CHAPTER 3 SHORT-TERM PLAN FOR THE PORT OF ANNABA

3.1 Target of Short-Term Plan

The major goals for the port of Annaba by 1997 are the redevelopment of the cereals berth and the completion of the container berth financed by the World Bank, which is indispensable under the short-term plan including rehabilitation of facilities and improvement of operations.

With regard to the facilities, the notable problems include a shortage of handling equipment to adequately handle the large volume of cargo as well as superannuation of the facilities that do exist.

In particular, there is a pressing need to redevelop the cereals wharf; ship waiting time is excessively long because the capacity of unloading equipment and storage facilities is insufficient to handle cereals. Therefore, it is necessary to provide the necessary unloading equipment and storage facilities.

As for superannuation of the facilities, the problem is acute at the petroleum products berth (No.26) and the rail-mounted unloader at the sugar berth (No.11). An unloader at the sugar berth requires demolition, it will be necessary to consider alternative equipment to make up for this shortage; equipment should be evaluated in terms of handling and economical efficiency. And the present petroleum berth should be maintained with supplemental repair for the time being.

A short-term policy aimed at increasing the actual handling productivity of certain key facilities will ensure smooth implementation of the master plan.

3.2 Study Concerning Required Berths

3.2.1 Determination of Number of Berths

The proposed scale in the short-term plan must be in accordance with the volume of cargoes handled. In Chapter 8, the volume of cargoes that will be handled at the port of Annaba in 1997 is shown in Table 3.2.1.

Table 3.2.1 Volume of Cargoes Handled in 1997

Commodities	Volume of Cargoes (tons)			Remarks
	Import	Export	Total	
(General Cargoes)				EPA
Timber	83,000		83,000	
Sugar	90,000		90,000	
Other Agricultural Prod.	24,000		24,000	
Other Foodstuff	97,000		97,000	
Chemical,Manufacture Pro.	132,000	5,000	137,000	
Other Construction Mater.	35,000		35,000	
Sub-total	461,000	5,000	466,000	
(Bulk Cargoes)				EPA
Cereals	900,000		900,000	
Sugar	100,000		100,000	
Vegetable Oil	138,000		138,000	
Sub-total	1,138,000		1,138,000	
Total	1,599,000	5,000	1,604,000	
Coal	1,647,000		1,647,000	SIDER
Coke		34,000	34,000	
Metallic Prod.	159,000	509,000	668,000	
Tar		35,000	35,000	
Phosphat		1,164,000	1,164,000	FERPHOS
Carbonic Chemical	16,000		16,000	ASMIDAL
Fertilizer		109,000	109,000	
Sulphur	130,000		130,000	
Potash	83,000		83,000	
Ammonia		98,000	98,000	
Petroleum Prod.	616,000		616,000	NAFTAL
Sub-total	2,651,000	1,949,000	4,600,000	
(Container Cargoes)	52,000		52,000	
		27,000	27,000	
Sub-total	52,000	27,000	79,000	
Grand Total	4,302,000	1,981,000	6,283,000	

3.2.2 General Cargo and Ro-Ro Vessel Wharf

General cargo volume will be 466 thousand tons in 1997. However, since 64 thousand tons transported by Ro-Ro vessels is planned to be handled at Berth No.1 and No.2 (or No.3 and No.22), the volume to be handled at general cargo berths is assumed at 402 thousand tons.

(1) Number of berths

1) In planning for general cargo, the following conditions are set:
   a. The volume of general cargoes handled in 1997 is 402 thousand tons.
   b. The cargo handling capacity of 23.6 tons/hour is used for calculation.
   c. The average per-ship loading/unloading volume is 1,700 tons.
   d. Average time for using berths is 3,720 hours per year (12.0 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.

f. The size of ships is considered to be 6,000 DWT.

2) In planning for Ro-Ro vessel, the following conditions are set:

a. The volume of cargoes handled in 1997 is 64 thousand tons.

b. A cargo handling capacity of 20.8 tons/hour is used for calculation.

c. The average per-ship loading/unloading volume is 720 tons.

d. The per-berth available time for using berths is 3,720 hours per year (12 hours/days x 310 days).

e. Necessary processing time for entry and departure is 2 hours per ship.

f. The size of ships is considered to be 5,000 DWT.

The required number of general cargo berths in 1997 is determined as follows: The total annual ship calls for these vessels is 325. The total berthing time is 20,757. Since the per-berth annual hours available for use are 3,720 hours per year, the berth occupancy ratio is 62.0 % for nine berths.

Based on these estimations, the existing berths should be sufficient in the short term.

(2) Planning of cargo handling and storage facilities

In 1997, the volumes of cargoes through transit shed and open storage yards area are estimated as shown in Table 3.2.2.

The required area of the storage facilities is determined by the formula as mentioned in Part I, Section 12.3.

Table 3.2.2 Volume of Cargoes Passing through Transit Shed and Open Storage Yard in 1997

Commodities	Volume of Cargo (tons)	Direct Cargo (tons)	(tons)		
			Open Storage	Transit Shed	Sub-total
Timber	83,000		83,000		83,000
Sugar	90,000	45,000		45,000	45,000
Other Agricultural Prod.	24,000	12,000		12,000	12,000
Other Foodstuff	97,000	48,500		48,500	48,500
Chemical, Manufacture Prod.	137,000	68,500		68,500	68,500
Other Construction Mater.	35,000		35,000		35,000
Total	466,000	174,000	118,000	174,000	292,000

1) Transit shed

The required size of the transit shed is shown in Table 3.2.3.

Table 3.2.3 Required Area of Transit Shed

	Volume of Cargo Handled N	Annual Storage Volume R x a x W (tons/m2)			Required Area (N x P / R x a x W) /B (m2)
Sugar	45,000	122	0.5	2.5	511
Other Agricultural Prod.	12,000	122	0.5	2.5	136
Other Foodstuff	48,500	122	0.5	2.5	551
Chemical, Manufacture Pro	68,500	37	0.5	2.5	2,567
Total					3,800

2) Open storage yard

The necessary size of open storage yard is shown in Table 3.2.4.

Table 3.2.4 Required Size of Open Storage Yard

	Volume of Cargo Handled N	Annual Storage Volume R x a x W (tons/m2)			Required Area (N x P / R x a x W) /B (m2)
Timber	83,000	37	0.5	1.2	6,480
Other Construction Mater.	35,000	24	0.5	2.0	2,528
Total					9,000

Then the existing storage facilities should be sufficient in the short term.

3.2.3 Cereals Wharf

The present cereals wharf, is equipped two units of unloading equipment (nominal capacity 400 t/hour x 1, 100 t/hour x 1), which is insufficient to handle increasing volumes of cargo because one (100 t/hour) is already superannuated.

It is estimated that the volume of cereals in 1997 will reach the level of 900 thousand tons. Therefore, the capacity of unloading equipment of this wharf should be increased to 600 t/hour (400 t/hour x 1, 200 t/hour x 1).

(1) Number of berths

In planning, the following conditions are set:

a. The volume of cereals to be handled in 1997 is 900 thousand tons.

b. The cargo handling equipment consists of two unloaders (600 t/hr) for this berth. The work efficiency is 0.64.

c. The average per-ship unloading volume is 24,000 tons.

d. The per-berth available time for using berths is 3,720 hours per year (12.0 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 30,000 DWT.

The number of cereals berths required in 1997 is calculated as follows: The annual number of ships calling at the port is 38. Since the per-ship berthing time is 65 hours based on the volume of unloading and the cargo handling capacity, the total berthing time is 2,470 hours. Since the per-berth available time for use is 3,720 hours per year, the berth occupancy ratio is 66.4 % for one berth.

Accordingly, the capacity of the existing wharf should be sufficient for the short-term. However, it is necessary to provide one new unloading equipment (nominal capacity 200 t/hour).

As for the silo, a silo with a holding capacity of 16,000 tons is already in place. Since in 1997 the annual volume of cereals to pass through the silo will be 900 thousand tons and assuming an annual turnover of 20 times/yr, then an additional silo with a holding capacity of 30,000 tons will be required.

3.2.4 Raw Sugar and Vegetable Oil Wharf

At present, raw sugar is handled at Berth No.11 together with vegetable oil.

Raw sugar and vegetable oil handled in 1997 will be 100 thousand tons and 138 thousand tons, respectively.

(1) Number of berths

1) In planning for raw sugar, the following conditions are set:
a. The volume of raw sugar in 1997 is 100 thousand tons.
b. The cargo handling capacity of 64 tons/hour is used for calculation.
c. The average per-ship unloading volume is 6,000 tons.
d. The per-berth available time for using berths is 3,720 hours per year (12.0 hours/days x 310 days).

e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 15,000 DWT.

2) In planning for vegetable oil, the following conditions are set:
a. The volume of vegetable oil in 1997 is 138 thousand tons.
b. The cargo handling capacity of 64 tons/hour is used for calculation.
c. The average per-ship unloading volume is 1,700 tons.
d. The per-berth available time for using berths is 7,440 hours per year (24.0 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 4,000 DWT.

The number of berths required in 1997 is calculated as follows: The annual number of ships calling at port is 98. The total berthing time is 3,942 hours. Since the per-berth available time for use is 7,440 hours per year, the berth occupancy ratio is 53.9 % for one berth.

Based on these estimations, the capacity of existing berth should be sufficient in the short term.

3.2.5 Coal and Coke Wharf

Coal and coke will be loaded/unloaded by movable rotor (actual capacity 640 t/hour) at Berth No.13 as at present.

The volume of coal and coke to be handled in 1997 will be 1.681 million tons.

(1) Number of berths
In planning, the following conditions are set:
a. The volume of coal and coke to be handled in 1997 is 1.681 million tons.
b. A cargo handling capacity of 640 tons/hour is used for calculation.
c. The average per-ship loading/unloading volume is 33,000 tons.
d. The per-berth available time for using berths is 5,580 hours per year (18.0 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.

f. The size of ships is considered to be 60,000 DWT.

The number of coal and coke berths required in 1997 is calculated as follows: The annual number of ships calling at the port is 51. Since the per-ship berthing time is 54 hours based on the volume of loading/unloading and the cargo handling capacity, the total berthing time is 2,754 hours. Since the per-berth available time for use is 5,580 hours per year, the berth occupancy ratio is 49.4 % for one berth.

Based on these estimations, the capacity of the existing berth should be sufficient in the short term.

As for storage facilities, it appears that there will be a shortage of stockyard capacity of about 5,500 tons, however, since it will be difficult to quickly enlarge the stockyard, it will thus be necessary to decrease the number of staying days to make up for this shortage, which shall be 18 days.

3.2.6 Metallic Products Wharf

At present, metallic products are handled at Berth No.14 and No.15.

The volume to be handled in 1997 will be 668 thousand tons.

(1) Number of berths

In planning, the following conditions are set:

a. The volume of metallic products to be handled in 1997 is 668 thousand tons.
b. A cargo handling capacity of 100 tons/hour is used for calculation.
c. The average per-ship loading/unloading volume is 5,000 tons.
d. The per-berth available time for using berths is 5,580 hours per year (18.0 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 7,000 DWT.

The number of metallic products berths required in 1997 is calculated as follows: The annual number of ships calling at the port is 134. Since the per-ship berthing time is 52 hours based on the volume of loading/unloading and

the cargo handling capacity, the total berthing time is 6,968 hours. Since the per-berth available time for use is 5,580 hours per year, the berth occupancy rate is 62.4 for two berths.

Based on these estimations, the capacity of existing two berths and stockyard should be sufficient in the short term.

3.2.7 Ammonia, Tar and Petroleum Products Wharf

The above three kind of commodities will be handled at Berth No.18 as they are at present.

Of the respective volumes to be handled at this berth, ammonia and tar handled in 1997 will be 98 thousand tons and 35 thousand tons, and petroleum products will be 80 thousand tons, the same as the present volume.

(1) Number of berths

1) In planning for ammonia, the following conditions are set:
   a. The volume of ammonia to be handled in 1997 is 98 thousand tons.
   b. A cargo handling capacity of 140 tons/hour is used for calculation.
   c. The average per-ship loading volume is 5,000 tons.
   d. The per-berth available time for using berths is 7,440 hours per year (24 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.
   f. The size of ships is considered to be 6,000 DWT.

2) In planning for tar, the following conditions are set:
   a. The volume of tar to be handled in 1997 is 35 thousand tons.
   b. A cargo handling capacity of 100 tons/hour is used for calculation.
   c. The average per-ship loading volume is 4,000 tons.
   d. The per-berth available time for using berths is 7,440 hours per year (24 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.
   f. The size of ships is considered to be 5,000 DWT.

3) In planning for petroleum products, the following conditions are set:

a. The volume of petroleum handled in 1997 is 80 thousand tons.
b. A cargo handling capacity of 60 tons/hour is used for calculation.
c. The average per-ship unloading volume is 5,000 tons.
d. The per-berth available time for using berths is 7,440 hours per year (24 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 6,000 DWT.

The necessary number of berths in 1997 is determined as follows: The annual number of ship calls for the three kinds of commodities is 45. Then, the total berthing time of the three kinds of carriers is 2,498. Since the available berth time for use is 7,440 hours per year, the berth occupancy ratio is 33.6 % for one berth.

Accordingly, the capacity of the existing berth should be sufficient in the short term.

3.2.8 Fertilizer, Carbonic Chemical, Sulphur and Potash Wharf

The above four kinds of commodities will be handled at Berth No.20.

Fertilizer, carbonic chemical, sulphur and potash handled in 1997 will be 109 thousand tons, 16 thousand tons, 130 thousand tons and 83 thousand tons, respectively.

(1) Number of berths

1) In planning for fertilizer, the following conditions are set:

a. The volume of fertilizer to be handled in 1997 is 109 thousand tons.
b. A cargo handling capacity of 60 tons/hour is used for calculation.
c. The average per-ship loading volume is 5,000 tons.
d. The per-berth available time for using berths is 5,580 hours per year (18 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 6,000 DWT.

2) In planning for carbonic chemical, the following conditions are set:
   a. The volume of carbonic chemical to be handled in 1997 is 16 thousand tons.
   b. A cargo handling capacity of 45 tons/hour is used for calculation.
   c. The average per-ship unloading volume is 5,000 tons.
   d. The per-berth available time for using berths is 5,580 hours per year (18 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.
   f. The size of ships is considered to be 6,000 DWT.

3) In planning for sulphur, the following conditions are set:
   a. The volume of sulphur to be handled in 1997 is 130 thousand tons.
   b. A cargo handling capacity of 130 tons/hour is used for calculation.
   c. The average per-ship unloading volume is 6,000 tons.
   d. The per-berth available time for using berths is 5,580 hours per year (18 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.
   f. The size of ships is considered to be 7,000 DWT.

4) In planning for potash, the following conditions are set:
   a. The volume of potash to be handled in 1997 is 83 thousand tons.
   b. A cargo handling capacity of 130 tons/hour is used for calculation.
   c. The average per-ship unloading volume is 4,000 tons.
   d. The per-berth available time for using berths is 5,580 hours per year (18 hours/days x 310 days).
   e. Necessary processing time for entry and departure is 2 hours per ship.
   f. The size of ships is considered to be 5,000 DWT.

The necessary number of berths in 1997 is determined as follows: The total annual number of ship calls for these carriers is 68. The total berthing time of these carriers is 3,958 hours. Since the available berth time for use is 5,580 hours per year, the berth occupancy ratio is 70.9 % for one berth.

Based on these estimations, it appears that there will be a shortage of berth, as it will be difficult to quickly construct a new berth. Under these conditions, if the other berths (Berth No.16 and No.17) are not occupied, it would be appropriate for these cargoes vessels to use these empty berths.

3.2.9 Petroleum Products Wharf

At present, petroleum is mainly handled at Berth No.26. The volume of petroleum products to be handled at the port of Annaba in 1997 will be 616 thousand tons. Since 80 thousand tons is planned to be handled at Berth No.18, the same as the present, the volume to be handled at Berth No.26 is assumed to be 536 thousand tons.

However, this berth is seriously damaged, but should be maintained with supplemental repair for the time being. And it will be necessary to improve operation efficiency to increase cargo handling volume.

(1) Number of berths

In planning, the following conditions are set:

a. The volume of petroleum products to be handled in 1997 is 536 thousand tons.
b. A cargo handling capacity of 120 tons/hour is used for calculation.
c. The average per-ship unloading volume is 5,000 tons.
d. The per-berth available time for using berths is 7,440 hours per year (24 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 6,000 DWT.

The number of petroleum berths required in 1997 is calculated as follows: The annual number of ships calling at the port is 107. Since the per-ship berthing time is 44 hours based on the volume of unloading and the cargo handling capacity, the total berthing time is 4,708 hours. Since the per-berth available time for use is 7,440 hours per year, the berth occupancy ratio is 63.3 % for one berth.

Based on these estimations, the capacity of the existing berth should be sufficient in the short term.

3.2.10 Phosphate Wharf

The volume of phosphate to be handled at Berth No.19 in 1997 will be 1.164 million tons.

(1) Number of berths

In planning, the following conditions are set:

a. The volume of phosphate to be handled in 1997 is 1.164 million tons.
b. A cargo handling capacity of 770 tons/hour is used for calculation.
c. The average per-ship loading volume is 8,500 tons.
d. The per-berth available time for using berths is 5,580 hours per year (18.0 hours/days x 310 days).
e. Necessary processing time for entry and departure is 2 hours per ship.
f. The size of ships is considered to be 10,000 DWT.

The number of phosphate berths required in 1997 is calculated as follows:

The annual number of ships calling at the port is 137. Since the per-ship berthing time is 13 hours based on the volume of unloading and the cargo handling capacity, the total berthing time is 1,781 hours. Since the per-berth available time for use is 5,580 hours per year, the berth occupancy ratio is 31.9 % for one berth.

Based on these estimations, the capacity of the existing berth should be sufficient in the short term.

Berth No.19 has a berth length of 220 m and a water depth of -9.5 m. Large ships are more economically viable and thus their numbers are increasing. In response to this, FERPHOS plans to use Berth No.16 and 17 becauce both have water depths of -12.5 m and are connected with Berth No.19 by belt conveyor. It is difficult to deepen a water depth along Berth No.19 by dredging without reconstruction of the existing quay structures in view of structural stability.

3.2.11 Car Ferry Wharf

At present, ferry services at the port of Annaba are provided at Berth No.4.

The total number of passengers in 1997 will be 56,000 passengers.

(1) Number of berths

In planning, the following conditions are set:

a. The number of passengers in 1997 is 56,000
b. The average number of passengers per ship is 1,300.
c. The average mooring time per ship is 53 hours.
d. The annual available hours for using berth is 5,580 hours. (18 hours/days x 310 days)
e. The size of ships is considered to be the 10,000 DWT class.

The number of car ferry berths required in 1997 is calculated as follows: The annual number of ships calling at the port is 43. Since the per-ship berthing time is 53 hours, the total berthing time is 2,279 hours. Since the per-berth available time for use is 5,580 hours per year, the berth occupancy ratio is 40.8 % for one berth.

Based on these estimations, the capacity of the existing berth should be sufficient in the short term.

3.2.12 Container Wharf

The reconstruction of the container berth financed by the World Bank will combine Berth No.1 and No.2.

Volume of container cargoes handled in 1997 will be 79 thousand tons.

(1) Number of berths

1) In planning for container berth, the following conditions are set:
a. The volume of container cargoes to be handled in 1997 is 79 thou sand tons.
b. Based on 1990 results, 10.3 tons is used as per-container cargo volume.
c. The average handling volume per hour is 15 TEU/hour.
d. It is assumed that the per-ship number of loaded containers that are loaded or unloaded is 500 TEU. Since the import/export ratio in 1997 is 66 % for import and 34 % for export, the ratio of empty containers to loaded container is 32 %. So, the per-ship number of containers handled is 700 TEU.
e. The per-berth annual hours available for use are 3,720 hours (12 hours/days x 310 days).

f. The necessary processing time for entry and departure is 2 hours per ship.

g. The size of ships is considered to be the 15,000 DWT class.

The necessary number of berths in 1997 is calculated as follows: Since the total number of containers in 1997 is 10.1 thousand TEU, the total annual ship calls for container vessels is 14. The total berthing time is 686. Since the per-berth annual hours available for use are 3,720 hours per year, the berth occupancy ratio is 18.4 % for one berth.

Based on these estimations, the capacity of the planned berth should be sufficient in the short term.

(2) Required scale of storage facilities

The required area of the storage facilities is determined by the formula as mentioned in Part I, Section 12.3.

1) Container yard

The required storage number of containers is shown in Table 3.2.5.

Table 3.2.5 Results of Required Storage Capacity in Container Yard

Items	Unit	Loaded Containers		Empty Containers	Total
		Import	Export		
Container Handling Volume	tons	52,000	27,000	-	79,000
Tons per-container	tons	10.3	10.3		
Annual Container Throughput (My)	TEUs	5,049	2,621	2,454	10,124
My / Dy x Dw x P	TEUs	212	77	103	392
Stacking Height	Layers	2.2	2.2	3.0	-
Required Number of Ground Slots	Slots	96	35	34	166
Slot area	m2				6,074

2) Container freight station (CFS)

The required size of the CFS is 1,600 m2.

Then the capacity of the total storage facilities including CFS shown in Part I, Fig.12.2.1, which has 579 slots and other areas, should be sufficient in the short term.

3.3 Other Port Facilities

(1) Road

The volume of traffic generated at the port is determined by the formula as mentioned in Part I, Section 12.3.

Table 3.3.1 shows generated traffic volume by Wharf.

Table 3.3.1 Generated Traffic Volume in 1997

Type	Cargo Volume ('000t)	Cargo weight of loaded (t/car)	Hourly generated traffic volume (car/hour)
Genral Cargo	466	8	73
Container Cargo	79	8.1	12
Cereals	459	12.0	47
Other Bulk	900	10.5	107
Total	1,904		239

Daily port generated traffic volume is about 2,400 cars.

An access road and inner port road connecting with the national road are proposed to smoothly distribute port traffic generated at the wharves.

(2) Railway

At present, railway transportation is the major mode of transportation at the port of Annaba; the volume of railway cargoes at the port in 1990 was about 2.55 million tons or 59.% of port-handled cargo.

The total volume of railway cargoes at the port of Annaba in 1997 is assumed to be about 4.4 million tons.

The average number of arrival trains per day is calculated by the formula as mentioned in Part I, Section 12.3.

The average number of arrival trains in 1997 is 14.8 trains.

3.4 Cargo Handling System

3.4.1 Raw sugar in Bulk

Given the nature of the cargo and the existing handling facilities, the following handling manners are considered;

Case 1 : By the existing handling facilities

The existing hoppers are equipped on the transverse conveyor system along the berth but the top of the hoppers are too high, some 11m from the ground, so that the positioning of the grab buckets above the hoppers is very difficult, causing one of the low cargo handling rate at present.

In order to achieve a constant high handling rate, it is preferable to reconstruct the transverse conveyor system at a lower position and to install new quay cranes with large lifting capacity for handling large grab buckets. This would have the advantage that when the berth is not occupied by sugar carriers, these cranes can be used for handling other cargoes.

Case 2 : By specialized exclusive crane

In this system, cargo is unloaded by specialized quay cranes with grab buckets (See Fig.3.4.1) and forwarded to the existing transverse conveyor via a conveyor connected between the cranes and the transverse conveyor. This system gives a higher handling rate than other systems.

Case 3 : By specially made slant conveyors and movable hoppers

In this system, cargo is unloaded and dumped into movable hoppers by grab buckets and forwarded to the existing transverse conveyor by slant conveyors which are specially made and placed between the hoppers and the transverse conveyor (See Fig.3.4.2).

The capacity of the grab buckets is one factor in the determination of cargo handling rate, hence in order to achieve a high handling rate, it is required to install new quay cranes with large lifting capacity for handling large grab buckets, but when the berth is not occupied by sugar carriers, theses cranes

can be also used for handling of other cargoes.

On the other hand the unloading can be done by ship's gear/cranes or mobile tower cranes.

Case 4 : By Mobile cranes

In this system, cargo is unloaded by mobile tower cranes with grab buckets and loaded onto trucks through movable hoppers placed on the apron, for forwarding to the shed.

This system dose not require a specialized berth and the attainable handling rate depends on the turn-around rate of the trucks between the apron and the shed.

Case 5 : By ship's gear and movable hoppers

In this system, cargo is unloaded by ship's gear/cranes with grab buckets and loaded onto trucks through movable hoppers placed on the apron, for forwarding to the shed.

This system dose not require a specialized berth or specialized unloading machines and the attainable handling rate depends on the turn-around rate of the trucks between the apron and the shed.

Considering the forecast handling volume of sugar in the port, the cargo handling system recommended from an economic point of view is that the unloading is carried out by means of ship's gear/cranes and forwarding to the existing transverse conveyor system is done by slant conveyor system.

A comparison in coast by handling systems is shown tin table 3.4.1

Table 3.4.1 Comparison in Cost by Handling Systems

Handling System	Total Cost (Unit : 1,000 DA)
Case 1-1 By existing handling system to purchase 2 new quay cranes (20 tons)	: 94,170
Case 1-2 By existing handling system to purchase 2 new mobile tower cranes (20 tons)	: 18,834
Case 2 By 2 specialized cranes to purchase 2 cranes (7 tons)	: 262,800
Case 3-1 By slant conveyors to purchase 2 quay cranes (20 tons), 2 slant conveyors & 2 movable hoppers	: 99,251
Case 3-2 By slant conveyors to purchase 2 mobile tower cranes (20 tons), 2 slant conveyors & 2 movable hoppers	: 23,915
Case 3-3 By slant conveyors and ship's cranes to purchase 2 slant conveyors & 2 movable hoppers	: 5,081
Case 4 By mobile cranes to purchase 2 mobile cranes (20 q tons) & 2 movable hoppers	: 20,433
Case 5 By ship's cranes to purchase 2 movable hoppers	: 12,680

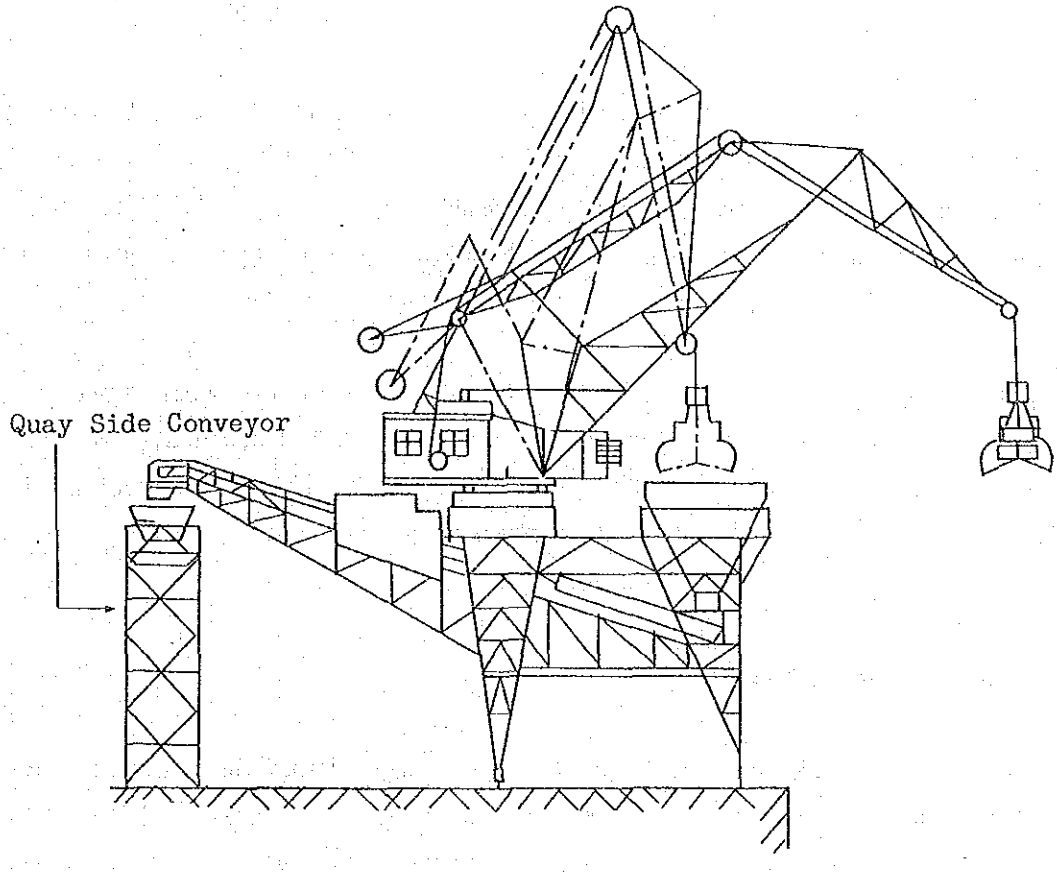


Fig. 3.4.1 Specialized Exclusive Crane

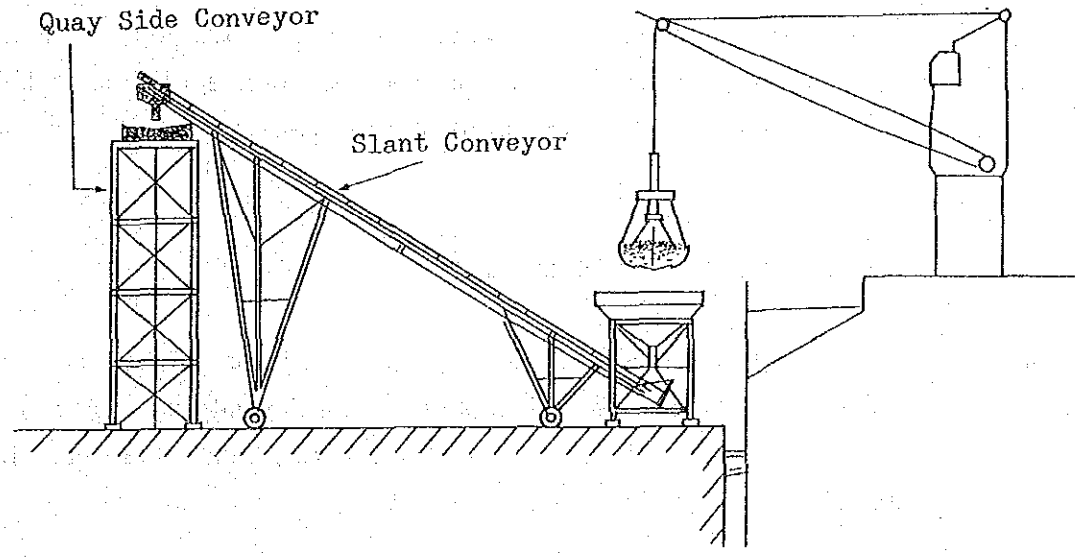


Fig. 3.4.2 Slant Conveyor System

3.4.2 Cereals in Bulk

For the target year 1997, the cargo handling system of cereals in bulk is basically similar to the present handling system. The cargo unloaded from vessels is first stored in and evacuated through both the existing silos and the new silos which are to be constructed beside the existing silo behind berth No.12.

