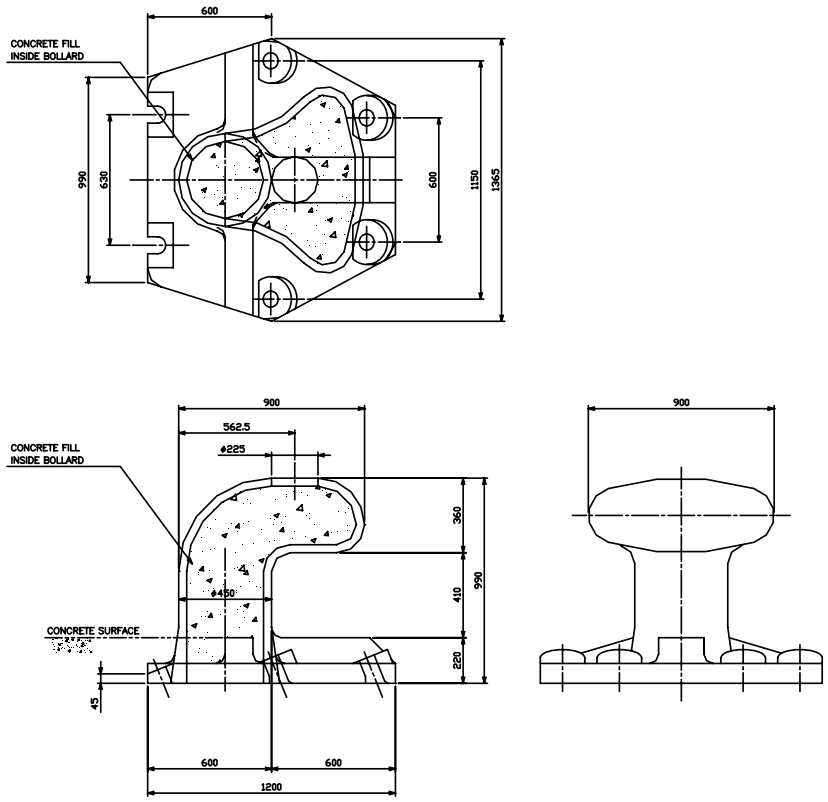

Figure 10-18 Proposed Bollard of 1000 kN Type

Berth No.2

Maximum Gross Tonnage of Target Vessel: 1,623 t
Proposed size of bollard: 250 kN type
Proposed spacing of bollard: 20 m

Berth No.1

Maximum Gross Tonnage of Target Vessel: 30 t
Proposed size of bollard: 30 kN type
Proposed spacing of bollard: 5 m

2) Cost Estimate

Based on the result of field survey, the construction plan and approximate cost estimate will be compiled as follows.

Basic condition for cost estimate;

The construction cost has been estimated based on the result of material survey cost on October 2005 at Angola.

Exchange rate of currency is fixed as follows (Oct. 2005);

US$1.0=Kz.87.6= ¥116

Physical contingency is estimated at 5 %.

Engineering services fee is estimated at 5 %.

Indirect cost is estimated at 20 %.

Price escalation is not included for construction, and equipment.

The direct cost of construction is classified into the foreign and local currency component, the percentage distribution of major items is shown below.

No.	Work Item	Foreign (%)	Local (%)
1	Concrete Pavement	60	40
2	Asphalt Pavement	70	30
3	Wharf Repair	50	50
4	Electrical, Water, Repair	90	10
5	Cargo Handling Equipment	100	0

Table 10-41 Port of Namibe Short-Term Rehabilitation Plan Construction Cost

Facility	Unit	Quantity	Unit Price US$	Construction Cost(1,000US$)		
				Total	Foreign	Local
1.Apron,Yard Pavement	m^2	111,750	120	13,410	8,046	5,364
2. Repair Wharf	m	680	680	462	231	231
3.Rubber Fender	set	79	90,494	7,149	6,434	715
4.Bollard	set	35	4,571	160	144	16
5.Repair Access Road	m^2	5,580	40	223	156	67
6.Remove South Warehouse	m^2	3,000	120	360	180	180
7.Reefer Facilities	L.S	1		384	346	38
8.Repaire Water, Oil supply Pipe	L.S	1		136	68	68
9.Lighting Tower	L.S	1		95	67	28
10. Remove Quay Crane	L.S	1		82	57	25
Total				22,461	15,729	6,732
11.Cargo Equipment*	L.S	1		3,675	3,675	0
12.Engineering Services	L.S	1		1,277	894	383
12.Physical Contingency	L.S	1		1,277	383	894
13.Tax	L.S	1		1.011	0	1,011
Grand Total				29,701	20,681	9,020

* Mobile Crane: 1 unit, Forklift:1 unit, Reach Stacker: 2 units, Top lifter:1 unit

Table 10-42 Port of Namibe Short-Term Rehabilitation Plan Working Schedule (Month)

Work Item	2	4	6	8	10	12	14	16	18	20	22	24
1.Preparatory Works												
2.Apron Yard Pavement												
3.Repair Wharf Car-stopper												
4.Rubber Fender, Bollard												
5.Repair Access Road												
6.Removal Warehouse												
7.Reefer Facilities												
8.Repair Water Pipes												
9.Cargo Handling Equipment												
10. Miscellaneous Works												

10.3.4 Preliminary Economic Analysis and Financial Analysis

1) Preliminary Economic Analysis

The purpose of the economic analysis is to appraise the economic feasibility of the short-term rehabilitation plan for Namibe port from the viewpoint of national economy. An economic analysis was carried out applying the following method. Short-term rehabilitation plan was defined and it was compared to the without case. All the benefits and costs accruing from the difference between 'with' and 'without' cases were calculated. The economic internal return (EIRR) based on a cost-benefit analysis was used to appraise the feasibility of the project. The EIRR is a discount rate which makes the costs and the benefits of the project during the project life equal. Taking into consideration the depreciation period of the facilities of 30 years and the construction period of 5 years including detail design, the project life period of calculation in the economic analysis is assumed to be 35 years from the beginning of construction. The exchange rate adopted for this analysis is US$1=AKZ87.6. Low case of demand forecast is adopted for this analysis.

i) Costs of the Project

The items that should be considered as costs of the project are construction costs, maintenance costs, and renewal investment costs.

ii) Construction Costs

Construction costs and investment schedule are shown in Table 10-43

Table 10-43 Construction Costs (unit: US$1,000)

2009			2010			Total
Total	Foreign	Local	Total	Foreign	Local	
6,670	3,525	3,145	23,031	17,156	5,875	29,701

iii) Maintenance Costs

The costs of maintaining of port facilities and equipment per year are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of original construction costs. Maintenance costs are shown in Table 10-44.

Table 10-44 Maintenance Costs

Unit: 1,000US$

	Construction Cost	Maintenance Cost
Civil Works	26,026	260
Machine & Equipment	3,675	147

iv) Renewal Investment Costs

The renewal costs for cargo handling equipment after their economic service lives should be considered. The economic service lives of equipment are planned in Table 10-45. This investment will be done by foreign portion.

Table 10-45 Renewal Investment Cost

	Durable Period	Cost (1,000US$)
Mobile Crane, Reach Stacker, Top Lifter	10 Years	3,675

v) Benefits of the Project

As benefits brought about by the short-term rehabilitation plan of Namibe port, saving in land transportation costs is identified. Cargo is assumed to divert to Lobito port in case that Namibe port cannot afford to handle its cargo. Increased port capacity through the rehabilitation saves land transportation from Lobito to Namibe or its hinterland. Based on the land transport cost from Lobito to Namibe (US$ 120 per ton), the unit benefit is assumed as US$ 18 per ton. This is 15% of the land transport cost.

vi) Evaluation of the Project

EIRR of the project at Namibe Port is calculated as 24%. It is generally recognized that a project is feasible if the EIRR exceeds the opportunity cost of capital. Usually, the opportunity cost of capital is considered to range from 8% to 10% according to the degree of development in each country. It is acceptable that a project with an EIRR of more than 8% is economically feasible for infrastructure or social service projects. As for this project, even though the economic calculation only takes into account the items that are easily quantified, the EIRR is still 24%. Therefore, this short-term development project is feasible from the viewpoint of the national economy.

2) Preliminary Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the short-term rehabilitation plan for Namibe port from the viewpoint of the financial soundness of the port management body during the project life. A financial analysis was carried out applying the following method. Short-term rehabilitation plan was defined it was compared to the without case. All the benefits and costs accruing from the difference between ‘with’ and ‘without’ cases were calculated. The financial internal return (FIRR) based on a cost-benefit analysis was used to appraise the feasibility of the project. The FIRR is a discount rate which makes the costs and the benefits of the project during the project life equal. Taking into consideration the depreciation period of the facilities

of 30 years and the construction period of 5 years including detail design, the project life period of calculation in the financial analysis is assumed to be 35 years from the beginning of construction. The exchange rate adopted for this analysis is US$1=AKZ87.6. Low case of demand forecast is adopted for this analysis.

i) Costs of Project

The items that should be considered as costs of the project are construction costs, maintenance costs, renewal investment costs and operating costs including other port facilities.

ii) Construction Costs

Construction costs and investment schedule are shown in Table 10-46.

Table 10-46 Construction Costs (unit: US$1,000)

2009			2010			Total
Total	Foreign	Local	Total	Foreign	Local	
6,670	3,525	3,145	23,031	17,156	5,875	29,701

iii) Maintenance Costs

The costs of maintaining of port facilities and equipment per year are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of original construction costs. Maintenance costs are shown in Table 10-47.

Table 10-47 Maintenance Costs

Unit: 1,000US$

	Construction Cost	Maintenance Cost
Civil Works	26,026	260
Machine & Equipment	3,675	147

iv) Renewal Investment Costs

The renewal costs for cargo handling equipment after their economic service lives should be considered. The economic service lives of equipment are planned in Table 10-48. This investment will be done by foreign portion.

Table 10-48 Renewal Investment Costs

	Durable Period	Cost (1,000US$)
Mobile Crane, Reach Stacker, Top Lifter	10 Years	3,675

v) Operating and Maintenance Costs

Operating and maintenance costs are divided into variable portion and fixed portion. The variable portion is calculated by multiplying cargo volume and unit cost per ton which is calculated using the financial data of Namibe port in 2004. In 2004, share of the variable portion is assumed as 80% and that of the fixed portion is assumed as 20% or US$ 1,300milion. The unit cost is also assumed as US$ 23 per ton.

vi) Benefits of Project

Operating revenues are estimated from the difference in revenues between the 'with case' and the 'without case'. All revenues are calculated by multiplying the cargo volume and unit revenue per ton which is calculated using the financial data of Namibe port in 2004. The unit revenue is assumed as US$ 29 per ton.

vii) Evaluation of the Project

FIRR of the short- term rehabilitation plan for Namibe port is 5.1%. In case of using Japanese ODA loan for infrastructure development in LDC, the interest rate is under 2% in 2005. Judging from the above, this project is regarded as financially feasible under the assumptions in this chapter.

10.3.5 Draft of Initial Environmental Examination

1) Analysis of Alternatives (including without Project option)

The comparison between With and Without Project targeted in the year of 2010 is as per Table 10-49 shown below. In this study, "With Project" is called as "Proposed Project".

Without Project Alternative: Less efficiency of ships berthing and cargo handling, more damages to quay and ships are assumed if the project is not implemented.

With Project: It is secured the safety of ships navigation and berthing. It becomes possible to handle refer cargoes. It will be possible to contribute to reduction of the cost of commodities through better efficiency of cargo handling.

Table 10-49 Comparison of With and Without Project (Namibe)

Comparison Item		Current state (2004)	Without Project (2010)	With Project (2010)
・Quay length		680m	680m	680m
・Yard dimension		111,750 ㎡	111,750 ㎡	111,750 ㎡
Social	Traffic	**C**	**D**	**D**
	Economy	**C**	**C**	**B**
	Living	**C**	**C**	**B**
	Safety	**C**	**C**	**A**
	waste	**C**	**C**	**C**
Natural	Fauna & Flora	**C**	**C**	**C**
	Landscape	**C**	**C**	**C**
Pollution	Air	**C**	**C**	**C**
	Water	**C**	**C**	**C**
	Noise & Vibration	**C**	**C**	**C**

Note) Highly Positive: A Positive: B
Not Significant: C Negative: D
Highly Negative: E

2) IEE

i) Survey Method

The result of IEE of Port of Namibe is shown at Table 10-6. There are three negative impacts are predicted that are “Construction waste by removing existing facilities”, “Impact to water area of quay front during the removal of existing quay” during construction period and “Impacts to fishery activities by increasing of port vehicles” during operation period. The impact assessments including the mitigation became “B” for “Wastes”, “C” for “Traffic・Public Facilities”, “Water Pollution” and “D” for other items.

Review of natural and social environmental conditions which may be influenced by the implementation of the proposed Short term Rehabilitation Program (draft)

Selection of the sensitive and valuable items for environment in order to minimize environmental impact generated by the alternatives

Preliminary assessment for the selection of negative impact at the time of construction and operation (SCOPING) and the mitigations

ii) Key Impacts Identified:

The result of IEE of Port of Namibe is shown at Table 10-50. There are three negative impacts are predicted that are “Construction waste by removing existing facilities”, “Impact to water area of quay front during the removal of existing quay” during construction period and “Impacts to fishery activities by increasing of port vehicles” during operation period. The impact assessments including the mitigation became “B” for “Wastes”, “C” for “Traffic・Public Facilities”, “Water Pollution” and “D”for other items.

Environmental impacts during construction and operation phases

The safety in fish market in conjunction with port construction vehicles and port traffic: The port roads constructed along Port of Namibe are wide with about 10m in width and the traffic is not busy. There is a swimming beach along with port road but, it is located at about 2km off from Port of Namibe and the road is dead ended therefore, it will not be a traffic route for construction vehicles. Consequently, there is almost no impact to even high season of swimming beach. And the impacts from ships to and from the port as well as port construction work to the beach will be very minor. However, there is the amenity gathering about 100 to 150 fishery related people including citizens located on the road near the entrance of the port. They land, clean and sell fishes there therefore the impact to the safety of fishery activities by the traffic of port construction vehicles have to be considered. Fishery facilities located within the port area is managed by the Port of Namibe and the relations between fishery related and port related persons have been kept in good condition.

Construction wastes by removing existing facilities: It is necessary to clarify disposal method and area for concrete blocks and wastes and the surplus soils generated from the removals of existing quay and existing concrete paved yard during construction period.

Water pollution by removal of existing quay, Change of water depth: The extent of the impact is depended on the detailed construction method though the impacts such as water pollution by rehabilitation work of existing quay and change of water depth by falling concrete wastes can be considered.

iii) Mitigations

The following methods as mitigations for negative impacts during construction period are considered.

The safety to fishery activities by the traffic of port construction vehicles and increase of port vehicles

It can be mitigated by the construction of by pass road with the length about 50m in order not to pass through fishery activity zone. It can be mitigated by installing safety control system like pedestrian crossing or traffic signals or placing traffic control staff. It can be mitigated by reducing moving speed of port vehicles near port entrance.

Construction wastes by removal of existing facilities

It is considered to dispose at the disposing place in existing port area if the volume is not a lot. If the volume is a lot the open space having a good distance from residential area has to be considered. The plan how to transport, treat and dispose has to be submitted and get the approval from City of Namibe.

The recycling is possible to use as construction materials such as sub-base material for road, back filling material, filling material of structures, reclamations material in order to minimize the impact. The artificial fish shelter is another possible mitigation.

Water pollution of quay front" "The change of water depth

The mitigation is possible by installing safety net in order not to fall concrete blocks and concrete waste to the water in front of the quay during quay removable works. The mitigation is possible to install silt protection curtain for the protection of water pollution and expansion of turbidity by concrete waste generated at the time of removal when using concrete cutter and breaker. In case that water depth in front of the quay became shallow by accumulation of falling concrete waste it is possible to mitigate it by removing them after the works completed.

Table 10-50 Result of IEE (Port of Namibe)

Evaluation Item	Evaluation – Reasons	Mitigation
Social Environment		
1. Resettlement	The plan is to repair facilities in the existing sites, so resettlement due to construction is not expected.	
2. Economic Activities	The project is limited to the rehabilitation works of existing port area and Namibe bay is wider water area of 8km x 5km therefore the impacts to fishery activities and marine recreation are minor. And, the relation with fishery cooperative has been kept in good condition.	
3. Traffic and public facilities	Port road is wide with about 10m and the traffic is not busy so minor impact to swimming beach is considered. However, as active fish sales area including landing and cleaning are there near the port entrance on the road the impact to the safety of the fishery activities by the traffic of port vehicles has to be considered.	・Construction of by pass road, Speed Control, Adoption of safety control system
4. Split of Communities	Physical area separation is not occurred since the project is limited to the rehabilitation work within the area of existing port.	
5. Cultural Heritage	No new site development is planned.	
6. Water and Common Rights	The Port Authority controls port area in Namibe bay including fishing port and swimming beach. There is very minor impact to fishery activities and marine recreation since the Namibe bay is very wide in area. The military facility is also in the port area however, it is not under operation.	
7. Public Health Condition	As the project is limited to the rehabilitation work within existing port area it is unlikely to be polluted by endemic disease, infectious disease, and the hazardous substance coming from outside.	
8. Wastes	Dredging work is not planned however, construction wastes and surplus soils are likely to be generated by the removal of existing quay and yard.	・Recycling as construction materials ・Recycling as artificial shelters ・Plan of traffic・treatment・disposal
9. Hazards (Risks)	Rock and land slide are anxious at the north side of the port however, no construction work is planned there and the yard is paved therefore, the impact must be minor.	
Natural Environment		
1. Topography and Geology	The project is limited to the rehabilitation work within the existing port area so the significant topographic change will not be occurred but, the change of water depth by rehabilitation works may be possible.	・Protection of falling construction wastes ・Removal of construction wastes after falling
2. Soil Erosion	The repair work will be conducted in the existing sites.	
3. Groundwater	Large scale discharge of groundwater is not required.	
4. Hydrological situation	Though there is a runoff path of debris flow in the center of the bay, it is out of the working area in the plan.	
5. Coast and Sea	Offshore components like extension of wharf, reclamation and dredging are not planned, so there is no influence to any hydrographic conditions	
6. Fauna and Flora	The plan is for repair work of existing facilities. According to local staff, whale migration is observed here but no breeding site of turtles and the like.	
7. Landscape	The plan is to repair facilities in the existing sites.	
Pollution and Public Hazards		
1. Air Pollution	The facilities which will be the source of air pollution are not included in the project. Residential and urban areas are good distance being more than 1km from the site so the impact is minor.	
2. Water Pollution	There may be slight chance of turbidity by water front rehabilitation works of the quay	
3. Soil Contamination	The cargo handled in the new yard is containerized cargo so it is hard to consider any influence by dust and hazardous chemical substance.	
4. Noise and Vibration	Residential houses and densely populated area are off from the site so the impact must be minor.	
5. Land Subsidence	Land subsidence of ambient surrounding is not considered under this study.	
6. Offensive Odor	Facilities which generate odor are not planned.	

Assessment; A: High Negative Impact, B: Low Negative Impact, C: Unknown Impact, D: No impact

3) Terms of Reference (TOR) for EIA

i) Outline

IEE studied in previous chapters 1) and 2) is composed as a part of EIA and it is utilized as data whether the project is acceptable in view of the impact to social environment and natural environment as well as clarifying key impacts of EIA. As the result of IEE, It is judged that there will be no major impact since the project is limited to rehabilitation works of existing land facilities without changing the existing normal lines and the existing utilization method however, some minor impacts have been assumed by the implementation of rehabilitation works. These impacts will be found through the future detailed design and detailed construction plan. The mitigations at the construction period and the monitoring are more significant than the prediction of these impacts.

The execution of EIA is required for any port project by EIA law of Angola. From this time, MINTRANS have to get approval of MINUA according to EIA concerned laws when the detailed design (facility design, construction method, construction material and etc.) will become apparent.

It is necessary to have common understanding between the persons of Angola Government in charge of EIA and Design Consultant provided the data obtained through the study of natural environmental survey, social environmental survey and stakeholders meetings.

It is recommended that the implementation of EIA and the detailed design of the project are executed at the same time. By so doing the design information is transferred to environmental team and the extent of the impacts and the mitigations can be feedback to design team immediately.

The public consultation including MINUA is required when the EIA is executed in order to get opinions from the representative of residents who are living in the vicinity and the area having impacts, the area representative of NGO and local governments. It is also recommended that the meeting is held among MINUA, residents and project related group commencing from initial stage of execution of EIA in order to make the plan understood well.