The existing pneumatic unloader should be replaced with a rail-mount pneumatic unloader with an unloading capacity of 200 tons/hour, because the existing unloader is very old and heavily deteriorated and the capacity of the unloader is relatively small compared to the capacity of storage silos.

3.4.3 Coal in Bulk at Berth No.13

In order to achieve smooth handling of cargo using the existing complex handling facilities owned by SIDER, the management and control of the stocked cargo in the storage yards is the most important factor, that is a sufficient space for receiving coal to be unloaded needs to be prepared in the storage yard in advance before berthing of vessels.

Accordingly, it is necessary to increase the capacity of inland transport by rail from the port to the steel mill. In practice, train transport should be scheduled according to the arrival schedule of vessels, volume of unloaded coal and volume of coal stored in the storage yard at that time.

3.4.4 Steel Products at Berths Nos.14 and 15

Considering the demand forecast for steel products for target year 1997, smooth cargo handling at berths Nos.14 and 15 will depend on the efficient utilization of the existing steel products storage yards, and therefore it is necessary to examine the following points.

- Shortening holding time of the cargoes in the storage yards as much as possible,
- Designed inland transport of the cargoes from/to the port to match with

the loading/unloading schedules of vessels.

However, considering the steadily increasing cargo flow after 1997, the capacity of the existing storage yard is relatively small, and therefore, it will be required to prepare an storage yard in the port area or near the port in addition to the existing storage yard and to transport cargoes by shuttle trucks from/to ship's side in accordance with loading and unloading plans.

3.5 Consideration of Environmental Aspects

3.5.1 Environment Impacts of the Port Development

The main components of environment to be affected by the port development are as mentioned in Part I, Section 12.3.

3.5.2 Measures in the Future

Though the port was equipped with facilities to receive waste engine oil from vessels at the port, it is necessary to accommodate facilities to treat ballast, bilge, etc. to meet requirement of MARPOL convention.

As for water pollution, according to the report "Study on the pollution of dredging materials" of June, 1991, the polluted of sediment inside the port area was found, which contained high concentrated heavy metals.

In order to minimize water pollution at the port, a standard for discharged water will have to be established and a monitoring system arranged in advance.

At same time, sewage from the city and drainage water from the wharves need to be treated before being discharge into the basins of the port at earliest possible time.

3.6 Proposed Scale Under the Short-Term Plan

The port facilities necessary to handle cargoes in 1997 are summarized as follows:

(1) Cereals Wharf (Berth No.12)
Cargo storage facilities: one (1) new silo (holding capacity of 30,000 tons)
Cargo handling facilities: one (1) new pneumatic unloader (nominal capacity of 200 tons/hour)

(2) Raw Sugar Wharf (Berth No.11)

Cargo handling facilities: two (2) new slant conveyors and two (2) movable hoppers

Purchase cost: 5.081 million DA

(3) Petroleum Products Wharf (Berth No.26)

Scale: supplemental repair

Construction cost: 455 thousand DA

As for abovementioned facilities, it has already been decided that (1) will be implemented in the near future, and is being financed by the World Bank; in addition, (2) only involves the improvement of present handling system while (3) requires only small repair. As the total costs are small, they are not considered in this feasibility study.

However, the feasibilty study for realization of the necessary facilities planned in the Master Plan shall be started even before 1997, during the period of the short-term plan.

3.7 Cost Estimation

3.7.1 Basic Condition for Cost Estimation

The main condition for the cost estimation are as shown in the Article 1.12.1 of the Short Term Plan of the Port of Algeirs.

3.7.2 Result of Estimation

A summary of the estimation results is presented in the Table 3.7.1 and result for each item is presented in Table 3.7.2.

Table 3.7.1 Summary of Construction Cost

Unit: Million DA

No.	Item	Construction Cost		
		Foreign Portion	Local Portion	Total
1.	Repairs of Petroleum Berth	0.3	0.1	0.4
2.	Cereal Berth	246.5	115.9	362.4
	Sub Total	246.8	116.0	362.8
3.	Pneumatic Unloade 200 T/H	100.4	9.1	109.5
	Direct Cost total	347.2	125.1	472.3
4.	Physical Contingency	24.7	11.6	36.3
5.	Engineering Service	19.7	9.3	29.0
	Indirect Cost Total	44.4	20.9	65.3
6.	Total Cost	391.6	146.0	537.6
7.	Tax(VAT)	27.4	10.2	37.6
8.	Project Cost	419.0	156.2	575.2

The yearly disbursement schedule has been estimated as shown in Table

Table 3.7.2 Construction Cost

Unit: 1,000 DA

Facilities		Consturuction Cost		
Item	Sub Item	Foreign Portion	Local Portion	Total
1. Repairs of Petroleum Berth	(1)Direct Cost	266	122	388
	*Steel Pipe Piling o/400	230	104	334
	*Miscellanceous	23	10	33
	*Mobilization	13	8	21
	(2)Indirect Cost	46	21	67
	*Physical Contingency	25	11	36
	*Engineering Services	21	10	31
	(3)Construction Cost	312	143	455
2. Cereal Berth	(1)Direct Cost	246,522	115,880	362,402
	*Silos & Buildings	113,180	69,390	182,570
	*Accompanying Machinery	115,030	40,420	155,450
	*Mobilization Cost	18,312	6,070	24,382
	(2)Indirect Cost	44,374	20,858	65,232
	*Physical Contingency	24,652	11,588	36,240
	*Engineering Services	19,722	9,270	28,992
	(3)Pneumatic Unloader 200T/H x 2	100,371	9,124	109,495
3. Total Cost		391,579	146,005	537,584
4. Tax(VAT)	3 x 7 %	27,411	10,220	37,631
5. Project Cost		418,990	156,225	575,215

Table 3.7.3 Yearly Disbursement Schedule

Unit: Million DA

No.	Item	Total Construction Cost			1st Year		2nd Year		3rd Year	
		Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Foreign Portion	Local Portion	Foreign Portion	Local Portion
1.	Repairs Petroleum Berth	0.3	0.1	0.4	–	–	0.3	0.1	–	–
2.	Cereal Berth	246.5	115.9	362.4	–	–	132.4	64.2	114.1	51.7
3.	Pneumatic Unloader 200T/H x 2	100.4	9.1	109.5	–	–	–	–	100.4	9.1
4.	Physical Contingency	24.8	11.6	36.3	–	–	9.4	6.0	15.3	5.6
5.	Engineering Services	19.7	9.3	29.0	7.4	3.5	6.2	2.9	6.1	2.9
6.	Tax	27.4	10.2	37.6	0.5	0.2	10.4	5.1	16.5	4.9
	Total Construction Cost	419.1	156.2	575.2	7.9	3.7	158.7	78.3	252.4	74.2

CHAPTER 4 PORT MANAGEMENT AND OPERATIONS

4.1 Improvement of Operations in the Current Terminals

4.1.1 A Basic Problem to be Solved

In Algerian ports, especially in the port of Algiers, there is a shortage of storage space in a port area. This problem, lack of enough space for handling and storage, clearly does not enable EPs to perform port operations properly, so even if various recommendations are made for improvement of port operations, the desired results might not be achieved due to the existence of this problem.

In this context, countermeasures to shortage of storage space will be studied firstly. After that, necessary recommendations to improve port operations will be studied.

4.1.2 Countermeasures to Shortage of Storage Space

The most basic problem in the field of port management and operation is shortage of storage space. Shortage of space is caused mainly by over staying of cargoes in the port. This caused ineffective operation, improper cargo administration and other problems in port operations. To improve this situation, possible countermeasures from the view point of management are as follows.

1) To raise the rate of the transit and the depot tax according to storagee periods of time in order to discourage consignees from storing cargo for long.

2) To provide stock yards and warehouses behind the port or in suburbs for consignees in order to store their cargo after customs clearance.

The increase rate of the transit and the depot tax will be studied in the next chapter section.

Current level of the transit and the depot tax in Algeria is shown in Fig. 4.1.1. Also, level of the storage charge in the Port of Tokyo is shown in Fig.4.1.2. for the reference. Both ports' level of the charges are shown in the same chart of Fig.4.1.3. The charge system for storage in Algerian ports, which is composed of the transit and the depot tax, has two points to be improved.

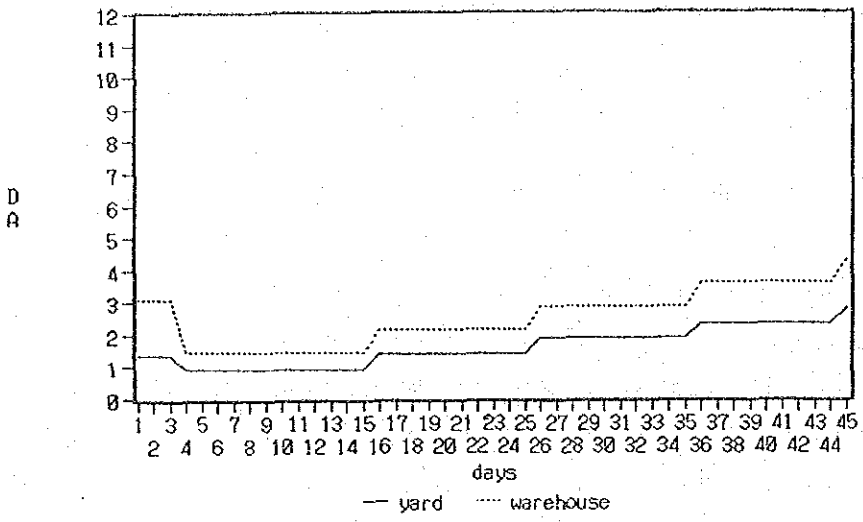


Fig. 4.1.1 Level of Transit and Depot Tax in Algeria

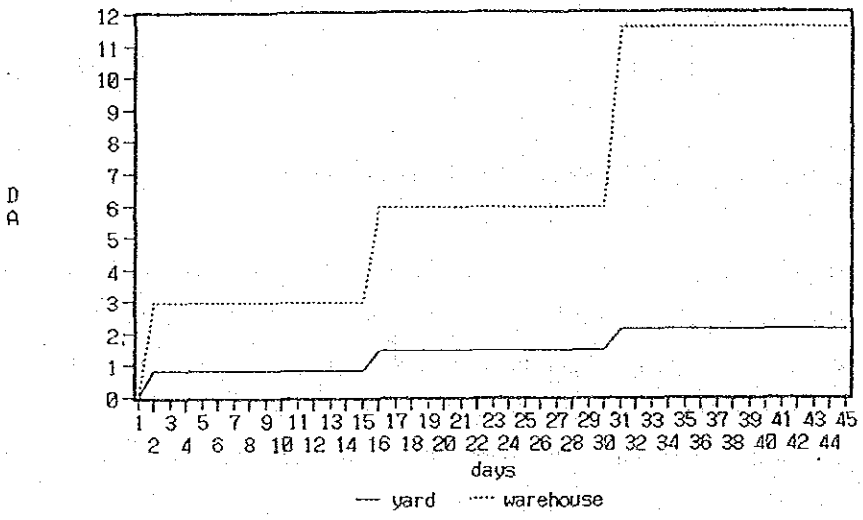


Fig. 4.1.2 Level of Storage Charge in Port of Tokyo

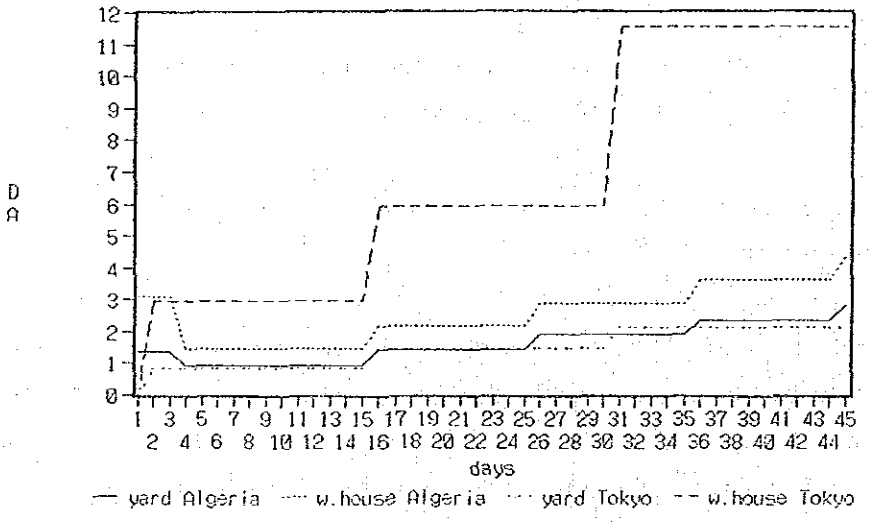


Fig. 4.1.3 Comparison of Storage Taliff

First, from the fourth day the tax rate is decreasing and this situation makes consignees lose their motivation to quickly carry their cargo out of the port area.

Second, the level of the depot tax for cargo which is stored in warehouse is relatively low. This caused the consignee to use warehouses in a port area as a long term stock point because the storage charge in a port may be actually cheaper than the cost outside a port.

This situation could be improved by raising the rate of taxes. In addition, the most important point is that both taxes should be maintained at a level higher than the cost for storage of cargo by the consignees.

4.1.3 Specialization and Reorganization

In order to resolve various problems which the ports currently have in the field of port management and operations, it is effective to promote specialization of wharves and to reorganize operations of cargo handling and storage realizing consistency of cargo administration from ship to consignee. Currently, in the Algerian ports, quay is not fixed for ships' berthing except for some special type of ships and cargoes. In addition, cargo handling and cargo storage are operated by different divisions in EPs and both divisions are in charge of the operations in the entire port area respectively. (see Fig.4.1.4)

Basically, the same cargo should be handled at the same quay by the same workers using the same equipment and be stored at the same yards or shed behind the quay. It will produce efficient and reliable cargo handling, storage and delivery. Therefore, wharves should be as specialized as possible in accordance with the diversity of cargo. Also, cargo handling and storage operations should be performed by the same divisions which are established by each wharf. (see Fig.4.1.5)

Those specialized wharves are the exception of the berthing principle, "first come first serve", and priority will be given to the ships which unload/load the cargo that is assumed to be handled at that wharf. Thus, the same kind of cargo will be handled at the same wharf by a company that is consistently in charge of cargo handling, storage and delivery. This type of operation and

organization will ensure that skilled workers are at hand and will clarify the responsibility of the cargo administration.

For reference, a possible organization chart of a port administration body and a stevedoring company which operates cargo handling and storage are shown in Fig.4.1.6 and Fig.4.1.7. In the chart of the port administration body, Cargo Handling Department and Commercial Department are deleted compared with the existence organization of the EPs, and a new department, a Facilities Management Department, is added in order to manage port facilities which are owned by the body. In the chart of the stevedoring company, departments are divided in accordance with the wharves where operation is executed by that department. Also, an "Instructions/Coordination Division" is newly established as a headquarters to draft a cargo handling/storage plan, to instruct handling and storage operation, to coordinate with inter-divisions of the company, cargo ships, consignees/shippers and port administration body. An operation flow which shows relations between divisions of the company is shown in Fig. 4.1.8.

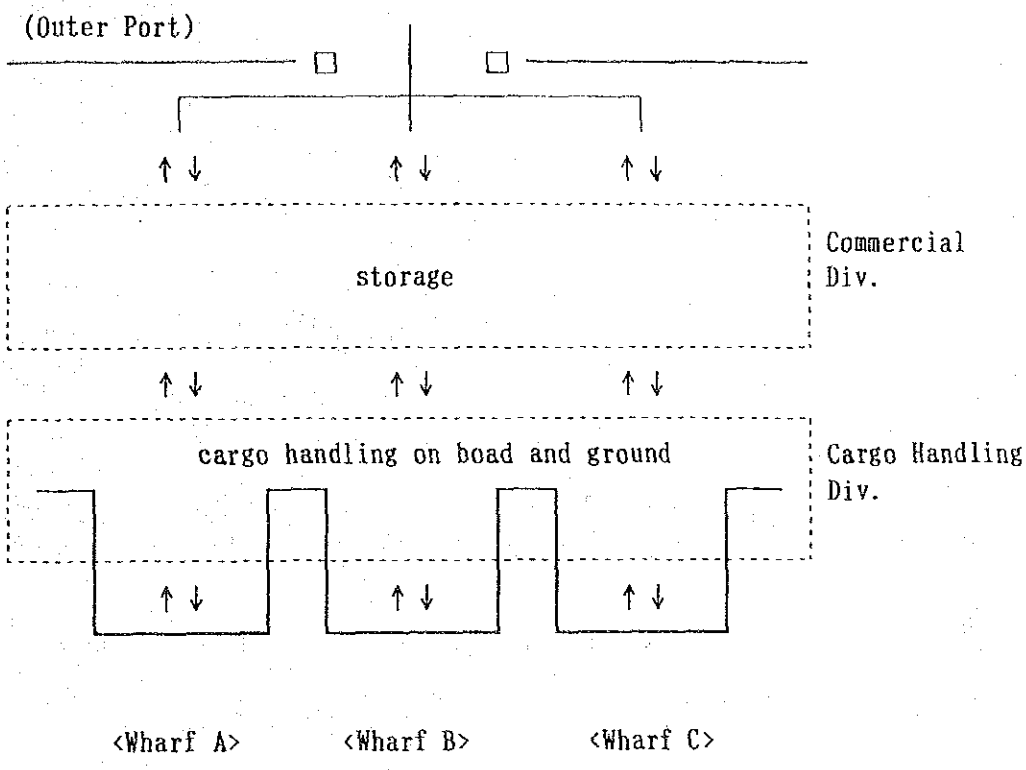


Fig. 4.1.4 Operation in the Wharves by the Current Organization

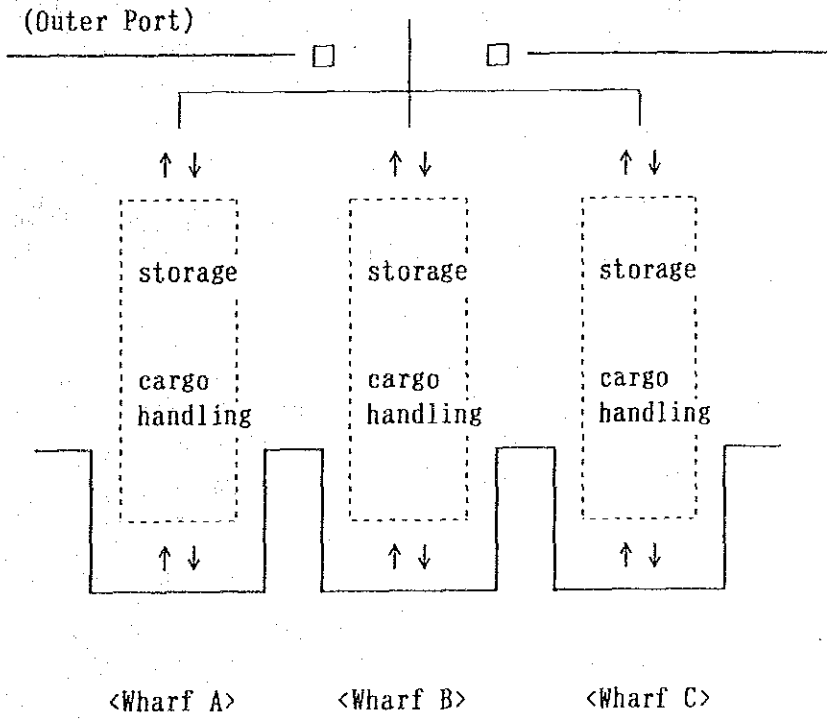


Fig. 4.1.5 Operation in the Wharves by a Reformed Organization

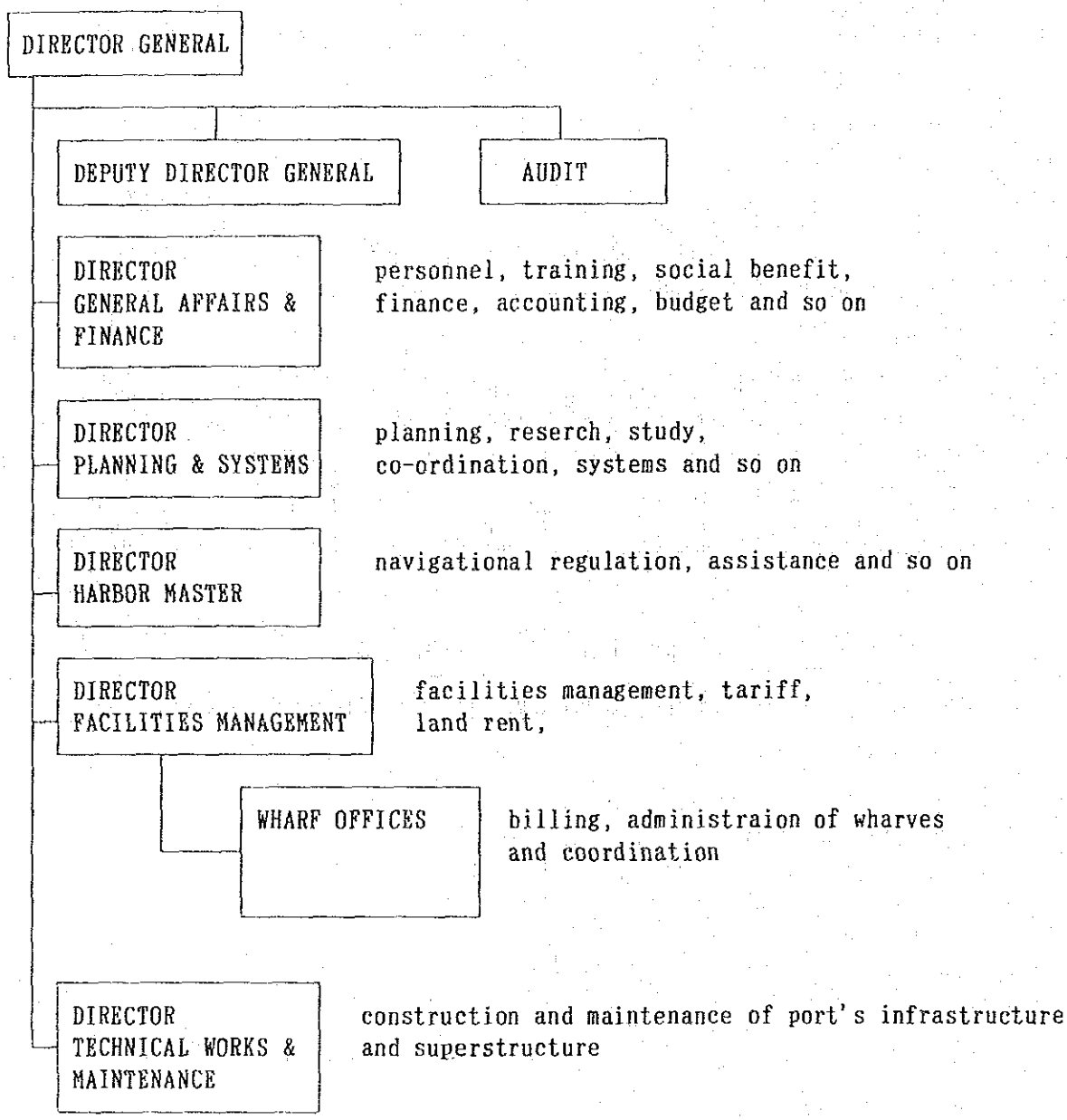
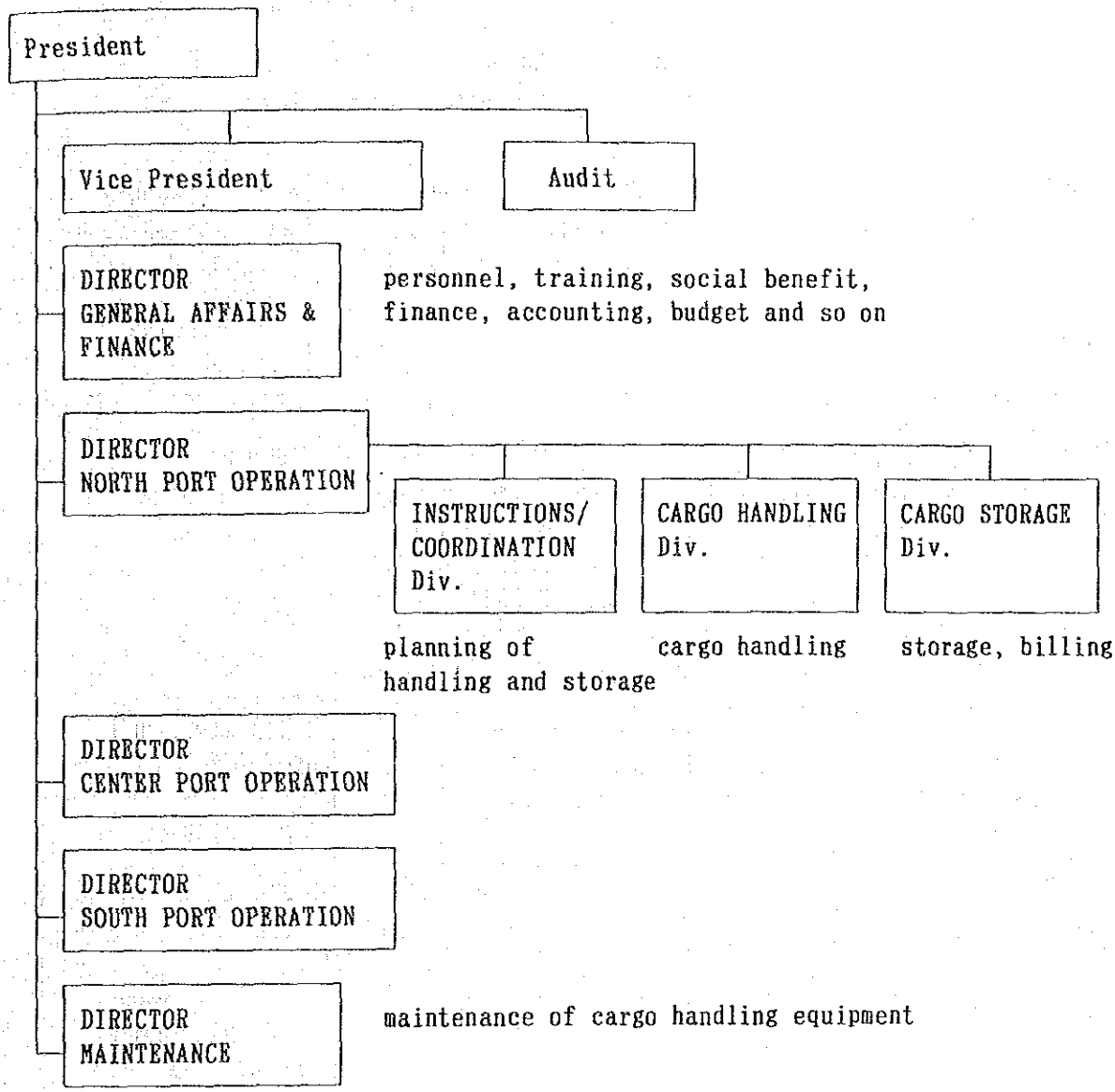
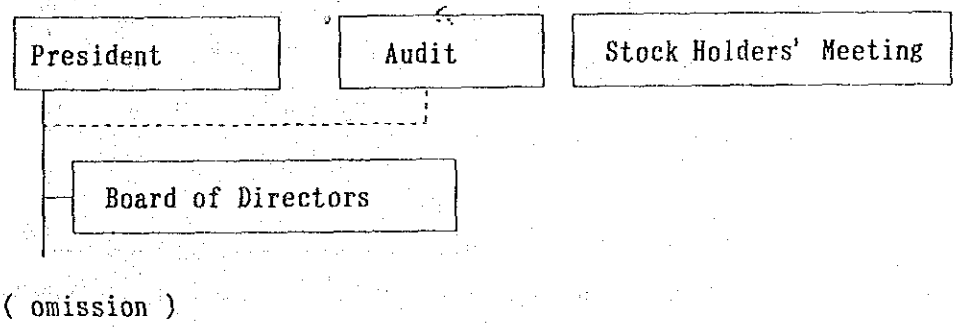


Fig. 4.1.6 A Organization Chart of Port Administration Body



Example Organization Chart Of a Private Company's Top Management



(omission)

Fig. 4.1.7 A Organization Chart of Cargo Handling/Storage Company

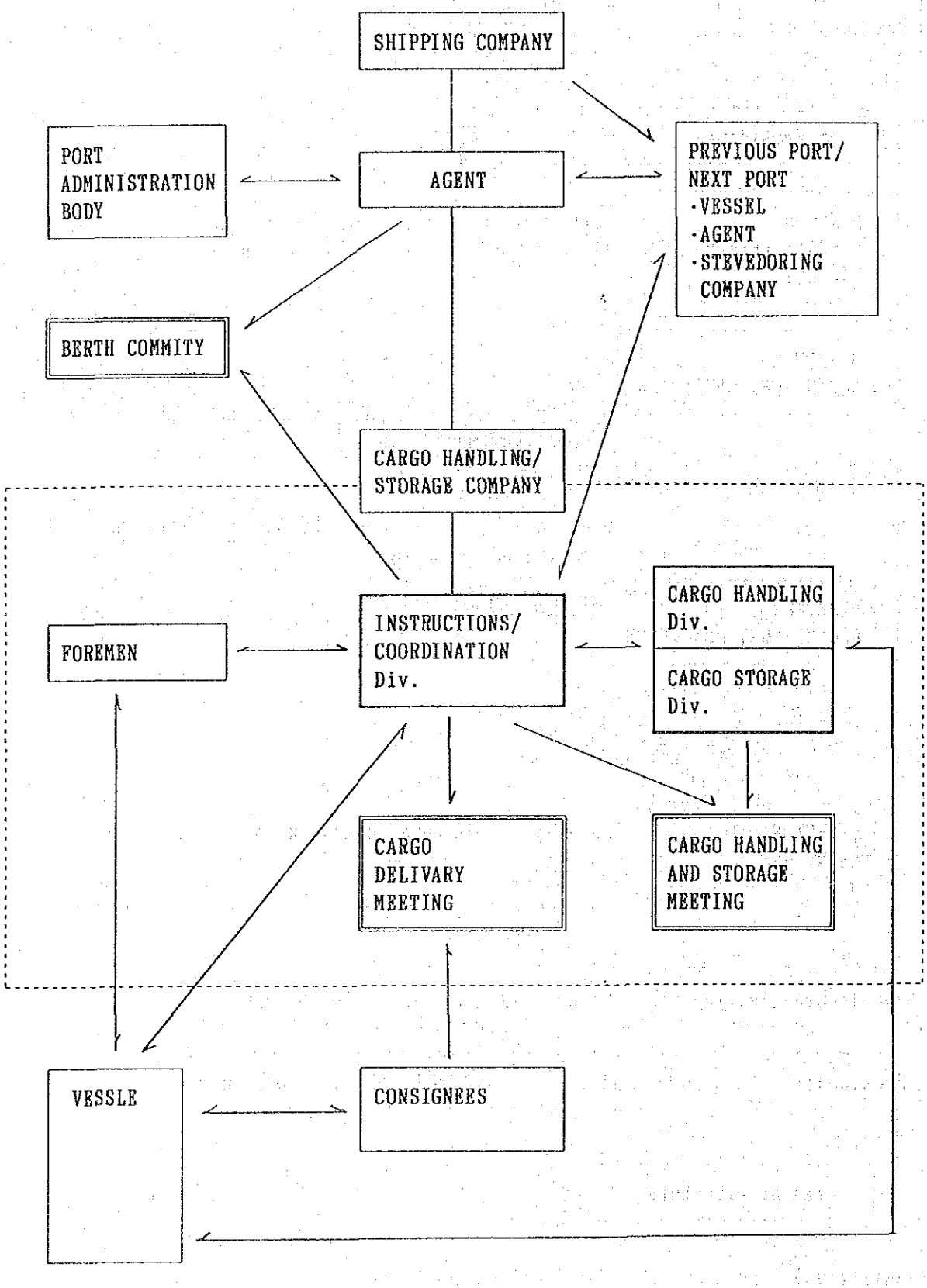


Fig. 4.1.8 Operation of Cargo Handling/Storage Company

4.2 Basic Policy for Computerization

4.2.1 Computerization in Advanced Ports

Computer systems currently adopted by the advanced ports in the world are classified into three categories according to their functions. They are Port Administration System, each system for Terminal Operation and Inter-industries Data Exchange System.