The disclosure of EIS outline, impacts prediction to environment and the mitigations are recommended in the public consultations. The opinions and the complaints regarding the project which were submitted or reported in the meeting should be feedback to the proposed project as the reconsider items. The mitigations against environmental deterioration have to be planned to proposed project.

ii) Survey, Prediction, Assessment

Regarding Survey, Prediction, Assessment at the time of EIA the following methods should be considered.

Regarding the safety to fishery activities by increasing port construction vehicles and port vehicles.

According to the result of the survey for actual artisanal fishery activities near Port of Namibe, the number of registered fishing boat are 243 and the catching volume are about 6,400ton (20t/day calculated as 300 days operation in a year) Fishes are landed at walking trail along with port road near the port and gathering about 100 to 150 fishery related people and general citizen sells and buys fishes there.

At present, the traffic of port related vehicles are not busy and fishery facilities in the port area and fishery activities are conducted within the port area so it keeps good relation between people related to the fishery and the port. However, the spot is the place where the safety must be considered since the traffic lines of port vehicles and fishery activities are congested each other. In this respect, it

is recommended to have a consciousness survey proposing detailed construction plan (traffic route and the volume of vehicles during construction period, number of vehicles, possible utilization times), future increase of port vehicles and their mitigations at public consultation as well as getting hearing from people related fishery.

The mitigations to the safety and the satisfaction levels found by the consciousness survey for fishermen and residence will be the objectives for the assessment.

It is recommended to have periodical monitoring surveys for the safety during construction period and the future as well if the mitigations are not implemented.

Regarding construction waste:

It is necessary to select main source of the outbreaks of waste through detailed design and detailed construction method and figure out location of the source of outbreaks, the sort of the waste and its volume.

It is important to secure dumping site and the waste disposal plan since these are going to be big problems in the process of collection, transportation, treatment and disposal. It is the objective of assessment that makes the volume of waste small and no impact given to the environment of vicinity of disposal area upon the considerations on the sort of waste, method of disposal and social environment of disposal area.

Regarding the impact to surrounding environments it is recommended to have interviews from surrounding areas and get confirmation at the public consultations upon clarifying the waste treatment method and the disposal area.

It is recommended to conduct periodical site survey to check whether the planned waste treatment is carried out as per schedule.

Regarding water pollution and change of water depth by rehabilitation work of quay

Firstly, to survey the impacts to water environment by removing existing concrete structure and in-situ concrete work judging from the detailed design and construction method of the rehabilitation of existing quay is necessary. It may be possible to predict the water quality through hearing and simulation. It is necessary to check water depth in the concerned area before the construction work commenced as the water depth will be changed by falling concrete waste.

It is presumed that the impact to expansion of turbidity and water pollution will be minor since the construction works are limited to rehabilitation works of existing quay excluding dredging work, rehabilitation work of under water, marine construction work. The extent of impacts by water pollution or change water depth caused by construction method is more significant than the survey and the prediction. However, the impacts depending on the extent of turbidity to fishery activities in the fishing port area near the site where fish landing and fish cleaning using seawater are conducted have to be assessed.

It is recommended to conduct periodical survey at water area of quay front and fishing port area aiming to find the volume of Suspended Solids during construction period. It is also recommended to check the water depth before the construction and during construction period by periodical survey in order not to change the water depth by falling concrete waste.

10.4 The Port of Cabinda

10.4.1 Rehabilitation Needs

Depth of the quay front basin was dredged to 3.4 meters, however, recent bathymetric survey showed that the east half of the 120 meter berth has a depth of about 3.0 m and the west half has a depth of 2-3 meters. Sedimentation is going on at a rapid pace and has resulted in a huge sand dune in the west of the quay. The sand dune may extend over an area of 20 ha and can be used for port expansion.

The wood deck of the quay was recently repaired and all wood sticks were replaced with new ones. It is necessary to extend the width of quay and the passage deck to the quay and to pave the surface with concrete in order to improve the productivity of cargo handing. While the foundation piles of the quay may not have enough strength to support the concrete surface, new structure will be necessary for the Port of Cabinda.

There is a quay in the Cacongo District but it is badly decayed and not serviceable. It may be necessary to build a new jetty to encourage the export of wood products. Having received approval from MINTRANS, the port authority of Cabinda intends to develop a new jetty along the west side of the present jetty, and build the quay on the top of the jetty with a depth of 5.5 m – 8.0 m. It will be necessary to make a detailed study on sand drifts, sedimentation and to design the quay with enough width for the turning of trucks.

Table 10-51 shows problems of the Port of Cabinda and measures to be taken in the near future to improve the productivity and reduce the cost of cargo handling operations. Since the port authority has already taken necessary action and requests no assistance, the Study proposes no item for the Short-term Rehabilitation Plan at the Port of Cabinda.

It will be crucial to develop a new deep water port to accommodate ocean vessels and to avoid the transshipment at the offshore anchorage and reduce the cost of coastal shipping. A study on the new port site shall be conducted in due course.

Table 10-51 Problems and Necessary Measures for the Port of Cabinda

Problems	Appropriate Measures	Short-term Plan
Pavement in the yard	To be finished in the near future	
Cargo handling equipment	To increase mobile cranes, reach stackers and forklifts	
Expansion of container yard	To construct new yard for empty containers on the sand dune	
Bathymetric survey	To make a detailed chart in addition to the Chart 3285 (Cabinda Enclave)	
Removal of sunken ships	To conduct a field study around the port and remove obstacles	
Maintenance dredging	To dredge the basin in front of the quay wall and the channel; and to procure a dredger	
Navigational aids	To repair buoys	
Jetty in Cacongo District	To build a new jetty if wood export is resumed	
Electronic Data Interchange	To establish EDI system between Customs, Immigration, Shipping lines and others	

10.4.2 Rehabilitation of Port Facilities

1) Required Port Facilities in 2010

New pier plan has received the central government's approval and the construction will begin in Cabinda port. After operation of the new pier, berthing capacity will increase. On the other hand, yard will be rather narrow and thus yard expansion seems to be required.

2) Rehabilitation and Yard Expansion

In order to improve the productivity of cargo handling, it is important to pave the container yard shown in Figure 10-19. Since an empty container yard is located 1,200 meters west of the port, wasteful transport by a reach stacker and chassis from the port to the empty container yard and back is required. New container yard can be developed in the sand dune adjacent to the port.

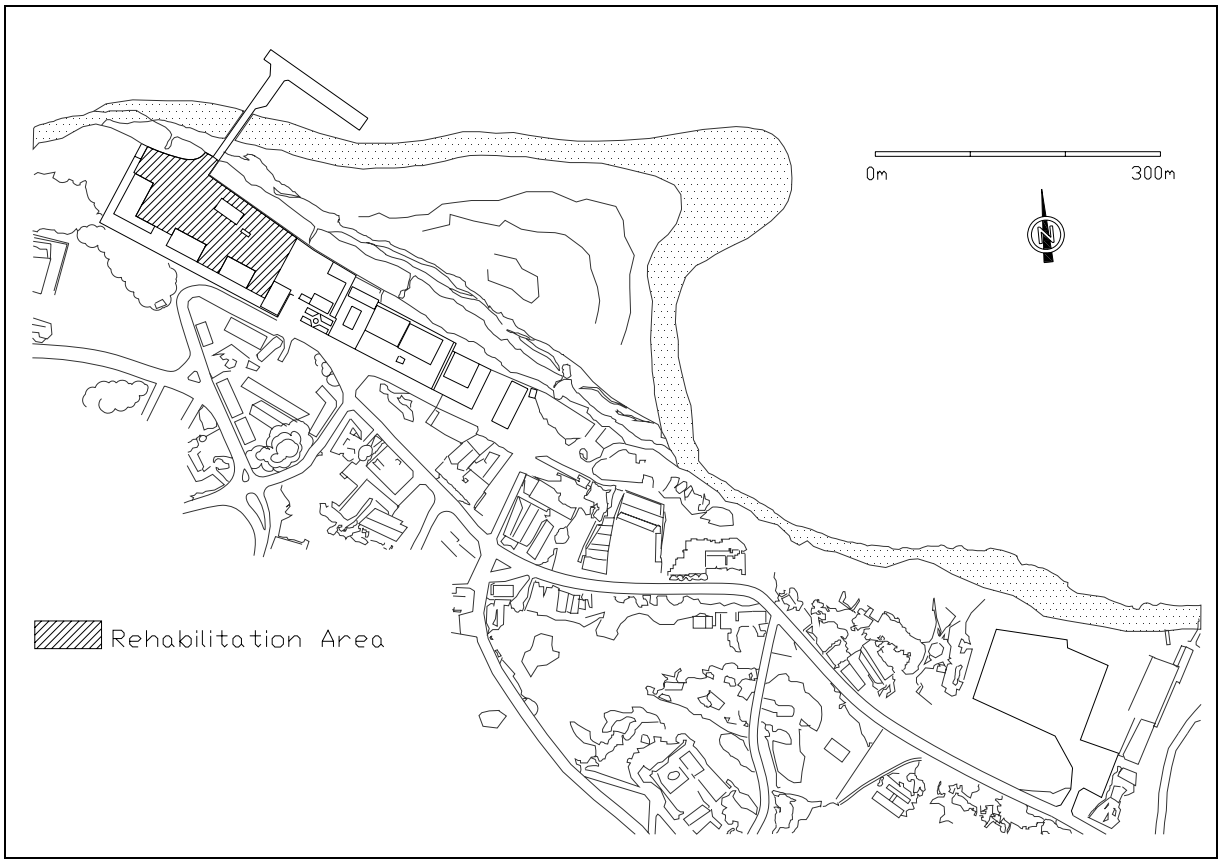

Figure 10-19 Rehabilitation Area in the Port of Cabinda

Ocean going vessels stop at an anchorage with a depth of 9.0 - 10.7 meters and cannot access the quay. Since the access channel is used by small ships and barges specially assigned for this area, no detailed chart is available from the offshore anchorage to the quay of Cabinda. Chart No. 3285 (Cabinda Enclave） has a scale of 1/150,000. It is therefore necessary to make a bathymetric survey in the area shown in Figure 10-20 and prepare a detailed nautical chart. Access channel to the quay of Cabinda requires dredging over a length of 6,500 m to a depth of 10 m, 3,500 m to a depth of 8 m and 500 m to a depth of 6 m.

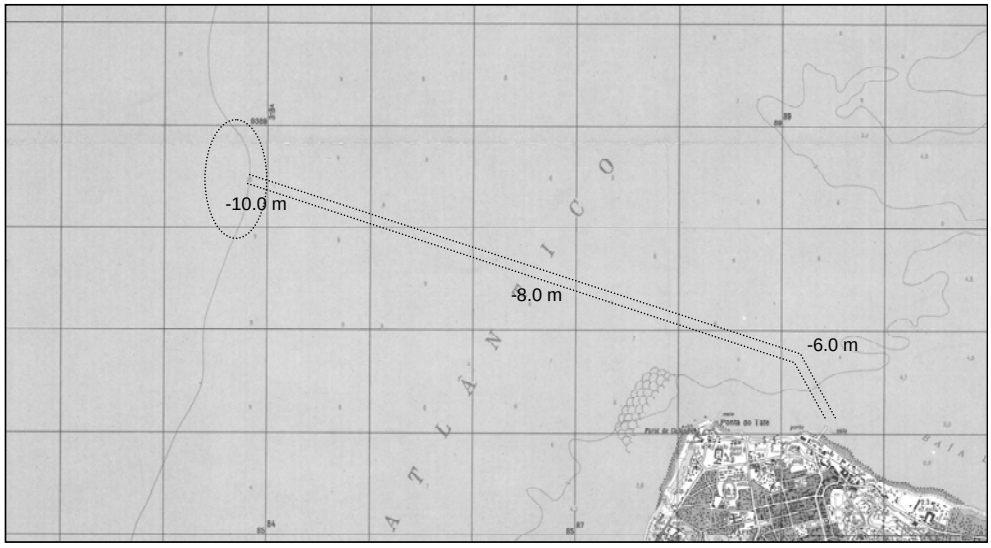

Figure 10-20 Anchorage and Navigation to the Port of Cabinda

10.5 Summary of Short-term Rehabilitation Plan

10.5.1 Short-term Rehabilitation Plan of Four Ports

Port policy of Angolan government is to introduce private sectors into terminal operation and to encourage privatization of port activities. Port authorities are therefore requested to be a land lord type organization and to manage the port by their own account. According to this policy, the port of Luanda gave a concession of terminal operation to two commercial enterprises, and will give a concession of container terminal to another one. The ports of Lobito and Namibe, which are managed and operated by respective port authorities, do not handle a sufficient volume of cargo to attract private investment. At this stage of port development, rehabilitation and improvement of the ports of Lobito and Namibe would have to be done by port authorities. The port of Cabinda has poor facilities and cannot accommodate coastal vessels with a draft of more than 3 meters. However, the port has recently implemented the repair work and has no need for a short-term rehabilitation plan. This report therefore, does not include a rehabilitation plan for the Port of Cabinda but comments on the port's future development in Chapter 15.

Among port facilities included in the Short-term Rehabilitation Plan, first priority shall be given to paving the yard and apron, and to repairing rubber fenders and coping concrete of the quay wall. Rehabilitation of these facilities is the responsibility of concessionaires at the Port of Luanda. Rehabilitation of the Port of Cabinda is now ongoing and will be completed in the near future. Therefore, no facility is included in the short-term rehabilitation plan of the Port of Cabinda.

From the viewpoint of productivity, next priority shall be given to cargo handling equipment such as reach stackers, forklifts, top lifters, mobile cranes and chassis. Procurement of this equipment is also the responsibility of concessionaires at the Port of Luanda. In view of food stuffs import and fish/agricultural products export, priority shall also be given to refrigerator warehouse and reefer facilities. It is necessary to increase/install reefer plugs and power generator at the Ports of Lobito and Namibe.

Angolan nautical charts were mostly made before 1970 and minor corrections were released several times. However, bathymetric survey for chart revision has not been carried out since the beginning of the civil war. In this connection, it is recommended to implement a bathymetric survey to confirm the depth of channel and basin, particularly in the Bay of Luanda and along the navigational channel of Cabinda.

In addition, it is also urgently necessary to repair roads in the port, demolish unused warehouses and quay cranes, repair water pipe and fuel oil pipe, and install the electronic data interchange system. Table 10-52 summarizes facilities included in the Short-term Rehabilitation Plan.

Table 10-52 Summary of Short-term Rehabilitation Plan

Facilities	Luanda Port	Lobito Port	Namibe Port
Pavement in the yard and apron; Quay wall capping concrete and rubber fenders	By Concessionaires GC*1: 10 ha MPT: 19 ha CT: 14 ha	North and South Wharves: 15 ha、 Quay l: 1,112m	Yard and Berths No.1-3: 11 ha、 Qua: 680m
Procurement of cargo handling equipment	By Concessionaires	Additional one MC*2; two RS, and two FT	Additional two RS, one FT, and one TP
Navigational channel and basin	Bathymetric survey: 15.6km2 Two buoys and one light beacon	To be discussed in the next phase	To be discussed in the next phase
Reefer facilities and power supply	By Concessionaires	Reefer plugs and power generator	Reefer plugs and power generator
Others	By Concessionaires	Water and fuel oil supply pipes;	Inner port road; Yard lighting; Demolition of quay cranes and a warehouse; Water and fuel oil pipes;
Estimated cost	US$ 0.5 million*3	US$ 35 million	US$ 29 million

Note: The Port of Cabinda is not included in the Short-term Development Plan
*1 GC: General Cargo Terminal, MPT: Multi-purpose Terminal, CT: Container Terminal
*2 MC: Mobile Crane, RS: Reach Stacker, FL: Folk Lift, TP: Top Lifter
*3 Rehabilitation of buoys only. In the General Cargo Terminal, Multi-Terminal Co. plans to invest US$19million.

10.5.2 Priority for Rehabilitation

Taking into account the economic benefit of the implementation of the project, priority of rehabilitation shall be considered from the view points of 1) the promotion of economic reconstruction of Angola, 2) the development of damaged regions by the civil war, 3) the connection with Priority Phase Multisector Rehabilitation and Reconstruction Program, 4) the multiplier effect of railway and road rehabilitation projects, 5) the extent of deterioration of port facilities, 6) the safety and productivity of cargo handling operation, 7) requirements from port authorities, 8) the possibility of development of port facilities by the concession to private sectors, and 9) the preference of the government.

Among these prerequisites, there are a close connection between items 1) and 2), 3) and 4), and 5) and 6). Item 9) should be considered as part of a comprehensive evaluation of priority. Therefore, items listed in Table 10-53 were selected as factors to evaluate the priority of port rehabilitation projects for the ports of Luanda, Lobito, Namibe and Cabinda. Table 10-53 shows the assessment of priority of the rehabilitation of four ports.

Table 10-53 Priority of the rehabilitation of ports

Prerequisites	Luanda	Lobito	Namibe	Cabinda
Promotion of economic reconstruction	A	A	B	B
Close connection with relevant projects	B	A	B	C
Extent of deterioration of port facilities	B	B	A	C
Requirements from port authorities	C	A	A	C
Possibility of rehabilitation by a private sector	C	B	A	B
Total	1A(2B2C)	3A(2B)	3A(2B)	2B(3C)

Note: A: High priority in view of possibility, importance and effectiveness; B: Priority next to A; C: Priority next to B

As indicated in Table 10-53, the Ports of Lobito and Namibe have the same score of 3A, while the Ports of Luanda and Cabinda have 1A and 2B respectively. Comparing Lobito and Namibe, while both have the same score, priority shall be given to Lobito if emphasis is placed on the economic reconstruction of inland regions and landlocked countries. However, Namibe has priority if emphasis is placed on the deterioration of port facilities and the possibility of private enterprise participation. MINTRANS places priority on the rehabilitation of the Port of Namibe in consideration of the poor state of port facilities.

In order to increase the port capacity and productivity, it is indispensable to encourage the port development by means of financial assistance from the government or international donor agencies, particularly by means of low interest loan. Taking into account the financial situation of the Port of Namibe, it may be appropriate to give priority of grant aid assistance to Namibe. As the port of Lobito will need more funds for port rehabilitation and development than the port of Namibe, priority of loan assistance may be given to the port of Lobito.

While the port of Luanda has to be redeveloped by concessionaires, there are signs that some of them will not be able to raise enough funds to invest in their terminal. It is therefore necessary for the port authority of Luanda to encourage concessionaires to improve their terminal facilities to meet the increasing demand. Priority shall be given to the rehabilitation and improvement of the container terminal followed by the multi-purpose terminal.

In this regard, efforts are being made to propose a short-term rehabilitation plan for the ports of Lobito and Namibe.

11. Urgent Rehabilitation Program

11.1 The Port of Lobito

11.1.1 Facilities with Urgent Rehabilitation Needs

Among port facilities proposed in the Short-term Rehabilitation Plan for the Port of Lobito, Berths No.7 - 8 and their back yard have most urgent needs for repair work from the viewpoint of the demand, location and possibility of repair work. Figure 11-1 shows the area for Urgent Rehabilitation Program and Table 11-1 shows facilities and equipment required for the plan.