(1) Port Administration System

These systems have been developed by port administration bodies mainly to control berthing and usage of public yards and warehouses. The system is commonly composed of the following subsystems.

1) Vessel movement system

This subsystem provide information on the ships, such as name of ship, ETA, ETD, berth No. and so on, which are berthed in the port or are scheduled to arrive in the port.

2) Warehouse and yard system

To control usage of public warehouses and yards, receipt of merchandise and shipment of merchandise have been recorded in the system, and the report of space inventory and necessary documents are automatically provided.

3) Billing system

Charges for ships and cargo storage are calculated using data of "Vessel movement system" and "Warehouse and yard system". Also, invoice is prepared by the system.

4) Traffic tonnage statistics system

Fundamental cargo traffic information is recorded in the system to provide port statistics.

(2) Each System for Terminal Operation

Systems necessary to each terminal operation are developed by the terminal operators. Basically this system is almost similar to the "Warehouse and yard system" mentioned above.

Especially, in a container terminal, operation is highly mechanized to achieve high efficiency, therefore introduction of a computer system for the operation can bring great merits to the operator. Commonly, basic object of this computer system is to show exact location of each container van in the container yard. This work can be done manually if handling volume of containers is small. It is said that a computer system is required when the number of handling container exceed 50,000 TEU/year in a terminal.

(3) Inter-industries Data Interchange System

This system provides online network to public organizations and private enterprises included in port industry to interchange shipping cargo information efficiently. In the process of importing or exporting cargo, complicated and various information will be interchanged between many port related organizations and companies. Establishment of the network to interchange this information contributes to quick information access, reduction of manpower for data input, prevention of mistypes, simplification of documentation for shipping and so on. The organizations and companies who are expected to be included in this network are a port administration body, steamship lines, customs, terminal operators, warehouses, railroads, truck carriers, consignees/shippers, banks and so on.

This network inevitably requires expansion and linkage with overseas enterprises related to cargo transportation. In order to transmit electronic data to other countries, standardization of document format and communication protocol is needed.

Under the Economic and Social Council (ECOSOC) of the United Nations, WP.4 (Working Party on Facilitation of International Trade Procedures) is working on two themes, "Data elements and automatic data interchange" and "Procedures and documentation". As a result of the work, some recommendations have already been made for data interchange and standardization of document. On the other hand, I.S.O and other related international organizations are working on standardization of electronic data and communication protocol which permits the interchange of electric data between various type of computers.

Those works are still on going, but already some ports in European countries can partially provide this kind of network service based on some of the international standards recommended by the U.N. The network in the Port of Rotterdam, for example, is open for use by port related enterprises including

those in foreign countries, and each user has a mail box for receiving or sending electric data and messages. In our opinion, this mail box system is highly practical and requires rather little capital to build and maintain. Also, each enterprise does not need to invest much capital to join the network. If a company wants to install only the minimum system, a personal computer with a modem is all that is required, and a communication software is provided by the network.

4.2.2 Basic Policy

Computer systems are usually introduced to realize efficiency, cost reduction and to provide high quality of services. From the view point of economy (cost and performance), existing systems can be classified into two categories.

(1) Stand Alone System

One is called the "stand alone system" which usually employs personal computers which are operated as an off line system with package software that is developed for popular use. For instance, simple and repetitive calculation in a field of accounting, salary, and civil engineering is appropriate work for this system. There is a great variety of package software for those works and some are very functional at a reasonable price. Introduction of this system requires little money and performance is usually very good.

(2) Online System

The other is called the "online system" which usually employs a main frame computer and work stations in online system, and software is usually developed especially for the system, for instance tickets reservation systems and nation wide data base systems. This system is suitable for enterprises requiring immediate and a great deal of data interchange in many different places through a center computer. Introduction of this system requires substantial investment money and after completion, partial modification of the program to change output or to add new information to the system is often difficult. Also, many workers need to be trained for operation and maintenance of the system.

(3) Basic Policy

For the first step in the computerization of EPs, introduction of the stand

alone system should be promoted in order to realize effectiveness and quick disposition of the works. This system can be developed at a rather small cost and its performance is good. Personal computers should be provided to each workers engaged in jobs which include simple and repetitive calculation. In addition, a training program should be initiated to realize effective usage of package software corresponding to the needs of workers.

Also, in the container terminals, computers should be introduced to administrate location of containers in container yards when handling number of containers is forecast to exceed 50,000 TEU/year.

To use international trade data interchange systems being developed in European ports will be very beneficial to the Algerian ports which have a great deal of cargo traffic with them. For instance, container terminal operators can get shipping cargo information quickly as electric data, and can omit re-input of the cargo information to process or modify for their usage. However, the work on standardization is still on going and most time and study will be required before its completion. Therefore, at this time, study for the usage of these networks should be started in order to prepare future connection to the networks.

In the second step, online system will be developed to improve service level of the port operation responding to advancement of containerization and other port industry's computerization. Online system, especially network system for inter-enterprises data interchange, will need to be developed under the leadership of the government because the system can not be developed without cooperation of various public organization and private companies.

4.3 Container Terminal Operation

In this section, operation of container terminal will be studied.

4.3.1 Operation Flow

Container movement and necessary jobs for handling in a typical container terminal are shown in Fig.4.3.1 for export containers and in Fig.4.3.2 for import containers.

(1) Container Movement

1) Export containers

Prior to a ship's arrival, export FCL containers (full container load cargo) are received at the gate office and stacked in the container yard, export LCL cargoes (less than container load cargo) are brought into the CFS by shippers, and then stuffed into containers by the operator. All export containers (full and empty) are loaded onto a ship in accordance with the loading sequence plan.

2) Import containers

All import containers are discharged from ships and then transferred to the container yard for stacking. FCL containers are basically delivered from the container yard directly to consignees through the gate office. Containers with consolidated cargoes (LCL containers) are moved to the designated shed (CFS, container freight station). Cargoes are unstuffed from the containers in the CFS, sorted, and then delivered. The empty containers are then stored at the container yard or transferred to the shipping companies' empty container depots located outside the terminal.

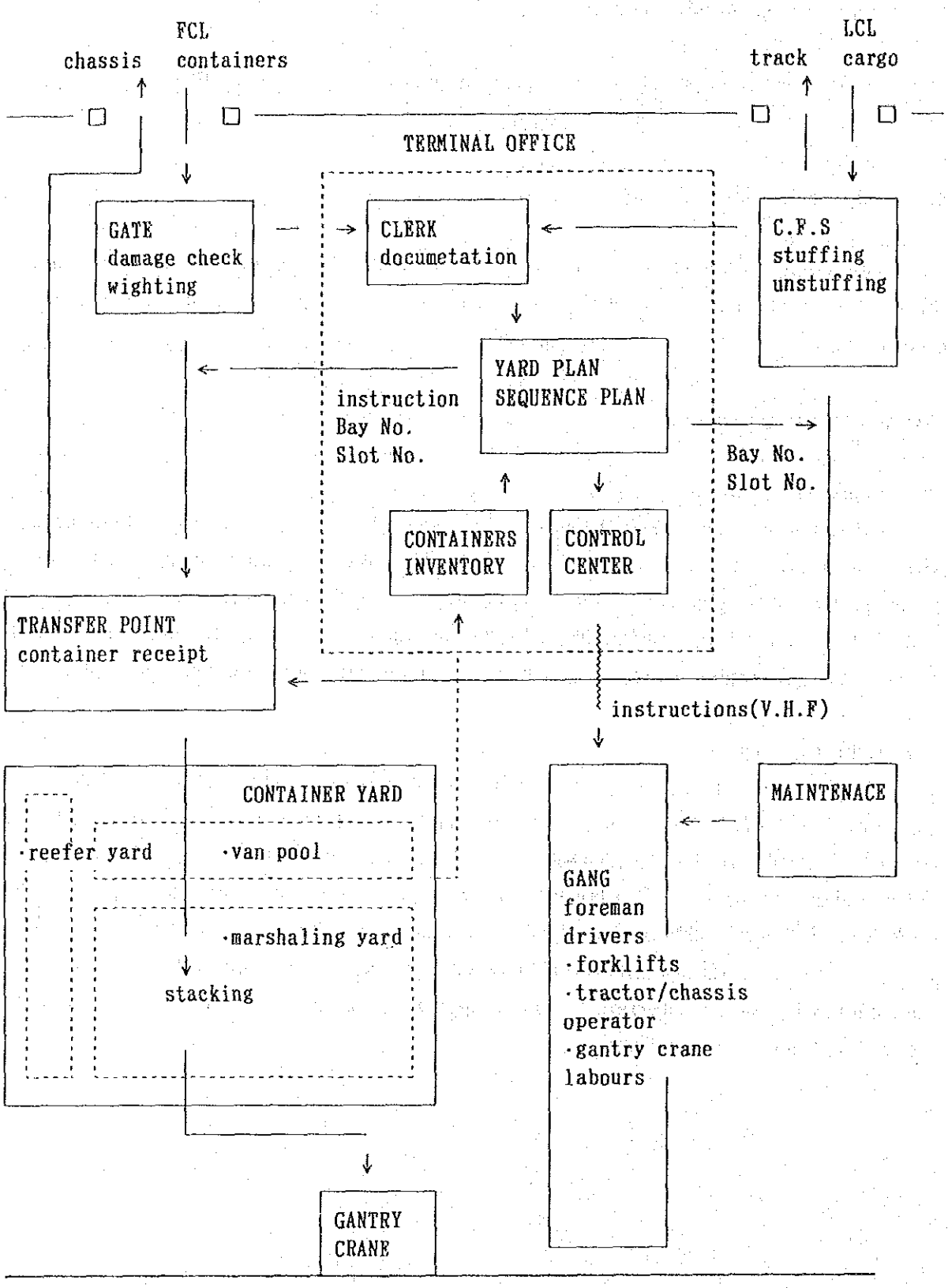


Fig. 4.3.1 Organization and Operation Flow in a Container Terminal (Export)

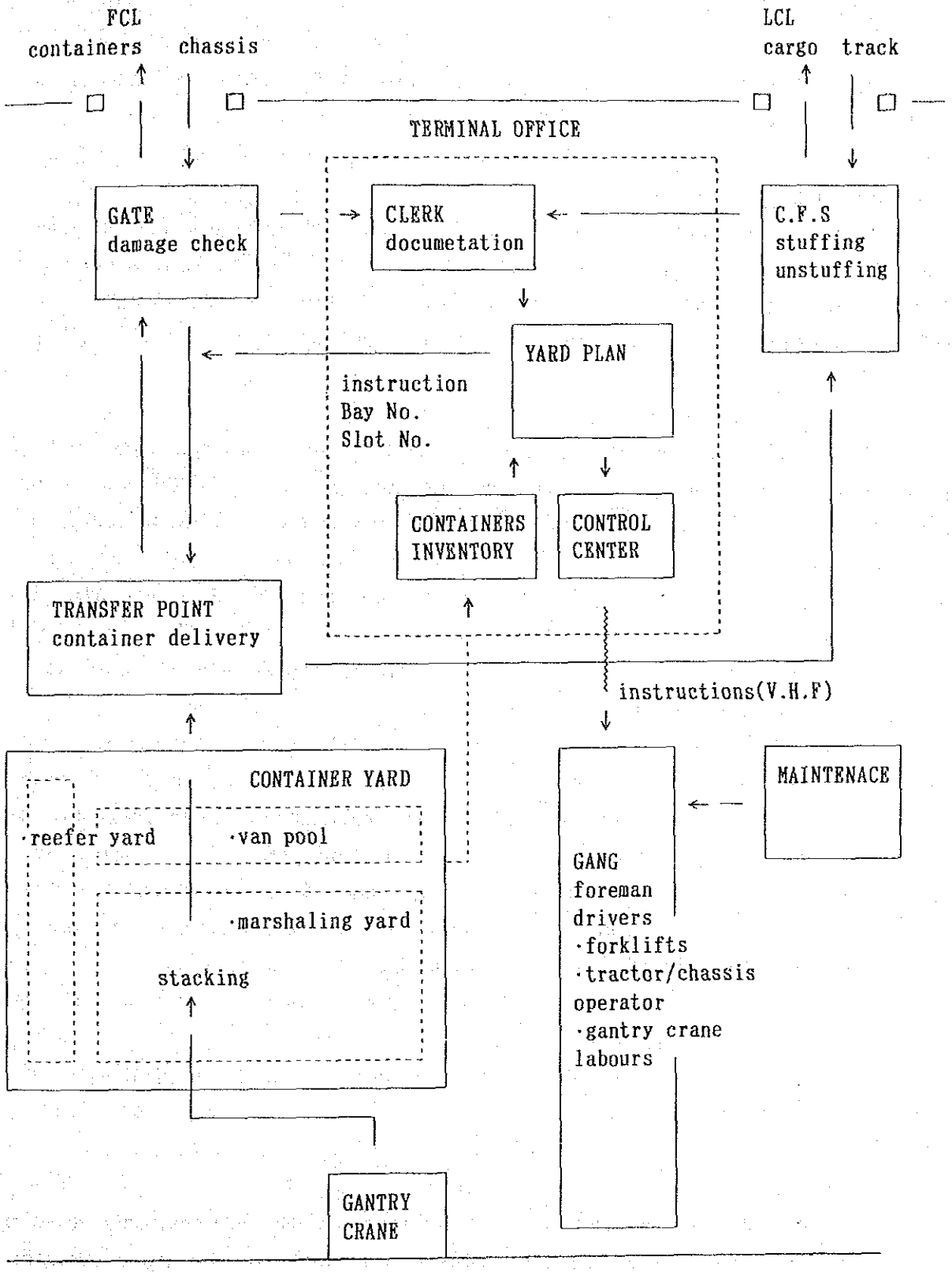


Fig. 4.3.2 Organization and Operation Flow in a Container Terminal (Import)

(2) Facilities and their Function

The roles of facilities and equipment shown in Fig.4.3.1 and Fig.4.3.2 are explained as follows.

1) Gate and Track Scale

In the gate, damage check of container van is done and weight of cargo loaded in container is taken by track scale. Also, the gate is usually the location for the transfer of legal responsibility between shipper/consignees and shipping companies.

2) Administration Office

A administration office building is usually built near the gate and it provides a center control room for the terminal and other office rooms for related companies. Also, it is better to have a lunchroom and rest rooms for workers.

3) Transfer Point

Transfer Point is the place where container is transferred to/from a trailer by a straddle carrier to stack or delivery.

4) Marshaling Yard and Van Pool

Stacking yard for containers which are unloaded or are waiting to be loaded to ships is called a marshaling yard. Van pool is a stacking yard especially for empty containers and usually it means the yard which is located outside a container terminal. (Sometimes a container yard where empty containers are stacked is also called a van pool.)

5) Plug Receptacles for Reefer Containers

An are of the container yard called the reefer yard, is equipped with plug receptacles for reefer containers.

6) Gantry Cranes

Productivities of gantry cranes in a terminal depend not only on the ability of gantry cranes themselves but also on the ability of the crane operator. Development of well skilled operators is important in achieving maximum performance.

7) Container Freight Station (C.F.S.)

In a CFS, small lot cargoes (L.C.L cargoes) are receiving, delivering, storing, stuffing and unstuffing to/from containers. CFS usually has the shape of rectangle and one side is called a container side which is used by container tractor/trailers and another side is called a track side which is used by tracks to receive or deliver small lot cargoes.

8) Maintenance Shop/Area

For maintenance and repair of straddle carriers and other vehicles and equipment, small factory or space is provided in a terminal.

4.3.2 Terminal Operator

(1) Function of the Port Administration Body

Generally, a container terminal should be operated by single operator who has sufficiently skilled personnel and equipment to provide good service to port users. The CFS operator in the container terminal is expected to be the same as the container terminal operator.

As described in CHAPTER 13 of Part I, the port administration body should be simplified as a organization of the public sector of the port. Operations having a commercial character, such as tug service and cargo handling operation, should be separated from the port administration body. The port administration body simply owns land, infrastructure and superstructure such as gantry cranes, container yards and CFS, and those facilities will be leased to organizations such as stevedoring companies which own cargo handling equipment such as forklifts and execute cargo handling and storage operation. (see Table 4.3.1)

Therefore, it is recommended that the new container terminal be operated by a professional organization such as stevedoring company, and the port administration body only permits usage of the facilities in the terminal and receive revenue from the operator in the form of a facility usage charge.

Table 4.3.1 Ownership and Operation in a Container Terminal

Port Administration Body	Container Terminal Operator
(ownership) quay and apron container yard gantry cranes CFS other fixed assets	tractors, chassis and drivers forklifts and drivers crane operators other labour

(2) Operating Body of the Terminal

There are three organizations which can serve as the operator of the terminal, namely, EP, CNAN and GEMA.

As mentioned in CHAPTER 13 of Part I, in the early stages of containerization, semi container ships and small full container ships operated by various shipping companies will call on the ports instead of large full container mother ships operated by the major shipping companies. This kind of terminal should not be used as a exclusive berth but be used as a public berth. The new container terminal will be such a terminal.

Generally, a shipping company can become a terminal operator in order to handle their container cargo exclusively in the terminal, therefore, a public terminal which is expected to be used by various shipping companies is not suitable to be operated by a shipping company. Furthermore, to introduce competitive condition into port operations is needed in Algerian ports. Monopoly brings inefficiency and deterioration of the quality of service.

Therefore, it is better that an organization such as the GEMA becomes the operator of the new container terminals.

4.4 Multi Purpose Terminal Operation

In this section, operation of the multi purpose terminal which is newly planned in the Port of Algiers is studied.

4.4.1 Operation in the Terminal

This terminal is planed to be used as a multi purpose terminal until the year of 1999. After 2000, when the volume of container handling in the port reaches a sufficient level, the terminal will be used as the Container Terminal-2. Therefore, it will be temporarily used as a multi purpose terminal for three years.

The main policy of operation described in 4.1.3, specialization and reorganization, can also be applied to this terminal. The name, multi purpose, does not mean that all variety of cargoes need to be always handled in the terminal. It only means that the terminal can be used for a variety of purposes in accordance with the future demand at the port.

Therefore, in the terminal, some specific kind of cargoes or ships which regularly call the port should have a priority, as the same as with other terminals.

4.4.2 Operating Body

As mentioned before, this terminal will be operated as a multi purpose terminal temporarily for three years until the year 1999, and will handle general cargo, metal products and so on as one of the berths in the port. Therefore, the new company for cargo handling which is recommended in 4.1.3 (see Fig.4.1.7) and will operate cargo handling and storage in existence wharves should be considered as the operator of this terminal.

(1) Organization and Personnel

An example of the organization and number of employees required for the management and operation of the terminal is shown in Table 4.4.1. The organization is basically similar to the chart shown at Fig.4.1.7 and number of

employees is estimated based on the study of Japanese standards and some developing countries.

Table 4.4.1 Organization and Number of Employees for the Operation in the Multi Purpose Terminal

Divisions	Function	Number of Employees	Note
General Affairs	General affairs, Personnel, Accounting	5	
Instructions/ Coordination	Planning of cargo handling Cargo supervisors	5	
Cargo Handling	Loading/Unloading and Transporting of cargo	84	2 gang 2 shift
Cargo Storage	Cargo storage Preparing invoice	10	
Maintenance	Maintenance of vehicles and cargo handling equipments	10	
Total		114	

CHAPTER 5 ECONOMIC ANALYSIS

5.1 Purpose and Methodology of Economic Analysis

5.1.1 Purpose

The basic purpose of this chapter is to investigate the economic benefits as well as economic costs which will arise from the project, and to evaluate whether the net benefits exceed those which could be derived from other investment opportunities.

5.1.2 Methodology

An economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of this project (refer to A.4).

In estimating costs and benefits of the projects, those should be fixed quantitatively as much as possible. Then, "Economic Pricing" is applied after the removal of "Transfer Items" such as tax. "Economic Pricing" here means the appraisal of costs and benefits in terms of international prices (refer to A.5).

5.1.3 Prerequisites for the Economic Analysis

(1) Benefits of the Projects

The following benefits are considered to be brought about by the Short-term Development Plan for the study ports;

A. Savings in marine transportation costs such as ships' staying costs

B. Savings in land transportation costs

C. Contribution to the national economic development through modernization of the Port

D. Promotion of regional economic development through development of port related industries

E. Increased employment opportunities and incomes

F. Improvement of cargo handling safety and reduction of cargo damage

Realizing these benefits is indispensable for the promotion of the study ports and it will lead to the improvement of Algerian economic situation and

international status.

However some of the expected benefits cannot be evaluated in strictly monetary terms, so the benefit which can be evaluated monetarily, such as A and B, is considered in the cost-benefit analysis, and as for the other intangible benefits, only qualitative analysis is undertaken.

(2) Project Life

Taking account of the depreciation period of the main facilities, the period of calculation ("Project Life") in the economic analysis is assumed to be thirty years from the beginning of construction.

(3) Foreign Exchange Rate

The foreign exchange rate adopted for this analysis is ;

1DA = 5.99YEN as of November, 1991

5.2 The Port of Algiers

5.2.1 Focus of the Analysis

The following two projects are appraised separately:

- Terminal-2 Project; Construction of Terminal-2 including installation of gantry cranes of Terminal-1
- Cereal Terminal

5.2.2 Terminal-2 Project

(1) "Without" Case

In the without case, containers will be handled only at Terminal-1 without gantry cranes for containers until the terminal will be saturated. After the saturation at the terminal, it is assumed that a part of containers will be transported through the port of Djen Djen and these will be transported to the hinterland of the port of Algiers by land.

On the other hand, general cargoes will be handled only within the

existing berths, so consequently serious congestion is expected to occur.

(2) Cargo Volume by Ship Type

The cargo volume handled at the port of Algiers in target year was forecast in Chapter 8 of Part I. The cargo volume will increase after 1997 and the cargo volume by ship type in "with" and "without" cases are assumed as follows.

A. "With" case

Table 5.2.2.1 shows the cargo volume handled by general cargo vessels and container vessels at Terminal 1 and 2 after 1997. As mentioned in Chapter 1 of this part, the container cargo volume will exceed the handling capacity of Terminal 1 (169,000TEU) in 2000, after that, the excess volume will be handled at Terminal 2. However, that volume will also exceed the capacity of Terminal 2 (112,000TEU) in 2003, when the maximum capacity of Terminal 2 is assumed to be reached; the excess volume will be dealt with in the next phase project.

B. "Without" case

The cargo volume handled by general cargo vessels is the same as that of "with" case. As for the container cargo, the cargo volume will exceed the capacity of Terminal 1 in 1999, after that, the excess volume is assumed to be handled at the port of Djen Djen and transported to the hinterland of the port

Table 5.2.2.1 Distributed Cargo Volume Transported by General Cargo Vessels and Container Vessels (Terminal-2 Project)

	Container vessels(Unit:TEU)		G.C.vessels(Unit:tons)	
	With	Without (Deviation)	General C.	Ro-Ro
1997	123,000	123,000	880,000	430,000
1998	145,000	145,000	876,000	427,000
1999	169,000	145,000 (24,000)	869,000	421,000
2000	196,000	145,000 (51,000)	-	-
2001	224,000	145,000 (79,000)	-	-
2002	254,000	145,000 (109,000)	-	-
2003-	281,000	145,000 (136,000)	-	-

of Algiers by land as mentioned above.

(3) Benefits

1) Savings in Marine Transportation Costs

If the increased volume of cargo were to be handled only by the existing

facilities, then the number of ships waiting for berth space would increase to the point where port congestion would become a serious problem.

Implementing the project will avert this problem, namely it will reduce the staying time of ships that is the time waiting for berth space and handling cargo, and this ships' cost reduction is a benefit of the project. This benefit can be calculated by multiplying difference in ships' staying time between both cases by ships' staying costs (per unit time).

However, as for the common carriers such as container vessels and general cargo vessels, this reduction of costs may primarily benefit ship operators and all of them can not be attributed to Algeria. Considering that Algerian fleet, such as CNAN, will carry 50% of all general cargo and that about 50% of the benefit attributed to foreign ship operators is assumed to return to Algeria over time through the market mechanism of world shipping, the total benefits to Algeria can be estimated at 75% (50% + 50% x 1/2) of savings in costs of container and general cargo vessels.

A. Difference in Staying Time

The average waiting period is estimated by the results of a computer simulation in accordance with the Queuing Theory.

B. Ships' Staying Costs

"Staying Costs" are ship costs incurred while a vessel is within the port. The method of calculating staying costs involves determining the economic cost per day of each individual item such as labor, depreciation costs, fuel, etc., and adding these costs together.

C. Savings in Marine Transportation Costs

Savings in marine transportation costs are estimated from A and B, as shown in Table 5.2.2.2, and the details are shown in Table A.3.1.

Table 5.2.2.2 Saving in Marine Transportation Costs
(Terminal-2 Project)

		1997	1998	1999	2000	2001	2002	2003-
Container	Cargo volume (TEU)	123,000	145,000	169,000	196,000	224,000	254,000	281,000
vessels	Number of vessels	128	151	176	205	233	264	293
(ship size)	Ships' staying costs							
6500dwt	per day (000DA)	170 - 457	170 - 457	170 - 457	170 - 457	170 - 457	170 - 457	170 - 457
-22000dwt	Benefit(000DA)	133,789	143,395	131,678	131,678	127,616	99,397	54,628
General C.	Cargo volume (Ton)	1,310,000	1,303,000	1,290,000	-	-	-	-
vessels	Number of vessels	831	626	818	-	-	-	-
(ship size)	Ships' staying costs	g.c.: 92	g.c.: 92	g.c.: 92	-	-	-	-
g.c.:3800gt	per day (000DA)	RoRo: 90	RoRo: 90	RoRo: 90	-	-	-	-
RoRo:3500gt	Benefit(000DA)	225,298	184,114	163,048	-	-	-	-
Total Benefit (000DA)		359,087	327,509	294,725	131,678	127,616	99,397	54,628

2) Savings in Land Transportation Costs

As mentioned previously, under the "without" case, Terminal 1 will be saturated in 1999, so after that, the excess volume is assumed to be handled at the port of Djen Djen and transported to the hinterland of the port of Algiers by land. Therefore, the savings in land transportation costs in the "without" case can be considered as one of the benefits of the project.

A. Cargo Volume for Transportation under the "Without" Case

The volume of container cargo which deviates to the port of Djen Djen under the "without" case is shown in Table 5.2.2.3.

Table 5.2.2.3 The Volume of Container Cargo Deviated to the Port Djen Djen

	1999	2000	2001	2002	2003-
Cntainer cargo Volume (TEU)	24,000	51,000	79,000	109,000	136,000

B. Calculation of Land Transportation Costs in Economic Prices

The unit cost of land transportation is calculated by estimating component costs, such as depreciation, labour, maintenance, fuel, insurance and so on, in economic price. Considering that the road distance between the port of Djen Djen and the hinterland of the port of Algiers is about 560 km, the unit cost of land transportation is estimated as 7,704 DA (the details are as shown in Table A.3.2). The benefit from savings in land transportation costs can be obtained by multiplying the above unit cost by cargo volume. The results are shown in Table 5.2.2.4.

Table 5.2.2.4 Saving in Land Transportation Costs

Year	Cargo Volume (TEUs)	Benefit ('000 YEN)	('000 DA)
1999	24,000	1,107,480	184,888
2000	51,000	2,353,395	392,887
2001	79,000	3,645,455	608,590
2002	109,000	5,029,805	839,700
2003	136,000	6,275,720	1,047,699
⋮	⋮	⋮	⋮
2022	136,000	6,275,720	1,047,699

3) Investment Costs for Deviation Port

Under the "without" case, Djen Djen port is utilized as the deviation port from the port of Algiers. So, investment and maintenance costs for the port of Djen Djen to handle container cargoes, such as construction of container yard

and access road, provision of handling equipment and so on, should be calculated as a benefit of the project. These costs on the port of Djen Djen is shown in Table A.3.4.

4) Other Intangible Benefits

A. Development of Port Related Industries

Without the implementation of the development project, the port of Algiers will be operating at a capacity that simply maintains the existing cargo flow. Industries in the hinterland require the development of the port as a prerequisite to their smooth operations. There fore the value added by such industries is an economic benefit of this project.

Also, the development of the port contributes to the improvement of the distribution mechanism and to the activation of industries in the hinterland.

B. Increase in Employment Opportunities

As for the additional employment arising from the project, employment for construction during the construction period and for operation after the facilities are completed are considered.

The rate of unemployment is estimated as pretty high level of 18% in Algeria, and there is excess supply of unskilled labour in the region, and the construction will provide employment for those people who would remain unemployed if the project does not take place. This employment is one of the major benefits of the project. The increase in employment opportunities is estimated as 258,000 person days for skilled labour and 230,000 person days for unskilled labour.

The increase of stevedoring needed to additional cargoes which will pass through the port due to the construction of new terminal is also considered as a benefit of the project.

Also with the activation of port related industries, employment opportunities for the local population are expected to increase.

C. Improvement of Cargo Handling Safety and Reduction of Cargo Damage

The existing yards are too narrow for safe and efficient cargo handling. Furthermore, there are no sufficient back-up facilities (warehouses, transit sheds, etc.). It is very difficult to assess the benefits of increased safety and reduction of damage in cargo handling in monetary terms. However, by construction of the new terminal and related facilities, safe cargo handling will be ensured, and the cargo damage that seems to be seriously occurred will be fairly reduced.

(4) Costs

The cost items of the project are: construction costs, maintenance costs, replacement costs and residual values.

1) Construction Costs

Construction costs are estimated in Chapter 1 of this part, and Table A.3.6 shows construction costs of the project to be analyzed, divided into local and foreign currency portions at market prices.

2) Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of the original construction costs excluding the costs of dredging and reclamation costs.

Annual maintenance costs are 41.707 million DA at market prices (the details are as shown in Table A.3.3).

3) Replacement Investment Costs and Residual Values

As for handling equipment, replacement costs should be considered at the end of depreciation. Also, residual values should be considered as a negative cost in the final year of the project.

(5) Economic Prices

1) Methodology

Methodology of economic pricing and applying conversion factors are as mentioned in A.5.

2) Economic Prices of Benefit Items

The savings in marine and land transportation cost is calculated at international prices, so this figure does not have to be converted for economic analysis. As for the costs of the deviation port, they are converted to economic prices as shown in Table A.3.5.

3) Economic Prices of Cost Items

A. Construction Costs

The costs mentioned in 5.2.2. (4) 1) are shown at market prices. In the economic analysis, these costs have to be divided into foreign currency portions,

non-traded goods, skilled labour and unskilled labour after exclusion of tax.

Since the foreign currency portions are shown in CIF prices, they do not need to be converted into economic prices. Economic prices of nontraded goods are calculated by multiplying the SCF, and the local labour costs are converted into economic prices by using the respective conversion factors mentioned previously.

Table A.3.7 shows the conversion into the economic prices of construction costs and Table A.3.8 shows its disbursement schedule.

B. Maintenance Costs

Since the maintenance costs include various indefinite elements, they are converted into economic prices by multiplying the SCF.

Annual maintenance costs are 38.162 million DA at economic prices (refer to Table A.3.3).

(6) Economic Profitability

1) Calculation and Assessment of the Economic Internal Rate of Return

Table 5.2.2.5 shows the flow of costs and benefits calculated using economic prices. The EIRR of Terminal-2 Project is calculated as 20.7%.

It is generally considered that a project with an EIRR of more than around 10% is economically feasible. For this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR is fairly high. Therefore this project is considered economically feasible.

2) Sensitivity Analysis

A. Identification of Cases

The various uncertain factors may enter in the appraisal of the project when estimating costs and benefits. Therefore, sensitivity tests are made to see if the project is justifiable when some of these factors are varied. In this study, three tests are made as sensitivity analysis, which are:

a. Case when costs increase by 10%

b. Case when benefits decrease by 10%

c. Case when costs increase by 10% and benefits decrease by 10%

B. Result of the Sensitivity Analysis

The result of the sensitivity analysis is presented in Table 5.2.2.6. Even in the case of c in which EIRR is minimized, it clearly exceed 17%.

When we consider these EIRRs as well as the various intangible benefits which cannot be quantified, we conclude that Terminal-2 Project for the port of

Table 5.2.2.5 Cost/Benefit Analysis (Port of Algiers, Terminal-2 project)

(Unit: 000DA)

	Year	Cost					Benefit				Benefit - Cost	Net Present Value (NPV)		
		Construction	Maintenance	Replacement Investment	Residual Value	Total	Savings in Marine Transportation Cost	Savings in Land Transportation Cost	Investment on Deviation Port	Total		Benefit	Cost	Benefit - Cost
1	1993	881,556	0	0	0	881,556	0	0	0	0	-881,556	0	881,556	-881,556
2	1994	565,244	0	0	0	565,244	0	0	0	0	-565,244	0	468,290	-468,290
3	1995	676,973	0	0	0	676,973	0	0	0	0	-676,973	0	464,654	-464,654
4	1996	1,174,100	0	0	0	1,174,100	0	0	0	0	-1,174,100	0	667,640	-667,640
5	1997	0	38,162	0	0	38,162	359,087	184,888	17,263	561,237	523,076	264,401	17,978	246,423
6	1998	0	38,162	0	0	38,162	327,509	392,887	154,128	874,524	836,362	341,325	14,895	326,430
7	1999	0	38,162	0	0	38,162	294,725	608,590	2,823	906,138	867,977	293,001	12,340	280,662
8	2000	0	38,162	0	0	38,162	131,678	839,700	2,823	974,201	936,039	260,977	10,223	250,754
9	2001	0	38,162	0	0	38,162	127,616	1,047,699	2,823	1,178,139	1,139,977	261,475	8,470	253,005
10	2002	0	38,162	0	0	38,162	99,397	1,047,699	2,823	1,149,920	1,111,758	211,437	7,017	204,420
11	2003	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	168,350	5,813	162,537
12	2004	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	139,474	4,816	134,658
13	2005	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	115,550	3,990	111,560
14	2006	0	38,162	43,582	0	81,744	54,628	1,047,699	2,823	1,105,151	1,023,407	95,731	7,081	88,650
15	2007	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	79,310	2,739	76,572
16	2008	0	38,162	0	0	38,162	54,628	1,047,699	46,405	1,148,733	1,110,571	68,298	2,269	66,029
17	2009	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	54,436	1,880	52,557
18	2010	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	45,099	1,557	43,542
19	2011	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	37,363	1,290	36,073
20	2012	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	30,955	1,069	29,886
21	2013	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	25,645	886	24,760
22	2014	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	21,246	734	20,513
23	2015	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	17,602	608	16,994
24	2016	0	38,162	411,664	0	449,826	54,628	1,047,699	2,823	1,105,151	655,325	14,583	5,936	8,647
25	2017	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	12,082	417	11,664
26	2018	0	38,162	0	0	38,162	54,628	1,047,699	46,405	1,148,733	1,110,571	10,404	346	10,058
27	2019	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	8,292	286	8,006
28	2020	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	6,870	237	6,633
29	2021	0	38,162	0	0	38,162	54,628	1,047,699	2,823	1,105,151	1,066,989	5,692	197	5,495
30	2022	0	38,162	0	-275,090	-236,928	54,628	1,047,699	-23,326	1,079,001	1,315,930	4,604	-1,011	5,615
	Total	3,297,873	992,210	455,246	-275,090	4,470,239	2,432,578	25,075,455	300,154	27,808,187	23,337,948	2,594,202	2,594,202	-0

EIRR= 0.20704

Algiers is unquestionably feasible from an economic viewpoint.

Table 5.2.2.6 Results of the Sensitivity Analysis (Terminal-2 Project)

	Original Case	Case a.	Case b.	Case c.
EIRR	20.7%	19.2%	19.1%	17.7%

5.2.3 Cereal Terminal Project

(1) "Without" case

In the without case, cereal must be handled at Quay No.33-3 in addition to Quay No.33-1, 35-1 and 35-3 with existing silos (storage capacity 30,000t) and existing handling equipments due to low handling productivity. Consequently serious congestion is expected to occur with cereal vessels.

Moreover, in the without case, steel products and wood must be handled only with in three berths, namely Quay No. 18-1, 19, 20-1 instead of four berths including Quay No.33-3, allocated in the with case, consequently longer ship waiting times are expected than the with case.

(2) Cargo Volume by Ship Type

The cereal cargo volume handled at the port of Algiers is the same for both "with" and "without" case as shown in Table 5.2.3.1. The volume will exceed the handling capacity of "with" case in 2000, so after that, cereal cargo volume is assumed to be fixed with that in 1999, and the excess volume will be dealt with in the next phase project.

Table 5.2.3.1 Distributed Cargo Volume Transported by Cereal Vessels and G.C. Vesels

Unit: Tons

	Cereal Vessels	General Cargo vessels	
		Wood	Steel P.
1997	2,000,000	267,000	338,000
1998	2,200,000	273,000	354,000
1999-	2,300,000	279,000	371,000

(3) Benefits

1) Savings in Ships' Staying Costs

Savings in ships' staying costs is shown in Table 5.2.3.2, and the details are shown in Table A.3.9.

Table 5.2.3.2 Savings in Ships' Staying Costs
(Cereal Terminal Project)

		1997	1998	1999
Cereal vessels	Cargo volume (Ton)	2,000,000	2,200,000	2,300,000
(ship size)	Number of vessels	87	96	100
28000dwt	Ships' staying costs per day (000DA)	176	176	176
	Benefit(000DA)	182,113	253,659	391,692
General C.	Cargo volume (Ton)	605,000	627,000	650,000
(ship size)	Number of vessels	124	129	134
Wood:12000gt	Ships' staying costs per day (000DA)	Wood: 162 Steel:102	Wood: 162 Steel:102	Wood: 162 Steel:102
Steel:5000gt	Benefit(000DA)	7,755	18,135	20,516
Total Benefit (000DA)		189,868	271,794	412,208

2) Other Intangible Benefits

A. Increase in Employment Opportunities

There is excess supply of unskilled labour in the region as mentioned previously, and the construction will provide employment for those people who would remain unemployed if the project does not take place. The increase in employment opportunities is estimated as 102,000 person days for skilled labour and 105,000 person days for unskilled labour.

(4) Costs

The cost items of the project are: construction costs, maintenance costs, replacement costs and residual values.

1) Construction Costs

Construction costs are estimated in Chapter 1 of this part, and Table A.3.6 shows construction costs of the project to be analyzed, divided into local and foreign currency portions at market prices.

2) Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of the original construction costs.

Annual maintenance costs are 27.310 million DA at market prices. (the details are as shown in Table A.3.3).

3) Replacement Investment Costs and Residual Values

As for handling equipment, replacement costs should be considered at the

end of depreciation. Also, residual values should be considered as a negative cost in the final year of the project.

(5) Economic Prices

1) Methodology

Methodology of economic pricing and applying conversion factors are as mentioned in A.5.

2) Economic Prices of Benefit Items

The savings in ships' staying cost is calculated at international prices, so this figure does not have to be converted for economic analysis.

3) Economic Prices of Cost Items

A. Construction Costs

The costs mentioned in 5.2.3 (4) 1) are shown at market prices. In the economic analysis, these costs have to be converted into the economic prices as mentioned in 5.2.2 (5) 3).

Table A.3.7 shows the conversion into the economic prices of construction costs and Table A.3.8 shows its disbursement schedule.

B. Maintenance Costs

Since the maintenance costs include various indefinite elements, they are converted into economic prices by multiplying the SCF.

Annual maintenance costs are 24.989 million DA at economic prices (refer to Table A.3.3).

(6) Economic Profitability

1) Calculation and Assessment of the Economic Internal Rate of Return

Table 5.2.3.3 shows the flow of costs and benefits calculated using economic prices. The EIRR of Cereal Terminal Project is calculated as 16.7%.

As mentioned in 5.2.2 (6), it is generally considered that a project with an EIRR of more than around 10% is economically feasible. For this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR is fairly high. Therefore this project is considered economically feasible.

Table 5.2.3.3 Cost/Benefit Analysis (Port of Algiers, Cereal Terminal Project)

(Unit: 000DA)

	Year	Cost					Benefit	Benefit - Cost	Net Present Value (NPV)		
		Construction	Maintenance	Replacement Investment	Residual Value	Total	Savings in Ship's Staying Costs		Benefit	Cost	Benefit - Cost
1	1993	33,680	0	0	0	33,680	0	-33,680	0	33,680	-33,680
2	1994	419,082	0	0	0	419,082	0	-419,082	0	359,163	-359,163
3	1995	693,793	0	0	0	693,793	0	-693,793	0	509,582	-509,582
4	1996	520,236	0	0	0	520,236	0	-520,236	0	327,474	-327,474
5	1997	0	24,989	0	0	24,989	189,868	164,879	102,428	13,481	88,948
6	1998	0	24,989	0	0	24,989	271,794	246,805	125,661	11,553	114,108
7	1999	0	24,989	0	0	24,989	412,208	387,219	163,332	9,901	153,430
8	2000	0	24,989	0	0	24,989	412,208	387,219	139,979	8,486	131,493
9	2001	0	24,989	0	0	24,989	412,208	387,219	119,965	7,272	112,693
10	2002	0	24,989	0	0	24,989	412,208	387,219	102,813	6,233	96,580
11	2003	0	24,989	0	0	24,989	412,208	387,219	88,113	5,342	82,771
12	2004	0	24,989	0	0	24,989	412,208	387,219	75,515	4,578	70,937
13	2005	0	24,989	0	0	24,989	412,208	387,219	64,718	3,923	60,795
14	2006	0	24,989	0	0	24,989	412,208	387,219	55,465	3,362	52,102
15	2007	0	24,989	0	0	24,989	412,208	387,219	47,535	2,882	44,653
16	2008	0	24,989	0	0	24,989	412,208	387,219	40,738	2,470	38,269
17	2009	0	24,989	0	0	24,989	412,208	387,219	34,914	2,117	32,797
18	2010	0	24,989	0	0	24,989	412,208	387,219	29,922	1,814	28,108
19	2011	0	24,989	334,854	0	359,843	412,208	52,365	25,644	22,386	3,258
20	2012	0	24,989	0	0	24,989	412,208	387,219	21,977	1,332	20,645
21	2013	0	24,989	0	0	24,989	412,208	387,219	18,835	1,142	17,693
22	2014	0	24,989	0	0	24,989	412,208	387,219	16,142	979	15,163
23	2015	0	24,989	0	0	24,989	412,208	387,219	13,834	839	12,995
24	2016	0	24,989	0	0	24,989	412,208	387,219	11,856	719	11,137
25	2017	0	24,989	0	0	24,989	412,208	387,219	10,161	616	9,545
26	2018	0	24,989	0	0	24,989	412,208	387,219	8,708	528	8,180
27	2019	0	24,989	0	0	24,989	412,208	387,219	7,463	452	7,011
28	2020	0	24,989	0	0	24,989	412,208	387,219	6,396	388	6,008
29	2021	0	24,989	0	0	24,989	412,208	387,219	5,482	332	5,149
30	2022	0	24,989	0	-89,294	-64,306	412,208	476,514	4,698	-733	5,431
	Total	1,666,790	649,705	334,854	-89,294	2,562,055	10,354,653	7,792,598	1,342,291	1,342,291	-0

EIRR= 0.16683

2) Sensitivity Analysis

A. Identification of Cases

As mentioned in 5.2.2 (6) 2), sensitivity tests should be made to see if the project is justifiable. In this study, three tests are made as sensitivity analysis, which are:

a. Case when costs increase by 10%

b. Case when benefits decrease by 10%

c. Case when costs increase by 10% and benefits decrease by 10%

B. Result of the Sensitivity Analysis

The result of the sensitivity analysis is presented in Table 5.2.3.4. Even in the case of c in which EIRR is minimized, it clearly exceed 13%.

When we consider these EIRRs as well as the various intangible benefits which cannot be quantified, we conclude that Cereal Terminal Project for the port of Algiers is unquestionably feasible from an economic viewpoint.

Table 5.2.3.4 Results of the Sensitivity Analysis (Cereal Terminal Project)

	Original Case	Case a.	Case b.	Case c.
EIRR	16.7%	15.2%	15.1%	13.7%

5.3 The Port of Oran

(1) Focus of the Analysis

The New Terminal Project including cereal silo is analyzed.

(2) "Without" case

In the without case, construction of New Terminal and new silos (storage capacity 35,000t) is not carried out, so the berth with a depth of 12 meters is only No.12 berth.

All of cereal carriers must berth first at Quay No.12, since the quay is only deep-water berth of 12 meters deep.

Nineteen cereal carriers laden with 25,000 tons will unload all of them in their holds, totaling 600,000 tons. The volume will be once stored in the existing silos. The remainder of cereal carriers will unload only 7,000 tons and then will be shifted to the other berth within the port or other ports such as Gazaouet with shallower water depths to unload the rest of cereals namely 18,000 tons each. Such operations will be necessary to receive the forecast volume of over 1,300,000 tons cereals.

(3) Volume of Cereal Cargo by Ship Type

The cargo volume handled at the port of Oran in target year was forecast in Chapter 8 of Part 1. The cargo volume will increase after 1997 and the volume of cereal cargo by ship type in "with" and "without" cases are assumed as follows.

A. "With" case

Table 5.3.1 shows the cargo volume handled by cereal vessels at No. 12 berth and New Terminal after 1997. As mentioned in Chapter 11 of Part 1, the cereal cargo volume will exceed the handling capacity of New Terminal in 2003, so after that, the volume is assumed to be fixed with that in 2002, and the excess volume will be dealt with in the next phase project.

B. "Without" case

The cereal cargo volume is the same as that of "with" case.

Table 5.3.1 Distributed Cargo Volume by ship

	Cargo Volume	With Case			Without Case		
		Unloading V. per ship	Number of ships	Mooring Berths	Unloading V. per ship	Number of ships	Mooring Berths
1997-2000	1,300,000	7,000	17	No.12	7,000	45	No.12
		25,000	19	No.12	18,000	28	Other B.
		35,000	20	New Termi.	25,000	19	No.12
2001	1,400,000	7,000	17	No.12	7,000	45	No.12
		25,000	19	No.12	18,000	28	Other B.
		35,000	23	New Termi.	25,000	23	No.12
2002-2022	1,500,000	7,000	17	No.12	7,000	45	No.12
		25,000	19	No.12	18,000	28	Other B.
		35,000	26	New Termi.	25,000	27	No.12

(4) Benefits

1) Savings in Ships' Staying Costs

Savings in ships' staying costs is shown in Table 5.3.2, and the details are shown in Table A.3.10.

Table 5.3.2 Savings in Ships' Staying Costs

			1997-2000	2001	2002-
Cereal vessels (ship size) with: 32000dwt : 40000dwt without: 32000dwt	Cargo volume (Ton)		1,300,000	1,400,000	1,500,000
	Number of vessels	with	56	59	62
		without	92	96	100
	Ships' staying costs per day (000DA)	with	189/203	189/203	189/203
		without	189	189	189
	Benefit(000DA)		164,263	165,395	189,635

2) Savings in Marine Transportation Costs by Increasing Ship Size

Marine transportation using larger sized ships can be realized by construction of New Terminal, so marine transportation cost can be saved as fewer ships will be required. The benefit from savings in transportation costs can be estimated as shown in Table 5.3.3.

Table 5.3.3 Savings in Marine Transpotation Costs by Increasing Ship Size

		Number of Ships	Ship cost per day (000DA)	Period of Navigation (Days)	Transport-ation Costs (000DA)
1997-2000	With Case	20	231	23	106,437
	Without C.	28	211	23	135,896
	Benefit				29,458
2001	With Case	23	231	23	121,643
	Without C.	32	211	23	155,310
	Benefit				33,667
2002-2022	With Case	26	231	23	136,848
	Without C.	36	211	23	174,723
	Benefit				37,875

3) Other Intangible Benefits

A. Increase in Employment Opportunities

There is excess supply of unskilled labour in the region as mentioned previously, and the construction will provide employment for those people who would remain unemployed if the project does not take place. The increase in employment opportunities is estimated as 68,000 person days for skilled labour and 74,000 person days for unskilled labour.

B. Improvement of Cargo Handling Safety and Reduction of Cargo Damage

The existing yards are too narrow for safe and efficient cargo handling. Furthermore, there are no sufficient back-up facilities. It is very difficult to assess the benefits of increased safety and reduction of damage in cargo handling in monetary terms. However, by construction of the new terminal and related facilities, safe cargo handling will be ensured, and the cargo damage that seems to be seriously occurred will be fairly reduced.

(5) Costs

The cost items of the project are: construction costs, maintenance costs, replacement costs and residual values.

1) Construction Costs

Construction costs are estimated in Chapter 2 of this part, and Table A.3.12 shows construction costs of the project to be analyzed, divided into local and foreign currency portions at market prices.

2) Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of the original construction costs excluding the costs of dredging and reclamation costs.

Annual maintenance costs are 12.570 million DA at market prices (the details are as shown in Table A.3.11).

3) Replacement Investment Costs and Residual Values

As for handling equipment, replacement costs should be considered at the end of depreciation. Also, residual values should be considered as a negative cost in the final year of the project.

(6) Economic Prices

1) Methodology

Methodology of economic pricing and applying conversion factors are as mentioned in A.5.

2) Economic Prices of Benefit Items

The savings in ships' staying cost and marine transportation costs are calculated at international prices, so this figure does not have to be converted for economic analysis.

3) Economic Prices of Cost Items

A. Construction Costs

The costs mentioned in 5.3 (5) 1) are shown at market prices. In the economic analysis, these costs have to be converted into the economic prices as mentioned in 5.2.2 (5) 3).

Table A.3.13 shows the conversion into the economic prices of construction costs and Table A.3.14 shows its disbursement schedule.

B. Maintenance Costs

Since the maintenance costs include various indefinite elements, they are converted into economic prices by multiplying the SCF.

Annual maintenance costs are 11.502 million DA at economic prices (refer to Table A.3.11).

(7) Economic Profitability

1) Calculation and Assessment of the Economic Internal Rate of Return

Table 5.3.4 shows the flow of costs and benefits calculated using economic prices. The EIRR of New Terminal Project is calculated as 18.4%.

As mentioned in 5.2.2 (6), it is generally considered that a project with an EIRR of more than around 10% is economically feasible. For this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR is fairly high. Therefore this project is considered economically feasible.

2) Sensitivity Analysis

A. Identification of Cases

As mentioned in 5.2.2 (6) 2), sensitivity tests should be made to see if the project is justifiable. In this study, three tests are made as sensitivity analysis, which are :

a. Case when costs increase by 10%

b. Case when benefits decrease by 10%

c. Case when costs increase by 10% and benefits decrease by 10%

B. Result of the Sensitivity Analysis

The result of the sensitivity analysis is presented in Table 5.3.5. Even in the case of c in which EIRR is minimized, it almost reaches 15%.

When we consider these EIRRs as well as the various intangible benefits which cannot be quantified, we conclude that the Short-term Development Project for the port of Oran is unquestionably feasible from an economic viewpoint.

Table 5.3.5 Results of the Sensitivity Analysis(Port of Oran)

	Original Case	Case a.	Case b.	Case c.
EIRR	18.4%	16.7%	16.5%	14.9%

Table 5.3.4 Cost/Benefit Analysis (Port of Oran)

(Unit: 000DA)

	Year	Cost					Benefit			Benefit - Cost	Net Present Value (NPV)		
		Construction	Maintenance	Replacement Investment	Residual Value	Total	Savings in Ship's Waiting Costs	Savings in Marine Transport Costs	Total		Benefit	Cost	Benefit - Cost
1	1993	22,464	0	0	0	22,464	0	0	0	-22,464	0	22,464	-22,464
2	1994	97,515	0	0	0	97,515	0	0	0	-97,515	0	82,382	-82,382
3	1995	320,721	0	0	0	320,721	0	0	0	-320,721	0	228,904	-228,904
4	1996	547,290	0	0	0	547,290	0	0	0	-547,290	0	329,995	-329,995
5	1997	0	11,502	0	0	11,502	164,263	29,458	193,721	182,220	98,680	5,859	92,822
6	1998	0	11,502	0	0	11,502	165,395	33,667	199,062	187,560	85,665	4,950	80,716
7	1999	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	82,714	4,182	78,533
8	2000	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	69,879	3,533	66,346
9	2001	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	59,035	2,984	56,050
10	2002	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	49,874	2,521	47,352
11	2003	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	42,134	2,130	40,004
12	2004	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	35,596	1,799	33,796
13	2005	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	30,072	1,520	28,552
14	2006	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	25,405	1,284	24,121
15	2007	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	21,463	1,085	20,378
16	2008	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	18,132	917	17,216
17	2009	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	15,318	774	14,544
18	2010	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	12,941	654	12,287
19	2011	0	11,502	152,449	0	163,951	189,635	37,875	227,510	63,560	10,933	7,879	3,054
20	2012	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	9,236	467	8,770
21	2013	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	7,803	394	7,409
22	2014	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	6,592	333	6,259
23	2015	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	5,569	282	5,288
24	2016	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	4,705	238	4,467
25	2017	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	3,975	201	3,774
26	2018	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	3,358	170	3,188
27	2019	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	2,837	143	2,694
28	2020	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	2,397	121	2,276
29	2021	0	11,502	0	0	11,502	189,635	37,875	227,510	216,009	2,025	102	1,922
30	2022	0	11,502	0	-40,653	-29,152	189,635	37,875	227,510	256,662	1,711	-219	1,930
	Total	987,989	299,039	152,449	-40,653	1,398,824	4,880,895	972,128	5,853,024	4,454,199	708,050	708,050	-0

EIRR= 0.18369

5.4 The Port of Annaba

As for the short-term development plan for the port of Annaba, every project should be carried out as soon as possible, needless to calculate EIRR.

In particular, regarding the proposed slant conveyor system for the raw sugar berth, the improvement of handling capacity will be remarkable in spite of the low cost, so it is needless to calculate the EIRR. This project is so efficient that it should be carried out as soon as possible.

Also, as for the repair work to the petroleum berth, it should be carried out too, as soon as possible.

CHAPTER 6 FINANCIAL ANALYSIS

6.1 Purpose of the Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the Short-Term Development Plan. The analysis focuses on the viability of the project itself and the financial soundness of the port management body during the project life.

6.2 Methodology of the Financial Analysis

6.2.1 Viability of the Project

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR (financial internal rate of return). The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula:

$$\sum_{i=1}^{n} \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

n : project life
Bi: revenues in the i-th year
Ci: costs in the i-th year
r : discount rate

Revenues and costs which are taken into account for the calculation of the FIRR are summarized as follows:

Revenues:

1) Port operating revenue
2) Residual value of the fixed assets at the end of the project life

Costs:

1) Investment cost including initial capital and rein vestment for renewal
2) Operating expense excluding depreciation and financial expense such as repayment of principal and interest on loans

When the calculated FIRR exceeds the weighted average interest rate of the total procured funds for the investments of the project, the project is regarded as financially feasible.

6.2.2 Financial Soundness of the Port Management Body

The financial soundness of the port management body is appraised based on projected financial statements (Income Statements, Cash Flow Statements and Balance Sheets). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

(1) Profitability

Rate of Return on Net Fixed Assets:

$$\frac{\text{Net Operating Income}}{\text{Total Fixed Assets}} \times 100\ (\%)$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is preferable to keep the rate higher than the average interest rate of the funds for the investments.

(2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$\frac{\text{Net Operating Income + Depreciation Cost}}{\text{Repayment of and Interest on Long-Term Loans}}$$

This indicator shows whether the operating income can cover the repayment of principal and interest on Long-term loans. It must be more than 1 and it is preferable that it is over 1.75.

(3) Operational Efficiency

Operating Ratio:

$$\frac{\text{Operating Expenditure}}{\text{Operating Revenue}} \times 100\ (\%)$$

Working Ratio:

$$\frac{\text{Operating Expenditure - Depreciation Cost}}{\text{Operating Revenue}} \times 100\ (\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port.

When the calculated operating ratios are less than 70 - 75%, and the working ratios are less than 50 - 60%, the operations are considered as being efficient.

6.3 General Prerequisites of the Financial Analysis

6.3.1 Scope of the Analysis

In Algeria, responsibility of port construction is shared by several governmental organizations. Construction of infrastructures such as breakwater, quay, seawall, dredging and reclamation are the responsibility of the Ministry of Equipment while the superstructures, such as transit shed, cargo handling equipment and so on, are the responsibility of the EPs. In addition, silos for cereals are constructed by the OAIC in the Port of Algiers, and by the EPs in the Port of Oran and Annaba.