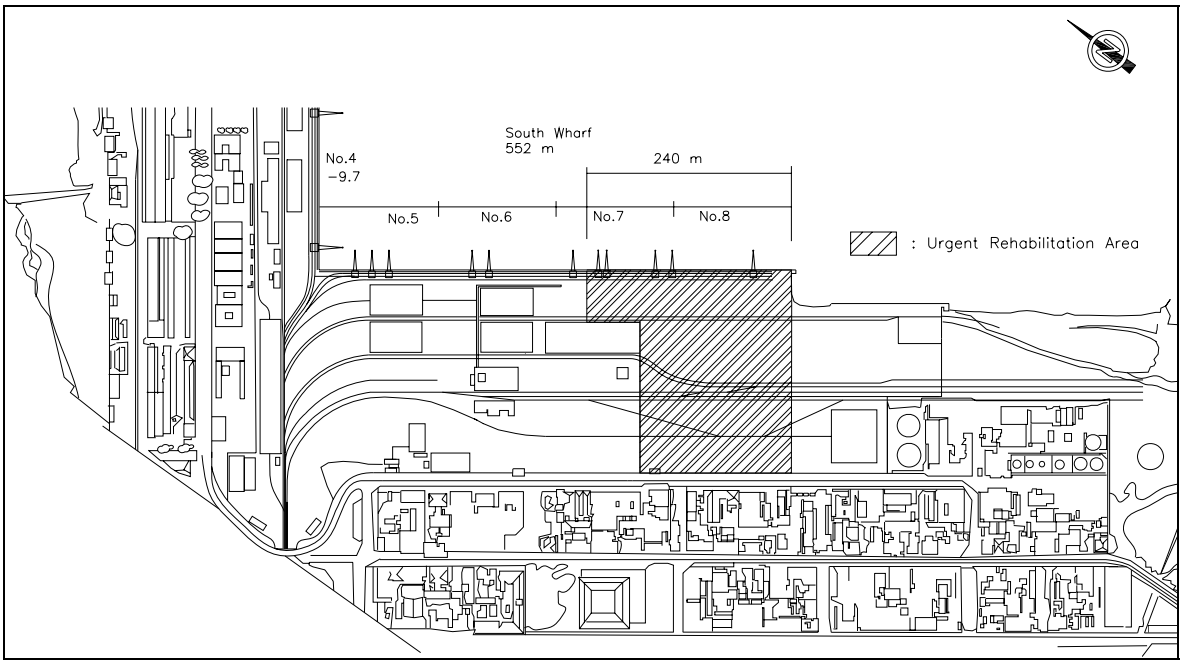

Figure 11-1 Urgent Rehabilitation Area in the Port of Lobito

Table 11-1 Urgent Rehabilitation Facilities and Equipment for the Port of Lobito

Facilities and Equipment	Location and Area
Pavement in the apron and yard	Apron behind the Berth No.8 and part of No.7; and yard with a total area of about46,000 m^2 (Urgent rehabilitation area has partially paved yard)
Quay wall and rubber fenders	Coping concrete and fenders on the quay wall of the Berth No.8 and part of No.7 with a length of 240 m
Reefer facilities and power supply	Reefer plugs and power generator in the container yard behind the Berth No.8 and part of No.7
Container handling equipment	One reach stacker and one top lifter for container operation
Water and fuel oil supply	Pipes and cables laid in the yard

11.1.2 Basic Design

1) Repair of coping concrete and quay wall including installation of car stop

Among the repair methods described in 10.2.3, considering the deterioration extent of the

coping concrete and quay wall of the Berth No.7 and No.8 and material availability in Angola, the following repair methods are proposed for each damaged portion:

Cracks on the concrete surface: Crack filling

Chipped off portion of concrete: Small section recovering

The concrete floating portion: Pouring concrete method of Large section recovering

The concrete spalling portion: Pouring concrete method of Large section recovering

In addition, car stops made by wood fiber reinforced plastic with 25 cm in height and 2 m in length are recommended to be placed on the coping concrete at 30 cm intervals by anchor bolts.

2) Apron and yard pavement

i) Concrete Pavement

As described in 10.2.3, concrete slab thickness of 35 cm is proposed for the apron pavement of the Berth No.7 and No.8. The concrete slab is reinforced with reinforcing bars.

ii) Asphalt Pavement

As described in 10.2.3, the following composition of asphalt pavement is proposed for the yard pavement of the Berth No.7 and No.8:

Surface course: Type AC II, thickness of 5cm

Binder course: Type AC IV, thickness of 15cm

Base course: Type “grading adjusted material”, thickness of 25 cm

Subbase course: thickness of 30 cm

Total thickness: 75 cm

3) Rubber Fender

As described in 10.2.3, the design vessel for the Berth No.7 and No.8 of the South quay is determined as “Container Carrier”. In the course of calculating the berthing energy, vessel’s draft which ensures the keel clearance of 10% of the water depth at the high water level (HWL) is applied. In addition, in order to check the validity of fender spacing, small bulk carrier is also taken into account. Table 11-2 and Table 11-3 show the calculation result of the fender system and Figure 11-2 shows the drawing of the proposed fender system.

Table 11-2 Calculation Result of Berthing Energy

Item	Berth No.7 and No.8
Name of Vessel	MSC Carina
Type of the Vessel	Container Ship
Dead Weight (ton)	45,725
Displacement (ton)	43,022
Berthing Velocity (m/s)	0.10
Hydrodynamic Mass Coefficient (Cm)	2.016
Eccentricity Coefficient (Ce)	0.598
Softness Coefficient (Cs)	1.0
Berth Configuration Coefficient Cc)	1.0
Berthing Energy (kN-m)	259

Table 11-3 Calculation Result of Fender Spacing

Vessel Type	Container	Bulk
Vessel DWT (ton)	45,725	2,503
Bent Radius : r (m)	94.2	24.1
Total Fender Height : H(m)	1.200	1.200
Fender Deflection : def(m)	0.630	0.270
Height of Fender System after Deflected (Total Height - Deflection) : h (m)	0.570	0.930
Fender Spacing : L(m)	20.7	13.3
Max. Proposed Spacing : Lf(m)	12.0	

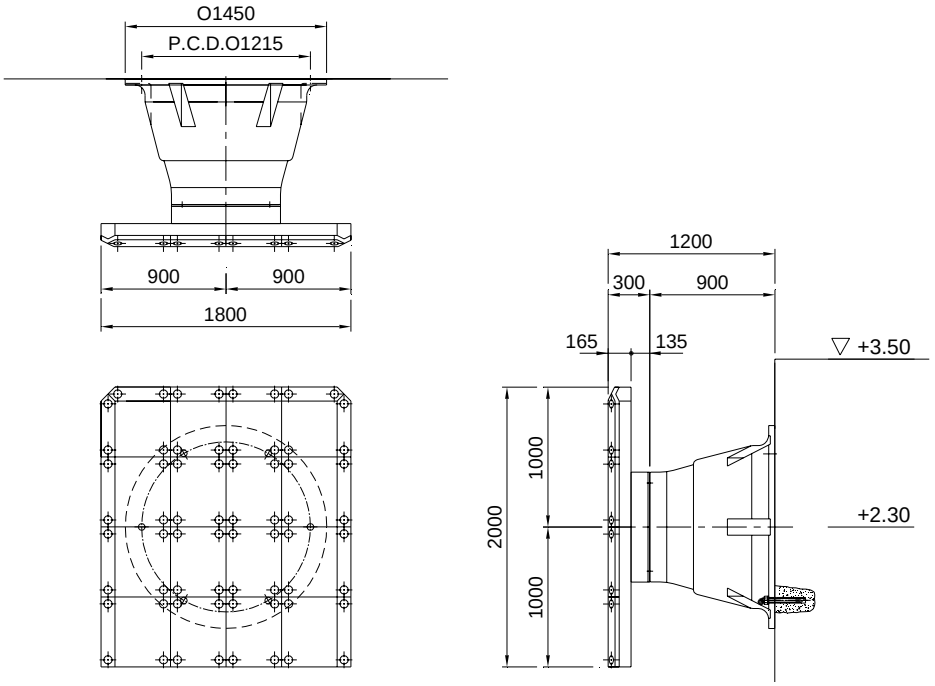

Figure 11-2 Proposed Fender System

4) Mooring bollard

Mooring bollards are determined by the gross tonnage of the design vessel. Table 11-4 shows the standard values of tractive forces of vessels acting on mooring bollards and Table 11-5 shows the standard interval of bollards.

Table 11-4 Tractive Force of Vessels

Gross tonnage (GT) of vessel (tons)	Tractive force acting on a bollard (kN)
200 ＜ GT ≦ 500	150
500 ＜ GT ≦ 1,000	250
1,000 ＜ GT ≦ 2,000	250
2,000 ＜ GT ≦ 3,000	350
3,000 ＜ GT ≦ 5,000	350
5,000 ＜ GT ≦ 10,000	500
10,000 ＜ GT ≦ 20,000	700
20,000 ＜ GT ≦ 50,000	1,000
50,000 ＜ GT ≦ 100,000	1,000

Table 11-5 Intervals of Bollards

Gross tonnage of vessel (tons)	Maximum interval of bollards (m)
2,000 ＜ GT	10 – 15
2,000 ＜ GT ≦ 5,000	20
5,000 ＜ GT ≦ 20,000	25
20,000 ＜ GT ≦ 50,000	35
50,000 ＜ GT ≦ 100,000	45

The maximum gross tonnage of design vessel is 42,260 tons for the Berth No.7 and No.8, therefore the tractive force of 1,000 and the maximum interval of 35 m can be derived from the above tables. The proposed mooring bollard as follows and Figure 11-3 shows the drawing of the 1,000 kN type bollard:

Berth No.7 and No.8 of the South Quay

Maximum Gross Tonnage of Design Vessel: 42,260 t

Proposed size of bollard: 1000 kN type

Proposed spacing of bollard: 35 m

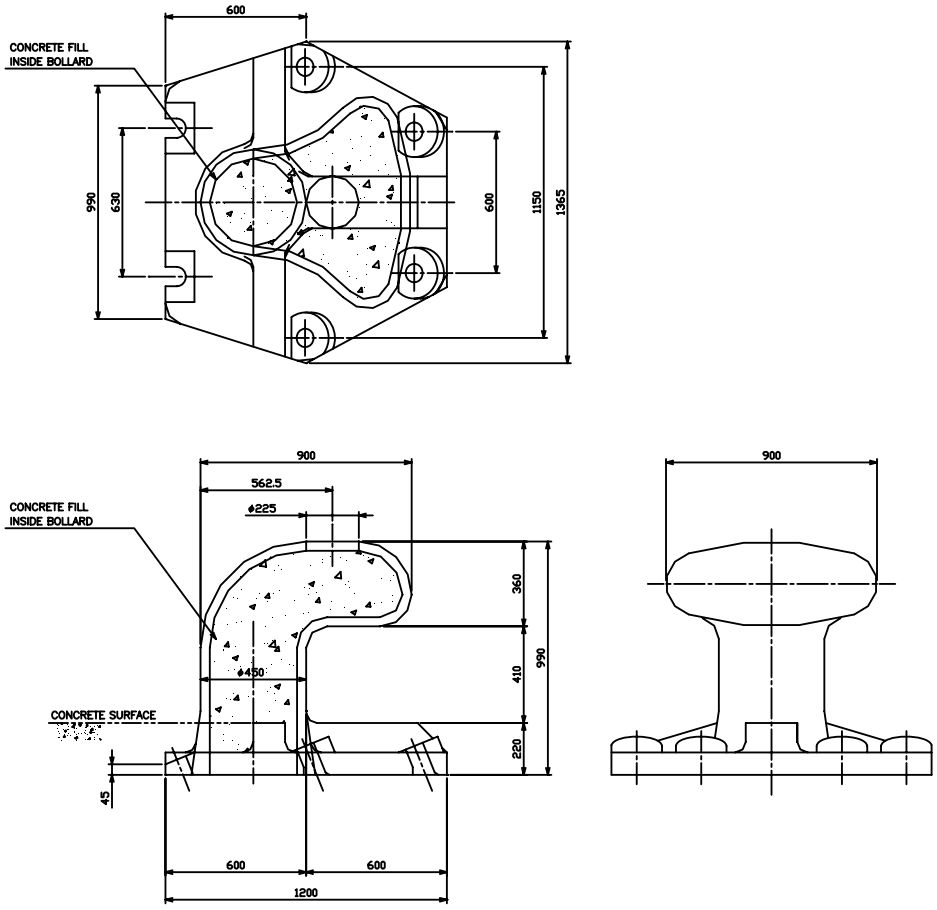

Figure 11-3 Proposed Bollard of 1000 kN Type

11.1.3 Construction Plan and Cost Estimate

Based on the result of field survey, the construction plan and cost estimate will be compiled as follows.

Basic condition for cost estimate;

The construction cost has been estimated based on the result of material survey cost on October 2005 at Angola.

Exchange rate of currency is fixed as follows (Oct. 2005): US$1.0=Kz.87.6= ¥116

Construction period is estimated for 12 months.

Price escalation is not included for construction, and equipment.

The direct cost of construction is classified into the foreign and local currency component, the percentage distribution of major items is shown below.

No.	Work Item	Foreign (%)	Local (%)
1	Concrete Pavement	60	40
2	Asphalt Pavement	70	30
3	Wharf Repair	50	50
4	Electrical, Water, Repair	90	10
5	Cargo Handling Equipment	100	0

Unit cost of major materials

No.	Item	Spec	Cost
1	Cement	Portland bag	240 US$/ton
2	Crushed Stone	250mm dia.	46 US$/$m^3$
3	Sand	Aggregate	52 US$/$m^3$
4	Steel Bar	16mm dia.	1,250 US$/ton

Table 11-6 Port of Lobito Urgent Rehabilitation Plan Construction Cost

Facility	Unit	Quantity	Unit Price US$	Construction Cost (1,000US$)		
				Total	Foreign	Local
1.Apron,Yard Pavement	m^2	35,075	120	4,209	2,525	1,684
2.Repaire Wharf	m	240	680	163	82	81
3.Rubber Fender	set	20	82,000	1,640	1,476	164
4.Bollard	set	8	9,760	78	70	8
5.Remove Existing pavement	m^2	17,500	60	1,050	525	525
6.Repaire Water, Oile supply pipes	L.S	1		69	35	34
7.Reefer Facilities	L.S	1		384	346	38
Total				7,593	5,059	2,534
8.Cargo Equipment*	L.S	1		1,541	1,541	0
9.Engineering Services	L.S	1		759	531	228
Grand Total				9,893	7,131	2,762

* Reach Stacker: 1 unit, Top Lifter: 1 unit

Table 11-7 Port of Lobito Urgent Rehabilitation Plan Working Schedule (Month)

Work Item	1	2	3	4	5	6	7	8	9	10	11	12
1.Preparatory Works												
2.Apron, Yard Pavement												
3.Repaire Wharf, Car-stopper												
4.Rubber Fender, Bollard												
5.Remove Exist. Pavement												
6.Repair Water Pipe, Buoy												
7.Miscellaneous Works												

11.1.4 Environmental and Social Consideration

Urgent rehabilitation program is included in the short term rehabilitation program and the urgent rehabilitation is basically for small scale project. Therefore, the impacts to surrounding environments will be minor comparing with the short term rehabilitation program. However, considering the result of IEE and the mitigations as shown in previous chapter 10.2.1, environmental social consideration mentioned below concerning “Waste treatment”, “Water pollution, Change of water depth of quay front”, “Dust” are necessary.

MINUA requires EIA for all port projects based on Angolan environmental laws and this project is not the exception. Therefore, EIA works and environmental verification procedure are recommended to be finished together with or earlier than detailed design or construction plan so as to feed them back.

Table 11-8 Items of Environmental and Social Consideration

Item	Content
1) Waste Treatment	Planning of waste disposal: It is necessary to clarify the disposal method and disposal area finding the details of wastes generated by the project at the time of the detailed design stage. Considerable mitigations as recycle of waste are “putting them to depressed area of open space in the port”, “utilizing as recycling sub-base material for new pavement”, utilize as reclamation material to SONAMET yard located closer to existing port” In case that the disposal area will be out side of the port the approval of the government of Lobito and others are necessary.
2) Water Pollution, Change of water depth of quay front	Reducing method of water pollution: It is recommended to have the construction method to prevent from falling of concrete waste, cement and mortar into water at the rehabilitation works in order to reduce the impacts to estuarine water where is a flamingo habitat connected to Lobito bay. Considerable mitigations are “installation of safety net to prevent falling”, “installation of silt protection curtain to prevent

	turbidity", "construction works at the time of ebb current" Change of water depth of quay front: The sounding survey of the quay front must be carried out before and after the construction and if the water depth becomes shallow by falling construction wastes after completion of the work it is necessary to remove them as contractor's obligation.
3) Reduction of dust	Especially, the area covered by urgent rehabilitation program is closer to urban area and found a lot of dust. Therefore, the following mitigations can be considered. The sand will be removed by yard cleaning before construction work commenced. Wheels of construction vehicles and construction machines will be washed and the construction work will be commenced after watering to construction area. Speed limitation of construction vehicles

11.2 The Port of Namibe

11.2.1 Facilities of Urgent Rehabilitation Needs

Berths No.3A and its back yard have most urgent needs for repair work among port facilities proposed in the Short-term Rehabilitation Plan for the Port of Namibe from the viewpoint of the demand, location and possibility of repair work. Figure 11-4 shows the area for Urgent Rehabilitation Plan and Table 11-9 shows facilities and equipment required for the plan.

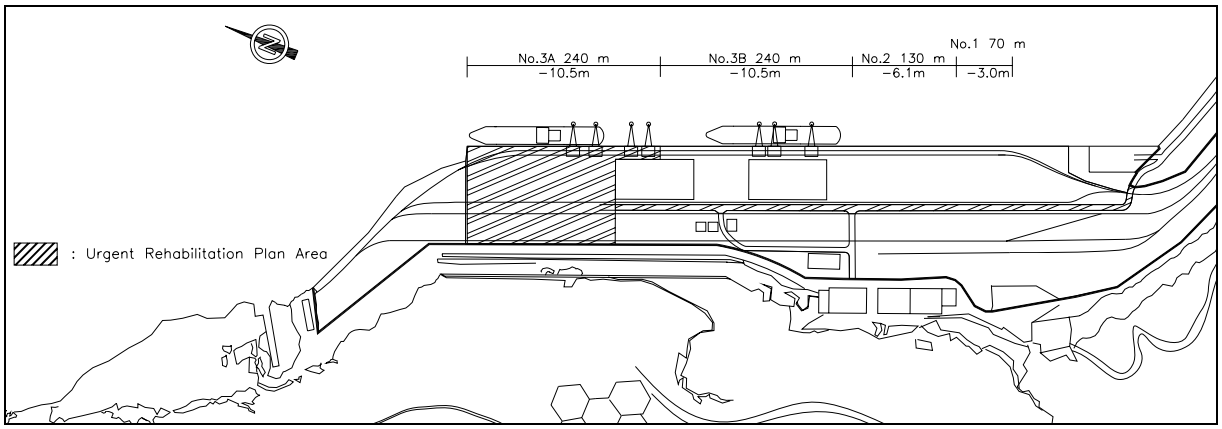

Figure 11-4 Urgent Rehabilitation Area in the Port of Namibe

Table 11-9 Urgent Rehabilitation Facilities and Equipment for the Port of Namibe

Facilities and Equipment	Location and Area
Pavement in the apron and yard	Apron and yard behind the Berth No.3A with a total area of 23,300 m^2
Quay wall and rubber fenders	Coping concrete and fenders on the quay wall of the Berth No.3A with a length of 240 m
Inner port road	Road from the gate to the Berth No.3A: 620 m
Reefer facilities and power supply	Reefer plugs and power generator in the container yard behind the Berth No.3A
Container handling equipment; Removal of unused quay cranes	One reach stacker for container, one forklift and one mobile crane for break bulk operations; and removal of four quay cranes
Water and fuel oil supply	Pipes and cables laid in the yard
Yard lighting	Lighting towers in the yard behind the Berth No.3A

11.2.2 Basic Design

1) Repair of coping concrete and quay wall including installation of car stop

Among the repair methods described in 10.2.3, considering the deterioration extent of the coping concrete and quay wall of the Berth No.3A and material availability in Angola, the following repair methods are proposed for each damaged portion:

Cracks on the concrete surface: Crack filling

Chipped off portion of concrete: Small section recovering

Section loss of coping concrete: Pouring concrete method of Large section recovering

In addition, car stops made by wood fiber reinforced plastic with 25 cm in height and 2 m in length are recommended to be placed on the coping concrete at 30 cm intervals by anchor bolts.

2) Apron and Yard pavement including Access Road

i) Concrete Pavement

As described in 10.3.3, concrete slab thickness of 35 cm is proposed for the apron pavement of the Berth No.3A. The concrete slab is reinforced with reinforcing bars.

ii) Asphalt Pavement

As described in 10.3.3, the following composition of asphalt pavement is proposed for the yard pavement of the Berth No.3A and access road:

Surface course: Type AC II, thickness of 5cm
Binder course: Type AC IV, thickness of 15cm
Base course: Type “grading adjusted material”, thickness of 25 cm
Subbase course: thickness of 30 cm
Total thickness: 75 cm

3) Rubber fenders

As described in 10.3.3, the design vessels for the Berth No.3A are determined as both "Bulk Carrier" and "Container Carrier". In the course of calculating the berthing energy, vessel's draft which ensures the keel clearance of 10% of the water depth at the high water level (HWL) is applied. In addition, in order to check the validity of fender spacing of the Berth No.3A, "General Cargo", which is described as the design vessel for the Berth No.2 in 10.3.3, is taken into account. Table 11-10 and Table 11-11 show the calculation result of the fender system and Figure 11-5 shows the drawing of the proposed fender system.