Construction of infrastructures conducted by the MOE is not a project directly generating revenue. Therefore, the construction cost of infrastructures is assumed to be paid by tax as it is at present, and this cost is not included in the investment costs for the financial analysis. The costs for procurement of cargo handling equipment and construction cost of superstructures conducted mainly by the EPs and the OAIC can be paid by its operating revenues, therefore, such costs are included in the investment costs for the financial analysis. The projects and costs included for the financial analysis are as follows:

(1) Port of Algiers

Container Terminal 2 ... pavement, CFS, cargo handling equipment, railway yard
Container Terminal 1 ... container cranes
Cereal Terminal ... silos, pneumatic unloaders

(2) Port of Oran

Container Yard ... pavement

Cereal Facilities ... silos, belt conveyor, pneumatic unloaders

Ratio of the cost for infrastructures is around 55 % of the total cost for the short-term projects, and the ratio of the cost for superstructures, ect. is around 45 % of the cost for the short-term projects.

6.3.2 Project Life

Taking account of the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined to be 30 years, including 4 years for the construction of the facilities.

6.3.3 Base Year

For the estimation of costs, expenditures and revenues analyzed quantitatively here, constant prices at 1991 are predominantly used. Price inflation or increases in nominal wages during the project life are irrelevant in the analysis.

6.4 Financial Analysis of the Projects in the Port of Algiers

6.4.1 Projects

The projects of the Short-Term Plan for the Port of Algiers, which are listed in 6.3.1, are financially accessed.

6.4.2 Prerequisites for Revenue and Cost

(1) Cargo handling volume

The cargo handling volume is estimated based on the demand forecast. The volume is shown in Table 6.4.1. The cargo volume that can be handled in

the terminal will reach its limit in 1999 (container terminal 1), in 2003 (container terminal 2), and in 1999 (cereal terminal) respectively.

Table 6.4.1 Projected Cargo Volume (Containers and Cereals)

	1997	1998	1999	2000	2001	2002	2003
container terminal 1 (1,000TEU)	123	145	169	169	169	169	169
container terminal 2 (1,000TEU)				27	55	85	112
cereal terminal (1,000t)	1,400	1,600	1,700	1,700	1,700	1,700	1,700

(2) Port charge and revenue

The revenues from the port activities are calculated based on the present tariff system and on the cargo handling volume shown in Table 6.4.1. The actual rates of the tariff are summarized in Table 6.4.2 and Table 6.4.3.

Table 6.4.2 Present Port Tariff for Containers

Handling charge	ground	board	total
20' container (DA/t)	78	5	83
40' container (DA/t)	93	4	97
empty container(DA/unit)	48	22	70

Storage charge	staying days		
	1-15	16-25	26-35
import			
20' container (DA/unit/day)	24	30	36
40' container	35	43.75	52.5
export			
20' container (DA/unit/day)	12	12	12
40' container (DA/unit/day)	18	18	18

Table 6.4.3 Present port tariff for conventional cargo

Handling charge (DA/t)	package type	ground	board	total
import				
agricultural products and foodstuff	palette	53	22	75
metal products				
iron	bulk	60	26	86
nonferrous	bulk	60	26	86
minerals	sack	43	38	81
manufactured goods	palette	48	20	68
vehicles	unit	56	19	75
export				
manufactured goods	palette	48	20	68
vehicles	unit	56	19	75

Storage charge (DA/t/day)	transit tax		depot tax			
	yard	shed	yard		shed	
	1-3 days	1-3	4-15	16-25	4-15	16-25
imported cargo	1.36	3.09	0.94	1.41	1.45	2.17
exported cargo	1.36	3.09	0.94	1.41	1.45	2.17

(3) Costs for initial investments

The initial investments for the Short-Term projects are estimated in Chapter 1, and the costs which should be included in the financial analysis as a basic case are shown in Table 6.4.4.

(4) Reinvestment

The facilities and equipment will be renewed based on their service lives. The funds for reinvestment are assumed to be financed by a local bank or internal reserve of the port administration body.

Table 6.4.4 Investment Costs included in the Financial Analysis

(unit:1,000DA)

	1993	1994	1995	1996	Total
Container Terminal 2 superstructure(CFS) handling equipments pavement				168,638	168,638
Container Terminal 1 container cranes		592	21,697	398,344	420,633
Cereal Terminal	37,645	463,117	765,938	572,868	1,839,568
Metallic Material Berth	491				491
Railway Siding	1,555	40,337	17,046		58,938
Total	39,691	504,046	804,681	1,139,850	2,488,268

(5) Operating Expense

The annual operating expense for the new terminal and facilities are assumed as follows:

1) personnel

The annual personnel expense are estimated based on the required number of workers and existing pay scales. Number of workers are listed in Table 6.4.5 and personnel expense per person including the cost of social benefit is calculated at 128,000 DA/year.

Table 6.4.5 Required Number of Workers

(persons)

	administ-ration	cargo handling		mainte-nance
		conventional	container	
Container terminal 2	7.6	114	221	
Container terminal 1				2
Cereal terminal	3			3
Total	10.6	114	221	5

note: number of workers for cargo handling includes workers for maintenance of handling equipment.

2) Maintenance and repair

The annual maintenance and repair costs for the port facilities are calculated as follows:

superstructure(CFS): 1 % of the original construction cost

cargo handling equipment: 2 % of the original procurement cost

infrastructure: 0.5 % of the original construction cost

3) Other expenditure

To provide other expenditure such as cost for fuel and general administration, 0.58 % of the total operating revenue is included to the operating expense.

4) Taxes

Taxes imposed on the payment of salaries and wages (6%), and imposed on port operating revenue (2.55%) are also included in the operating expense.

5) Depreciation costs

The annual depreciation costs of the port facilities and equipment are calculated by the straight line method based on their service lives.

(6) Income tax

Income tax is calculated as follows:

(operating revenue - operating expense - loan interest) x 60 %

6.4.3 Fund Raising

In Algeria, interest rate of local funds is around 18 - 22 %. Under such circumstances, almost all projects are judged as being not feasible. Low interest rates are required for implementation of the projects.

Thus, the foreign portion of the project costs is assumed to be raised by soft loans from abroad and conditions are assumed as follows:

Soft Loan

Loan period : 25 years

Grace period: 7 years

Interest rate: 3 %

(Note) These conditions are quoted from the current conditions of the OECF(Japan).

The local portion of the project costs is assumed to be raised by loans from domestic banks, and the conditions are assumed as follows:

Loan period : 20 years
Grace period: 0 years
Interest rate: 20 %
(Note) These conditions are quoted from the current conditions of the BAD (Bank of Algeria for Development).

6.4.4 Appraisal of the Projects

(1) Analyzed pattern

The calculation of the FIRR is examined on the following projects respectively to clarify the viability of each project.

1) container terminal 2
2) container terminal 1
3) cereal terminal

Furthermore, at each project, some additional cases are studied to compare FIRR under the different prerequisites.

(2) Results of the FIRR calculation

The results are shown in Table 6.4.7.

1) Container Terminal 2

In case 1-1, FIRR is calculated under the prerequisites mentioned in 6.3.1, and the result is 12.51 % under the current tariff level.

Cases 1-2 and 1-3 are studied to ascertain the level of the FIRR when construction costs for infrastructures are included in the analysis. Case 1-2 shows that the FIRR will be 7.29 % when the construction cost for quay is included in the analysis and the tariff level is increased by 10%. In case 1-3, seawall construction cost is also included in the analysis, and the FIRR is down to 3.49 % under the 10% increased tariff level.

Table 6.4.7 Projects and FIRR

PORT OF ALGIERS

Container Terminal 2

	case 1-1		case 1-2		case 1-3	
	facilities	FIRR (%)	facilities	FIRR (%)	facilities	FIRR (%)
project and FIRR	super handling equipment C.F.S. infra railway pavement	12.51	super handling equipment C.F.S. infra railway pavement quay	7.29	super handling equipment C.F.S. infra railway pavement quay seawall	3.49
infrastructure (government)	main breakwater sub breakwater dredging reclamation seawall quay		main breakwater sub breakwater dredging reclamation seawall		main breakwater sub breakwater dredging reclamation	
note	tariff current level		tariff 10% up		tariff 10% up	

Container Terminal 1

	case 2-1		case 2-2		case 2-3	
	facilities	FIRR (%)	facilities	FIRR (%)	facilities	FIRR (%)
project and FIRR	super gantry cranes infra	12.42	super gantry cranes infra	6.42	super gantry cranes infra foundation	5.80
infrastructure (government)	foundation		foundation			
note	tariff 10,000 DA/houresa		tariff 7,000 DA/houres		tariff 7,000 DA/houres	

Cereal Terminal

	case 3-1		case 3-2		case 3-3	
	facilities	FIRR (%)	facilities	FIRR (%)	facilities	FIRR (%)
project and FIRR	silos pneumatic unloader x2	11.81	silos pneumatic unloader x2	6.81	silos pneumatic unloader x2	2.55
note	tariff 187.2 DA/t (140% up)		tariff 113 DA/t (45% up)		tariff 78 DA/t	

	case 4-1	
	combination	FIRR (%)
Combination of the projects	case 1-1, 2-3, 3-1	11.14

2) Container Terminal 1

In case 2-1, assumption of a new tariff for usage of the container cranes is needed for calculation of the FIRR. When the tariff is assumed at 10,000 DA/hours, the FIRR of this investment will be 12.42 %.

In case 2-2, when the tariff for crane usage is assumed at the more competitive level of 7,000 DA/hour, the FIRR decreases to 6.42 %.

In case 2-3 shows that the FIRR will decrease to 5.80 % when the construction cost for foundation of the cranes is additionally included in the analysis under the tariff of 7,000 DA/hour.

3) Cereal Terminal

In case 3-1, a tariff for usage of cereal facilities, such as silos and pneumatic unloaders, needs to be set for the calculation of the FIRR. When the tariff for usage of the new cereal facilities including all facilities and equipment such as unloader, belt conveyer and silo etc is established at around 190 DA/t, FIRR of this investment will reach 11.81 %.

In case 3-2, when the tariff for usage of the facilities is established at the level of 120 DA/t, FIRR will decrease to 6.01 %.

In case 3-3, when the tariff is established at the level of about 80 DA/t, which is considered as the minimum level of the tariff according to the cost calculation, FIRR decreases to 2.55 %.

(3) Appraisal

In Table 6.4.8, weighted average interest rate of the funds is shown according to the above mentioned nine cases.

By comparing the data, cases 1-1, 2-1, 2-2, 2-3 and 3-1 exceed the weighted average interest rates. This means that those cases are considered financially feasible under the assumed fund raising plans. Among cases 2-1, 2-2 and 2-3, it is considered that the case 2-3 is the most favorable because of its tariff level.

Table 6.4.8 Average Interest Rate

interset rate of foreign loans 3 %
local loans 20 %

	case -1	case -2	case -3
container terminal 2	9.20 %	9.46 %	8.78 %
container terminal 1	5.25 %	5.25 %	5.48 %
cereal terminal	7.56 %	7.56 %	7.56 %

Table 6.4.9 Average Interest Rate

	Foreign Loan	Domestic Loan	Total
projects total	3 % (69.94 %)	20 % (30.06 %)	8.11 % (100.00 %)

(4) Conclusion

In conclusion, the combination of the projects, case 4-1 (composed of cases 1-1, 2-3 and 3-1) is judged to be financially feasible. Therefore, case 4-1 is recommended as the base case. In Table 6.4.11, FIRR calculation for case 4-1 is shown.

Table 6.4.11 FIRR CALCULATION

FIRR= 11.14%

Case:ALGER Base

Asumption

Construction =	100
Cargo Volume =	100
Expense =	100
Tariff =	100

UNIT:1,000DA

YEAR	REVENUE	COST			REVENUE-COST		PRESENT VALUE IN 1993		
		INVESTMENT	EXPENSE	TOTAL			REVENUE	COST	DIFFERENCE
1993	0	39,691	0	39,691	-39,691	1	0	35,712	-35,712
1994	0	504,046	0	504,046	-504,046	2	0	408,046	-408,046
1995	0	804,681	0	804,681	-804,681	3	0	586,114	-586,114
1996	0	1,139,850	0	1,139,850	-1,139,850	4	0	747,008	-747,008
1997	310,670	0	47,512	47,512	263,158	5	183,188	28,016	155,172
1998	350,529	0	48,759	48,759	301,770	6	185,969	25,868	160,100
1999	373,544	0	49,480	49,480	324,064	7	178,311	23,619	154,692
2000	367,161	0	63,798	63,798	303,363	8	157,693	27,401	130,292
2001	387,548	0	64,436	64,436	323,112	9	149,761	24,900	124,861
2002	410,440	0	65,152	65,152	345,288	10	142,707	22,653	120,054
2003	429,262	0	65,741	65,741	363,521	11	134,288	20,566	113,722
2004	429,262	0	65,741	65,741	363,521	12	120,825	18,504	102,320
2005	429,262	0	65,741	65,741	363,521	13	108,711	16,649	92,062
2006	429,262	0	65,741	65,741	363,521	14	97,812	14,980	82,833
2007	429,262	46,866	65,741	112,607	316,655	15	88,006	23,086	64,920
2008	429,262	0	65,741	65,741	363,521	16	79,183	12,127	67,056
2009	429,262	0	65,741	65,741	363,521	17	71,245	10,911	60,334
2010	429,262	0	65,741	65,741	363,521	18	64,102	9,817	54,285
2011	429,262	0	65,741	65,741	363,521	19	57,675	8,833	48,843
2012	429,262	360,851	65,741	426,592	2,670	20	51,893	51,570	323
2013	429,262	0	65,741	65,741	363,521	21	46,691	7,151	39,540
2014	429,262	0	65,741	65,741	363,521	22	42,010	6,434	35,576
2015	429,262	0	65,741	65,741	363,521	23	37,798	5,789	32,009
2016	429,262	0	65,741	65,741	363,521	24	34,009	5,208	28,800
2017	429,262	526,422	65,741	592,163	-162,901	25	30,599	42,211	-11,612
2018	429,262	0	65,741	65,741	363,521	26	27,531	4,216	23,315
2019	429,262	0	65,741	65,741	363,521	27	24,771	3,794	20,977
2020	429,262	0	65,741	65,741	363,521	28	22,288	3,413	18,874
2021	429,262	0	65,741	65,741	363,521	29	20,053	3,071	16,982
2022	429,109	-601,349	65,741	-535,608	964,717	30	18,036	-22,513	40,549
TOTAL	10,784,979	2,821,058	1,653,957	4,475,015	6,309,964	465	2,175,155	2,175,155	0

(5) Sensitive analysis

Sensitive analysis is conducted to examine the impact of unexpected future changes. The following three cases are envisioned:

case I : The project cost increases by 10 %
case II : The revenue decreases by 10 %
case III : The project cost increases by 10 % and the revenue decreases by 10 %

Table 6.4.12 shows the calculation results of each case. All the cases exceed the weighted average interest rate.

Table 6.4.12 FIRR Sensitive Analysis

(%)

	original case	case I	case II	case III
FIRR (case 4-1)	11.14	9.99	9.64	8.56
Average interest rate	8.11			

6.4.5 Financial Soundness of the Port Management Body

The base case (case 4-1) is appraised from the viewpoint of financial soundness of the port management body. The projected financial statement for the Short-Term projects and financial indicators, working ratio, operating ratio, rate of return on net fixed assets and debt service coverage ratio, are shown in Table 6.4.13.

(1) Profitability

The rate of return on net fixed assets is less than the average interest rate of the funds until 1997, but after 1998 it exceeds the average interest rate.

(2) Loan repayment capacity

The debt service coverage ratios exceed 1 throughout the project life. It is presumed that there will be no difficulty in repaying long-term loans using the

annual operating revenues.

(3) Operational efficiency

Both the operating ratios and working ratios maintain favorable levels.

6.4.6 Conclusion

Judging from the above analysis, the base case project is regarded as financially feasible. However, it is recommended that the EPAL should make effort to secure forecast cargo volume, to improve cargo handling efficiency and to reduce operating expenses constantly.

Table 6.4.13

FINANCIAL STATEMENT FOR SHORT-TERM PROJECT - PORT OF OLSBERG

(Income statement)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Operating revenue	0	0	0	0	0	318.670	350.529	373.544	387.181	387.545	410.448	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262	429.262
Operating expenses	0	0	0	0	0	153.654	155.181	155.821	170.139	172.777	171.493	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882	172.882
salary and wage	0	0	0	0	0	16.589	16.589	16.589	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285	30.285
maintenance and repair	0	0	0	0	0	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461	28.461
depreciation	0	0	0	0	0	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000
others	0	0	0	0	0	1.799	2.930	2.163	2.120	2.244	2.378	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485	2.485
indirect tax	0	0	0	0	0	0.917	0.934	10.521	11.100	11.788	12.283	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763	12.763
Operating profit	0	0	0	0	0	156.016	195.428	217.723	197.822	216.771	238.947	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188
Non-operating expense	2	818	11.588	31.337	84.254	284.729	193.894	181.825	180.596	178.779	175.758	170.974	165.849	160.316	154.293	147.692	140.365	132.202	123.923	112.628	100.765	87.149	71.426	53.175	31.891	45.967	43.714	41.089	38.228	38.950	38.486
interest on long-term loans	0	818	11.438	28.855	55.594	183.129	182.445	181.825	180.596	178.779	175.758	170.974	165.849	160.316	154.293	147.692	140.365	132.202	123.923	112.628	100.765	87.149	71.426	53.175	31.891	45.967	43.714	41.089	38.228	38.950	38.486
interest on short-term loans	0	0	150	2.482	8.750	21.600	11.449	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net income (before tax)	0	-818	-11.588	-31.337	-84.254	-47.913	2.334	36.998	18.428	37.992	63.188	86.286	91.338	96.864	102.887	109.498	116.815	124.978	134.158	144.554	156.415	170.831	185.754	204.885	225.289	210.213	213.465	216.171	217.960	218.338	218.774
Taxation	0	0	0	0	0	0	1.400	21.859	9.856	22.795	37.913	51.724	54.799	58.118	61.732	65.699	70.089	74.987	80.494	86.733	93.849	102.919	111.452	122.483	135.173	126.128	128.079	129.702	130.776	130.958	131.265
Net income (after tax)	0	-818	-11.588	-31.337	-84.254	-47.913	933	14.439	8.571	15.197	25.275	34.482	36.532	38.746	41.155	43.799	46.726	49.991	53.663	57.822	62.566	68.813	74.302	81.902	90.115	84.085	85.386	86.469	87.184	87.392	87.510

(Cash Flow Statement)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cash inflow	0	39.691	583.230	702.278	1.896.192	154.983	248.271	373.485	468.389	593.389	788.579	798.235	823.813	851.489	878.756	905.570	884.841	989.272	932.889	952.481	989.719	622.972	630.151	631.955	825.881	813.975	369.989	452.873	582.282	719.351	981.549
cash beginning	0	0	-818	-12.411	-43.748	-188.881	-53.245	49.675	165.279	270.530	363.545	432.960	488.546	488.132	515.483	542.303	521.373	546.884	588.821	589.213	688.451	258.885	268.923	268.692	262.593	248.888	8.782	95.685	285.814	347.894	538.262
operating profit	0	0	0	0	0	156.016	195.428	217.723	197.822	216.771	238.947	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188	257.188
depreciation	0	0	0	0	0	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	106.000	298.000	0	0	0	0
long-term loan	0	39.691	584.048	884.881	1.139.958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash outflow	0	40.509	515.646	636.868	1.284.384	288.149	198.596	288.206	197.859	229.844	275.612	335.699	335.681	335.917	330.448	384.197	338.837	348.451	342.825	346.930	718.914	355.149	361.493	358.368	379.853	683.374	274.384	253.858	221.199	172.869	172.339
investment	0	39.891	584.048	884.881	1.139.958	0	0	0	0	0	0	0	0	0	0	46.868	0	0	0	0	388.851	0	0	0	0	526.422	0	0	0	0	0
Pri. on long-term loans	0	0	0	0	0	3.418	4.182	4.922	7.487	28.278	61.948	112.092	115.934	117.483	120.423	123.958	128.183	133.262	139.357	146.672	155.449	165.982	176.621	193.788	211.988	183.857	182.571	83.148	51.282	2.221	2.068
interest on long-term loans	0	818	11.438	28.855	55.594	183.129	182.445	181.825	180.596	178.779	175.758	170.974	165.849	160.316	154.293	147.882	140.365	132.202	123.923	112.628	100.765	87.149	71.426	53.175	31.891	45.967	43.714	41.089	38.228	38.858	38.486
interest on short-term loan	0	0	150	2.482	8.750	21.600	10.849	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
income tax	0	0	0	0	0	0	1.400	21.659	9.855	22.795	37.913	51.724	54.799	58.118	61.732	65.699	70.089	74.987	80.494	86.733	93.849	102.919	111.452	122.483	135.173	126.128	128.079	129.702	130.776	130.958	131.265
Cash inflow-outflow	0	-818	-12.411	-43.748	-188.881	-53.245	49.675	165.279	270.530	363.545	432.960	468.546	488.132	515.483	542.303	521.373	546.884	588.821	589.213	688.451	258.885	268.923	268.692	262.593	248.888	8.782	95.685	285.814	347.894	538.262	729.214
fund surplus	0	818	12.411	43.748	188.881	53.245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
short-term loan	0	818	12.411	43.748	188.881	53.245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(Balance Sheet)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
(Assets)																															
Current Assets	0	0	0	0	0	0	49.675	165.279	270.530	363.545	432.960	468.546	488.132	515.483	542.303	521.373	546.884	588.821	589.213	688.451	258.885	268.923	268.692	262.593	248.888	8.782	95.685	285.814	347.894	538.262	729.214
Cash & Deposit	0	0	0	0	0	0	49.675	165.279	270.530	363.545	432.960	468.546	488.132	515.483	542.303	521.373	546.884	588.821	589.213	688.451	258.885	268.923	268.692	262.593	248.888	8.782	95.685	285.814	347.894	538.262	729.214
Other Current Assets																															
Fixed Assets	0	39.691	543.737	1.348.418	2.488.268	2.382.188	2.276.093	2.170.085	2.063.917	1.957.838	1.851.742	1.745.654	1.639.567	1.533.479	1.427.391	1.368.178	1.262.882	1.155.994	1.049.987	943.819	1.198.583	1.092.496	986.408	880.320	774.233	1.194.567	1.088.479	982.392	876.304	770.215	564.129
Depreciable Assets	0	39.691	543.737	1.348.418	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.489.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.268	2.488.269
Accumulated Depreciation	0	0	0	0	106.000	212.175	318.263	424.351	530.438	636.525	742.614	848.781	954.788	1.060.877	1.128.090	1.220.186	1.332.274	1.438.361	1.544.449	1.289.685	1.395.772	1.501.860	1.607.948	1.714.035	1.293.781	1.399.789	1.505.875	1.611.964	1.718.052	1.824.139
Net Fixed Assets	0	39.691	543.737	1.348.418	2.382.268	2.382.188	2.276.093	2.170.085	2.063.917	1.957.838	1.851.742	1.745.654	1.639.567	1.533.479	1.427.391	1.368.178	1.262.882	1.155.994	1.049.987	943.819	1.198.583	1.092.496	986.408	880.320	774.233	1.194.567	1.088.479	982.392	876.304	770.215	564.129
Total Assets	0	39.691	543.737	1.348.418	2.488.268	2.382.188	2.325.767	2.335.284	2.334.446	2.321.375	2.284.718	2.288.288	2.127.699	2.048.962	1.969.694	1.889.543	1.809.885	1.724.815	1.639.128	1.558.278	1.457.388	1.359.419	1.255.188	1.142.914	1.021.841	1.281.269	1.184.884	1.187.486	1.223.389	1.308.498	1.393.342

(Liabilities & Capital)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Current Liabilities	0	818	12.411	43.748	188.881	53.245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-term Loans	0	818	12.411	43.748	188.881	53.245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Current Liabilities																															
Fixed Liabilities	0	39.891	543.737	1.348.418	2.488.268	2.424.858	2.488.748	2.475.926	2.482.419	2.448.149	2.378.289	2.265.217	2.150.183	2.032.788	1.912.277	1.788.327	1.660.145	1.529.883	1.397.525	1.249.853	1.089.484	919.423	740.802	547.814	335.926	431.159	328.598	245.452	194.249	192.923	189.382
Long-term Loans	0	39.891	543.737	1.348.418	2.488.268	2.424.858	2.488.748	2.475.926	2.482.419	2.448.149	2.378.289	2.265.217	2.150.183	2.032.788	1.912.277	1.788.327	1.660.145	1.529.883	1.397.525	1.249.853	1.089.484	919.423	740.802	547.814	335.926	431.159	328.598	245.452	194.249	192.923	189.382
Other Fixed Liabilities																															
Capital	0	0	-12.411	-43.748	-188.881	-155.914	-154.981	-140.542	-133.971	-118.774	-93.499	-59.817	-22.484	16.282	57.416	101.216	147.941	197.932	251.595	309.417	371.984	439.998	514.298	595.988	686.815	778.188	855.685	941.955	1.029.139	1.116.471	1.203.981
Capital Fund																															
Retained Earnings	0	0	-12.411	-43.748	-188.881	-155.914	-154.981	-140.542	-133.971	-118.774	-93.499	-59.817	-22.484	16.282	57.416	101.216	147.941	197.932	251.595	309.417	371.984	439.998	514.298	595.988	686.815	778.188	855.685	941.955	1.029.139	1.116.471	1.203.981
Total Liabilities & Capital	0	40.509	543.737	1.348.418	2.488.268	2.382.188	2.325.767	2.335.284	2.334.448	2.321.375	2.284.718	2.288.288	2.127.699	2.048.962	1.969.694	1.889.543	1.809.885	1.724.815	1.639.128	1.558.278	1.457.388	1.359.419	1.255.188	1.142.914	1.021.841	1.281.269	1.184.884	1.187.486	1.223.389	1.308.498	1.393.342

(Financial indicator)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rate of return on net fixed assets (%)						6.6	8.6	10.8	9.5	11.1	12.9	14.7	15.7	16.9	18.8	18.8	28.4	22.2	24.5	27.2	21.5	23.5	28.1	29.2	33.2	21.5	23.8	26.2	29.3	33.4	38.7
Debt service coverage						1.489	1.616	1.736	1.812	1.559	1.452	1.279	1.293	1.308	1.322	1.337	1.353	1.368	1.386	1.401	1.418	1.435	1.453	1.471	1.490	2.489	2.493	2.926	4.817	8.645	8.645
Operating ratio (%)						50	44	42	48	44	42	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Working ratio (%)						15	14	13	17	17	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

6.5 Financial Analysis of the Projects in the Port of Oran

6.5.1 Projects

The projects of the Short-Term Plan for the Port of Oran, which are listed in 6.3.1, are financially accessed.

6.5.2 Prerequisites for Revenue and Cost

(1) Cargo handling volume

The cargo handling volume is estimated based on the demand forecast. The volume is shown in Table 6.5.1. The container volume handled at the container yard which is planned in the Short-Term Plan will reach its limit of handling capacity in 2000. The cargo volume of cereals handled at the new terminal will reach its limit in 2003.

Table 6.5.1 Projected Cargo Volume Handled at the New Terminal (Containers and Cereals)

	1997	1998	1999	2000	2001	2002	2003
Container Yard (1,000TEU)	25.9	30.2	34.8	36.4	36.4	36.4	36.4
Cereal Terminal (1,000t)	400	400	400	400	500	600	700

(2) Port charge and revenue

The revenues from the port activities are calculated based on the present tariff system and on the cargo handling volume shown in Table 6.5.1. The actual rates of the tariff are summarized in Table 6.4.2.

(3) Costs for initial investments

The initial investments of the Short-Term project are estimated in Chapter 2, and the costs included in the financial analysis as a basic case are shown in Table 6.5.2.

Table 6.5.2 Investment Costs included in the Financial Analysis

(unit:1,000DA)

	1993	1994	1995	1996	Total
Container Yard pavement	826		8,381	13,523	22,730
Cereal Terminal superstructure and handling equipment	11,078		250,608	390,476	652,162
Total	11,904		258,989	403,999	674,892

(4) Reinvestment

The facilities and equipment will be renewed based on their service lives. The funds for reinvestment are assumed to be financed by a local bank or internal reserve of the EPO.

(5) Operating Expense

The annual operating expense for the new terminal and facility are assumed as follows:

1) Personnel

The annual personnel expense is estimated based on the required number of workers and existing pay scales. Number of workers are listed in Table 6.5.3 and personnel expense per person including the cost of social benefit is calculated at 128,000 DA/year.

Table 6.5.3 Required Number of Workers

(persons)

	administration	maintenance	total
Container yard	4.3	0.3	4.6
Cereal Terminal	3	3	6
Total	7.3	3.3	10.6

2) Maintenance and repair

The annual maintenance and repair costs for the port facilities are calculated as follows:

superstructure: 1 % of the original construction cost

cargo handling equipment: 2 % of the original procurement cost

infrastructure: 0.5 % of the original construction cost

3) Other expenditure

To provide other expenditure such as cost for fuel and general administration, 0.58 % of the total operating revenue is included in the operating expense.

4) Taxes

Taxes imposed on the payment of salaries and wages (6%), and imposed on port operating revenue (2.55%) are also included in the operating expense.

5) Depreciation costs

The annual depreciation costs of the port facilities and equipment are calculated by the straight line method based on their service lives.

(6) Income tax

Income tax is calculated as follows:

(operating revenue - operating expense - loan interest) x 60 %

6.5.3 Fund Raising

Assumption concerning fund raising is the same as in the case of the EPAL. (see 6.4.3 Fund Raising)

6.5.4 Appraisal of the Projects

(1) Analyzed patterns

The caiculation of the FIRR is examined on the following projects respectivery to clarify the viability of the each project.

1) Container yard
2) Cereal facility

Furthermore, at each project, some additional cases are studied to compare FIRR under the different prerequisites.

(2) Results of the FIRR calculation

The results are shown in Table 6.5.5.

1) Container Yard

In case 5-1, the FIRR is calculated under the prerequisites mentioned in 6.3.1, and the result is 18.15% under the current tariff level.

Case 5-2 and 5-3 are studied to ascertain the level of the FIRR when the construction costs for infrastructures are included in the analysis. Case 5-2 shows that the FIRR will be 6.97% when the construction cost (15%) of reclamation is included in the analysis under the condition in which tariff level is increased by 10%.

In case 5-3, the cost (50%) of reclamation is included in the analysis, and the FIRR decreases to 2.44 % under the 10 % increased tariff level.