Table 11-10 Calculation Result of Berthing Energy

Item	Berth No.3A	
Name of Vessel	Liberty Grace	MSC Carina
Type of the Vessel	Bulk Carrier	Container Ship
Dead Weight (ton)	50,601	45,725
Displacement (ton)	51,792	43,022
Berthing Velocity (m/s)	0.15	0.15
Hydrodynamic Mass Coefficient (Cm)	1.663	2.016
Eccentricity Coefficient (Ce)	0.599	0.598
Softness Coefficient (Cs)	1.0	1.0
Berth Configuration Coefficient Cc)	1.0	1.0
Berthing Energy (kN-m)	580	583

Table 11-11 Calculation Result of Fender Spacing

	Berth No.3		
Vessel Type	Bulk	Container	General Cargo
Vessel DWT (ton)	50,601	45,725	3,000
Bent Radius : r (m)	90.5	94.2	16.0
Total Fender Height : H(m)	1.490	1.490	1.490
Fender Deflection : def(m)	0.805	0.805	0.288
Height of Fender System after Deflected (Total Height - Deflection) : h (m)	0.685	0.685	1.202
Fender Spacing : L(m)	22.2	22.7	12.2
Max. Proposed Spacing : Lf(m)		12.0	

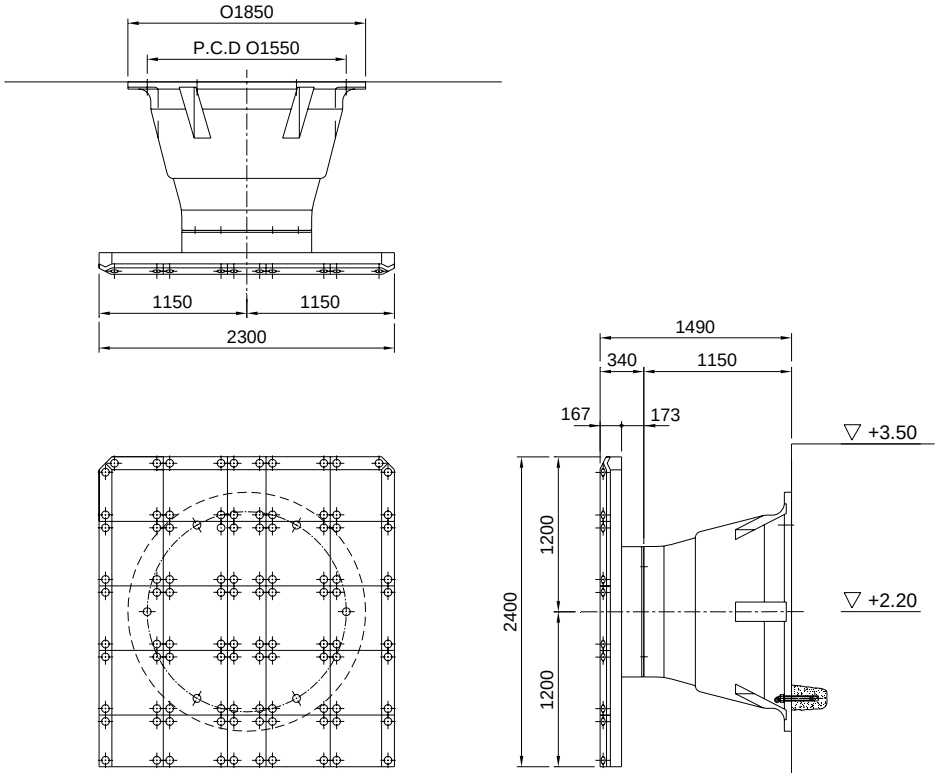

Figure 11-5 Proposed Fender System for the Berth No.3A

4) Mooring Bollard

Mooring bollards are determined by the gross tonnage of the design vessel. According to Table 11-4 and Table 11-5, the maximum gross tonnage of design vessel is 42,260 tons for the Berth No.3A, therefore the tractive force of 1,000 and the maximum interval of 35 m can be derived. The proposed mooring bollard as follows and Figure 11-6 shows the drawing of the 1,000 kN type bollard:

Berth No.3A

Maximum Gross Tonnage of Design Vessel: 42,260 t

Proposed size of bollard: 1000 kN type

Proposed spacing of bollard: 35 m

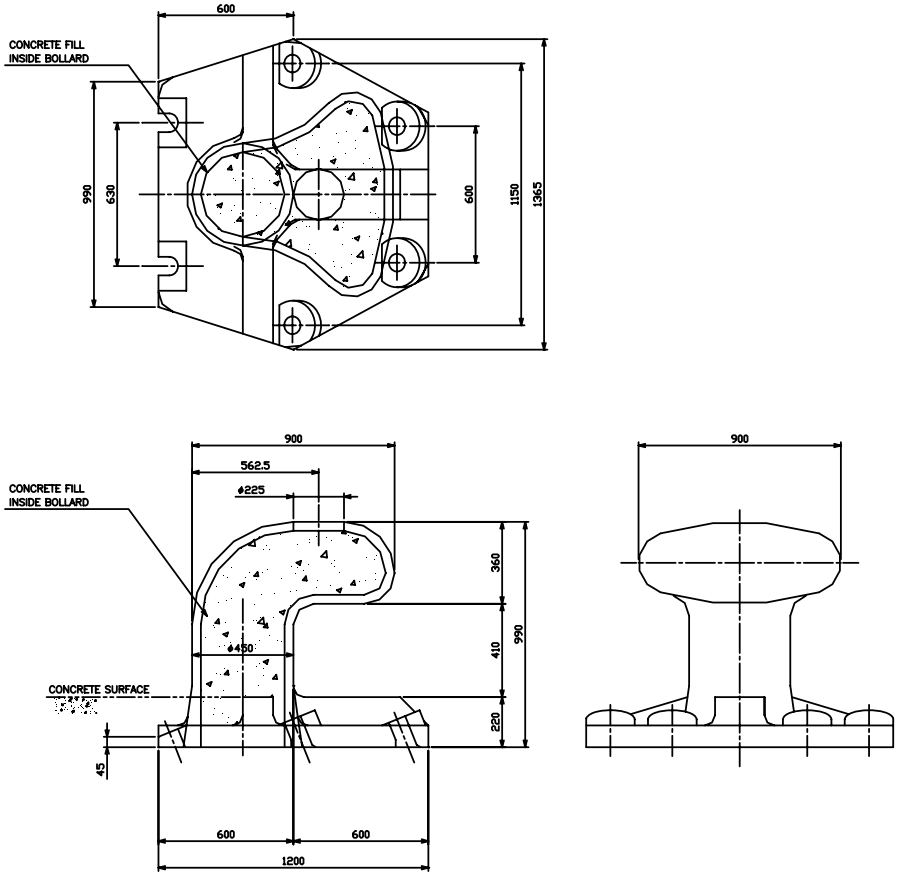

Figure 11-6 Proposed Bollard of 1000 kN Type

11.2.3 Construction Plan and Cost Estimate

Based on the result of field survey, the construction plan and cost estimate will be compiled as follows.

Basic condition for cost estimate;

The construction cost has been estimated based on the result of material survey cost on October 2005 at Angola.

Exchange rate of currency is fixed as follows (Oct. 2005): US$1.0=Kz.87.6= ¥116

Construction period is estimated for 12 months.

Price escalation is not included for construction, and equipment.

The direct cost of construction is classified into the foreign and local currency component, the percentage distribution of major items is shown below.

No.	Work Item	Foreign (%)	Local (%)
1	Concrete Pavement	60	40
2	Asphalt Pavement	70	30
3	Wharf Repair	50	50
4	Electrical, Water, Repair	90	10
5	Cargo Handling Equipment	100	0

Unit cost of major materials

No.	Item	Spec	Cost
1	Cement	Portland bag	240 US$/ton
2	Crushed Stone	250mm dia.	46 US$/$m^3$
3	Sand	Aggregate	52 US$/$m^3$
4	Steel Bar	16mm dia.	1,250 US$/ton

Table 11-12 Port of Namibe Urgent Rehabilitation Plan Construction Cost

Facility	Unit	Quantity	Unit Price US$	Construction Cost (1,000US$)		
				Total	Foreign	Local
1.Epron,Yard Pavement	m^2	23,300	120	2,796	1,678	1,118
2.Repaire Wharf	m	240	680	163	82	81
3.Rubber Fender	set	20	105,000	2,100	1,890	210
4. Bollard	set	8	9,760	78	70	8
5.Repaire Access road	m^2	5,580	40	223	156	67
6.Remove Exist.pavement	m^2	5,000	60	300	150	150
7.Remove South Warehouse	m^2	3,600	100	360	180	180
8.Repaire Water, Oil supply pipes	L.S	1		31	16	15
9.Reefer Facilities	L.S	1		384	346	38
10.Lighting Tower	L.S.	1		95	67	28
11. Remove Quay Crane	L.S	1		82	57	25
Total				6,612	4,692	1,920
12.Cargo Equipment*	L.S	1		2,134	2,134	0
13.Engineering Services	L.S	1		661	463	198
Grand Total				9,407	7,289	2,118

* Mobile Crane: 1 unit, Reach Stacker: 1 unit, Folk lift: 1 unit

Table 11-13 Port of Namibe Urgent Rehabilitation Plan Working Schedule (Month)

Work Item	1	2	3	4	5	6	7	8	9	10	11	12
1.Preparatory Works												
2.Apron Yard Pavement												
3.Repaire Wharf, Car-stopper												
4.Rubber Fender, Bollard												
5.Remove Exist. Pavement												
6.Repair Access Road												
7.Miscellaneous Works												

11.2.4 Environmental and Social Consideration

Urgent rehabilitation program is included in the short term rehabilitation plan and the urgent rehabilitation is basically small scale project. Therefore, the impacts to surrounding environments will be minor comparing with the short term rehabilitation plan. However, considering the result of IEE and the mitigations as shown in previous chapter 10.3.1, environmental social consideration mentioned below concerning "Waste treatment", "Water pollution, Change of water depth of quay front", "Safety to on land fishery activities" during construction and operation period is necessary.

MINUA requires EIA for all port projects based on Angolan environmental laws and this project is not the exception. Therefore, EIA works and environmental verification procedure are recommended to be finished together with or earlier than detailed design or construction plan so as to feed them back.

Table 11-14 Items of Environmental and Social Consideration

Item	Content
1) Waste Treatment	Planning of waste disposal: It is necessary to clarify the disposal method and disposal area finding the details of wastes generated by the project at the time of the detailed design stage. Considerable mitigations as recycle of waste are "putting them to depressed area of open space in the port", "utilizing as recycling sub-base material for new pavement"," utilize as reclamation material to SONAMET yard located closer to existing port" In case that the disposal area will be out side of the port the approval of the government of Namibe and others are necessary.
2) Water Pollution, Change of water depth of quay front	Reducing method of water pollution: It is recommended to have the construction method to protect falling of concrete waste, cement and mortar into water at the rehabilitation works in order to minimize the impacts to fishing port located near the port. Considerable mitigations are "installation of safety net to prevent falling", "installation of silt protection curtain to prevent turbidity", "construction works at the time of ebb current" Change of water depth of quay front: The sounding survey of the quay front must be carried out before and after the construction and if the water depth becomes shallow by falling construction wastes after completion of the work it is necessary to remove them as contractor's obligation.
3) Safety to on land fishery activities	Fishing port is located at around entrance where port vehicles move in and out and it is the gathering spot of port and fishery activities. At this moment, the traffic of port vehicles is not busy and the road width is enough therefore, it keeps good relation under the situation that there is no impacts for safety, claim and repulsion from concerned people. However, as this gathering spot is congested already by port and fishery activities it is necessary to consider the safety aspect when the port construction is commenced and the port activity is intensified. In this aspect, the mitigations at the construction and operation period such as

	"relocation of port entrance, construction of by-pass road", speed limitation of vehicles around port entrance", "placing of traffic control staff and safety control system like installation of traffic signal" are considered.

11.3 Summary of Urgent Rehabilitation Program

11.3.1 Urgent Rehabilitation of the Ports of Lobito and Namibe

Previous Chapters 11.1 and 11.2 identify facilities and location with top priority for rehabilitation among facilities included in the Short-term Rehabilitation Plan. Table 11-15 summarizes facilities and equipment proposed for the Urgent Rehabilitation Program. Since the rehabilitation of the Port of Luanda will be carried out by concessionaires and that of Cabinda will be finished soon, the Study focused on the rehabilitation of the Ports of Lobito and Namibe.

In order to facilitate the rehabilitation, it is recommended to implement the Urgent Rehabilitation Program by grant aid from a donor country and to rehabilitate the other facilities included in the Short-term Rehabilitation Plan with a low-interest loan from a donor country and/or an international agency.

Table 11-15 Summary of facilities and Equipment for Urgent Rehabilitation

Facilities and Equipment	Lobito Port	Namibe Port
Pavement in the yard and apron; Coping concrete, car stoppers and rubber fenders on the quay wall	Yard behind the Berth No.8 and part of the Berth No.7 with a total area of 4.6 ha, a length of 240m	Yard behind the Berth No.3A with an area of 2.3 ha, a length of 240m
Cargo handling equipment	Additional one reach stacker and one top lifter	Additional one reach stacker, one mobile crane and one forklift
Reefer facilities and power supply	Reefer plugs and power generator	Reefer plugs and power generator
Others	Water and fuel oil supply pipes	Inner port road 620 m, Yard lighting towers, Removal of warehouse and quay cranes, Water and oil supply pipes
Estimated cost	US$9.9 million	US$9.4 million

11.3.2 Priority Package of Urgent Rehabilitation

Urgent rehabilitation program of the Ports of Lobito and Namibe consists of civil works, procurement of cargo handling equipment and installation of incidental facilities. Main part of the civil works is to restore the pavement of yard and apron to good condition, and to repair rubber fenders and coping concrete of the quay wall. Incidental facilities are reefer container storage, power supply, yard lighting, water and fuel supply, warehouses, silo and other facilities related to cargo handling.

Three areas, namely, civil works, procurement of cargo handling equipment and installation of incidental facilities, are so synergetic that they shall be carried out simultaneously. Cargo handling equipment cannot function effectively when the pavement is not in good condition.

Rehabilitation of water pipe or fuel pipe and the pavement of yard and apron shall be implemented at the same time. Therefore, the three areas need simultaneous implementation.

If annual investment is limited due to budget constraints, first priority shall be given to civil works and second priority to the procurement of cargo handling equipment followed by the installation of incidental facilities such as reefer plugs, yard lighting and storage facilities.

It may be possible to carry out the rehabilitation in two stages; however, it is strongly recommended to implement each project of the urgent rehabilitation program simultaneously.

12. Emergency Port Rehabilitation Equipment

The objectives of this rehabilitation area are the ports of Cabinda, Luanda, Lobito and Namibe. Based on the field survey results and the list of each port rehabilitation, some rehabilitation equipments have been selected as emergency equipment.

12.1 Concept of Emergency Rehabilitation Equipment

The emergency port rehabilitation equipment shall be selected based on the emergency need for rehabilitation in consideration of technical, safety and environmental aspects for the ports of Cabinda, Luanda, Lobito and Namibe. Delivery period, equipment cost, equipment contribution, foreign currency procurement and maintenance capability will be important component in selecting emergency rehabilitation equipment. Followings are findings of emergency rehabilitation equipment for each port.

12.1.1 Port of Luanda

The port plays an important role of cargo movement for three million people capital region in Angola. Most of port facilities belong to private companies by concession contracts of port operation, however some facilities are under direct control of port authority. Following emergency rehabilitation requirements can be found as candidate.

Rehabilitation of navigation aids

Removal of sunken ships and wrecks

Monitoring of sea depth inside port area periodically

The rehabilitation of buoys is proposed for the short-term rehabilitation plan and the removal of sunken/wrecked ships is for the mid or long-term development plan. Regarding the monitoring of water depth in port waters, it will be appropriate for the port to have a means of monitoring and implement periodical surveys by themselves. In this connection, echo sounder is selected as emergency rehabilitation equipment for the Port of Luanda.

12.1.2 Port of Lobito

The port is well known as the terminal of the Benguela railway and the port plays an important role of cargo movement for second largest city of Angola with population of eight hundred thousand.

Most of port facilities are directly operated by Lobito port authority which has reputation of smooth operation. The port facilities look old but good working condition by preventive maintenance of workshop support system. Followings are candidate of emergency rehabilitation equipment.

Installation of steel plate to repair uneven ground condition at wharf

Floating fender system for container berth

Installation of steel plate putting on uneven ground at wharf will improve the cargo handling speed. Truck tires are used in stead of rubber fender system for entire existing wharf, floating fender will protect ship and wharf at the time of ship berthing for the time being, until installation of rubber fenders.

12.1.3 Port of Namibe

The port consists of two areas, namely the commercial port and Sacomar. The key role of cargo movement is transportation to southern part of Angola with population of three hundred thousand. Most of port facilities are directory operated by the Namibe port authority, however most of port facilities were constructed in 1958 and have remained without any maintenance after 1969. Followings are candidate of emergency rehabilitation equipment.

Installation of steel plate to repair uneven ground condition at wharf

Floating fender system for the commercial wharf

Installation of steel plate putting on uneven ground at commercial wharf will be indispensable for smooth and safe cargo handling. Truck tires are used instead of rubber fenders for entire existing commercial wharf, installation of floating fender will protect ship and wharf at the time of ship berthing for the time being until the installation of rubber fenders.

12.1.4 Port of Cabinda

The port plays an important role as a logistic gate in the enclave province with population of two hundred thousand. Most of port facilities are directory operated by Cabinda port authority, it has a L-shaped jetty where general cargos used for daily life, however water depth is shallow in front of berth and ship cargo must be transferred by barge to 10km offshore.

The existing port needs maintenance dredging periodically due to sedimentation from river mouse, the long term new port plan is ongoing at another site recently. Monitoring of sea depth inside port area is selected as emergency necessity.

The sea depth monitoring by echo sounder in port is important for safety cargo handling, the technology transfer for monitoring system will be required.

12.2 Selection of Emergency Equipment

The detailed investigation have been performed during the field survey period to confirm the capability of acceptance of emergency equipment and we have confirmed that each port authority has enough manpower for implementation of civil/mechanical maintenance works and direct control by port authority will be most economical method. Regarding equipment material, reusable equipment/material in port will be prevailed. Items for selection criteria are shown below.

Equipment regarding high emergency component;

Equipment viable to be completed during study period;

Equipment cost less than fifty million yen each;

Equipment to contribute remarkable facilitate rehabilitation;

Equipment requiring procurement by foreign currency; and

Equipment capable of maintenance by each port authority

After selecting equipment, procurement method, procurement spec, appointed date of delivery and cost estimates are prepared. The criteria of candidate equipment is shown in Table 12-1.

Table 12-1 Criteria for Candidate Equipment

Item	Urgency	Period Delivery	Price	Rehabilitation Contribution	Foreign Currency	Maintenance Operation
Steel Plate	◎	◎	○	○	○	○
Floating fender	◎	○	○	○	○	○
Echo Sounder	○	○	○	△	○	○

12.3 List of Candidate Equipment

In accordance with the detailed site investigation and the result of hearing from each port authority, following list of candidate equipment will be decided (see Table 12-2).

Table 12-2 List of Candidate Equipment for Emergency Rehabilitation

Priority	Items	Period	Port of Luanda	Port of Lobito	Port of Namibe	Port of Cabinda	Approx Cost CIF Angola ¥
1	Steel Plate	5 Months		Container Berth	Container Berth		40 pieces ¥5,000,000
2	Floating Fender	5 Months		Container Berth	Container Berth		10 sets ¥40,000,000
2	Echo Sounder	4 Months	Depth Monitor			Depth Monitor	2 sets ¥2,600,000
Total							3 items ¥47,600,000

Selection Reason;

Priority 1: Commercial wharf of Lobito and Namibe ports have a lot of uneven ground condition at apron area, therefore installation of steel plate for smooth and safety cargo handling is recommended as emergency equipment.

Priority 2: 10,000 DWT class container ships are periodically visit to Lobito and Namibe container berths, however truck tires are using fender system in stead of international standard of rubber fender, installation of floating fender will be good countermeasure for the time being.

12.4 Additional Site Survey for Procurement

During the second field survey period, additional site confirmation survey has been performed at ports of Lobito and Namibe in collaboration with ports authority for steel plate procurement.

The study team explained the effective usage and storage of steel plate to ports authority and the detailed information, namely 20 pieces of 22mm thickness, 1.5m width, and 3.0m length covering space will be 90 m^2 in one 20 foot container for each port. JICA head office approved steel plate procurement during second field survey period and preparation of shipping for Angola has commenced promptly.

12.5 Delivery Schedule for Selected Equipment

12.5.1 Steel Plate

Two 20 foot containers have arranged for transportation and shipping Yokohama port addressed to ports of Lobito and Namibe on 24th November 2005. The original shipping documents already arrived each port authority in the first week of December 2005.

Twenty pieces of steel plates have arrived port of Namibe on 20th January 2006, the study team have visited the Port of Namibe on 8th February 2006 and the Port of Lobito on 14th February 2006 and confirmed the existence of steel plates at site and delivered it to the Ports of Namibe and Lobito with technical advice for practical usage of steel plate.

12.5.2 Echo-Sounder

Preparation of specification and instruction sheet have commenced in September 2005, procurement of echo-sounder has commenced in December 2005 in Tokyo Japan. Two sets of TDM-9000A Echo-Sounder are manufactured in Japan and transported to Angola by the study team on 2nd February 2006.

The demonstration and instruction of echo-sounder has been performed by the study team to the technical staff of the ports of Luanda and Cabinda on 3rd and 4th of March 2006 at the port of Luanda, namely equipment explanation by English and Portuguese technical instruction manual in the meeting room on 3rd, offshore training for bathymetric survey by echo-sounder on 4th respectively. The echo-sounder have been handed over to the ports of Luanda and Cabinda each one set.

13. Port Management

13.1 Laws and Regulations

13.1.1 Overviews

Until 1975, the National Directorate of Ports and Railways administrated Angolan seaports. But under the new regime, the ports were owned and managed by the National Government. In 1991/1992 National Constitution was reformed, and the Law for Economic Sectors (Law 13/94), which represents the first step towards liberalization of the economic sector, was approved by the National Assembly. In line with the new law, governmental organizations were separated into two categories: Organizations, which can be self-sustaining and thus subject to Market Mechanisms and those which are non-profitable or public in nature. After the year 2000, organizations in the former category were privatized. At this time, the port authority became a self-sustaining public enterprise. Presently, the self-sustainability of ports is in a trial stage. In 2003, the private investment law was modified and the Port Law was also modified (Law53/03).The modification was intended to simplify and modernize procedures so as to reap the benefits of private sector participation.

The privatization of the Luanda Port started in 2003. According to the privatization scheme, Luanda Port was divided into three administrative areas: The concession contracts for the two terminals were procured by direct negotiations with the operators. The third terminal, however, was opened to international bidding. The international bid was closed in March 2003. The result of the evaluation was announced in 2004. But there has been some debate concerning the fairness of the bidding procedure. Since the concessionaire of the third terminal has not been finalized, the Luanda Port Authority presently operates the third terminal. In the mean time, container throughput has increased steadily. Waiting time for vacant berths is also increasing. The early resolution of the concession issue is desired because the concessionaire will invest US$55 million in increasing handling capacity and this will go a long way towards alleviating congestion in the terminal. The important laws for ports are indicated in Table 13-1.

Table 13-1 Important Laws for Ports

Decree Law No.1/98	Statute of the Ministry of Transport
Decree No.26/98	Statute of Port of Luanda
Decree No.28/98	Statute of Port of Lobito
Decree No.33/98	Statute of Port of Namibe
Joint Executive Decree No. 17/02	Regulation on Port Tariffs in Angola
Decree No. 53/03	Regulations on Port Exploitation

13.1.2 Ministry of Transport and Port Authorities

1) MINTRANS (=Ministry of Transport)

MINTRANS presently controls Angolan ports. The organization chart of MINTRANS is shown in Figure 13-1. There are departments responsible for the land transport, maritime transport and ports, and civil aviation. The organization has been undergoing changes recently to better respond to the transport issues in light of privatization and globalization. The above three departments have recently converted into independent institutes. The institutes will have their own budget and the authority to make their own decisions.

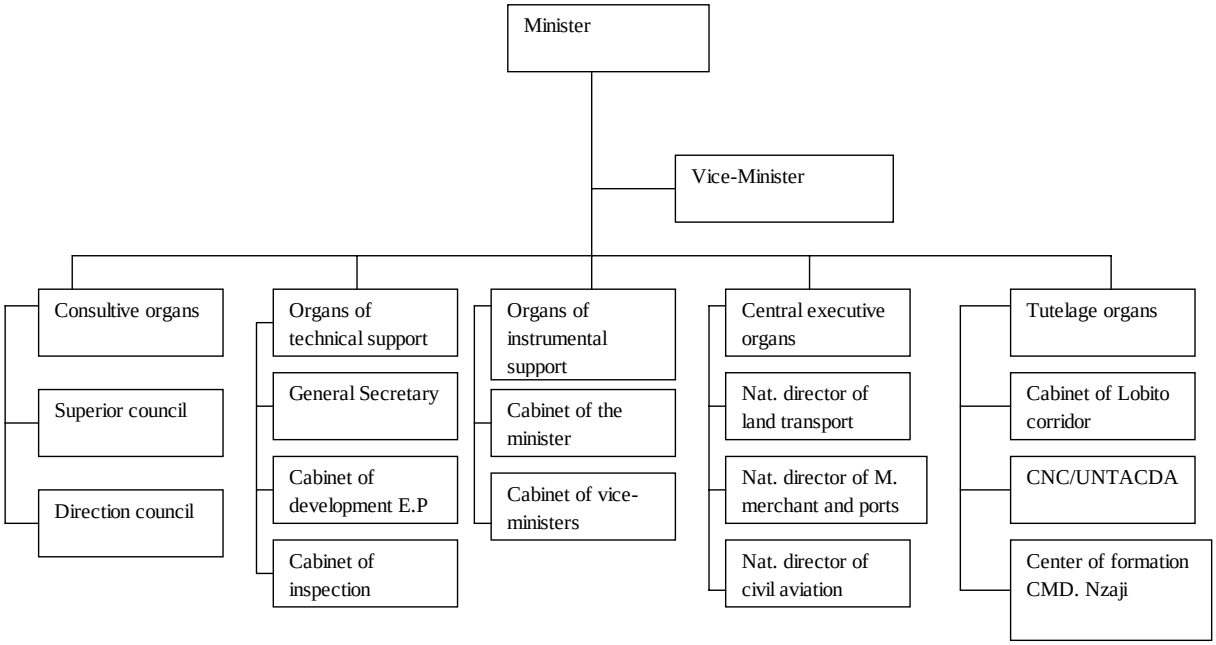

Figure 13-1 Organization Chart of Ministry of Transport

MINTRANS currently has the following targets:

Integration of ports in the national and regional logistics transport network;

Privatization of port operations;

Strategic port positioning on a regional scale, favorable to the development of a transshipment port; and

Amendments to the legal and institutional framing.

Action Plans of MINTRANS aims at:

(Program I): Recuperation and modernization of infrastructure,

(Program II): Re-organization of marine terminal and privatization of management,

(Program III): Improvement of techno-nautical services

MINTRANS has also put priority on maintaining international standards. In this connection, Angola has been a member of the PMAWCA (the Port Management Association of West and Central Africa), enabling it to obtain news and information related to management trends throughout the world. PMAWCA was created in 1972 by the Economic Commission for Africa United Nations (CEA). At present, there are 20 regular members and 11 associated, covering approximately 95000 km of the coast of Africa. The principal objectives of this association are the improvement and standardization of port equipment and services, with a view to increasing efficiency in the area of transport in West and Central Africa.

The recent topics of the PMAWCA are:

Safety and Security, and Preservation of Environment

The utilization of the PMAWCA training center(CFP-AGPAOC)

Competition among ports of the region

Protection of the port environment, marine pollution control and maritime navigation safety

Environmental policy as a management tool

Intervention and action measures in cases of marine pollution

Necessity of readiness to cope with emergency situations in case of disaster

Port Autonome de Douala: Port reform, prelude to competitiveness

Study on port pricing policies of PMAWCA member ports

Recommendation 011-03/26/COS - TSl should invite PMAWCA member ports to establish one stop shops similar to that of the Port Autonome de Douala, in Cameroon.

Recommendation 012-03/26/COS-TSI inviting member ports to install weighbridges at entrances and exits to check the load as well as to work closely with the Administrations responsible for road transport with a view to harmonizing axle weight.

Recommendation 016-03/26/COS-TSI inviting member ports to build their technical capacities in terms of processing of oceanographic, hydrographic and hydra-sedimentary data.

All are also the current topics related to port management in the world. As seen above, restoration of port functions, coping with globalization, introducing privatization, and reform of port organization are being tackled in Angola.

Table 13-2 shows key indices of the Major Ports in Angola in 2004. Angolan ports are located at strategic places. Luanda, Lobito, and Namibe have a calm, wide, and deep basin sheltered by a peninsula that enables very big vessels to utilize the ports safely. In addition, natural resources are abundant in Angola. The restoration of the corridor will enable remarkable economic growth in Angola. Angolan Ports should be ready to cope with the cargo demand so as to contribute to the nation's prosperity.

Table 13-2 Key Indices in Angolan Ports

	Cabinda	Soyo	Luanda	Lobito	Namibe
Nunmber of Personnel	150	63	1800	1200	720
Number of Berths	2	3	17	8	4
Yard Area (m^2)	9,000		450,000	153,000	112,000
Annual Ship Nos	307	100	2,863	742	422
Revenue('000 kz)	237,275	137,017	3,157,517*	1,832,801*	710,766
Expenditure('000 kz)	268,720	153,300	2,331,642*	1,787,950*	670,635
Balance('000Akz)	-31,445	-16,283	825,875*	44,851*	40,131

*Data in 2004

2) Port of Luanda

The organization of Luanda Port is shown Figure 13-3. Luanda Port is managed and operated by the corporation of Luanda Port. The number of employees is 1800. Luanda Port has a consulate committee which advises or audits the activities of the Luanda Port. Recently Luanda Port started to turn over the cargo handling operation to the private sector. The personnel of the operation divisions in Luanda Port are also transferred to the newly formed private companies.

Luanda Port has started concession contracts. According to the privatization plan, the port area is roughly divided into three parts. SONILS, which is the special logistics terminal for oil production, has started operation under a concession contract with the Port Authority. General cargo terminal is operated by newly formed private operators, which were the operation groups of the port

authority. Multipurpose terminal area is reserved for the local companies, while use of the container terminal area will be decided through international competitive bidding. The progress of privatization has almost reached the final stage.

The Port of Luanda must play an important role in the nation's economic restoration. Since all of the problems will not be solved by privatization alone, the port authority and the Ministry of transportation must prepare multiple solutions.

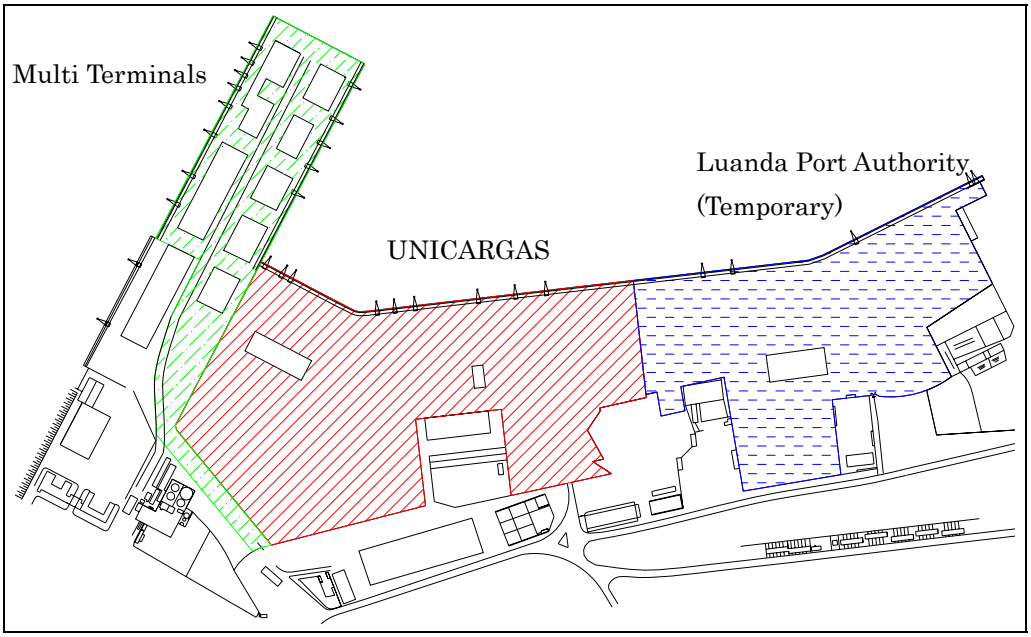

Figure 13-2 Terminal Layout of the Port of Luanda

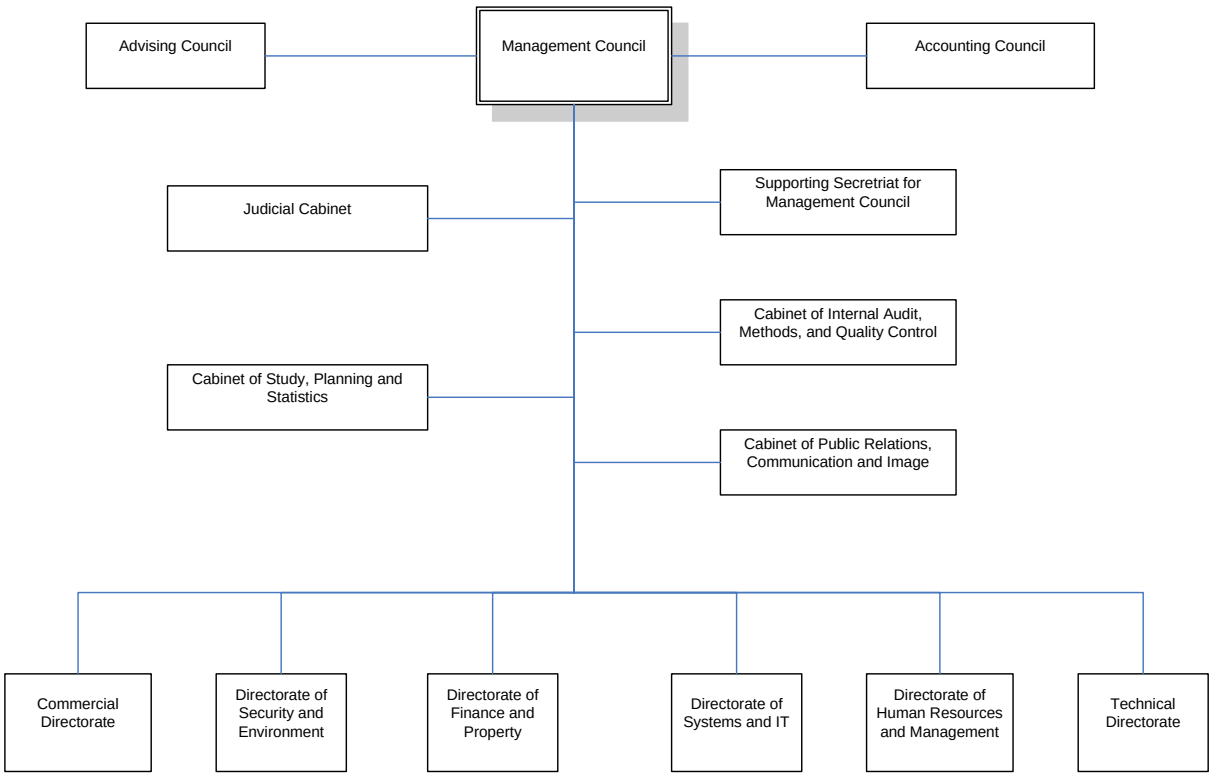

Figure 13-3 Organization Chart of Port of Luanda

Table 13-3 Staff assignment by sections (Luanda Port Corporation)

General Division	38
Administration and Human Resources	65
Economic and Financial Division	55
Commercial Division	39
Technology	81
Security & Ambulance	241
Junta Medical	26
Others	6
Total	551

3) Port of Lobito

Lobito Port is managed and operated by the corporation of Lobito Port. The number of employees is 1200. Lobito Port has an important role, as the center of the Lobito Corridor, in the transportation of the region.

The port has conducted regular maintenance of its equipment to ensure that operations are not interrupted. However, current cargo volume is only 30% of the volume recorded in 1973. Since the rehabilitation of the Lobito Corridor is in progress, and it will start operation in the near future, port rehabilitation is urgently needed. As most of the facilities of the port are superannuated, they must be renewed and modernized. The organization of Lobito Port is shown in Figure 13-4.

Table 13-4 Staff assignment by sections (Lobito Port Corporation)

General Division	3
Administration	42
Human Resources	88
Finance and Planning	57
Social & Culture	62
Procurement	32
Protection Phisical	73
Operation	415
Maintenance & Civil	338
Others	90
Total	1200

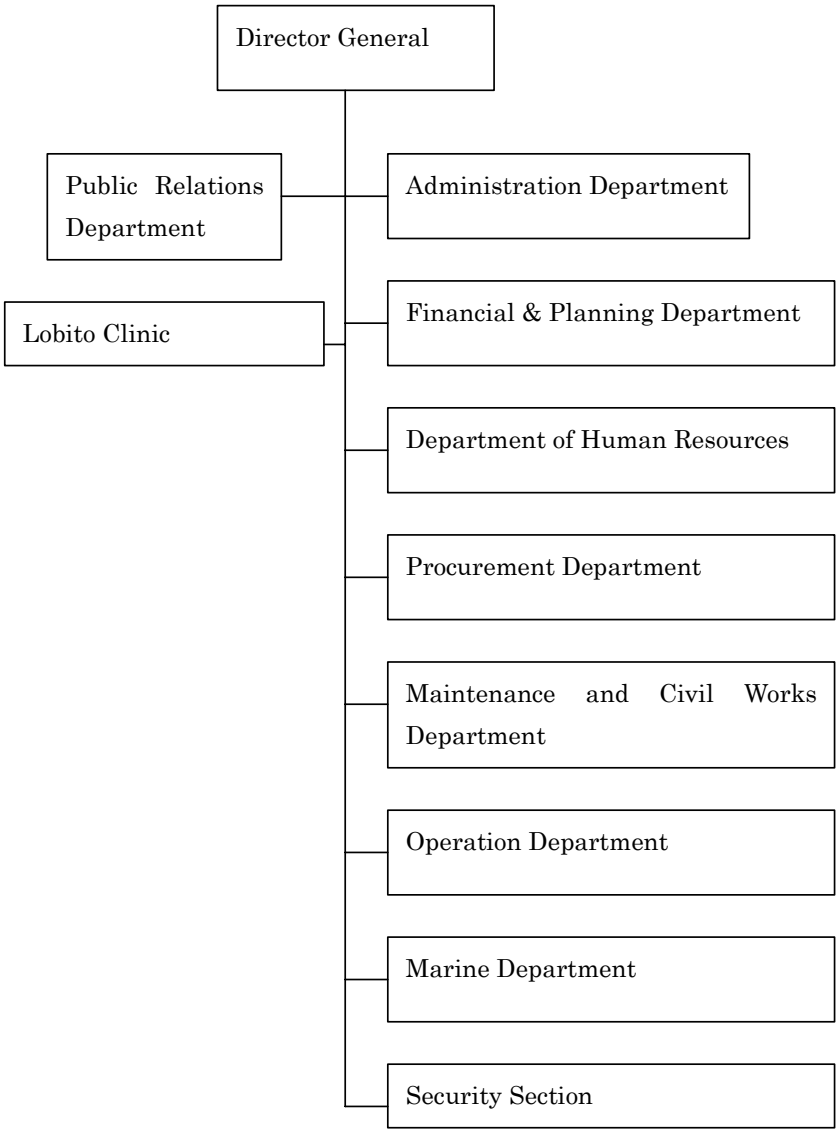

Figure 13-4 Organization Chart of Port Enterprise of Lobito Port

4) Port of Namibe

The organization of the Namibe Port Corporation is shown in Figure 13-5. The number of employees is 720.

Namibe port handled six million tons of iron ore at the Saco Mar in the past. Presently the black granite stone for export is handled at Namibe Port. The repair of the pavement is urgently needed for safe operations as well as efficient cargo handling. Annual cargo volume reached 400,000 tons recently. But taking into account the resumption of railway service and production of mines in the hinterland, the port should be prepared to handle the envisaged demand as soon as possible.