Table 6.5.5 Projects and FIRR

PORT OF ORAN

Container Yard

	case 5-1		case 5-2		case 5-3	
	facilities	FIRR (%)	facilities	FIRR (%)	facilities	FIRR (%)
project and FIRR	super infra pavement	18.15	super infra pavement reclamation (15%)	6.97	super infra pavement reclamation (50%)	2.44
infrastructure (government)	protect mound dredging quay reclamation		protect mound dredging quay reclamation (85%)		protect mound dredging quay reclamation (50%)	
note	tariff current level		tariff 10% up		tariff 10% up	

Cereal Facility

	case 6-1		case 6-2		case 6-3	
	facilities	FIRR (%)	facilities	FIRR (%)	facilities	FIRR (%)
project and FIRR	silos, belt conveyer pneumatic unloader x2	12.41	silos, belt conveyer pneumatic unloader x2	6.17	silo, belt conveyer pneumatic unloader x2	2.22
note	tariff 228 DA/t (140% up)		tariff 138 DA/t (45% up)		tariff 95 DA/t	

	case 7-1	
	combination	FIRR (%)
Combination of the projects	case 5-1, 6-1	12.59

2) Cereal facility

In case 6-1, a tariff for usage of the cereal facility needs to be set for the calculation of the FIRR. When the tariff for usage of the cereal facility including silos, unloaders and belt conveyer is established at around 228 DA/t, the FIRR of this investment will reach 12.41 %.

Case 6-2 shows when the tariff is established at the level of 138 DA/t, the FIRR will decrease to 6.17 %.

In case 6-3, when the tariff is established at the level of about 95 DA/t, which is considered as the minimum level of the tariff according to the cost calculation, the FIRR will decrease to 2.22 %.

(3) Appraisal

In Table 6.5.6, weighted average interest rate of the funds is shown according to the above mentioned six cases. By comparing these tables, it is clear that case 5-1 and 6-1 exceed the weighted average interest rate of the funds, thus, case 7-1, which is the combination of those projects (case 5-1 and 6-1) is considered financially feasible.

Table 6.5.6 Average Interest Rate

interset rate of foreign loans 3 %
local loans 20 %

	case -1	case -2	case -3
container yard	10.64 %	8.82 %	8.17 %
cereal facility	7.58 %	7.58 %	7.58 %

Table 6.5.7 Average Interest Rate

	Foreign Loan	Domestic Loan	Total
projects total	3 % (71.40 %)	20 % (28.60 %)	7.86 % (100.00 %)

(4) Conclusion

In conclusion, case 7-1 is judged to be financially feasible. Therefore, case 7-1 is recommended as the base case. In table 6.5.9, FIRR calculation for case 7-1 is shown.

Table 6.5.9 FIRR CALCULATION

FIRR= 12.59%

Case:ORAN Base

Asumption

Construction =	100
Cargo Volume =	100
Expense =	100
Tariff =	100

UNIT:1,0000A

YEAR	REVENUE	COST			REVENUE-COST		PRESENT VALUE IN 1994		
		INVESTMENT	EXPENSE	TOTAL			REVENUE	COST	DIFFERENCE
1994	0	11,904	0	11,904	-11,904	1	0	10,573	-10,573
1995	0	258,989	0	258,989	-258,989	2	0	204,292	-204,292
1996	0	403,999	0	403,999	-403,999	3	0	283,032	-283,032
1997	79,227	0	11,442	11,442	67,785	4	49,296	7,119	42,177
1998	79,881	0	11,462	11,462	68,419	5	44,144	6,334	37,810
1999	80,588	0	11,485	11,485	69,103	6	39,553	5,637	33,916
2000	80,775	0	11,490	11,490	69,285	7	35,210	5,009	30,202
2001	99,495	0	12,076	12,076	87,419	8	38,520	4,675	33,844
2002	118,215	0	12,662	12,662	105,553	9	40,648	4,354	36,294
2003	136,935	0	13,248	13,248	123,687	10	41,818	4,046	37,772
2004	136,935	0	13,248	13,248	123,687	11	37,141	3,593	33,547
2005	136,935	0	13,248	13,248	123,687	12	32,986	3,191	29,795
2006	136,935	0	13,248	13,248	123,687	13	29,297	2,834	26,462
2007	136,935	0	13,248	13,248	123,687	14	26,020	2,517	23,502
2008	136,935	0	13,248	13,248	123,687	15	23,109	2,236	20,874
2009	136,935	0	13,248	13,248	123,687	16	20,525	1,986	18,539
2010	136,935	0	13,248	13,248	123,687	17	18,229	1,764	16,465
2011	136,935	0	13,248	13,248	123,687	18	16,190	1,566	14,624
2012	136,935	264,608	13,248	277,856	-140,921	19	14,379	29,177	-14,798
2013	136,935	0	13,248	13,248	123,687	20	12,771	1,236	11,535
2014	136,935	0	13,248	13,248	123,687	21	11,342	1,097	10,245
2015	136,935	0	13,248	13,248	123,687	22	10,074	975	9,099
2016	136,935	0	13,248	13,248	123,687	23	8,947	866	8,081
2017	136,935	22,730	13,248	35,978	100,957	24	7,946	2,088	5,858
2018	136,935	0	13,248	13,248	123,687	25	7,057	683	6,375
2019	136,935	0	13,248	13,248	123,687	26	6,268	606	5,662
2020	136,935	0	13,248	13,248	123,687	27	5,567	539	5,028
2021	136,935	0	13,248	13,248	123,687	28	4,944	478	4,466
2022	136,935	0	13,248	13,248	123,687	29	4,391	425	3,966
2023	136,935	-106,461	13,248	-93,213	230,148	30	3,900	-2,655	6,555
TOTAL	3,413,816	855,769	348,825	1,204,594	2,209,222	465	590,271	590,271	0

(5) Sensitive analysis

Sensitive analysis is conducted to examine the impact of unexpected future

case I : The project cost increases by 10 %

case II : The revenue decreases by 10 %

case III : The project cost increases by 10 % and the revenue decreases by 10%

Table 6.5.10 shows the calculation results of each case. All the cases exceed the weighted average interest rate of funds.

Table 6.5.10 FIRR Sensitive Analysis

(%)

	original case	case I	case II	case III
FIRR (case 7-1)	12.59	11.40	11.11	9.98
Average interest rate	7.86			

6.5.5 Financial Soundness of the Port Management Body

The base case (case 7-1) is appraised from the viewpoint of financial soundness of the port management body. The projected financial statements and financial indicators, working ratio, operating ratio, rate of return on net fixed assets and debt service coverage ratio, are shown in Table 6.5.11.

(1) Profitability

The rate of return on net fixed assets is less than the average interest rate of the funds until 2000, but after 2001 it exceeds the average interest rate.

(2) Loan repayment capacity

The debt service coverage ratios exceed 1 throughout the project life. It is presumed that there will be no difficulty in repaying long-term loans using the annual operating revenues.

(3) Operational efficiency

Both the operating ratios and working ratios maintain favorable levels.

6.5.6 Conclusion

Judging from the above analysis, the base case project is regarded as financially feasible. However, it is recommended that the EPO should make effort to secure forecast cargo volume, to improve cargo handling efficiency and to reduce operating expenses constantly.

Table 6.5.11

FINANCIAL STATEMENT FOR SHORT-TERM PROJECT
- PORT OF OSAKA

(Income Statement)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Operating revenue	0	0	0	0	0	39,227	39,881	40,508	68,775	99,405	110,215	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935	136,935
Operating expenses	0	0	0	0	0	30,974	30,995	40,817	38,584	39,178	39,758	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342	48,342
salary and wage	0	0	0	0	0	1,357	1,357	1,357	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
maintenance and repair	0	0	0	0	0	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715	7,715
depreciation	0	0	0	0	0	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342
others	0	0	0	0	0	459	481	407	488	576	684	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793	793
interest 5%	0	0	0	0	0	2,102	2,118	2,138	2,088	2,537	3,014	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492	3,492
Operating profit	0	0	0	0	0	39,253	39,886	40,571	42,191	60,325	70,459	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593
Non-operating expense	0	221	265	5,295	15,828	58,162	53,875	51,402	51,103	50,748	58,045	48,734	47,325	45,798	44,125	42,283	40,235	37,948	35,358	32,405	29,034	25,898	30,537	25,228	19,828	11,733	10,787	9,834	9,118	8,898	8,618
interest on long-term loans	0	221	221	5,198	14,672	51,848	51,640	51,402	51,103	50,748	58,045	48,734	47,325	45,798	44,125	42,283	40,235	37,948	35,358	32,405	29,034	25,898	30,537	25,228	19,828	11,733	10,787	9,834	9,118	8,898	8,618
interest on short-term loan	0	0	44	97	1,156	4,322	2,234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext income (before tax)	0	-221	-265	-5,295	-15,828	-18,909	-13,989	-10,830	-8,912	9,578	28,414	47,859	49,269	50,797	52,468	54,311	56,358	58,653	61,243	64,188	67,568	81,496	65,056	71,365	77,573	84,860	85,786	86,759	87,477	87,787	87,984
Taxation	0	0	0	0	0	0	0	0	0	5,747	17,049	28,715	29,561	30,478	31,481	32,586	33,815	35,192	36,746	38,513	34,536	30,897	39,034	42,819	46,544	50,916	51,478	52,055	52,486	52,624	52,790
Net income (after tax)	0	-221	-265	-5,295	-15,828	-18,909	-13,989	-10,830	-8,912	3,831	11,366	19,144	19,707	20,319	20,987	21,724	22,543	23,461	24,497	25,675	23,024	24,598	26,022	28,546	31,029	33,944	34,308	34,704	34,991	35,083	35,194

(Cash Flow Statement)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cash inflow	0	11,984	-221	258,502	358,217	45,985	57,858	78,988	88,597	124,032	171,888	217,885	234,948	252,282	289,478	286,498	305,229	319,549	335,392	359,328	414,392	458,378	465,421	478,544	473,298	473,141	484,961	219,962	255,298	292,926	361,969
cash beginning	0	0	-221	-487	-5,782	-21,818	-11,172	1,987	18,865	35,365	65,865	92,678	118,813	127,328	144,537	161,581	178,294	194,613	210,371	225,398	239,457	33,441	48,485	45,689	48,382	48,286	59,926	95,827	138,353	174,998	237,833
operating profit	0	0	0	0	0	39,253	39,886	40,571	42,191	60,325	70,459	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593	88,593
depreciation	0	0	0	0	0	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342	20,342
long-term loan	0	11,984	0	258,989	403,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash outflow	0	12,125	265	264,284	419,827	67,157	55,859	52,935	53,232	58,987	79,198	107,592	107,822	107,724	187,912	188,282	188,618	189,177	189,916	190,888	388,952	117,998	119,812	122,182	125,892	113,215	89,834	89,688	88,298	82,892	83,858
investment	0	11,984	0	258,989	403,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	264,688	0	0	0	0	22,738	0	0	0	0	0
Prin. on long-term loans	0	0	0	0	-8	995	1,195	1,433	2,138	2,474	12,183	38,142	38,738	31,458	32,385	33,333	34,566	36,045	37,828	39,958	42,774	45,895	49,641	54,135	59,528	67,936	27,720	18,895	1,382	1,059	
Interest on long-term loans	0	221	221	5,199	14,672	51,848	51,848	51,402	51,103	50,748	58,045	48,734	47,325	45,798	44,125	42,283	40,235	37,948	35,358	32,405	29,034	25,898	30,537	25,228	19,828	11,733	10,787	9,834	9,118	8,898	8,618
interest on short-term loan	0	0	44	97	1,156	4,322	2,234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
income tax	0	0	0	0	0	0	0	0	0	5,747	17,049	28,715	29,561	30,478	31,481	32,586	33,815	35,192	36,746	38,513	34,536	30,897	39,034	42,819	46,544	50,916	51,478	52,055	52,486	52,624	52,790
Cash inflow-outflow	0	-221	-487	-5,782	-21,818	-11,172	1,987	18,865	35,365	65,865	92,678	118,813	127,328	144,537	161,581	178,294	194,613	210,371	225,398	239,457	33,441	48,485	45,689	48,382	48,286	59,926	95,827	138,353	174,998	237,833	295,911
found surplus	0	221	487	5,782	21,818	11,172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
short-term loan	0	221	487	5,782	21,818	11,172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(Balance Sheet)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
(Assets)																															
Current Assets	0	0	0	0	0	0	0	1,987	18,865	35,365	65,865	92,678	118,813	127,328	144,537	161,581	178,294	194,613	210,371	225,398	239,457	33,441	48,485	45,689	48,382	48,286	59,926	95,827	138,353	174,998	237,833	295,911
Cash & Deposit	0	0	0	0	0	0	0	1,987	18,865	35,365	65,865	92,678	118,813	127,328	144,537	161,581	178,294	194,613	210,371	225,398	239,457	33,441	48,485	45,689	48,382	48,286	59,926	95,827	138,353	174,998	237,833	295,911
Other Current Assets																															
Fixed Assets	0	11,984	11,984	278,893	674,892	646,558	618,288	589,888	561,524	533,192	504,848	476,498	448,156	419,814	391,472	363,130	334,788	306,446	278,104	249,762	385,423	357,081	328,739	388,397	272,855	266,443	238,101	289,759	181,417	153,075	124,733
Depreciable Assets	0	11,984	11,984	278,893	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892	674,892
Accumulated Depreciation	0	0	0	0	0	28,342	56,684	85,026	113,368	141,710	170,052	198,394	228,736	255,078	283,420	311,762	340,104	368,446	396,788	425,130	289,468	317,811	346,153	374,495	402,837	408,449	436,791	485,133	493,475	521,817	550,159
Net Fixed Assets	0	11,984	11,984	278,893	674,892	646,558	618,288	589,888	561,524	533,192	504,848	476,498	448,156	419,814	391,472	363,130	334,788	306,446	278,104	249,762	385,423	357,081	328,739	388,397	272,855	266,443	238,101	289,759	181,417	153,075	124,733
Total Assets	0	11,984	11,984	278,893	674,892	646,558	628,185	607,931	598,089	598,247	597,518	588,511	575,492	564,351	553,033	541,424	529,481	518,817	509,484	489,219	418,864	397,586	374,348	348,759	328,281	328,369	333,128	348,112	356,487	398,188	423,644
(Liabilities & Capital)																															
Current Liabilities	0	221	487	5,782	21,818	11,172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-term Loans	0	221	487	5,782	21,818	11,172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Current Liabilities																															
Fixed Liabilities	0	11,984	11,984	278,893	674,892	673,897	672,782	671,269	669,139	666,685	654,562	624,428	593,884	562,234	529,928	498,595	462,829	425,984	388,163	349,213	385,786	298,132	259,877	257,285	98,233	71,864	44,384	17,544	0	0	0
Long-term Loans	0	11,984	11,984	278,893	674,892	673,897	672,782	671,269	669,139	666,685	654,562	624,428	593,884	562,234	529,928	498,595	462,829	425,984	388,163	349,213	385,786	298,132	259,877	257,285	98,233	71,864	44,384	17,544	0	0	0
Other Fixed Liabilities																															
Capital	0	0	-487	-5,782	-21,818	-38,519	-52,587	-63,338	-72,258	-68,438	-57,052	-37,989	-18,281	2,118	23,105	42,829	67,319	92,834	115,321	141,888	113,157	137,454	163,471	191,474	222,048	255,505	288,744	322,568	356,487	398,188	423,644
Capital Fund																															
Retained Earnings	0	0	-487	-5,782	-21,818	-38,519	-52,587	-63,338	-72,258	-68,438	-57,052	-37,989	-18,281	2,118	23,105	42,829	67,319	92,834	115,321	141,888	113,157	137,454	163,471	191,554	222,048	255,505	288,744	322,568	356,487	398,188	423,644
Total Liabilities & Capital	0	12,125	11,984	278,893	674,892	646,558	628,185	607,931	598,089	598,247	597,510	586,511	575,492	564,351	553,033	541,424	529,481	518,817	509,484	489,219	418,864	397,586	374,348	348,759	328,281	328,369	333,128	348,112	356,487	398,188	423,644

(Financial indicator)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rate of return on net fixed assets (%)						6.1	6.5	6.9	7.6	11.3	15.5	20.7	21.8	23.8	24.7	26.8	28.9	31.5	34.7	38.7	25.1	27.1	29.4	32.2	35.5	38.3	40.6	46.8	53.2	83.1	77.4
Debt service coverage						1.184	1.321	1.341	1.388	1.747	2.134	2.584	2.848	2.728	2.831	2.955	3.185	3.293	3.534	3.855	3.201	3.568	4.851	4.952	8.589	18.848	11.571	12.784	13.785	14.262	14.511
Operating ratio (%)						58	58	58	48	38	34	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Working ratio (%)						15	15	14	13	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

APPENDIX

A.1 General Suggestion for Cargo Handling Operation

A.1.1 Handling System of Sacked Cargo

In order to minimize not only the time and the cost of loading/unloading at ports but also the cost of transportation to the hinterland, the international transportation of general cargoes is tending towards unitization, such as palletization and containerization.

Nevertheless a large amount of sacked foodstuffs are still handled without being unitized, and the rate of handling volume of these cargoes to the handling volume of general cargoes is a very high in all Algerian Ports. It seems that these sacked cargoes will be also gradually containerized in future following modernization of the port facilities in the study ports to meet the modern trends. However, at present, handling of these cargoes obstructs port operation in every Algerian Port, because the handling rate is rather low, and in order to accomplish smooth port operation, every port must urgently improve their handling system of such cargo.

The present situation of the trade and the traffic flow of these cargoes is as follows in Algeria. The traffic flow of inland transportation from the ports seems to have been already built up by each importer.

- These cargoes are imported by limited enterprises such as ENAPL.
- These cargoes are carried by general cargo vessels laden only with one kind of cargo without unitizing.
- These cargoes do not required storage in transit sheds in the ports for customs clearance, because of special customs measures being applied.
- These cargoes are directly landed onto trucks from the vessels and directly transported from the port to the hinterland without using the transit sheds in the ports.
- The destinations of the cargoes in the hinterland are limited and there are storage warehouses in place.

However, according to the packaging type of the sacked cargo, a through transportation system by palletization is suitable for loading/unloading from/to

vessels including inland transportation to/from the hinterland. There are two manners of the through transportation by palletization.

- with one way pallets (disposable pallets)
- with returnable pallets

In the system with returnable pallets, the control of pallets is a most important factor for effective operation, and generally speaking, the through transport system using returnable pallets has the following problems.

- taking back empty pallets
- keeping and/or losing the pallets
- standardizing size of pallets
- lack of handling equipment for pallets at cargo receivers
- lowering loading ratio on inland transport,e.g. trucks or rail wagon

In the existing situation, it is considered that a through transportation system with returnable pallets can be adopted only for the inland transport in Algeria.

Therefore, it is recommended that cargo traffic from vessel's holds to cargo receiver is carried out using a through transportation system with returnable wooden pallets which are owned by each importer, that is to say that cargo is piled up on returnable wooden pallets in the vessel's hold or at the apron after landing. The palleting cargo is first stored in transit sheds in the port for a short period and then distributed to cargo receivers as it is.

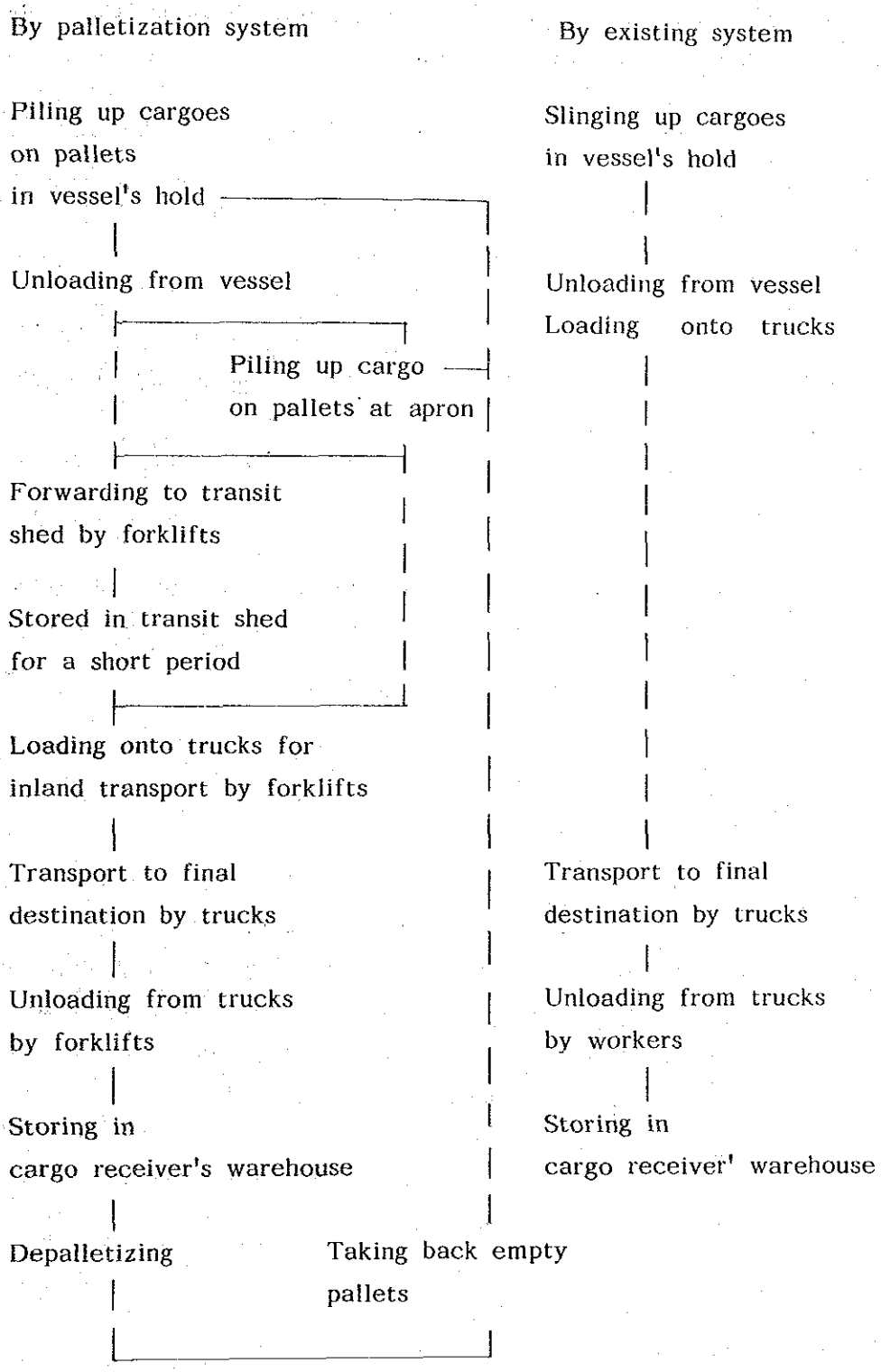


Fig.A.1.1 Comparison of Handling Flows

In this palletization system, the numbers of handling stages increases, however, the following advantages are considered;

- it is not necessary to arrange many trucks to meet the unloading chedule of vessels,
- no idling time of unloading of vessels while waiting trucks,
- it is possible to handle cargoes at narrow aprons,
- it is possible to minimize the handling time at the aprons,
- it is feasible to plan regular inland transport from the port by trucks
- all the handling can be done by forklifts through all the handling stages during the inland transport,
- it is feasible to decrease workers for handling in cargo receiver's warehouses,

Given these advantages, although an initial investment is required to prepare many pallets, this system will benefit importers as regards economy, practicality and ease of handling.

Further, in the case that this proposed system is adopted, the size, type and necessary quantity of pallets must also be considered.

In Japan, various types and sizes of returnable pallets are used for inland transportation in accordance with the user's demand. The typical types of pallets are shown in Fig.A.1.3, which are specified by Japanese Industrial Standard (JIS). And for the proposed system in Algeria, the reversible double wing type wooden pallet is considered to be suitable, because pallets are used also as an unloading tool, and are lifted by slings.

The suitable size and necessary quantity of pallets should be determined taking the following into consideration;

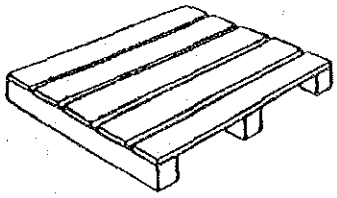
- package size of the intended cargo
- size of trucks for inland transport
- handling volume of the intended cargo
- estimated turn-around rate of pallets

Fortunately, the present sacked cargoes seem to be almost similar in size, weight and traffic flow, and therefore, all the pallet users can use uniform

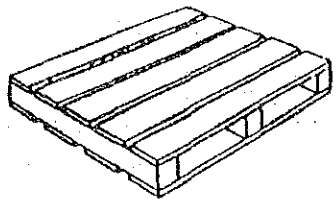
pallets and accommodate pallets with each other, and it would be possible to minimize the necessary quantity of pallets.

In practice, in order to ascertain the economy and practicality of this system, a particular importer should be selected to carry out a pioneer scheme.

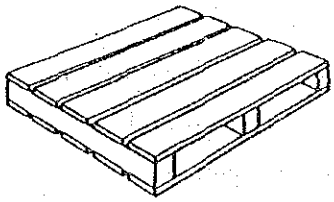
Single Decked Pallet



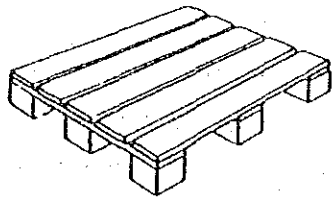
Double Decked Pallet



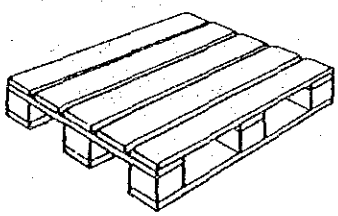
Reversible Pallet



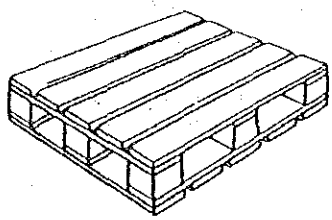
Single Decked
Two-way Pallet



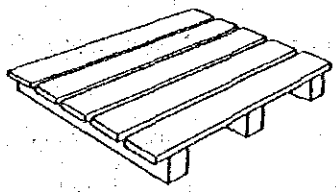
Double Decked
Four-way Pallet



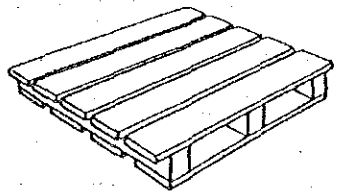
Reversible
Four-way Pallet



Single Decked
Single Wing Pallet



Double Decked
Single Wing Pallet



Reversible Double
Wing Pallet

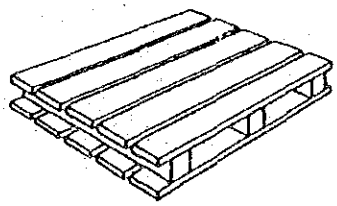


Fig. A.1.3. Typical Types of Wooden Pallet

A.1.2 Standardization of the Number of Stevedores per Gang

Generally speaking, it is easier to standardize the size of stevedore gangs handling of bulk cargo, such as cereals, coal, sugar, etc., than these handling general cargo, because, as regards general cargo, the number of stevedores per gang and the handling rate per hour differs according to the following.

- kind, type, nature and handling volume of cargo
- type and size of vessel
- handling manner for unloading/loading
- hlndling manner and cargo flow after unloading and before loading
- handling equipment in ship's holds/at apron
- stowage in ship's holds
- capacity of transit shed/open yard

The Eps of the study ports give guide lines for standard numbers of stevedores per gang by kind/type of cargo and type of vessel, and a target handling volume per hour, which are considered to be reasonable.

For reference,in Japanese ports, the formation of a gang is classified into the undermentioned ranks with a minimum charge for each class per shift on the stevedorage tariff. In practice, the number of stevedores per gang increases and/or decreases case by case, considering the above-mentioned items.

Number of stevedores

Rank	For unloading/ loading on board vessel	For handling aboard vessel to storage	For and ling at/from apron to storage	Kind of handling Cargo
A	9 men or less	9 men or less	4 - 6 men	Pallet,Case,Steel
B	10 - 13 men	10 - 13 men	7 - 9 men	- do -
C	14 - 17 men	14 - 17 men	10 - 12 men	Loose Cargo(Bags)
D	18 - 21 men	18 - 21 men	13 - 15 men	- do -
E	22 men or over	22 men or over	16 - 18 men	Special Cargo
F	-	-	19 - 21 men	- do -

A.1.3 Handling of Perishable Goods (Refrigerated Cargoes)

At present, there are no refrigerated warehouses in the ports, and refrigerated cargoes imported by reefer vessels are directly loaded onto refrigerated vans and delivered to cargo receivers. Considering the present port situation, it would be better to construct refrigerated warehouses near the port than in the port areas from economic and practical point of view.

On the other hand, in future, it is expected that refrigerated cargoes will be switched from reefer vessels to reefer containers along with the promotion of containerization, and therefore, it is recommended to prepare sufficient plug sockets for the reefer containers and/or prepare wiring in the container terminal in advance to meet the further demand.

A.2 Composition of a Gang for the Multi Purpose Terminal

Note: one gang is composed of 21 persons.
productivity is assumed 300 t per gang/shift.
number of persons in one gang is estimated as follows.

1) Board		
	Foreman	1
	Crane Operators	2
	Deck Man	1
	Forklift Drivers	1
	Labour	6
	subtotal	11
2) Ground		
	Forklift Drivers	2
	Labour	4
	subtotal	6
3) Storage		
	Forklift Drivers	2
	Labour	2
	subtotal	4
Total		21

Table A.3.1 Savings in Marine Transportation Cost (Port of Algiers, Terminal-2 Project)

Container Vessels

Case:1997 123 000 TEU

123 000 TEU TERMINAL 1(-11M):WITHOUT CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
57,810	6,500	1,020	72	3.3	239,550	11,504	665,017
49,200	12,000	1,245	49	4.3	260,330	22,600	1,111,895
8,610	22,000	2,735	4	2.1	20,441	39,978	344,213
7,380	22,000	2,735	3	7.9	66,580	73,908	545,443
				Sub Total	586,901	Sub Total	2,666,569
				Terminal 1 Total Transportation cost			3,253,470

123 000 TEU TERMINAL 1(-11M):WITH CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
57,810	6,500	1,020	72	0.9	69,715	7,296	421,782
49,200	12,000	1,245	49	1.3	81,872	17,495	860,754
8,610	22,000	2,735	4	0.8	7,768	29,836	256,885
7,380	22,000	2,735	3	1.9	15,769	63,766	470,593
				Sub Total	174,924	Sub Total	2,010,017
				Terminal 1 Total Transportation cost			2,184,941
				Saving in Marine Transportation Cost			1,068,529 000yen
						=	178,386 000DA
						Benefit(75%)=	133,789 000DA

Case:1998 145 000 TEU

145 000 TEU TERMINAL 1(-11M):WITHOUT CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
68,150	6,500	1,020	85	3.0	260,674	11,504	783,964
58,000	12,000	1,245	58	3.2	231,674	22,600	1,310,771
10,150	22,000	2,735	4	4.5	52,050	39,978	405,780
8,700	22,000	2,735	4	5.3	52,464	73,908	643,002
				Sub Total	596,862	Sub Total	3,143,516
				Terminal 1 Total Transportation cost			3,740,378

145 000 TEU TERMINAL 1(-11M):WITH CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
68,150	6,500	1,020	85	1.1	93,770	7,296	497,222
58,000	12,000	1,245	58	1.5	107,111	17,495	1,014,710
10,150	22,000	2,735	4	0.7	8,193	29,836	302,835
8,700	22,000	2,735	4	1.7	16,524	63,766	554,764
				Sub Total	225,599	Sub Total	2,369,532
				Terminal 1 Total Transportation cost			2,595,131
				Saving in Marine Transportation Cost			1,145,247 000yen
						=	191,193 000DA
						Benefit(75%)=	143,395 000DA

Case:1999 169 000 TEU

24 000 TEU DEVIATION PORT:WITHOUT CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
11,280	6,500	1,020	14	0.0	0	11,504	129,759
9,600	12,000	1,245	10	0.0	0	22,600	216,955
1,680	22,000	2,735	1	0.0	0	39,978	67,184
1,440	22,000	2,735	1	0.0	0	73,908	106,428
				Sub Total	0	Sub Total	520,306
				Deviation Port Transportation cost			520,306
				Terminal 1 Total Transportation cost			3,740,378
				Total Transportation cost			4,260,684

169 000 TEU TERMINAL 1(-11M):WITH CASE							
Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Waiting Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
79,430	6,500	1,020	99	1.8	186,090	7,296	579,521
67,600	12,000	1,245	88	2.3	194,274	17,495	1,182,662
11,830	22,000	2,735	5	3.0	40,444	29,836	352,960
10,140	22,000	2,735	4	2.3	26,481	63,766	646,587
				Sub Total	447,288	Sub Total	2,761,730
				Terminal 1 Total Transportation cost			3,209,019
				Saving in Marine Transportation Cost			1,051,865 000yen
						=	175,570 000DA
						Benefit(75%)=	131,678 000DA

Case:2000 196 000 TEU

51 000 TEU DEVIATION PORT:WITHOUT CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
23,970	6,500	1,020	30	0.0	0	11,504	275,739
20,400	12,000	1,245	20	0.0	0	22,600	461,030
3,570	22,000	2,735	1	0.0	0	39,978	142,723
3,060	22,000	2,735	1	0.0	0	73,908	226,159
			Sub Total		0	Sub Total	1,105,651
			Deviation Port Transportation cost				1,105,651
			Terminal 1 Total Transportation cost				3,740,378
			Total Transportation cost				4,846,028

27 000 TEU TERMINAL 2(-13M):WITH CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
12,690	6,500	1,020	16	0.0	0	11,504	145,979
10,800	12,000	1,245	11	0.0	0	22,600	244,075
1,890	22,000	2,735	1	0.0	0	39,978	75,559
1,620	22,000	2,735	1	0.0	0	73,908	119,731
			Sub Total		0	Sub Total	585,344
			Terminal 2 Total Transportation cost				585,344
			Terminal 1 Total Transportation cost				3,209,019
			Total Transportation cost				3,794,363
			Saving in Marine Transportation Cost				1,051,665 000yen
						=	175,570 000DA
						Benefit(75%)=	131,678 000DA

Case:2001 224 000 TEU

79 000 TEU DEVIATION PORT:WITHOUT CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
37,130	6,500	1,020	46	0.0	0	11,504	427,125
31,600	12,000	1,245	32	0.0	0	22,600	714,144
5,530	22,000	2,735	2	0.0	0	39,978	221,080
4,740	22,000	2,735	2	0.0	0	73,908	350,325
			Sub Total		0	Sub Total	1,712,674
			Deviation Port Transportation cost				1,712,674
			Terminal 1 Total Transportation cost				3,740,378
			Total Transportation cost				5,453,052

55 000 TEU TERMINAL 2(-13M):WITH CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
25,850	6,500	1,020	32	0.3	8,926	11,504	297,365
22,000	12,000	1,245	22	0.9	23,510	22,600	497,189
3,850	22,000	2,735	2	0.0	0	39,978	153,916
3,300	22,000	2,735	1	0.0	0	73,908	243,897
			Sub Total		32,436	Sub Total	1,192,368
			Terminal 2 Total Transportation cost				1,224,804
			Terminal 1 Total Transportation cost				3,209,019
			Total Transportation cost				4,433,823
			Saving in Marine Transportation Cost				1,019,229 000yen
						=	170,155 000DA
						Benefit(75%)=	127,616 000DA

Case:2002 254 000 TEU

109 000 TEU DEVIATION PORT:WITHOUT CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
51,230	6,500	1,020	64	0.0	0	11,504	589,324
43,600	12,000	1,245	44	0.0	0	22,600	985,338
7,630	22,000	2,735	3	0.0	0	39,978	305,034
6,540	22,000	2,735	3	0.0	0	73,908	483,360
			Sub Total		0	Sub Total	2,363,057
			Deviation Port Transportation cost				2,363,057
			Terminal 1 Total Transportation cost				3,740,378
			Total Transportation cost				6,103,435

85 000 TEU TERMINAL 2(-13M):WITH CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
39,950	6,500	1,020	50	1.8	91,049	11,504	459,565
34,000	12,000	1,245	34	2.3	97,183	22,600	768,383
5,950	22,000	2,735	2	3.3	22,602	39,978	237,871
5,100	22,000	2,735	2	8.1	46,979	73,908	376,932
			Sub Total		257,812	Sub Total	1,842,751
			Terminal 2 Total Transportation cost				2,100,563
			Terminal 1 Total Transportation cost				3,209,019
			Total Transportation cost				5,309,582
			Saving in Marine Transportation Cost				793,853 000yen
						=	132,530 000DA
						Benefit(75%)=	99,397 000DA

Case:2003- 281 000 TEU

136 000 TEU DEVIATION PORT:WITHOUT CASE

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
63,920	6,500	1,020	80	0.0	0	11,504	735,304
54,400	12,000	1,245	54	0.0	0	22,600	1,229,413
9,520	22,000	2,735	4	0.0	0	39,978	380,693
8,160	22,000	2,735	3	0.0	0	73,908	603,092
			Sub Total		0	Sub Total	2,948,402
			Deviation Port Transportation cost				2,948,402
			Terminal 1 Total Transportation cost				3,740,378
			Total Transportation cost				6,688,779

112 000 TEU TERMINAL 2(-13M):WITH CASE:2 BERTH

Number of Container (TEU)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Wating Days	Ships'Wating Costs (000yen)	Unit cost of Transp. (Yen/TEU)	Total Transport.cost (000yen)
52,640	6,500	1,020	66	4.2	281,608	11,504	805,544
44,800	12,000	1,245	45	4.7	263,774	22,600	1,012,458
7,840	22,000	2,735	3	3.3	29,781	39,978	313,430
6,720	22,000	2,735	3	5.3	40,205	73,908	496,664
			Sub Total		615,367	Sub Total	2,428,095
			Terminal 2 Total Transportation cost				3,043,462
			Terminal 1 Total Transportation cost				3,209,019
			Total Transportation cost				6,252,481
			Saving in Marine Transportation Cost				436,298 000yen
						=	72,836 000DA
						Benefit(75%)=	54,628 000DA

General Cargo Vessels

Case:1997

					WITHOUT CASE		WITH CASE		Saving Costs
Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	Average Waiting Days	Ship Waiting Costs (000yen)	Average Waiting Days	Ship Waiting Costs (000yen)	
General C.	880,000	3800	553	440	7.7	1,873,564	0.6	139,909	
Ro-Ro	430,000	3500	538	391	0.8	173,505	0.5	107,783	
Total	1,310,000			831		2,047,069		247,692	1,799,377 Thousand Yen = 300,397 Thousand DA Benefit=225,298(75%)

Case:1998

					WITHOUT CASE		WITH CASE		Saving Costs
Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	Average Waiting Days	Ship Waiting Costs (000yen)	Average Waiting Days	Ship Waiting Costs (000yen)	
General C.	876,000	3800	553	438	6.2	1,504,754	0.5	126,534	
Ro-Ro	427,000	3500	538	388	1.0	211,452	0.6	119,214	
Total	1,303,000			826		1,716,207		245,748	1,470,459 Thousand Yen = 245,486 Thousand DA Benefit=184,114(75%)

Case:1999

					WITHOUT CASE		WITH CASE		Saving Costs
Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	Average Waiting Days	Ship Waiting Costs (000yen)	Average Waiting Days	Ship Waiting Costs (000yen)	
General C.	869,000	3800	553	435	5.7	1,362,379	0.5	109,999	
Ro-Ro	421,000	3500	538	383	0.8	162,049	0.5	112,219	
Total	1,290,000			817		1,524,428		222,219	1,302,209 Thousand Yen = 217,397 Thousand DA Benefit=163,048(75%)

Table A.3.2 Unit Cost of Land Transportation

(Unit:million DA)

Year	1	2	3	4	5
Price before depreciation	1.836	0.731	0.291	0.116	0.046
Rate of depreciation	0.100	0.100	0.100	0.100	0.100
Price before repayment	1.836	1.469	1.102	0.735	0.367
Rate of interest	0.013	0.013	0.013	0.013	0.013
Number of container/year	27.602	27.602	27.602	27.602	27.602
Personnel cost	0.444	0.444	0.444	0.444	0.444
Cost of repaires	0.073	0.073	0.073	0.073	0.073
Insurance premium	0.018	0.018	0.018	0.018	0.018
Administraton cost	0.184	0.189	0.195	0.201	0.207
Interest	0.139	0.111	0.084	0.056	0.028
Depreciation cost	1.105	0.440	0.175	0.070	0.028
Total	1.964	1.277	0.990	0.862	0.798
Unit cost per container(DA)	11,881	7,722	5,986	5,215	4,829

Average cost 7,126

(Unit:DA)

Land transportation cost on one way	Unit cost	Van lease cost	Fuel cost	Total
(per one container)	7,126	99	479	7,704

Table A.3.3 Maintenance Cost (Port of Algiers)

Unit:000DA

	Construc-tion Cost	Rate of M/C	Maintena-nce Cost
(Terminal 2)			
Main Breakwater	1,030,671		
Sub Breakwater	327,565		
Seawall	238,435		
Quay	207,281		
Pavement of Yard	66,809		
Warehouse	33,372		
Road etc	8,014		
Mobilization	159,012		
Indirection cost	359,331		
Sub total	2,430,490	1%	24,305
Handling Equipment	43,800	4%	1,752
Total	2,474,290		26,057
(Terminal 1)			
Foundation	16,609		
Miscellous	498		
Mobilization	1327		
Indirection cost	2,397		
Sub total	20,831	1%	208
Handling Equipment	372,284	4%	14,891
Total	393,115		15,100
(Railway Siding)			
Railway	45,640		
Miscellaneous	3,206		
Indirection cost	6,337		
Total	55,083	1%	551
Grand Total	2,922,488		41,707
(Cereal Terminal)			
Foundation	10,959		
Railway	23,760		
Cereal silo	1,047,550		
Mobilization	90,475		
Indirection cost	209,235		
Sub total	1,381,979	1%	13,820
Pneumatic Unloader	337,244	4%	13,490
Total	1,719,223		27,310

(Terminal 1,2)

Market prices 41,707,000 DA

Economic Prices 41,707,000x91.5%=38,162,000 DA

(Cereal Terminal)

Market prices 27,310,000 DA

Economic Prices 27,310,000x91.5%=24,989,000 DA

Table A.3.4 Investment Cost for Djen Djen Port (at market prices)

	F/P ('000 DA)	L/P ('000 DA)	TOTAL ('000 DA)	TOTAL ('000 YEN)
Pavement of Yard	36,855	29,954	66,809	400,186
Warehouse etc	20,513	12,859	33,372	199,898
Road etc	4,472	3,542	8,014	48,004
Sub total	61,840	46,355	108,195	648,088
Mobilization	6,802	1,391	8,193	49,076
Direct cost	68,642	47,746	116,388	697,164
Phisical contin.	4,571	3,050	7,620	45,644
E/S	5,491	3,820	9,311	55,773
Handling Equip.	41,256	2,544	43,800	262,362
Grand total	119,960	57,159	177,119	1,060,944

Maintenance cost 133,319x1%+43,800x4%= 3,085 Thousand DA
(Market prices)
Maintenance cost 3,085x91.5%= 2,823 Thousand DA
(Economic prices)

Table A.3.5 Investment Cost for Djen Djen Port (at economic prices)

	Total(M/P)	Total(E/P)	1997	1,998
Pavement of Yard	66,809	63,920		63,920
Warehouse etc	33,372	31,951		31,951
Road etc	8,014	7,681	7,009	672
Sub total	108,195	103,552	7,009	96,543
Mobilization	8,193	8,067	8,067	
Direct cost	116,388	111,619	15,076	96,543
Phisical contin.	7,620	7,342	992	6,351
E/S	9,311	8,847	1,195	7,652
Handling Equip.	43,800	43,582		43,582
Grand total	177,119	171,390	17,263	154,128

Table A.3.6 Construciton Cost at Market Prices (Port of Algiers)

Unit: 1,000DA

Facilities		Total Construction Cost			1993			1994			1995			1996		
Item	Sub Item	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total
1.Container Terminal	1)Main Breakwater	687,785	342,886	1,030,671	143,159	127,162	270,321	180,987	68,521	249,508	177,248	65,553	242,801	186,391	81,650	268,041
	2)Sub Breakwater	224,949	102,616	327,565	11,655	16,170	27,825			0	91,379	37,074	128,453	121,915	49,372	171,287
	3)Seawall	169,559	68,876	238,435	21,086	15,566	36,652	78,645	28,997	107,642	40,694	14,602	55,296	29,134	9,711	38,845
	4)Dredging of Basin & Channel	19,950	117,800	137,750	19,950	117,800	137,750			0			0			0
	5)Reclamation of Land	198,291	68,874	267,165	66,860	23,761	90,621	65,716	22,557	88,273	65,715	22,556	88,271			0
	6)Quay	126,467	80,814	207,281			0	16,450	11,637	28,087	36,675	23,113	59,788	73,342	46,064	119,406
	7)Preparation & Pavement of Yard	36,855	29,954	66,809			0			0			0	36,855	29,954	66,809
	8)Terminal Buildings	20,513	12,859	33,372			0			0			0	20,513	12,859	33,372
	9)Miscellaneous	4,472	3,542	8,014			0	98	103	201	3,975	3,138	7,113	399	301	700
	10)Mobilization Cost	163,773	24,846	188,619	163,773	24,846	188,619			0			0			0
	11)Phisical contigency	144,944	75,873	220,817	37,395	28,908	66,304	30,003	11,684	41,687	36,526	14,795	51,321	41,019	20,486	61,505
	12)Engineering Services	132,209	68,245	200,454	70,236	34,006	104,242	20,657	11,413	32,070	20,658	11,413	32,071	20,658	11,413	32,071
	13)Cargo Handling Equipment	41,256	2,544	43,800			0			0			0	41,256	2,544	43,800
	14)Tax	137,972	69,981	207,953	37,388	27,175	64,563	27,479	10,844	38,323	33,101	13,457	46,558	40,004	18,505	58,509
	Total Construction Cost	2,108,995	1,069,710	3,178,705	671,503	415,394	986,897	420,035	165,756	585,791	505,971	205,701	711,672	611,486	282,859	894,345
2.Container Terminal	1)Foundation of Crane	9,875	6,734	16,609							9,875	6,734	16,609			
	2)Miscellaneous	296	202	498							296	202	498			
	3)Mobilization	1,119	208	1,327							1,119	208	1,327			
	4)Phisical contigency	565	357	922							565	357	922			
	5)Engineering Services	903	572	1,475				338	215	553	565	357	922			
	6)Container Crane 30.5T x 2	323,038	49,246	372,284									0	323,038	49,246	372,284
	7)Tax	23,506	4,012	27,518				24	15	39	869	550	1,419	22,613	3,447	26,060
	Total Construction Cost	359,302	61,331	420,633				362	230	592	13,289	8,408	21,697	345,651	52,693	398,344
3.Railway Siding	1)Railway Construction	23,000	22,540	45,540				17,250	16,905	34,155	5,750	5,635	11,385			
	2)Miscellaneous	2,530	676	3,206							2,530	676	3,206			
	3)Phisical contigency	1,277	1,161	2,438				895	813	1,708	382	348	730			
	4)Engineering Services	2,042	1,857	3,899	757	696	1,453	964	871	1,835	321	290	611			
	5)Tax	2,019	1,836	3,856	53	49	102	1,338	1,301	2,639	628	486	1,114			
	Total Construction Cost	30,868	28,070	58,939	810	745	1,555	20,447	19,890	40,337	9,611	7,435	17,046			
	Total	2,499,165	1,159,112	3,658,277	672,313	416,139	988,452	440,844	185,876	626,720	528,871	221,544	750,415	957,137	335,552	1,292,689
4.Cereal Terminal	1)Foundation of Unloader	5,831	5,128	10,959							3,499	3,077	6,576	2,332	2,051	4,383
	2)Service Railway line	12,000	11,760	23,760							8,400	8,232	16,632	3,600	3,528	7,128
	3)Cereal Silos	707,250	340,300	1,047,550				192,886	92,809	285,695	308,618	148,495	457,113	205,746	98,996	304,742
	4)Mobilization	79,759	10,716	90,475				79,759	10,716	90,475						
	5)Phisical contigency	79,495	35,921	115,416				25,583	11,521	37,104	32,666	14,675	47,341	21,246	9,725	30,971
	6)Engineering Services	64,387	29,432	93,819	24,145	11,037	35,182	13,414	6,132	19,546	13,414	6,132	19,546	13,414	6,131	19,545
	7)Pneumatic Unloader 400T x 2	309,140	28,104	337,244							154,570	14,052	168,622	154,570	14,052	168,622
	8)Tax	88,050	32,295	120,346	1,690	773	2,463	21,815	8,482	30,297	36,482	13,626	50,108	28,063	9,414	37,477
	Total Construction Cost	1,345,912	493,656	1,839,569	25,835	11,810	37,645	333,457	129,660	463,117	557,649	208,289	765,938	428,971	143,897	572,868

Table A.3.7 Conversion of Construction Cost to Economic Prices

Facilities		Construction Costs (Market Prices)	Foreign Portion (Market P)	Local Portion						Transfer Items	Construction Costs (Economic Prices)
				Non-traded goods	Skilled Labour	Unskilled Labour	Total (Market P)	At Economic prices	Local Conversion f.		
	Conversion Factor		100.0%	91.5%	90.9%	51.7%					
1.Container Terminal	1)Main Breakwater	1,030,671	687,785	294,651	25,561	22,674	342,886	304,563	88.8%		992,348
	2)Sub Breakwater	327,565	224,949	87,286	8,124	7,206	102,616	90,977	88.7%		315,926
	3)Seawall	238,435	169,559	57,717	5,913	5,246	68,876	60,898	88.4%		230,457
	4)Dredging of Basin & Channel	137,750	19,950	117,290	482	28	117,800	107,773	91.5%		127,723
	5)Reclamation of Land	267,165	198,291	56,317	3,206	9,351	68,874	59,279	86.1%		257,570
	6)Quay	207,281	126,467	67,713	5,908	7,193	80,814	71,047	87.9%		197,514
	7)Preparation & Pavement of Yard	66,809	36,855	28,591	508	855	29,954	27,065	90.4%		63,920
	8)Terminal Buildings	33,372	20,513	11,150	898	811	12,859	11,438	88.9%		31,951
	9)Miscellaneous	8,014	4,472	3,351	112	79	3,542	3,209	90.6%		7,681
	10)Mobilization Cost	188,619	163,773	15,887	7,073	1,886	24,846	21,941	88.3%		185,714
	11)Phisical contigency	220,817	144,944	67,511	4,416	3,946	75,873	67,827	89.4%		212,771
	12)Engineering Services	200,454	132,209	20,074	38,217	9,954	68,245	58,253	85.4%		190,462
	13)Cargo Handling Equipment	43,800	41,256	2,522	18	4	2,544	2,326	91.4%		43,582
	14)Tax	207,953						0		207,953	0
	Total Construction Cost	3,178,705	1,971,023	830,060	100,436	69,233	999,729	886,595	88.7%	207,953	2,857,618
2.Container Terminal	1)Foundation of Crane	18,609	9,875	5,688	473	573	6,734	5,931	88.1%		15,806
	12)Miscellaneous	498	296	171	14	17	202	178	88.1%		474
	3)Mobilization	1,327	1,119	145	50	13	208	185	88.9%		1,304
	4)Phisical contigency	922	565	322	18	17	357	320	89.6%		885
	5)Engineering Services	1,475	903	183	320	69	572	494	86.4%		1,397
	6)Container Crane 30.5T x 2	372,284	323,038	49,060	149	37	49,246	45,044	91.5%		368,082
	7)Tax	27,518						0		27,518	0
	Total Construction Cost	420,633	335,796	55,569	1,024	726	57,319	52,152	91.0%	27,518	387,946
3.Railway Siding	1)Railway Construction	45,540	23,000	20,872	564	1,104	22,540	20,181	89.5%		43,181
	2)Miscellaneous	3,206	2,530	660	9	7	676	616	91.1%		3,146
	3)Phisical contigency	2,438	1,277	1,126	23	12	1,161	1,057	91.1%		2,334
	4)Engineering Services	3,899	2,042	594	1,040	223	1,857	1,604	86.4%		3,646
	5)Tax	3,856						0		3,856	0
	Total Construction Cost	58,939	28,849	23,252	1,636	1,346	26,234	23,459	89.4%	3,856	52,308
	Total	3,658,277	2,335,668	908,881	103,096	71,305	1,083,282	962,205	88.8%	239,327	3,297,873
4.Cereal Terminal	1)Foundation of Unloader	10,959	5,831	4,332	360	436	5,128	4,516	88.1%		10,347
	2)Service Railway line	23,760	12,000	10,819	329	612	11,760	10,515	89.4%		22,515
	3)Cereal Silos	1,047,550	707,250	290,650	22,392	27,258	340,300	300,391	88.3%		1,007,641
	4)Mobilization	90,475	79,759	10,207	402	107	10,716	9,760	91.1%		89,519
	5)Phisical contigency	115,416	79,495	34,556	718	647	35,921	32,606	90.8%		112,101
	6)Engineering Services	93,819	64,387	9,418	16,482	3,532	29,432	25,426	86.4%		89,813
	7)Pneumatic Unloader 400T x 2	337,244	309,140	28,090	11	3	28,104	25,714	91.5%		334,854
	8)Tax	120,346						0		120,346	0
	Total Construction Cost	1,839,569	1,257,862	388,072	40,694	32,595	461,361	408,928	88.6%	120,348	1,666,790

Table A.3.8 Construction Cost at Economic Prices (Port of Algiers)

Unit: 1,000DA

Facilities		Total Construction Cost			1993			1994			1995			1996		
Item	Sub Item	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total
1.Container Terminal	1)Main Breakwater	687,785	304,563	992,348	143,159	112,950	256,109	180,987	60,863	241,850	177,248	58,226	235,474	186,391	72,524	258,915
	22)Sub Breakwater	224,948	90,977	315,926	11,655	14,336	25,991		0	0	91,379	32,869	124,248	121,915	43,772	165,687
	3)Seawall	169,559	60,898	230,457	21,086	13,763	34,849	78,645	25,638	104,283	40,694	12,911	53,605	29,134	8,586	37,720
	4)Dredging of Basin & Channel	19,950	107,773	127,723	19,950	107,773	127,723		0	0		0	0		0	0
	5)Reclamation of Land	198,291	59,279	257,570	66,860	20,451	87,311	65,716	19,414	85,130	65,715	19,414	85,129		0	0
	6)Quay	126,467	71,047	197,514		0	0	16,450	10,231	26,681	36,675	20,319	56,994	73,342	40,497	113,839
	7)Preparation & Pavement of Yard	36,855	27,065	63,920		0	0		0	0		0	0	36,855	27,065	63,920
	8)Terminal Buildings	20,513	11,438	31,951		0	0		0	0		0	0	20,513	11,438	31,951
	9)Miscellaneous	4,472	3,209	7,681		0	0	98	93	191	3,975	2,843	6,818	399	273	672
	10)Mobilization Cost	163,773	21,941	185,714	163,773	21,941	185,714		0	0		0	0		0	0
	11)Phisical contigency	144,944	67,827	212,771	37,396	25,842	63,238	30,003	10,445	40,448	36,526	13,226	49,752	41,019	18,313	59,332
	12)Engineering Services	132,209	58,253	190,462	70,236	29,027	99,263	20,657	9,742	30,399	20,658	9,742	30,400	20,658	9,742	30,400
	13)Cargo Handling Equipment	41,256	2,326	43,582		0	0		0	0		0	0	41,256	2,326	43,582
	14)Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Construction Cost	1,971,023	886,595	2,857,618	534,115	346,083	880,198	392,556	136,426	528,982	472,870	169,550	642,420	671,482	234,536	806,018
2.Container Terminal	1)Foundation of Crane	9,875	5,931	15,806		0	0		0	0	9,875	5,931	15,806		0	0
	12)Miscellaneous	296	178	474		0	0		0	0	296	178	474		0	0
	3)Mobilization	1,119	185	1,304		0	0		0	0	1,119	185	1,304		0	0
	4)Phisical contigency	565	320	885		0	0		0	0	565	320	885		0	0
	5)Engineering Services	903	494	1,397		0	0	338	186	524	565	308	873		0	0
	6)Container Crane 30.5T x 2	323,038	45,044	368,082		0	0		0	0		0	0	323,038	45,044	368,082
	7)Tax	0	0	0		0	0	0	0	0	0	0	0	0	0	0
	Total Construction Cost	335,796	52,152	387,948		0	0	338	186	524	12,420	6,922	19,342	323,038	45,044	368,082
3.Railway Siding	1)Railway Construction	23,000	20,181	43,181		0	0	17,250	15,136	32,386	5,750	5,045	10,795		0	0
	2)Miscellaneous	2,530	616	3,146		0	0		0	0	2,530	616	3,146		0	0
	3)Phisical contigency	1,277	1,057	2,334		0	0	895	740	1,635	382	317	699		0	0
	4)Engineering Services	2,042	1,604	3,646	757	601	1,358	964	752	1,716	321	251	572		0	0
	5)Tax	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	Total Construction Cost	28,849	23,459	52,308	757	601	1,358	19,109	16,629	35,738	8,983	6,228	15,211		0	0
	Total	2,335,668	962,205	3,297,873	534,872	346,684	881,556	412,003	153,241	565,244	494,273	182,700	676,973	894,520	279,580	1,174,100
4.Cereal Terminal	1)Foundation of Unloader	5,831	4,516	10,347		0	0		0	0	3,499	2,710	6,209	2,332	1,806	4,138
	2)Service Railway line	12,000	10,515	22,515		0	0		0	0	8,400	7,360	15,760	3,600	3,154	6,754
	3)Cereal Silos	707,250	300,391	1,007,641		0	0	192,886	81,925	274,811	308,618	131,080	439,698	205,746	87,386	293,132
	4)Mobilization	79,759	9,760	89,519		0	0	79,759	9,760	89,519		0	0		0	0
	5)Phisical contigency	79,495	32,606	112,101		0	0	25,583	10,458	36,041	32,666	13,321	45,987	21,246	8,827	30,073
	6)Engineering Services	64,387	25,426	89,813	24,145	9,535	33,680	13,414	5,297	18,711	13,414	5,297	18,711	13,414	5,296	18,710
	7)Pneumatic Unloader 400T x 2	309,140	25,714	334,854		0	0		0	0	154,570	12,857	167,427	154,570	12,857	167,427
	8)Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Construction Cost	1,257,862	408,928	1,666,790	24,145	9,535	33,680	311,642	107,440	419,082	521,167	172,626	693,793	400,908	119,328	520,236

Table A.3.9 Saving in Ships' Staying Costs (Cereal Terminal Project)

Cereal Vessels

Case:1997 2,000 thousand ton

WITHOUT CASE						WITH CASE						Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
1,400,000	28000	1,056	61	22.9	1,473,579	2,000,000	28,000	1,056	87	7.4	679,896	
600,000	28000	1,056	26	10.8	297,172							
Total	Mooring Quay; 33-1, 33-3, 35-1, 35-3				1,770,751	Mooring Quay; 33-1, 35-1, 35-3					679,896	1,090,856 Thousand Yen 182,113 Thousand DA

Case:1998 2,200 thousand ton

WITHOUT CASE						WITH CASE						Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
1,600,000	28000	1,056	70	27.1	1,988,647	2,200,000	28,000	1,056	96	7.6	766,403	
600,000	28000	1,056	26	10.8	297,172							
Total	Mooring Quay; 33-1, 33-3, 35-1, 35-3				2,285,819	Mooring Quay; 33-1, 35-1, 35-3					766,403	1,519,416 Thousand Yen 253,659 Thousand DA