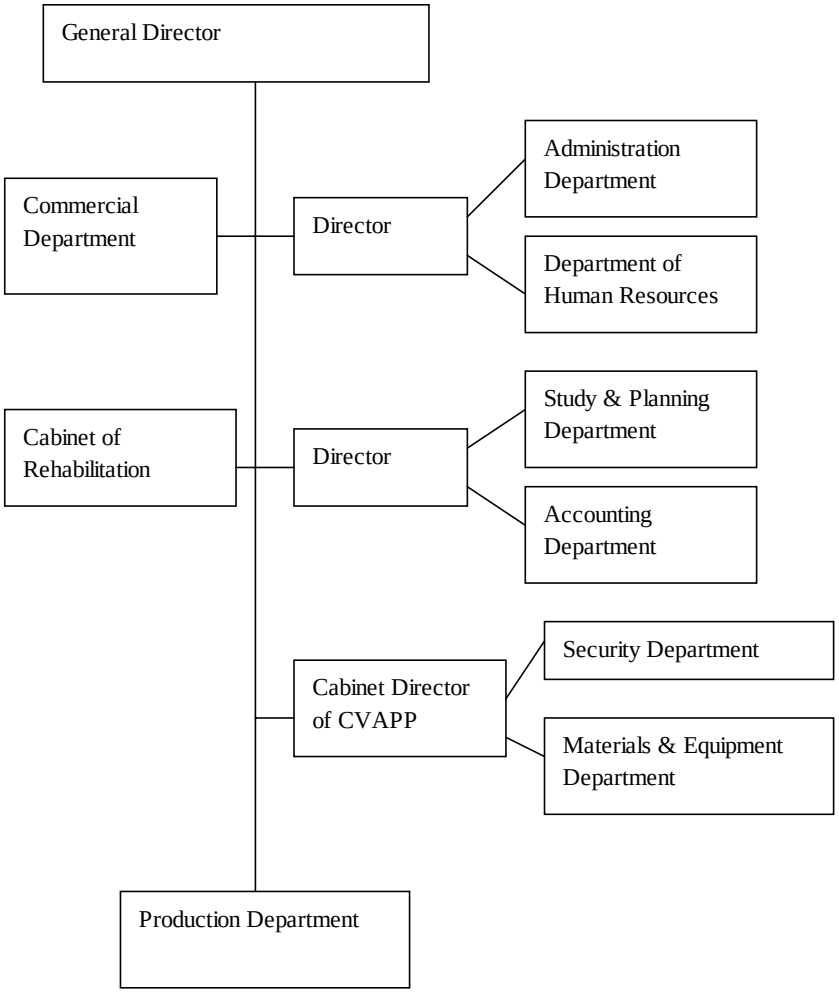

Figure 13-5 Organization Chart of Port of Namibe

Table 13-5 Staff assignment by sections (Namibe Port Corporation)

General Division	15
Reseach, Plan and Finance	13
Production	391
Administration and Human Resources	35
CVAPP(Security)	140
Commercial	79
Servicos de Saude	39
Rehabilitation	8
Total	720

5) Port of Cabinda

Cabinda Port is managed and operated by the Enterprise of Cabinda Port. The number of personnel of the enterprise is 150.

Cabinda Port offers offshore midstream operation service and barge transportation service from a place 10km offshore to the jetty at the port. The offshore operation is dangerous because there are no shelters from the long swell waves.

Cabinda Port has a jetty but it is not strong enough to support heavy containers. Cabinda Port is preparing for heavy log handling.

The balance sheet of Cabinda Port had shown a deficit because the container throughput was only 2,500TEUs in 2002, but a profit was registered when the container throughput became 4,000TEUs in 2004.

Cabinda Port has to deal with sedimentation in the port basin and requires deepening of the access channel to accommodate regular-sized ships. It is difficult to solve the sedimentation problem using its own resources since the income is very limited. But Cabinda Port's hinterland is rich in natural resources. The port development of the Cabinda should be coordinated with the development of the hinterland with the assistance of government funds.

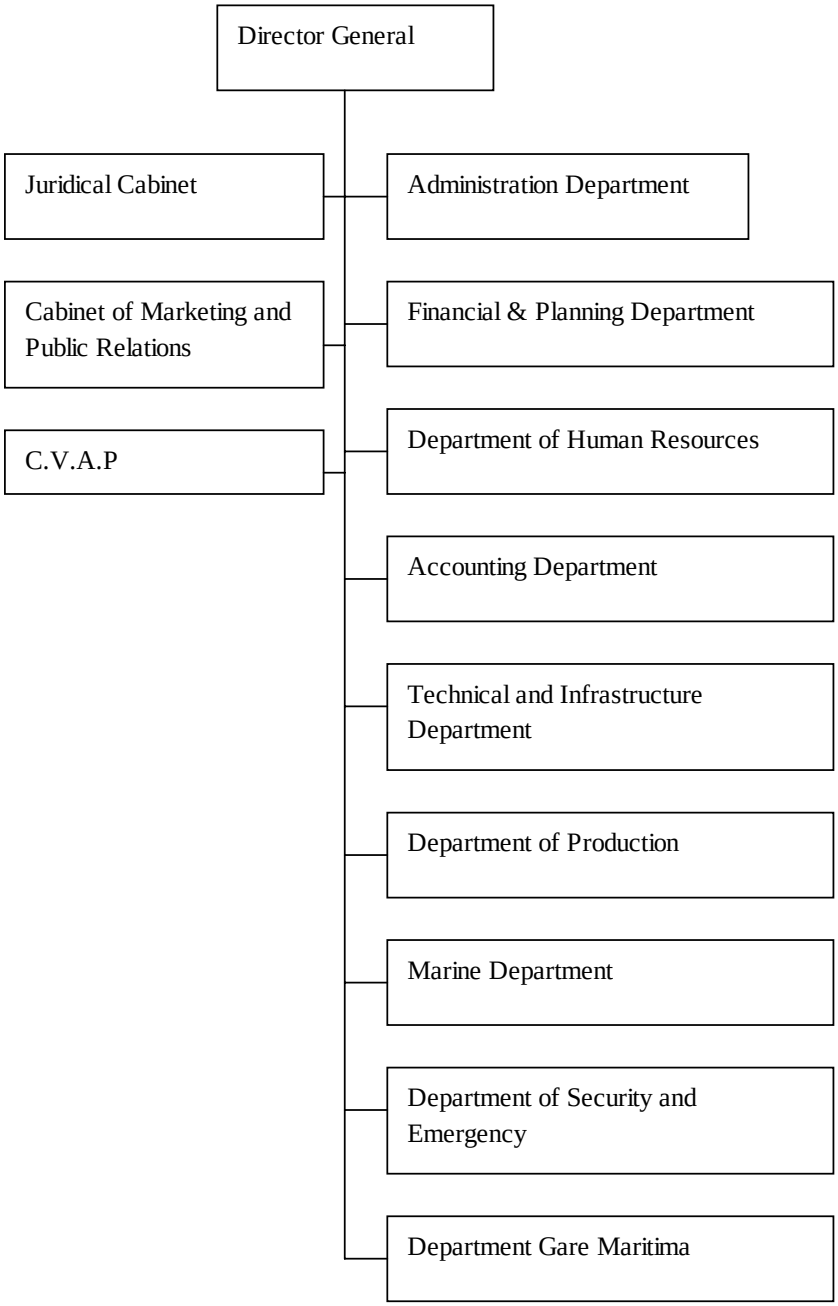

Figure 13-6 Organization Chart of Port Enterprise of Cabinda Port

Table 13-6 Staff assignment by sections (Cabinda Port Corporation)

Administration	21
Finance Division	11
Production	9
Research & Statistic	7
Human Resources	9
Financeiro Interio	14
Gabinete Juridico	17
D.G	22
Security & Medical Amburance	22
Maritime	15
Public Relations	3
Total	150

13.1.3 Problems of the Major Ports in Angola

1) Cargo Handling

Angolan Ports are currently old and ill-equipped due to the war. Common problems observed in Angolan ports are:

Damaged wharves have not been sufficiently repaired. Fenders for big ships are lost. The damaged mooring bits have not been repaired. Ships are obliged to suffer damage when they moor, or during cargo-handling operations.

Pavements are in poor condition. Vehicles and cargo are often damaged and lost. Accidents involving people sometimes occur.

Unused railways hinder the smooth movement of vehicles. The operational productivities are adversely affected by the railway crossings at the wharves.

Time is consumed because of ineffective mechanical equipment, such as old fashioned and insufficient heavy-duty quay cranes.

2) Financial Condition

The financial condition of Luanda, Lobito, and Namibe is improving because the cargo volume is increasing and the number of workers is decreasing. But Cabinda and Soyo Port do not have sufficient cargo volumes to enjoy the scale merit. The operation costs are high due to the long and shallow water basin of these ports. Ports must also try to decrease the cost at the port, since the ratio of the port charge in the price of the consumer goods is very high.

3) Port Tariff

Port Tariff has a direct influence on the financial condition of the public corporation. Each port does not decide the tariff by itself; the government decides it. Each port applies the decided rate based on the government regulations.

Note: The port tariff is provided by Decreto executive conjunto no.17/02 de 3 de Maio "Regulamento de tarifas Portiarias de Angola".

4) ISPS (International Ships & Ports Security Code)

ISPS code of the security measures of the sea route and the port comes into effect on July 1, 2004. Implementation of the ISPS has already been realized in Angola both for the security in navigation channels and the security of the port. The beacons are restored in some portions of the channel.

The ports in Angola implemented the Port Security Plan, equipment, the personnel assignment, and the check system, to satisfy regulations of ISPS code, though the original level of security was very high.

5) Customs Issues

The customs house in Luanda port has a very poor reputation because processing is very slow. A consignor has to wait a long time without reliable information on the expected date and progress of the clearance. Long waiting time causes a lot of economic loss for the nation, and hinders economic development.

Angola government is tackling this problem seriously. The Crown Agent, the British consultant, is assisting with customs reform. One of the results is the abolition of the system of prior customs clearance. The prior customs clearance, on the one hand, is good for the port authority because it prevents port congestion. But on the other hand, it is irrational that the lack of documentation results in a penalty. The documents of prior customs clearance are not ready especially when the importation is done from a nearby country like South Africa. Crown Agent also encourages the introduction of the EDI system to streamline customs procedures.

13.2 Recommendations on Improving Port Management

13.2.1 Governmental Level

Angola started restructuring the Ministry of Transport in 1997 with the assistance of the World Bank. The objective of the reform is to strengthen the ability to implement the following:

Integration of ports in the national and regional logistics transport network;

Privatization of port operations;

Strategic port positioning on a regional scale, favorable to the development of a transshipment port; and

Amendments to the legal and institutional framing.

The purpose of the reform is to heighten the ability of creation of the laws. The lead-time of decisions will be shortened. The Port Law was renewed in 2003 to cope with the privatization of the ports (Law 53º/03).

But Angola is in the process of recovering from a long civil war. Telephone lines are not yet available throughout the entire country. The public transportation is not reliable. Employees generally return home from work at three in the afternoon.

Under these circumstances, a lot of work remains to be done. A Special Institution with its own source of funds is planned to expedite the implementation of the ports policy. However, this Institution has not yet been realized. Focusing on urgent needs, the following functions of the public sector should be strengthened.

Function of authorization of the Master Plan of the port;

Function of provision of the technical information which are useful for the ports to establish the future plan or to preserve the environment of the ports;

Function of the sponsorship of the port development; and

Function to remove the confusion or excessive competition among port operators.

The authorization by the government of the Port Master Plan enables ports to reserve the space to expand in future, and makes it easy to introduce funds for development. The coordinated transportation plan with the road network and railway network should also be considered in the master plan.

13.2.2 Port Authority Level

1) Master Plan

A master plan that is open to the public is necessary for all ports. The area of the container yard is insufficient to ease the present congestion in Luanda. To overcome the space shortage problem, BOT or utilization of foreign funds should be applied. And in order to attract the interest of the private sector, a master plan that is open to the public should be formulated. Ports of Lobito, Namibe, and Cabinda need also to establish a master plan. Regular amendments to the master plan are also important and this should be set out in a government regulation.

2) Safety and Hygiene Regulations at the Port

The deterioration of the environment should not be permitted. The dust problem in Lobito Port and the water pollution by bilge water in Luanda Port need to be addressed. In order to maintain safe and sanitary conditions, it is necessary to have safety and hygiene regulations at the port. Safety and hygiene can coexist with high productivity.

3) Easy Access to Port Regulations and Tariffs

Everyone should be able to refer to port regulations at any time. For this purpose, laws and government ordinances should be compiled into a booklet and distributed to related organizations. For port user's convenience, the rules and the tariffs should be available on the Internet.

4) Strengthening of Organization

Capacity for establishing the master plan is necessary. To date there have been no major projects implemented by Angolan Ports. In addition, statistical data vital for formulating a master plan are unavailable. It is necessary to promote ICT (Information and Communication Technology). To achieve this, strengthening of the entire organization through education and training is required.

5) Acquisition of Knowledge

Technical knowledge concerning marine works and enhancement of productivity is needed for the development of the port. The sedimentation problem of Cabinda Port is one of the big problems. Knowledge to overcome natural hazards and maintenance of the desirable environment is also necessary. The knowledge required is vast and covers a wide range of fields. It is necessary to take advantage of all opportunities to acquire knowledge. The training scheme of JICA is one such opportunity.

6) Open Discussions on Efficiency Enhancement

All employees should have the opportunity to participate in meetings where ways to enhance efficiency are discussed.

13.2.3 Enhancement of Efficiency in Terminal Operation

1) Upgrading of Infrastructure

The immediate cause of the inefficiencies can be attributed to the shortage of infrastructure. Therefore, it is essential to procure the infrastructure and expand the container yard. All ports in Angola have already become autonomous public corporations. In Luanda port, terminal operation is implemented by the concession contract with a private company. The form of "BO& Concession" like SONILS has been introduced as a development method. However, it is still necessary to strengthen the financial position of the Port Corporation.

2) Implementation of Mechanization

Manual labor results in a surplus of workers as injuries and lumbago are common in aged workers. Therefore, it is necessary to mechanize the loading work as much as possible. Containerization should be promoted because not only does it enhance productivity through mechanization and automation, it also prevents a surplus of workers.

3) EDP (Electronic Data Processing)

It is necessary to promote EDP not only at the office but also at all sites. In the container operation, the ship gear normally is capable of loading one container every two minutes. However, actual productivity is about 6 pieces per hour. The reason for the inefficiency can be attributed to the fact that the container is not smoothly supplied. If EDP could trace the position of the container correctly, the container can be smoothly supplied.

Bills, which are currently a hand-written document, are issued several months later than they should be in Luanda port. If information from all sites is sent in the form of Electronic Data, business documentation can be done in a day. Electronic Data Processing enables the collection of the data and analysis almost instantaneously. The EDP can process the person's move in and move out, as well as the commodity. Spare parts, fuel consumption berth allocation etc. can be easily controlled with Electronic Data Processing.

EDP also enables monitoring of all the things that are happening on the site and thus a problem can be addressed before it even happens.

13.2.4 Palliative Measures for Port Congestion

1) Latest Situation of Port Congestion

Luanda port was originally constructed for export cargoes (Cacao, Banana and Coffee). Now, however, more than 90% of daily living products depend on imports. Furthermore amount of imported cargoes from Brazil and China have rapidly increased. It is very difficult to keep sufficient space at the terminal for discharged containers. This is the biggest reason for the port congestion. In 2005, average waiting days were about 3~4 days. In 2006, the situation became worse and most vessels have been compelled to wait for 6~7 days for berths. The situation of waiting days and congestion surcharge is shown in Table 13-7.

Table 13-7 Port congestion and congestion surcharge in Luanda

	Average waiting days	Congestion surcharge / TEU (Euro)	From
March 2005	3～4	75	2005.2.10
April	3～4	100	2005.3.21
May	3～4	100	
June	3～4	200	2005.5.21
July	3～4	200	
August	2～3	150	2005.7.21
September	2～3	150	
October	2～3	100	2005.9.21
November	3～4	100	
December	3～4	100	
January 2006	4～5	100	
February	5～6	100	
March	6～7	100	
April	6～7	200	2006.3.21

Fixed by EWATA (Europe West Africa Trade Agreement)

Above congestion surcharge has been added to ocean freight to Angola. In addition, EWATA decided to introduce Emergency Terminal Congestion Surcharge for containers destined to Luanda. EUR200 / 20ft, EUR300 / 40ft have been newly added on 30th June 2005 and after.

The port congestion seemed to improve slightly in the summer of 2005. However most vessels were compelled to wait for berths for 6~7 days after March 2006 because of a shortage of terminal stevedoring machines, sufficient space for discharged containers, terminal workers and electric plugs for reefer containers.

2) Latest Situation of Ocean Freight Rates to Luanda

Because of severe port congestion, ocean freight to Luanda is more expensive than that to other neighboring ports. For example, ocean freight rates for general cargoes in 20ft container are as follows.

From Europe (Amsterdam)

to Luanda	Euro2,500/20 ft all-in
to Abidjan	Euro1,700/20 ft all-in
to Cape Town	Euro1,750/20 ft all-in

From Japan (Main port such as Yokohama, Kobe, Nagoya)

to Luanda	US$4,000/20 ft all-in
to Abidjan	US$3,400/20 ft all-in
to Cape Town	US$2,300/20 ft all-in

From Hong Kong

to Luanda	US$4,000/20 ft all-in
to Abidjan	US$3,400/20 ft all-in
to Cape Town	US$2,300/20 ft all-in

From Singapore

to Luanda	US$3,600/20 ft all-in
to Abidjan	US$3,100/20 ft all-in
to Cape Town	US$2,000/20 ft all-in

3) Palliative Measures for Port Congestion

Eventually the expansion of Luanda port is required to cope with congestion. In the short term, the following steps can be taken.

As the terminal operator has not introduced a computerized system, it can not find the stowed place of container and can not give precise instructions to the truck driver. Tally man has to look for containers each time. Therefore it takes a long time for container delivery. Such an inefficient system should be improved for smooth and rapid works in the terminal. Traffic jam on roads to/from Luanda port should be improved.

Consignee do not receive containers immediately because there are not sufficient warehouses for imported cargoes. A lot of containers are stowed at the terminal for many days (maximum 4 weeks) until being delivered. Furthermore storage fee at the terminal is very cheap in Luanda port compared with other ports, where high storage fees have been set to prevent port congestion caused by container's long staying. System of storage fee in Luanda port is as follows.

Free time at terminal	6 days
7 days ～ 30 days	US$2.40 / TEU per day
31 days ～	US$3.20 / TEU per day

On establishment of port tariff including storage fee, the Ministry of Transportation contacts the Ministry of Finance. Such low storage fee should be increased for the sake of quick receipt of imported cargoes.

By utilizing inland depot for stuffed and empty containers, usable space of the terminal should be enlarged. By introduction of night work (discharging/loading and delivery/receipt of containers at night), operation efficiency of the terminal should be improved.

Together with the introduction of the Emergency Terminal Congestion Surcharge on 30th June 2005, Port of Luanda prohibited return of empty containers to the terminal. They have to be returned to the yard for empty vans located a long way from Luanda port. They are kept there and taken to Luanda port at night when there is no traffic congestion at the cost of shipping lines.

13.2.5 Introduction of Efficiency of Private Company

A lot of private companies are participating in the operation of container terminals throughout the world. The main purpose is to improve the efficiency of port operation, to advance the service level of the port and to stabilize the port management. Also in Luanda port, private companies are requested to participate in port operation for the sake of advancing the service level and decreasing the charges concerned.

1) Advancement of Port Service

Port is a very important trade infrastructure both for the nation and the region. Due to the globalization of economic activities, efficiency and costs of port operation have a greater impact on Angola's economy than before. For example, if Luanda Port suffers from port congestion, ocean freight and charges to Luanda become higher than that to neighboring ports around Luanda.

By introducing the skill and energy of the private sector, efficient port operation can be expected. Charges should also be decreased.

2) Efficient Management of the Port

In case the public sector operates and manages a port by itself, it sometimes can not take prompt decisions due to its bureaucratic nature. When a private company participates in port management, however, quick responses can be expected. Private companies are also more willing to take risks which can lead to large profits provided the port is well-managed. Therefore a private company would have a strong incentive to alleviate port congestion and cope with sudden changes in the economy and trade conditions.

3) Promotion of the Port

Because of 30 years civil war in Angola, there are few persons with the necessary skills to carry out development and port management. By introducing international terminal operators, Luanda port will be able to offer world-class port service. Prompt development of the port can be also expected due to the terminal operator's ability of canvassing a lot of containers.

4) Reduction of Financial Burden

The Angolan government is suffering from financial constraints. It can not supply the funds required for port development by itself. On the other hand, the realization of an efficient port is earnestly required. The introduction of private funds can free Luanda Port Authority from its financial problems. Furthermore it can obtain profit, or concession fee fixed by the concession agreement.

However, at this stage, UNICARGAS (one of the private companies with a fixed concession agreement with Luanda Port Authority) lacks the experience of a world-wide terminal operator. It is not a private company but a state-operated company.

AP Moller Terminals under the Maersk group equipped with sufficient experience in world-wide terminal business made a successful bid for the concession agreement. However it has not been able to start construction of its terminal for more than two years due to a dispute with SGEP, who is contesting the result of the bid.

Therefore Luanda port has not benefited from the concession agreement in spite of its eagerness. Following measures can be taken to promote effective privatization.