Case:1999 2,300 thousand ton

WITHOUT CASE						WITH CASE						Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
1,700,000	28000	1,056	74	37.6	2,933,461	2,300,000	28,000	1,056	100	8.4	884,400	
600,000	28000	1,056	26	10.8	297,172							
Total	Mooring Quay; 33-1, 33-3, 35-1, 35-3				3,230,633	Mooring Quay; 33-1, 35-1, 35-3					884,400	2,346,233 Thousand Yen 391,692 Thousand DA

General Cargo Vessels

Case:1997

Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	WITHOUT CASE: Average Waiting hours	WITHOUT CASE: Ship Waiting Costs (000yen)	WITH CASE: Average Waiting hours	WITH CASE: Ship Waiting Costs (000yen)	Saving Costs
Wood	267,000	12000	969	52	21.6	45,657	3.8	8,032	
Steel P.	338,000	5000	610	72	15.3	27,966	2	3,656	
Total	605,000					73,623		11,688	61,935 Thousand Yen 10,340 Thousand DA Benefit=7,755,000DA(75%)

Case:1998

Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	WITHOUT CASE: Average Waiting hours	WITHOUT CASE: Ship Waiting Costs (000yen)	WITH CASE: Average Waiting hours	WITH CASE: Ship Waiting Costs (000yen)	Saving Costs
Wood	273,000	12000	969	54	43.8	94,663	3.8	8,213	
Steel P.	354,000	5000	610	75	37.3	71,406	6.8	13,018	
Total	627,000					166,068		21,230	144,838 Thousand Yen 24,180 Thousand DA Benefit=18,135,000DA(75%)

Case:1999

Ship Type	Cargo Volume (Ton)	Ship Size (gross t)	Ship Cost (per day) (000yen)	Number of Ships	WITHOUT CASE: Average Waiting hours	WITHOUT CASE: Ship Waiting Costs (000yen)	WITH CASE: Average Waiting hours	WITH CASE: Ship Waiting Costs (000yen)	Saving Costs
Wood	279,000	12000	969	55	55.4	122,365	10.1	22,308	
Steel P.	371,000	5000	610	79	35.7	71,625	3.9	7,825	
Total	650,000					193,989		30,133	163,857 Thousand Yen 27,355 Thousand DA Benefit=20,516,000DA(75%)

Table A.3.10 Savings in Ships' Staying Costs (Port of Oran)

Case:1997-2000 1,300 thousand ton

WITHOUT CASE							WITH CASE							Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
481,000	32000	25000 NO12	1,113	19	15.3	322,703	481,000	32000	25000 NO12	1,113	19	9.8	208,086	
119,000	32000	7000 NO12	1,113	17	11.2	212,388	119,000	32000	7000 NO12	1,113	17	5.4	101,984	
196,000	32000	7000 NO12	1,113	28	12.1	378,123	700,000	40000	35000 New T.	1,218	20	14.5	352,733	
504,000	32000	18000 Other B.	1,113	28	23.5	733,523								
Total				92		1,646,737					56		662,803	983,934 Thousand Yen 164,263 Thousand DA

Case:2001 1,400 thousand ton

WITHOUT CASE							WITH CASE							Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
581,000	32000	25000 NO12	1,113	23	15.4	393,713	481,000	32000	25000 NO12	1,113	19	9.8	208,086	
119,000	32000	7000 NO12	1,113	17	10.5	199,049	119,000	32000	7000 NO12	1,113	17	5.4	101,984	
196,000	32000	7000 NO12	1,113	28	13.3	412,923	800,000	40000	35000 New T.	1,218	23	15.7	438,419	
504,000	32000	18000 Other B.	1,113	28	23.5	733,523								
Total				96		1,739,207					59		748,490	990,717 Thousand Yen 165,395 Thousand DA

Case:2002 1,500 thousand ton

WITHOUT CASE							WITH CASE							Saving Costs
Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	Cargo Volume (Ton)	Ship Size (dwt)	Unloading Mooring Volume Per Berth Ship(T)	Ship Cost (per day) (000yen)	Number of Ships	Average Staying days	Ship Staying Costs (000yen)	
681,000	32000	25000 NO12	1,113	27	20.3	610,156	481,000	32000	25000 NO12	1,113	19	9.8	208,086	
119,000	32000	7000 NO12	1,113	17	16.5	311,459	119,000	32000	7000 NO12	1,113	17	5.4	101,984	
196,000	32000	7000 NO12	1,113	28	19.0	590,682	900,000	40000	35000 New T.	1,218	26	25.2	798,667	
504,000	32000	18000 Other B.	1,113	28	23.5	732,354								
Total				100		2,244,651					62		1,108,738	1,135,913 Thousand Yen 189,635 Thousand DA

Table A.3.11 Maintenance Cost (Port of Oran)

Unit:000DA

	Construction Cost	Rate of M/C	Maintenance Cost
Quay	78,108		
Pavement of Yard	32,149		
Cereal Silo	205,430		
Accompanying E.	174,958		
Miscellaneous	29,973		
Mobilization	35,471		
Indirection cost	87,791		
Sub total	643,880	1%	6,439
Pneumatic Unloader	153,274	4%	6,131
Total	797,154		12,570

Market prices 12,570 thousand DA

Economic Prices 12570x91.5%=11,502 thousand DA

Table A.3.12 Construciton Cost at Market Prices (Port of Oran)

Unit: 1.000DA

Facilities		Total Construction Cost			1993			1994			1995			1996		
Item	Sub Item	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total
New Berth	1)Protect Mound	30,293	10,137	40,430							6,658	2,228	8,886	23,635	7,909	31,544
	2)Dredging of Basin	186	1,134	1,320							186	1,134	1,320			
	3)Reclamation of land	107,162	36,809	143,991				29,231	10,039	39,270	38,975	13,385	52,360	38,976	13,385	52,361
	4)Quay	48,845	29,263	78,108							8,290	5,181	13,471	40,555	24,082	64,637
	5)Preparation of Land	17,809	14,340	32,149							7,124	5,436	12,560	10,685	8,904	19,589
	6)Silo & Buildings	127,350	78,080	205,430							89,145	54,656	143,801	38,205	23,424	61,629
	7)Accompanying Machinery	129,471	45,487	174,958							38,841	13,646	52,487	90,630	31,841	122,471
	8)Miscellaneous	15,776	14,198	29,973				1,578	1,420	2,998	6,310	5,679	11,989	7,887	7,099	14,986
	9)Mobilization cost	27,819	14,478	42,297				27,819	14,478	42,297						
	10)Phisical contigency	41,127	19,222	60,349				4,460	1,772	6,232	16,071	8,113	24,184	20,596	9,337	29,933
	11)Engineering Services	40,378	19,514	59,892	15,746	7,777	23,523	7,136	3,097	10,233	8,748	4,320	13,068	8,748	4,320	13,068
	12)Pneumatic Unloader 200T/H x 2	143,638	9,636	153,274										143,638	9,636	153,274
	13)Tax	51,091	20,460	71,551	1,102	544	1,646	4,916	2,156	7,072	15,426	7,964	23,390	29,547	9,796	39,443
	Total Construction Cost	780,964	312,758	1,093,722	16,848	8,321	25,169	75,140	32,962	108,102	235,774	121,742	357,516	453,202	149,733	602,935

Table A.3.13 Conversion of Construction Cost to Economic Prices (Port of Oran)

Facilities		Construction Costs (Market Prices)	Foreign Portion (Market P)	Local Portion						Transfer Items	Construction Costs (Economic Prices)
				Non-traded goods	Skilled Labour	Unskilled Labour	Total (Market P)	At Econom-ic prices	Local Con-version f.		
	Conversion Factor		100.0%	91.5%	90.9%	51.7%					
New Berth	1)Protect Mound	40,430	30,293	8,245	1,003	889	10,137	8,918	88.0%		39,209
	2)Dredging of Basin	1,320	186	1,128	5	1	1,134	1,037	91.5%		1,223
	3)Reclamation of land	143,991	107,182	30,043	1,727	5,039	36,809	31,664	86.0%		138,846
	4)Quay	78,108	48,845	24,327	2,226	2,710	29,263	25,684	87.8%		74,529
	5)Preparation of Land	32,149	17,809	13,687	243	410	14,340	12,956	90.4%		30,765
	6)Silo & Buildings	205,430	127,350	66,688	5,138	6,254	78,080	68,923	88.3%		196,273
	7)Accompanying Machinery	174,958	129,471	38,850	2,993	3,644	45,487	40,152	88.3%		169,623
	8)Miscellaneous	29,973	15,775	13,453	435	310	14,198	12,865	90.6%		28,640
	9)Mobilization cost	42,297	27,819	12,955	1,203	320	14,478	13,113	90.6%		40,932
	10)Phisical contigency	60,349	41,127	16,869	1,239	1,114	19,222	17,137	89.2%		58,264
	11)Engineering Services	59,892	40,378	6,244	10,928	2,342	19,514	16,858	86.4%		57,236
	12)Pneumatic Unloader, Belt Con	153,274	143,638	9,553	68	15	9,636	8,811	91.4%		152,449
	13)Tax	71,551								71,551	0
	Total Construction Cost	1,093,722	729,873	242,042	27,208	23,048	292,298	258,116	88.3%	71,551	987,989

Table A.3.14 Construction Cost at Economic Prices (Port of Oran)

Facilities		Total Construction Cost			1993			1994			1995			1996		
Item	Sub Item	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total
New Berth	1)Protect Mound	30,293	8,916	39,209		0	0		0	0	6,658	1,960	8,618	23,635	6,956	30,591
	2)Dredging of Basin	186	1,037	1,223		0	0		0	0	186	1,037	1,223		0	0
	3)Reclamation of land	107,182	31,664	138,846		0	0	29,231	8,636	37,867	38,975	11,514	50,489	38,976	11,514	50,490
	4)Quay	48,845	25,684	74,529		0	0		0	0	8,290	4,547	12,837	40,555	21,136	61,691
	5)Preparation of Land	17,809	12,956	30,765		0	0		0	0	7,124	4,912	12,036	10,685	8,045	18,730
	6)Silo & Buildings	127,350	68,923	196,273		0	0		0	0	89,145	48,246	137,391	38,205	20,677	58,882
	7)Accompanying Equipment	129,471	40,152	169,623		0	0		0	0	38,841	12,046	50,887	90,630	28,107	118,737
	8)Miscellaneous	15,775	12,865	28,640		0	0	1,578	1,287	2,865	6,310	5,145	11,456	7,887	6,433	14,320
	9)Mobilization cost	27,819	13,113	40,932		0	0	27,819	13,113	40,932		0	0		0	0
	10)Phisical contigency	41,127	17,137	58,264		0	0	4,460	1,580	6,040	16,071	7,233	23,304	20,596	8,324	28,920
	11)Engineering Services	40,378	16,858	57,236	15,746	6,718	22,464	7,136	2,675	9,811	8,748	3,732	12,480	8,748	3,732	12,480
	12)Pneumatic Unloader 200T/H x 2	143,638	8,811	152,449		0	0		0	0		0	0	143,638	8,811	152,449
	13)Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Construction Cost	729,873	259,116	987,989	15,746	6,718	22,464	70,224	27,291	97,515	220,348	100,373	320,721	423,555	123,735	547,290

A.4 Economic Internal Rate of Return

The internal rate of return is expressed as a discount ratio satisfying the following equation:

$$\sum_{i=1}^{n} \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

where, n: Period of cost-benefit analysis
Bi: Benefits in i-th year
Ci: Costs in i-th year
r: Discount rate (EIRR)

The benefits are calculated by comparing "With-the-project Case" and "Without-the-project Case" where no investment is made.

A.5 Methodology of Economic Pricing

(1) Methodology

The purpose of the economic analysis is to examine the value of the project, that is to see if it represents an efficient allocation of resources in the national economy. The value of goods quoted at a market price do not always represent the true value of resources from the viewpoint of the national economy. The local currency portion of goods and materials at market prices often includes sales tax, custom duties and so on. The labour cost at market prices is often influenced by a minimum wage system. Therefore, "Economic Pricing" should be conducted for the economic analysis

The market prices are changed to economic prices by excluding transfer items such as sales tax and applying various conversion factors selectively.

(2) Method of Applying Conversion Factors

Generally, all costs are divided into labour, traded goods and nontraded goods. Labour is further divided into skilled labor and unskilled labor. The cost of skilled labor is obtained by multiplying its market price by the Conversion Factor for Consumption (CFC), and the cost of unskilled labor is calculated by

multiplying its market price by a rate of the Shadow Wage Rate and the CFC. Traded goods are expressed by the C.I.F. value for imports and by the F.O.B. for exports. As for non-traded goods, the economic price is calculated by multiplying the Standard Conversion Factor (SCF).

(3) Calculation of the Conversion Factors

A.Standard Conversion Factor (SCF)

Economic policy items such as import duties and export subsidies cause a price differential between the domestic market and international market. The SCF is applied to determine the economic prices of certain non-traded goods and services that cannot be directly valued at border prices, and the SCF is generally obtained by the following equation:

$$SCF = (I + E) / \{(I + Di) + (E - De)\}$$

where, I: Total value of imports
E: Total value of exports
Di: Total value of import duties
De: Total value of export duties and Subsidies

Each value in the above equation is calculated based upon Algerian custom data in 1990, and the SCF is estimated as 0.915.

B. Conversion Factor for Consumption (CFC)

The "Conversion Factor for Consumption" (CFC) is used for converting the prices of consumer goods from domestic market prices to border prices. This is particularly required in converting domestic labour costs to corresponding border prices. The CFC is usually calculated in the same manner as the SCF, replacing total imports and total exports by imports and exports of consumer goods only. In this study, the CFC is estimated as 0.909.

C. Shadow Wage Rate

For economic analysis, labour costs should be measured in terms of the opportunity cost of labour; that is, the value of the marginal product of labour foregone elsewhere because of its use in a given project.

a. Conversion Factor for Skilled Labour

The opportunity cost of skilled labour is assumed to be equal to the actual wage rate, since the number of skilled laborers is limited and the market mechanism is functioning properly.

However, since these are domestic prices, they should be converted to

border prices. Wages can be measured in terms of their purchasing power of consumer goods.

Therefore, the cost of skilled labour is calculated by multiplying their actual wage rate by the CFC; namely, "the Conversion Factor of Skilled Labour" is estimated as 0.909 in this study.

Conversion Factor for Skilled Labour = (Opportunity Cost of Skilled Labour/Nominal Wage Rate of Skilled Labour) x CFC = 1 x 0.909 = 0.909

b. Conversion Factor for Unskilled Labour

The opportunity cost of unskilled labour is generally far below the actual wage rate, since the rate is controlled by a minimum wage system and other regulations, nevertheless there are many unskilled laborers.

When a project is conducted, the inflow of unskilled labour to the project is mainly from the agricultural sector which is relatively elastic in its use of labour. Therefore, it is often assumed that the opportunity cost of unskilled labour is equal to the per capita income of the agricultural sector. In this study, the opportunity cost of unskilled labour of 52,955DA per year is adopted with reference to the data of ONS.

The "Conversion Factor for Unskilled Labour" is calculated as follows:
Conversion Factor for Unskilled Labour = (Opportunity Cost of Unskilled Labour/Nominal Wage Rate of Unskilled Labour) x CFC = (52,955/93,000) x 0.909 = 0.517

A.6 Analysis of Calmness in Basins Protected by Breakwaters

A.6.1 The Port of Algiers

According to the conditions mentioned in Section 1.7 of the main body, the main breakwater of 480 m long and the sub-breakwater of 320 m long are planned in the Master Plan. Calmness in the basins protected by the above breakwaters was analyzed using a computer simulation method as in the Master Plan. The results of the simulation in the storm conditions with return period of 10 years, a significant wave height of 4.8 m with period of 11.8 sec. and the direction of northeast, are shown in Fig.A.6.1. As shown in the figure, the basins except for the waters near the entrance of the port are expected to be kept under the critical wave height of 1.5 m for anchoring vessels.

Furthermore, even in the storm conditions with the return period of 50 years, structures protected by the breakwaters such as berths and sea walls are expected to be maintained safely against the waves coming from the outer sea.

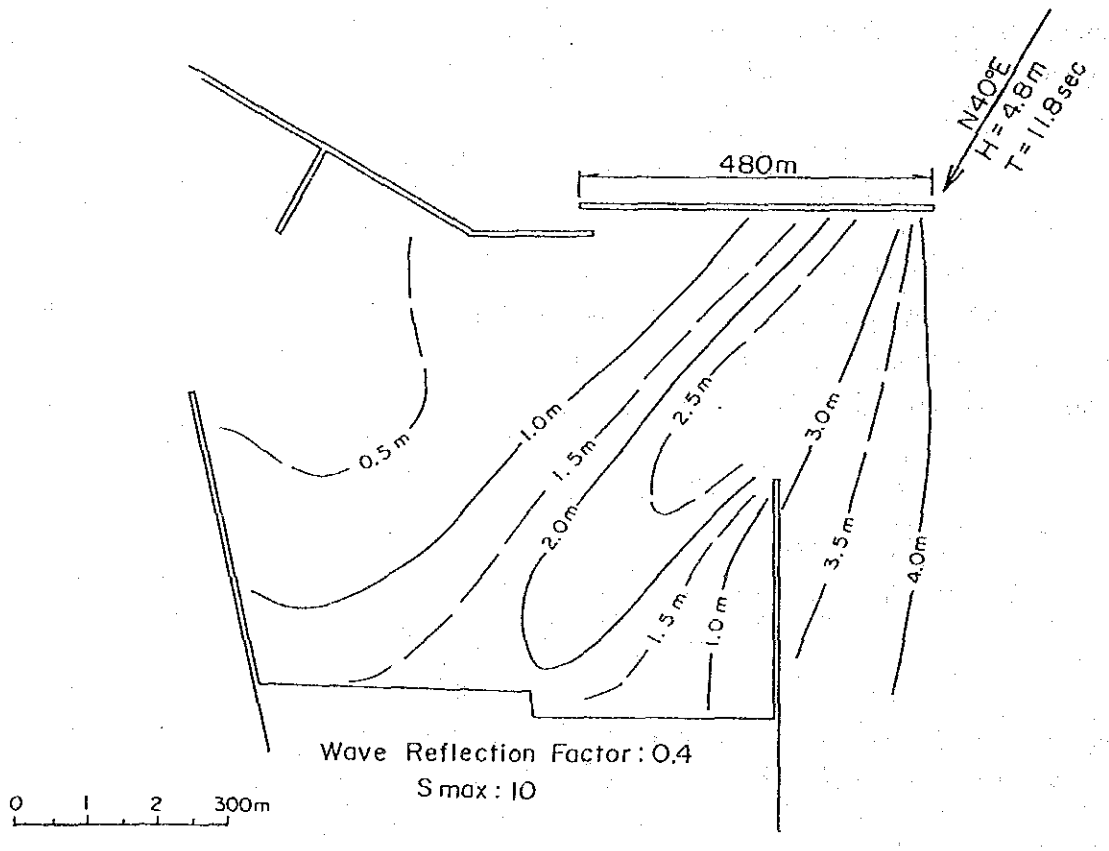


Fig.A.6.1 Degree of Basin Calmness in Algier port

A.6.2 The Port of Oran

Fig. A.6.2 presents the results of a simulation analysis of the degree of basin calmness made assuming the existing breakwater layout and further assuming a deepwater wave with a 50-year return period (H = 8.9m, T = 12,3 sec, D = N15^{O}E).

The simulation results show that the wave height in the basin area in front of the proposed container berth will be about 1.5 m. If the existing breakwater is extended by 100 m, the wave height at the midpoint of the container berth will only be reduced from 1.47 to 1.30 m.

At normal times, the sheltering effects of the breakwater relative to incoming waves of 0.5 m or more in height will be 99 % or more.

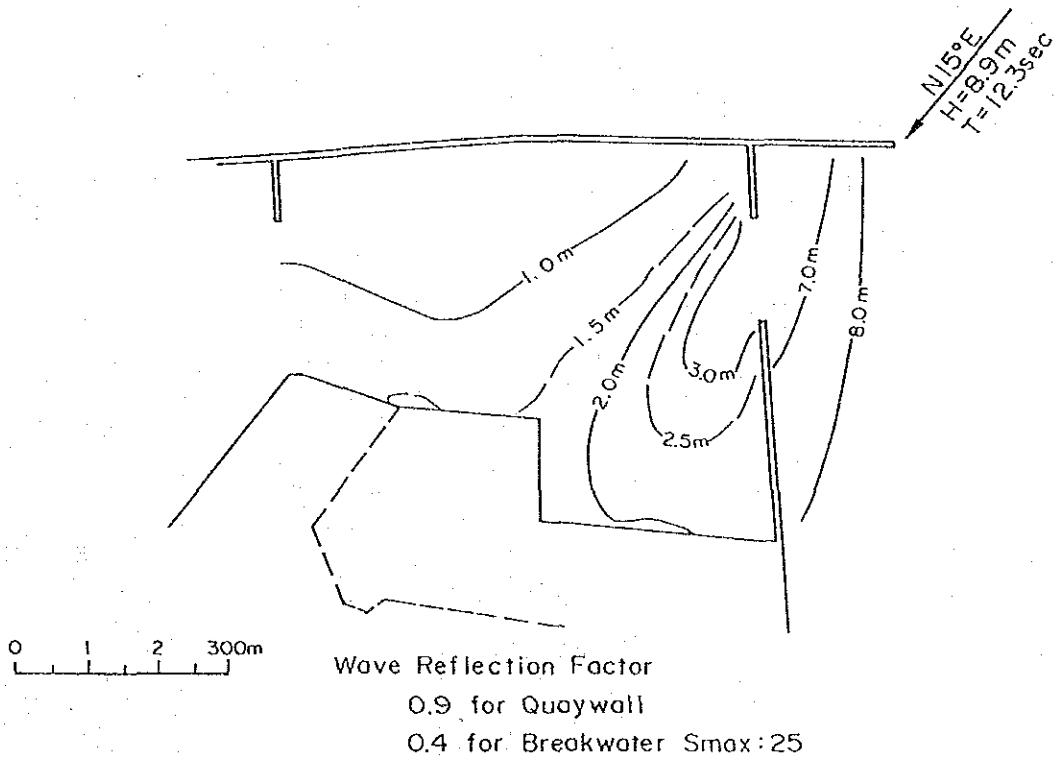


Fig.A.6.2 Degree of Basin Calmness in Oran port

Table A.7.1 Revenue and Expense for the Container Terminal 2 in the Port of Algiers

CASE: I-1
PORT : ALGIERS
PROJECT: CONTAINER TERMINAL 2 (1,000DA)

				1997	1998	1999	2000	2001	2002	2003
1 Revenue										
yard				10,891	9,898	9,630	12,859	20,829	29,969	38,599
CFS				4,863	4,864	4,869	2,780	2,780	2,780	2,780
G.C										
handling				19,719	19,646	19,474	12,818	25,938	40,338	53,281
rent equip.				166	166	166				
silo										
unloader										
direct unloading										
total				34,839	34,574	34,139	28,457	49,545	73,137	92,660
2 Expense										
wage	128	x1,000 DA/per person		15,565	15,565	15,565	29,261	29,261	29,261	29,261
		1997-99	2000-							
facilities manage.		7.6	7.6							
G.C										
handling	conventi	114								
handling	container		221							
silo										
subtotl		121.6	228.6	persons						
maintenace		0.5 - 2%		2,044	2,044	2,044	2,044	2,044	2,044	2,044
others		0.579 %		202	200	198	165	237	423	537
tax(wage)		6 %		934	934	934	1,756	1,756	1,756	1,756
tax(reve)		2.55 %		888	882	871	726	1,263	1,865	2,363
total				19,632	19,624	19,611	33,951	34,610	35,349	35,959

3 Investment

facilities	initial cost	dep. period	maintenance (%)	amount	dep. cost/year
quay					
yard	81,212	20	0.5	406	4,061
CFS	40,560	30	1	406	1,352
G.C					
handling	46,866	10	2	937	4,687
railway	58,938	30	0.5	295	1,965
total	227,576			2,044	

Note: Revenue from the backup area is not included.

Table A.7.2 Revenue and Expense for the Container Terminal 1 in the Port of Algiers

CASE: 2-3
PORT : ALGIERS
PROJECT: CONTAINER TERMINAL 1 (WORLD BANK)

(1,000DA)

		1997	1998	1999	2000	2001	2002	2003
1 Revenue								
yard								
CFS								
G.C	7,000DA/hours	36,765	42,739	49,113	48,412	47,711	47,011	46,310
handling								
rent equip.								
silo								
unloader								
direct unloading								
total		36,765	42,739	49,113	48,412	47,711	47,011	46,310
2 Expense								
wage								
	128 x1,000 DA/person	256	256	256	256	256	256	256
facilities manage.								
G.C maintenance	2							
handling conventional								
handling container								
silo								
subtotl	2 persons							
maintenace	2 %	7,989	7,989	7,989	7,989	7,989	7,989	7,989
others	0.579 %	213	247	284	280	276	272	268
tax(wage)	6 %	15	15	15	15	15	15	15
tax(revenue)	2.55 %	938	1,090	1,252	1,235	1,217	1,199	1,181
total		9,411	9,598	9,797	9,775	9,753	9,732	9,710

3 Investment

facilities	initial cost	dep. period	maintenance (%)	amount	dep. cost/year
quay		30	0.1	0	0
yard		20	0.5	0	0
CFS		30	1	0	0
G.C	398,344	20	2	7,967	19,917
GC foundation	22,289	30	0.1	22	743
railway		30	0.5	0	0
seawall		30	0.1	0	0
reclamation					
total	420,633			7,989	

Table A.7.3 Revenue and Expense for the Cereal Terminal in the Port of Algiers

CASE: 3-1
PORT : ALGIERS
PROJECT: CEREAL TERMINAL

			1997	1998	1999	2000	2001	2002	2003
1 Revenue									
yard									
CFS									
G.C									
handling									
rent equip.									
silo			66,100	75,542	80,264	80,264	80,264	80,264	80,264
unloader			33,511	38,298	40,691	40,691	40,691	40,691	40,691
direct unloading									
total (base case)			99,611	113,840	120,955	120,955	120,955	120,955	120,955
Total	140 % tariff up		239,066	273,216	290,292	290,292	290,292	290,292	290,292
2 Expense			1997	1998	1999	2000	2001	2002	2003
wage	128 x1,000 DA/person		768	768	768	768	768	768	768
facilities manage.									
G.C									
handling conventional									
handling container									
silo		6							
subtotl		6 persons							
maintenace		2 %	10,174	10,174	10,174	10,174	10,174	10,174	10,174
others		0.579 %	1,384	1,582	1,681	1,681	1,681	1,681	1,681
tax(wage)		6 %	46	46	46	46	46	46	46
tax(revenue)		2.55 %	6,096	6,967	7,402	7,402	7,402	7,402	7,402
Total			18,469	19,537	20,072	20,072	20,072	20,072	20,072

3 Investment

facilities	initial cost	dep. period	maintenance (%)	maintenance amount	dep. cost/year
quay		30	0.1	0	0
yard		20	0.5	0	0
CFS		30	1	0	0
G.C		20	2	0	0
GC foundation		30	2	0	0
railway		30	0.5	0	0
seawall		30	0.1	0	0
reclamation					
silos	1,478,718	30	0.2	2,957	49,291
unloaders	360,851	15	2.0	7,217	24,057
total	1,839,569			10,174	

Table A.7.4 Revenue and Expense for the Container Yard in the Port of Oran

CASE: 5-1
PORT : ORAN
PROJECT: CONTAINER YARD

			1997	1998	1999	2000	2001	2002	2003
1 Revenue									
yard			4,347	5,001	5,708	5,895	5,895	5,895	5,895
CFS									
G.C									
handling									
rent equip.									
silo									
unloader									
direct unloading									
total			4,347	5,001	5,708	5,895	5,895	5,895	5,895
2 Expense			1997	1998	1999	2000	2001	2002	2003
wage	128 x1,000 DA/year		589	589	589	589	589	589	589
facilities manage.		4.3							
maintenance		0.3							
handling conventional									
handling container									
silo									
subtotl		4.6 person							
maintenace		0.5 %	114	114	114	114	114	114	114
others		0.579 %	25	29	33	34	34	34	34
tax(wage)		6 %	35	35	35	35	35	35	35
tax(revenue)		2.55 %	111	128	146	150	150	150	150
total			874	894	916	922	922	922	922

3 Investment

facilities	initial cost	dep. period	maintenance (%)	maintenance amount	dep. cost/year
quay	0	30			
yard	22,730	20	0.5	114	1,137
CFS		30	1	0	0
G.C		20			
handling	0	10	2	0	0
railway					
total	22,730			114	

Table A.7.5 Revenue and Expense for the Container Facility in the Port of Oran

CASE: 6-1
PORT : ORAN
PROJECT: CEREAL FACILITY

		1997	1998	1999	2000	2001	2002	2003
1 Revenue								
yard								
CFS								
G.C								
handling								
rent equip.								
silo	140 % tariff up from base case	74,880	74,880	74,880	74,880	93,600	112,320	131,040
unloader								
direct unloading								
total		74,880	74,880	74,880	74,880	93,600	112,320	131,040
2 Expense		1997	1998	1999	2000	2001	2002	2003
wage	128 x1,000 DA/year	768	768	768	768	768	768	768
facilities manage.	3							
maintenance	3							
handling conv.								
handling container								
silo								
subtotl	6 persons							
maintenace	0.1-2 %	7,411	7,411	7,411	7,411	7,411	7,411	7,411
others	0.579 %	434	434	434	434	542	650	759
tax(wage)	6 %	46	46	46	46	46	46	46
tax(revenue)	2.55 %	1,909	1,909	1,909	1,909	2,387	2,864	3,342
total		10,568	10,568	10,568	10,568	11,154	11,740	12,325

3 Investment

facilities	initial cost	dep. period	maintenance (%)	maintenance amount	dep. cost/year
quay		30	0.1	0	0
yard		20	0.5	0	0
CFS		30	1	0	0
G.C					
handling		10	2	0	0
railway	0	30	0.5	0	0
silo	279,470	30	0.1	279	9,316
machinary	187,205	15	2.0	3,744	12,480
pneumatic unloaders	164,003	15	2.0	3,280	10,934
pavement	21,494	30	0.5	107	716
total	652,162			7,411	

JICA