5) Establishment of Council for Observation of Port Privatization

It is desirable to establish a council to oversee privatization of Luanda port. The council should be independent from both the private terminal companies and Luanda Port Authority. It should consist of persons with expertise and experience working in important posts of the Angolan government, Luanda local government, shipping lines and shippers. It should monitor the progress of the concession agreement and should give parties concerned instruction on terminal construction and ways to improve terminal management if required.

With reference to the Container Terminal, the Angolan high court has been deliberating on the bid dispute between AP Moller Terminals and SGEP for more than two years. This unresolved issue is one of main reasons for the severe port congestion because nobody can invest in the Container Terminal and improve it. It is hard to predict which one will win in the high court. An early settlement is required.

6) Support of Angolan Government for Financing of Private Company

Neither Multi Terminal nor UNICARGAS has sufficiently invested in its terminal. One of reasons is a lack of financial resources. Considering the financial situation of Angola, it is difficult to use budget of the national government and the local government. A loan supplied by foreign country and guaranteed by the government should be considered.

7) Incentive for Private Company

Concession fee should be settled so that private companies can increase their profit by handling more cargoes. If concession fee is increased according to the increase in cargo, some discount rule (for example: discount rate for cargoes exceeding settled line fixed by private company and Luanda Port Authority) should be introduced.

13.2.6 Improvement of Maintenance and Repair Engineering

1) Current Maintenance Condition of Port Facilities

In general, social infrastructure including port facilities, which is expected to function over a long period of time, tends to be damaged by various external stimuli generated during its in-service period. Therefore, appropriate maintenance and repair engineering is essential to retain the expected function of the port facility and utilize it as a useful social infrastructure for its in-service period.

Due to the lack of appropriate maintenance and repair works during the civil war, port facilities of Angolan ports are found to be severely deteriorated as described in chapters 5, 6, and Appendix and are not fulfilling their original functions. Therefore, desired cargo-handling efficiency and safe operations have not been achieved. With the prospect of growth in cargo throughput, formulating an appropriate maintenance and repair strategy of ports is necessary to avoid a logistical bottleneck.

2) Establishment of Maintenance Plan of Port Facilities

It is recommended that an appropriate maintenance plan of port facilities be established and implemented taking into account the following items:

Facility inspection should be divided into two main categories, regular inspection and irregular inspection in the event of a natural disaster. Each inspection is comprised of primary inspection and secondary inspection.

Primary inspection represents a simple and economical way of checking the apparent condition of the port facilities by visual survey and by some portable equipment.

Secondary inspection is conducted by using some special equipment and/or locally-demolishing the facility when the physical deterioration degree and cause of the degradation of the facility do not become clear in the course of the primary inspection.

Inspection method is recommended 1) to have enough degree of accuracy to measure allowable limits of the deterioration, 2) to employ portable equipment, and 3) to be workable and secure enough.

Inspection data is necessary to be collected and kept under certain rules. Systematically-collected maintenance data is background information to assist in appropriate deterioration assessments and formulation of maintenance and repair plan of the relevant facilities. In addition, it is useful in drafting a comprehensive repair plan and studying the life cycle cost of the relevant port.

In general, repair works include 1) countermeasures for restoring the deterioration, 2) countermeasures to arrest the progression of deterioration, 3) countermeasures for reinforcing the impaired function, 4) countermeasure against the cause of deterioration, and 5)countermeasure for reducing external forces.

Repair method should be determined in consideration of utilization of the facility, degree of deterioration, economic efficiency and workability of repair works as well as expected lifetime of the existing facility.

When conducting the repairing or strengthening works, it is necessary to draft the repairing or the strengthening plan defining the target restoration level of the facility. When conducting demolishing or scrapping works, it is necessary to select the optimum work method in view of the environmental condition, safety of the works, waste disposal and work period.

When the deterioration of the facility may have an impact on third persons, some kind of emergency measures should be taken.

In case that the degree of functional loss is not serious at present but is anticipated to worsen, it is necessary to increase the frequency of inspection and add the inspection items.

13.2.7 Improvement of Port Security Measures

Present condition of security measures in Angola is described in Chapter 5. A port Security committee comprised of port-related personnel should be established to oversee the implementation of security measures in Angola. This committee will approve the Port facilities Security plan (PFSP) before it is submitted to IMO. PFSP of Luanda, Lobito, Namibe and Cabinda have already been finished and were approved in July, 2004. However, it is necessary to continuously strengthen security measures by improving management and referring to the security measures of surrounding nations.

In addition, port security facilities of Angora such as gate, fence, and lighting are in place at present at each port and seem to be functioning well. In addition, Access control for persons entering the port is strictly carried out. However, X-ray machines are needed to scan the contents of container cargo. In addition, the yard is congested with vehicles.

Therefore, JICA study team recommends the introduction of the following measures to enhance port service at Angolan ports.

Improvement of port security awareness;

Clarification of responsibility;

Enlightenment of inhabitants / persons concerned;

Introduction of the most suitable security system;

Cooperation with related organizations;

Appropriate training;

Sharing latest information;

Compilation of international freight statistics; and

Drafting of the enforcement plan for port security improvement.

13.2.8 Funds for Port Rehabilitation

Angolan ports support rehabilitation and development of Angola by handling imported material or equipment for rehabilitation. If cargo throughput exceeds port handling capacity, Angolan rehabilitation will slow down and the risk of social instability will increase. Therefore, governmental port sector should secure sufficient budget for port rehabilitation to cope with the rapidly increasing cargo throughput. The following measures are recommended.

1) Practical Use of Existing Facilities and Formation of Cost-Saving Project

Between rehabilitating existing facilities and constructing new facilities, generally speaking the former is cheaper, the construction period is shorter and there is a higher cost benefit ratio. Under the current strict budget restriction for port investment, it is effective and practical to rehabilitate old port facilities and cope with rapidly increasing cargo throughput.

Port facilities in Angola were not maintained during the long civil war and have deteriorated to a great extent. That is one of the main factors hampering effective operations. By rehabilitating facilities, cargo handling capacity can be increased quickly and with a small budget. Future cargo throughput is predicted to increase rapidly due to the needs of rehabilitation works and increased socio-economic activities in Angola.

2) Expansion of National Government's Infrastructure Budget

Angolan national economy is booming and governmental revenue will be increasing, including new crude oil development. Under such economic conditions, it is desirable to expand national government's infrastructure budget and invest in port rehabilitation.

The budget for port rehabilitation is only 176 million kz in 2005/06. Some Angolan port authorities gain enough revenue for their operations. But it is not enough to carry out the required rehabilitation works or make new investment. Due to the civil war, many Angolan industries have been destroyed, and thus, the country relies on imports for food, daily necessities and materials or equipment for national rehabilitation. After some rehabilitation of the national economy has recovered, Angolan industries have to enter the global market for their further development. Therefore, Angolan ports support the stability of Angolan society and are the key infrastructure for future industrial development of this country.

To attract private resources to the port sector, public finance is one of key factors. It improves investment conditions for the private sector if the government uses the public budget for unprofitable fields.

3) Foreign ODA Loan Appropriation

Appropriation of foreign ODA source should be considered. Ports are indispensable infrastructure for socio-economic activities in developing countries and the revenue gained by port authorities through their utilization can be a source of repayment. For reference, Japanese ODA loan condition is shown in Table 13-8. For LDC, Japan provides interest rates lower than 1% and repayment periods 15- 40 years. The terms are much softer than a commercial loan. But foreign exchange ratio should be considered as a risk factor when applying for this loan.

Table 13-8 Japanese Yen Loan Condition

Category	Standard / Option		Interest Rate (%)	Repayment Period (Year)	Grace Period (Year)	Conditions for Procurement
Least Developed Countries	General Terms	Standard	0.9	30	10	Untied
		Option 1	0.85	25	7	
		Option 2	0.8	20	6	
		Option 3	0.75	15	5	
	Preferential Terms	Standard	0.75	40	10	Untied
		Option 1	0.65	30	10	
		Option 2	0.6	20	6	
		Option 3	0.5	15	5	

4) Measures to Attract Private Sector Participation

Under the strict budget limitation of Angolan ports, measures to attract private sector participation should be taken to promote port rehabilitation. Special incentives have to be prepared for less cargo throughput and less profitable periods, because private companies are reluctant to invest in port development unless a certain level of profit is attainable. To promote private sector participation, public sector should take into consideration many measures such as deregulation, tax incentives, allocation of public sector's finance and guarantee of debt by public sector.

13.2.9 Fostering Talented Personnel

1) Current Situation

Because of the dispute between AP Moller Terminals and SGEP, no suitable party can operate the Container Terminal. Therefore the Luanda Port Authority commenced terminal operation in Feb. 2005 after a long interval. There is only a few trained staff. It will take a rather long time until all staffs accustom themselves to the job.

There are problems in each terminal. It is necessary to foster talented persons to manage the terminal. It also required to strengthen the management organization in Luanda Port Authority, such as planning dep., management dep., operation dep., project dep. and promotion dep..

2) Need for Skilled Personnel

i) Requirements of Globalization

Shipping documents are dispatched not by mail but by electronic data. Circumstances surrounding ports have greatly changed due to globalization.

Luanda Port requires talented persons with good communication ability and computer skills to contact various ports, terminals and shipping lines in English (international language of commerce).

ii) Professionalism

Personnel who are dedicated to carrying out their assigned tasks in a diligent and responsible manner are required to promote Angolan ports in the age of globalization.

Fundamental business know-how as well as familiarity with the use of information networks and English ability is also required for today's terminal business.

iii) Management Staff

For management staff, not only fundamental ability but also worldliness and knowledge of various fields are required. To negotiate effectiveness with foreign terminal companies or shipping lines, a man of culture and wisdom who is familiar with foreign customs and rules is required.

iv) Interest in other Field

Staffs are required to have interest not only in the terminal but also in other field. A man who has interest in road network, warehouse, logistic center and free trade zone is required.

3) Way to Foster Talented Personnel

i) Open Hiring Policy

Both terminal companies and Luanda Port Authority needs to adopt a transparent hiring policy free from nepotism. All prospective applicants for a position should be treated fairly.

ii) Wages Based on Merit

A wage system based on the skill level and produced results should be introduced.

iii) In-House Training System

A good in-house training system covering various areas such as the English language, operation of personal computer, operation of stevedoring machines and management is required, so that each staff can select and study the suitable course for development of his capacity and experience.

13.3 Privatization of Container Terminal in Luanda

1) General Cargo Terminal

Multi Terminal (capitalized at US$3 millions) fixed a 20 year concession agreement with the Luanda Port Authority in August 2005 so as to manage daily operation, repair and construction of the terminal. Area of the terminal is 100,000 square meters.

NILE DUTCH AFRICA LINE and NILE DUTCH AFRICA LINE Lda (Angolan company and NDAL's shipping agency in Luanda) have a 49% share in Multi Terminal while COPINOL (Angolan company) holds a 51% share. The Minister of Transportation has endorsed this agreement.

Multi Terminal is a subsidiary company of Multi Group, who also has Multi Parques (it manages stowage and customs clearance of cars discharged at Port of Luanda. It is to open a new container storage yard in Dec. 2005.) and Multi Trade (development company).

Multi Trade is intending to construct twin tower buildings where the current passenger boat terminal stands. Ferry boats and helicopters are available to transport workers to the oil rig located off the coast there. Bus service to the airport is also available and passport control is conducted there.

2) UNICARGAS Terminal

UNICARGAS is a multi purpose terminal located east of the General Cargo Terminal. It is a state owned company. The president is nominated by the government. UNICARGAS also fixed a 20 year concession agreement with the Luanda Port Authority in August 2005. Area of the terminal is 190,000 square meters.

3) Container Terminal (APMT and SGEP are in dispute)

This terminal was once operated by SGEP (49% share held by Italian company, 51% by Angolan company). In Dec. 2003, consortium of APMT and Angolan company 'Gestao de Fundos' fixed the concession agreement. However, SGEP the losing bidder disputed the result. This case has been ongoing at the high court in Angola for more than two years. The impact of this lost time has been very big. APMT can not begin construction works.

Because of the dispute between APMT and SGEP, no suitable party can operate this

terminal. The Luanda Port Authority is operating it in place of them. It directly employs workers including driver of reach stackers and pays wages to them. After the privatization, the government will only establish the maximum level of tariff. Each terminal operator can set up each tariff by itself.

14. Capacity Development

14.1 Capacity Gap Assessment

14.1.1 Basic Elements of Capacity

Capacity gap assessment is carried out to promote the efficiency and quality of services based on the real problems of each port. Coordinated improvement of three elements is given priority. Infrastructures (machine and computer), individual, and the institution are the three elements

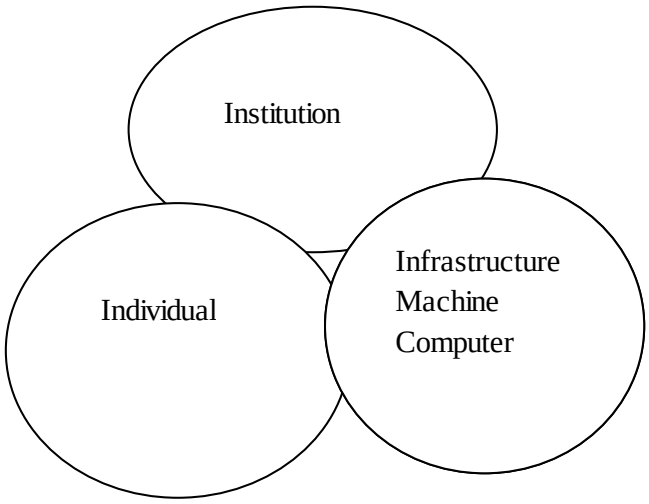

Figure 14-1 Three elements that govern capacity

14.1.2 Needs for Capacity Development

The direct factor which affects productivity is infrastructure, machines, and computers. Therefore, it is essential to provide the required infrastructure. The institutional reform of the port sector was examined with the assistance of WB in 1998. The institutional reform started in 2002. As a result, the port authorities became public corporations. Luanda port has begun to employ PSP (Private Sector Participation) in the form of Concession Contract. It remains important that the government have a mechanism to assist ports in terms of Fund and Technology. The initiatives of the Port Corporation for the port development have become more important than ever.

Ports in Angola have an excessive number of personnel compared with modern ports of other countries. For example, 300 people handle 200,000TEU. However, it is not realistic for the port authority to drastically decrease the number of person without essential infrastructure. Industry and services surrounding the port are not available to support the port activity. Under these circumstances, it is important to put emphasis on the promotion of individual ability to utilize computers.

14.1.3 Tasks Related to Capacity Development

The necessary tasks related to capacity development are as follows.

Port of Luanda

Formulation of the Master Plan to meet the cargo demand in the coming era;

Coordination of the public and private sector to overcome the congestion problem; removal of bottleneck in transportation, removal of waiting queues at berths, gates, or reception desks;

Revision of the patrol manual, repair manual; for the port basin, for the navigation aids, for the water

pollution, for the berthing facility;

Rearrangement of the terminal facilities, such as demolishing of the warehouse, rearrangement of bay plan;

Quick issuance of documents such as receipt and invoice, simplification of the port charges;

Quick customs clearance, simplification of the procedures, multiple choices to receive the service; and

Implementation of Electronic Documentation. Upgrading of the customer service by IT (Information Technology).

Port of Lobito

To seek a balance between the demand and port capacity;

At least one gantry crane should be procured for efficient loading-unloading operations;

The place for loading-unloading operations to railway should be reconsidered in order not to hinder the vehicles' movement;

The unused warehouses should be relocated from the main port area to the outskirts of the port. The area behind the quay should be used for the container-handling yard; and

Computer and communications system should be enhanced to rationalize the port operation and administration.

Port of Namibe

The port needs a strategic port development plan because the city of Namibe heavily depends on the port;

The port promotion action plan is needed;

The unused warehouse should be demolished, and the vacant area should be used for the container yard;

The railway terminal should be relocated in order not to hinder the movement of containers;

At least one heavy-duty crawler crane should be procured for the granite stone handling and container handling; and

Computer and communications systems should be introduced for efficient operation and administration.

Port of Cabinda

The port has a new port plan, which is currently being implemented. The plan includes widening of the container yard, timber yards and a gravity type jetty for protection of sand and for handling cargo. The port organization will be newly revised and computerization introduced.

14.1.4 Summery of Capacity Gap Assessment

Capacity gap is assessed in combination of the Infrastructure, Institution, and Personnel. The tasks of each port were taken into consideration to formulate the Capacity Development. Since there is not much difference between ports in terms of problems and countermeasures, the result of the assessment is summarized as a whole and shown in Table 14-1.

Table 14-1 Summery of Capacity Gap Assessment

Problem Area	Capacity Gap			Action Needed	
	Capacity Gap	Priority	Time span needed	Tasks	Necessity of Training
Insufficient Capacity to cope with the Cargo Demand	Large	A	Medium	Strengthen of Planning Division	Yes
				Strengthen of Technical Division	Yes
Inferior service for the customers comparing to International Standard	Large	AA	Medium	Introduction of EDP & EDI	Yes
				Procurement of Equipment for EDP & EDI	Yes
High Operation Cost	Large	AA	Medium	Containerization	Yes
				High efficiency with EDP	Yes
Shortage of Technology	Large	B	Medium	Participation in seminars	Yes
Domestic Marine Transportation Service is not available	Large	C	Medium	Test operation	Yes
				Promotion of the Domestic Marine Lines	Yes
Insufficient countermeasures for Safety & Hygiene	Small	B	Short	Publication of the Regulations on Safety & Hygiene issues	Yes
Congestion of the port, Delay of delivery of cargo	Large	AA	Medium	Introduction of EDP & Bar Code	Yes
Low productivity at yard operation, as well as business documentation.	Large	AA	Short	Ability to simulate the yard operation	Yes
				Introduction of EDP & Bar Code	Yes
Lack of know-how for avoiding trouble in case of business crises.	Small	A	Short	To acquire the know-how for avoiding trouble	Yes
				To have the manual in case of trouble	Yes
Lack of maintenance	Medium	B	Short	To have the maintenance manual	Yes
				To allocate the budget for the maintenance	Yes
High Price of Port Charges	Large	AA	Medium	To promote efficiency	Yes
Lack of Investment Funds	Medium	B	Long	Institutional Reform	Yes
				Privatization	Yes
				Application for Funds	Yes

14.2 Plan for Capacity Enhancement

The congestion at the Port of Luanda causes tremendous losses to the nation, and thus urgent Capacity Development is required to enhance the efficiency of the terminal operation. Accordingly, the following subjects are selected for technical transfer.

Ministry of Transport

Guidance on implementation of the project, from planning phase to commission phase;

Examples of terminals constructed with Japanese assistance; and

Port Policy, and experiences of Port Development in Japan (Through counter part training).

Port of Luanda

Financial loss caused by waiting ships;

Enhancement of efficiency in terminal operation by EDP; and

The history of Japanese Port Policy in relation to economic growth.

World shipping lines

Port of Lobito

Financial loss caused by waiting ships;

Enhancement of efficiency in terminal operation by EDP;

The history of Japanese Port Policy in relation to economic growth; and

World shipping lines.

Namibe Port

Financial loss caused by waiting ships;

Enhancement of efficiency in terminal operation by EDP; and

On the Job training of EDP.

Under the JICA scheme, counterpart training is carried out for the two Angolan officials who play very important roles in drafting the port policy in Angola. These official made site visits and held fruitful discussions with Japanese officials from the Ministry of Land Infrastructure and Transport, Tokyo Port, Yokohama Port, and Hakata Port.

14.3 Management of Private Companies under Concession Agreement in Luanda Port

Multi Terminais Co., (share holders: NILE DUTCH AFRICA LINE, NILE DUTCH AFRICA LINE Lda. and COPINOL) and UNICARGAS (state owned company) fixed a 20 year concession agreement with the Luanda Port Authority in August 2005. Investment and sound management of terminals should be realized. Role of parties concerned are as follows.

1) Role of Private Companies (Concessionaires)

Maintenance and management of berths transferred from the Luanda Port Authority;

Repair, maintenance and management of cranes and stevedoring machines transferred from the Luanda Port Authority;

New purchase, maintenance and management of cranes and stevedoring machines;

Construction and maintenance of terminal operation system;

Repair, maintenance and management of facilities on the ground (building of management office, truck gate, building for cargo inspection, transformer substation, paving of terminal, lighting of terminal, electric equipment for reefer containers etc) transferred from the Luanda Port Authority;

Management of container terminal including stevedoring;

Application of documents for the Ministry of Transportation and the Luanda Port Authority in case acquisition of permission is required by law for business;

Application of documents for the Ministry of Transportation and the Luanda Port Authority in case documents such as construction permission are required for business; and

Private companies make efforts to attract more cargoes together with the Luanda Port Authority.

2) Role of the Luanda Port Authority

Control of concessionaires and monitoring of their operation for the sake of efficient management of the port;

Making of statistics according to report regularly presented by concessionaires;

Maintenance and management (dredging work and disposal of sunken vessel etc.) of anchoring area, berthing area and navigation route in front of the berth;

Maintenance and management such as dredging of berthing area around the berth;

Regulation on disposal of bilge water;

Regulation on disposed gas from vessels;

Regulation on environment in water area of Luanda;

Granting of entrance permission to vessels; and

The Luanda Port Authority makes effort to attract more cargoes together with private companies.

3) Role of other parties

Piloting: by EPIBAL

Tug Boat: by EPINOSUL

Oil bunkering: by SONANGOL

Supply of water: by EPINOSUL

Supply of daily necessities and food: by Ships Chandler in Luanda

Disposal of garbage from vessels: three garbage companies in Luanda (Disposal of waste oil is unavailable). There is no organization in Luanda, which disposes garbage or waste oil on the sea.

14.4 Workshops and Seminars

14.4.1 Outline of Workshops

Workshop (lecture on the latest news of shipping and ports) was held mainly for staff of the Luanda Port Authority so as to support construction of Luanda Port under the concession agreement.

Participants (staff of Luanda Port Authority)
Mr. Antonio Domingos G.Paz (Audit Cabinet),

Mr. Augusto das Necessidades Francisco (Maintenance Dept.),
Mr. Conceicao Sibo (Marketing Dept.),
Mr. Diamantino Joaquim (Chief of Fiscalization/ Finance Section),
Mr. Euralio da Rosa (Chief of Technical Dept.),
Mr. Inacio Avelino (Inspector of Fiscalization),
Mr. Iracema Carvalho (Research, Planning and Statistics Dept.),
Mr. Mafundamene Manuel Antonio (Medium Technician of Civil Construction),
Ms. Maria Angela da C.Lafayette (Chief of Juridical Cabinet),
Ms. Maria Candida Gaspar Cohen (Chief of Study Cabinet),
Mr. Nicolau Diavunda (Civil Engineer of Technical Department),
Mr. Paulo Pereira Nunes (Chief of Electricity Sector),
Mr. Pedro Doria (Infrastructure Dept.),
Mr. Roberto Martins (Commercial Dept.),
Mr. Rodrigues Alberto (Auditor/ Superior Technician of Audit Cabinet),
Mr. Rosa Palmira (Commercial Dept.),
Mr. Rui Mendonca da Silva (Commercial Director),
Mr. Sansao Pitra (Technical Director),
Mr. Sebastiao Celio Faustino Baltazar (Medium Technician of Electric System)

Significance of container transportation in the day of globalization (Yoshimoto)

The role that globalization has played in advancing containerization was discussed. The significance of container transportation in supporting the activities of companies and exchange of goods all over the world was also explained. (6/8)

Role of ports in Japan for economic growth (Kunita)

The rehabilitation of Japanese ports following the devastation of World War II and the role ports have played in today's prosperity were discussed. Specifically, the relation between industrial growth and role of ports, port congestion during the period of rapid economic growth and the measures adopted to alleviate it, prevention measures for environmental pollution and shifting factories to rural areas, establishment of the public Port Corporation so as to cope with container transportation, privatization of ports in Japan, amenity at seashore and international competition of ports were highlighted. (6/10)

Condition of advancement of container port (Yoshimoto)

The top 30 container ports in the world were introduced. The location, policy of the port authority and economic action surrounding the ports were also discussed. (6/13)

The latest situation of shipping and ports in West Africa (Yoshimoto)

The latest situation of containerization and ports in West Africa was described. The necessity of container vessel with high speed and large container terminal with gantry crane was also discussed. (6/15)

The latest situation of Chinese port (Yoshimoto)

The rapid growth of cargoes in Shanghai, Shenzhen and increase of exports from Guangdong to West Africa were discussed. (10/19)

The latest situation of Luanda Container Terminal (Yoshimoto)

As the concession agreement is under dispute in Luanda, the Luanda Port Authority is responsible for stevedoring and management. The problems in daily operation and their solutions were discussed. (10/21)

The way to attract shipping lines to container ports and privatization (Yoshimoto)

A photo essay on the latest situation of leading container ports in the world was presented. Ways attract shipping lines and the situations of privatization were also described. (10/24)

The biggest container shipping company in the world (Yoshimoto)

Maersk Line, the biggest container shipping company, will get even bigger with the purchase of PONL. It has a lot of routes to Angola. The organization, history, action and business policy of Maersk was presented. (10/28)

Cost concerned in container terminal (Yoshimoto)

Container Terminal fees, or use fee of terminal and handling charge of container were discussed. It was pointed out that fees and charges in most prosperous ports such as Hong Kong, Los Angeles and New York are the most expensive in the world and that the prosperity of port depends not on the level of fees and charges but on amount of cargoes. (10/31)

Congestion in container terminal and measures to solve it (Yoshimoto)

Taking the case of Los Angeles port in the autumn of 2004 as an example, the reasons for congestion in a terminal and measures to solve it were described. (11/4)

Role and function of vessels 1 (Yoshimoto)

The role and function of general cargo vessels, container vessels, heavy cargo lifting vessels and tanker were explained. (11/7)

Role and function of vessels 2 (Yoshimoto)

The role and function of LNG tankers, bulk cargo (iron, coal and grain carrier), wood chip carriers, PCC (pure car carrier), cruising vessels and ferry boats were explained. (11/9)

Plan of port construction in Japan (Takemura)

Using examples from Japanese experience, research, study, point for investigation and construction methods required for making development plan in ports in Japan were explained. (2/8)

Operation in container terminal (Yoshimoto)

Terminal operation by transfer crane and by straddle carrier was discussed. The dispatch of shipping documents by electronic data and automatic track gate required for quick operation were also described. (2/8)

Economic affection of development of container port in Colombo under support of Japan (Suzuki)

The prosperity achieved by Colombo port container transshipment as hub port of containers and how Japan supported its development was discussed. The type of port required to stimulate economic growth in Angola was also introduced. (2/16)

Significance of public works and privatization (Yoshimoto)

It can be said that significance of public works is equal to significance of the nation. However it is difficult for the government to carry out all required public works because of financial constraints. Citing various examples, significance of privatization was explained. Points requiring care in concession agreement were also discussed. (2/16)

Maintenance of port facilities (Kiyosue)

Damaged mechanism of concrete facilities and typical way of repair for damage such as restoration of cross section, surface paint and restoration were discussed using the restoration work at Ooi container port in Tokyo as a model. (2/14)

Modern railway terminal in port (Nakano)

The role of railway in port logistics, taking Shanghai Super Express in Hakata port as example, was introduced. (2/24)

Role of port authority in concession agreement (Kunita)

When a port is developed and operated under concession agreement by concessionaire, who also invests in facilities concerned, a port authority is apt to ignore its original work and to fully depend on the concessionaire. It is important that the port authority should take protect public interest by drafting the port's master plan and alleviating congestion. (3/1)

Project to modernize Douala Container Terminal in Cameroon (Hoshino)

The progress of the project from 1991 (start of F/S) to 2000 was described. The condition of Yen loan and details of construction were also discussed. (3/1)

Lecture in Luanda

14.4.2 Technical Transfer through OJT

For the purpose of technology transfer, the following events and seminars were held.

Seminar for bathymetric survey at the port of Luanda (Aoyama)

Seminar for bathymetric survey using echo sounder was carried out at the Port of Luanda. Eleven participants from the Ministry of transport and the Port of Luanda attended. Manual for maintenance dredging, Method of Conducting bathymetric survey, and the planning method for the dredging were presented. OJT at the basin of the Port of Luanda was also carried out. (5/12)

Workshop for heavy cargo at the port of Namibe (Kunita)

Four staffs of Port of Namibe, in charge of maintenance, operation, and restoration, attended. Topics such as crane type and capacity, production rate, and price were discussed. (5/17)

Workshop for the deterioration survey at the port of Namibe (Kiyosue)

Survey on the present condition of the facilities was conducted with the assistance of Namibe Port. The purpose, the use of survey tools, and the evaluation method were presented. (5/17)

How to plan and manage a bulk terminal (Kunita)

Upon the request made by a counterpart staff of MINTRANS, the team provided information on how to plan and manage a bulk terminal. (5/20)

Seminar for bathymetric survey at the port of Cabinda (Aoyama)

OJT on bathymetric survey was conducted at the Port of Cabinda, which has a sedimentation problem. Two participants from the Port of Cabinda attended. The participants conducted the survey themselves, following the advice of team members. (5/24)

Workshop for the deterioration survey at the port of Lobito (Kiyosue)

Survey on soundness of the quays of Lobito was conducted with the assistance of the Port of Lobito. (6/2)

Workshop for the deterioration survey at the port of Namibe (Kiyosue)

Soundness Survey on Saco Mar was conducted with the assistance of Namibe Port. At the same time, OJT was conducted. The importance of the survey, the way of using tools, and evaluation

method were demonstrated to the staff of the Port of Namibe. (6/7)

Bathymetric Survey (Port of Cabinda)

Deterioration Survey (Port of Lobito)

Deterioration Survey (Port Saco Mar)

14.4.3 Outline of Seminars

An efficient port with sufficient Fine capacity for container handling is required for the development of the economy. Shipping lines are reluctant to call inefficient ports and even if they do, ocean freight and charges must be increased compared with other ports surrounding Angola. This will have a It bad effect on the economy in Angola.

JICA Study Team held a seminar for staff of the Ministry of Transportation and the Luanda Port Authority in Oct. 2005 and for staff of the Lobito Port Authority in Mar. 2006, so as to explain the latest situation of shipping and ports and to discuss the ideal port.

1) Seminar on Management of Port and Growth of Container Vessels

Participants

Mr. Diur Kassul Angelo (Chief of Port Dept. of DNMMP),
Dr. Jose Kuvingua (National Director of GEPE),
Mr. Jose Janota (Superior Technician of DNMMP),
Mr. Kama Ndungu (Chief of Section of DNMMP),
Mr. Vita Nsungo (Superior Technician of DNMMP)
Mr. Rui Mendonca da Silva (Commercial Director of the Port of Luanda)
Mr. Pedro Kahamba (GRPN Director of the Port of Namibe),
Mr.Pompeu Antonio (Environment Director of the Port of Namibe)
Mr. Januario Nguiniti (Auditor of the Port of Cabinda),
Mr. Salustiano F.Pinto Ferreira (Chief of Infrastructure Dept. of the Port of Cabinda)

Management of ports and types of port authorities (Suzuki)

Management of ports in Europe, USA and Asia together with their historical progress was described. The reasons of the UK's decision to privatize ports, the change of management of ports caused by privatization were also explained.

Growth of container vessels (Yoshimoto)

The reason for the growth in size of container vessels, the technology to support its growth and the future prospects were explained. It was also noted that not only improvement of the main route (North America – Asia – Europe) but also investment in an end route including Africa and South America is required so as to support logistics all over the world.

Seminar at Luanda Port Authority for related staff (10/26)

2) Seminar on the Latest Situation of World Ports

Participants (Port of Lobito)

Mr. Augusto Camuenho (Journalist/Chief Editor),
Mr. Cacesto Simao (Chief of Human Resources Dept.),
Mr. Faustino Venancio (Vice-Chief of Cargo Handling),
Mr. Jeremias Estevao (Chief of DAP),
Mr. Jose Andre (Vice-Chief of Operation Dept.),
Mr. Manuel da Cruz do Rosario (Chief of Maintenance Dept.),
Mr. Morais Pascoal Gonga (Operation Dept.),
Mr. Pedro Joaquim (Deputy Director),
Mr. Ramos J.Fernando (Navigation Agents),
Mr. Vicente Francisco Albano (Chief of Planning Dept.),

Recovery of ports in Japan (Okada)

Ports in Japan have recovered from damage caused by the World War II. The process of recovery realized by nation's support to ports, role of national government and local government, establishment of long term plan and fostering of important local ports to save jobs and promote production in Local area were discussed.

The latest situation of container shipping (Yoshimoto)

The latest situation of container shipping including the deployment of super large container vessel and unification of shipping lines caused by reorganization of alliances and purchases of company were introduced. It was also noted that severe port congestion should be improved and more export cargoes should be secured so that more shipping lines will call Angolan ports and ocean freight and charges will be decreased.

Information or indispensable factor for improvement of efficiency in ports (Kunita)

One of the reasons for congestion in ports is the poor management of stuffed and empty containers. The management of containers by electronic data to increase the speed of container handling was introduced. The benefits of barcode handy terminal in daily works were also described.

Seminar at Lobito Port Authority (3/10)

3) Seminar on Rehabilitation and Modernization of Angolan Ports

Participants: Approximately 60 people from:

MINTRANS;
MIREX;
MINOP;
MINARS;
MINCO;
Ports of Luanda, Lobito, Namibe, Soyo, Amboin;
United Nations Development Programme Angola Office;
Embassies of Japan, Royal Netherlamds, United Kingdom, United States of America;
Shipping lines and agents; and
Others.

Japan's experience on port reconstruction following World War II (Okada)

Ports in Japan have recovered from damage caused by the World War II. The process of recovery realized by nation's support to ports, role of national government and local government, establishment of long term plan and fostering of important local ports to save jobs and promote production in Local area were discussed.

Short-term Rehabilitation Plan and Future Development of Angolan Ports (Suzuki)

During the civil war, port facilities were severely damaged/deteriorated mainly due to a lack of proper maintenance and now ports face a shortage of cargo handling capacity. To promote economic growth, rehabilitation and modernization of commercial ports is crucial to the reconstruction and development of Angola. This presentation introduced Short-term Rehabilitation Plan for major Angolan ports and ideas for Future Port Development proposed by the JICA Study Team.

International cooperation by Japan's ODA (Takahashi)

Japan has been playing an important role in assisting developing countries through ODA as a member of DAC, and recently attaches importance to AU countries. Overall introduction of Japan's ODA was given from the viewpoint of Technical Cooperation by JICA and Financial Assistance by JBIC.

Seminar at Presidente Hotel, Luanda (6/15)

14.4.4 Monitoring of Capacity Development

1) Post Evaluation of Workshop

All participants highly appreciated the new knowledge acquired through the workshop, which would be useful for improvement of their daily work.

Participants were interested in port management and concession agreement, operation of the port, establishment of the port development plan and construction work. Requests were made for lectures on information systems in ports, security policy and protecting the port environment. They also understood following factors are required for development of Luanda Port.

Role of concessionaires and port authority is required to define. The construction practice of concessionaires is also required to observe;

Training including OJT (on the job training) is necessary for port management; and

A long term plan of port operation is required.

2) Feedback from the Seminar Participants

All participants highly appreciated the new knowledge they acquired through the workshop, which would be useful for improvement of their daily work.

Participants were particularly interested in port management and concession agreement, operation of the port, establishment of the port development plan, the latest situation of shipping in the world, construction work and Japanese experience in the restoration of ports. Requests were made for lectures on information systems in port and port management. They also understood following factors are required for the development of Lobito port.

Continued cooperation with JICA;

Solid personal training;

Efforts should be made to increase skill level of each section;

Latest knowledge of cargo handling needs to be acquired;

Knowledge on the operation of port, terminal and containers is acquired;

Personnel should participate in workshops or in-house training including those offered abroad;

Temporary transfer/exchange system with staff of other ports should be established; and

Awareness of international developments is important.

14.5 Capacity Development Concerning the EDP (Electronic Data Processing)

EDP will surely improve the documentation and have an effect on the following points:

Productivity in the quay as well as the yard will be improved;

The reduction of port charges and increased profitability will become possible;

The wage level can be improved by the enhancement of productivity;

The issue of bills, receipts, and the disbursements of clerical work will be streamlined;

Prompt use of the statistical data will become possible;

The analysis of financial matters will become easier; and

The quality of the service can be improved to the international level. The customer's waiting time can be reduced.

The inefficiency that is caused handwritten documents can be avoided with the barcode handy terminals and the personal computers. The barcode handy terminal can read the barcode and record the characters through pushing the buttons like a mobile phone. One can easily record things in a form of electronic data at the site of operation. Fifteen years ago, the cost to introduce a computer system for container operations was about US 500 million dollars. However due to the progress in computer technology, the computer and supporting software has become cheaper and more widely available. Now, it is possible for the staff of a port authority to create the software for controlling containers if he has enough knowledge to utilize the Micro-soft Excel Program with Visual Basic.

However employees of the port have had little experience in using the current personal computers. The development of the system also needs a trial and error period. The assistance of the experts will be useful for avoiding confusion. EDP in Angolan ports will need three stages, considering the present communication infrastructure in Angola.

First stage

Firstly, the provision of personal computer, and handy terminals is necessary. Secondly, training to use office programs, and training to use handy terminals is necessary. Data processing of this stage is categorized as the Batch Processing.

Second Stage

Data can be sent directly from the terminal to the center computer through LAN. Data can be unloaded anywhere through LAN.

Third Stage

Access from all over the world is possible through Internet. The remitting of money, application for customs documentation etc. will be possible. EDP can be widely achieved when there is the infrastructure for the Internet.

14.5.1 Workshop on EDP

Since EDP is very useful to enhance efficiency in terminal operation and office documentation, the team made a presentation on EDP during its second visit in Angola. EDP can be introduced even without LAN because the data can also be transferred in the form of CD. All that needed is the Handy terminals and personal computers with software for the EDP.

The team conducted the presentation for the port of Lobito. How EDP can be applied to the tracing of containers, the berth allocation, and gate checks, is introduced at the presentation. (Oct.3.2005)

The team conducted the presentation for the port of Namibe. How EDP can be applied to the tracing of containers, the berth allocation, and gate checks, is introduced at the presentation. (Oct.17.2005) Personnel of the Port of Namibe were very enthusiastic about EDP.

For the port of Luanda, the opportunity to make the presentation on EDP came during the 3rd visit. The financial loss to the nation caused by the waiting of ships, and the solution by EDP is explained. (March.1.2006)

Presentation in Lobito Port

Presentation in Namibe Port

14.5.2 On the Job Training in Namibe Port

The position of container is recorded using pen and paper in the Port of Namibe. When the loading operation is carried out, time is consumed for seeking the boxes. Fortunately, because of the small volume of handling, such as 5,000TEUs per year, there are no big losses. However, in the event that the cargo increases due to the restoration of Mocamedes railway, the tremendous losses in time will occur if EDP is not available. Since the port of Namibe is very eager to introduce EDP, the team carried out the Capacity Development on the EDP, i.e. applying to the check-in and check-out work at the gate, and tracing the container location in the container terminal.

The port prepared a new operation room for the above equipment. The port will attempt to make the maximum use of this new equipment.

Table 14-2 EDP utilization training at Namibe Port

Applied Item	Description
Check in/ Check out	Recording of container number and date/time at the gate or the wharf (Processing with computer program: Excel+VBA) Duration time (days) at container terminal, sorted by company
Container location	Recording of location of container, container number, and date (Processing with computer program: Exel+VBA) Listing of container location according to the loading sequence

Table 14-3 List of the equipment for the enhancement of the efficiency in Namibe Port

Commodity	Unit	Nos	Remarks
Bar Code Handy Terminal		4	With Cradle
Bar Code Reader (USB)		3	
Scanner Printer		2	
Personal Computer		3	With Office Soft
Ruminator		2	With Transformer
Projector		1	
Camera		1	
Consumables	Sum	1	


Materials for Training


Chairman of Namibe Port


Capacity Development

Bar Code for Address of Bay


Operation Room


Testing the Equipment

Photo 14-1 On the job training in Namibe Port

14.5.3 Assessment of Technology Transfer of EDP

Inquiry was made in order to clarify the effectiveness of the technology transfer. Following answers were obtained from the participants.

Do you understand how to read bar code using handy-terminal?

Yes=83%, No=0%, Gray=17%

Do you understand how to transmit the data from handy terminal to PC?

Yes=100%, No=0%, Gray=0%

Do you understand how to use the search function for location of container?

Yes=17%, No=0%, Gray=83%

Do you understand how to use the function for listing locations of containers?

Yes=0%, No=0%, Gray=100%

Do you understand how to make the bar code?

Yes=66%, No=34%, Gray=0%

Do you understand how to decide the addresses of container bays?

Yes=50%, No=50%, Gray=0%

Do you understand that EDP is useful to trace the location of container, and useful to enhancing the efficiency of container handling?

Yes=100%, No=0%, Gray=0%

How would you summarize the technical transfer on EDP?

I am interested in this subject and need more time=100%
It is enough. I fully understand it=0%
No more training. I am not interested=0%

All the trainees realized that the EDP is useful for the enhancement of the efficiency of container handling, and all the trainees felt the time for training was too short. The Port of Namibe also stated that it would welcome additional technical transfer on EDP from JICA.