and more piles than on good ground, likewise increasing construction costs.

However, the planned site of the −4.5 m general cargo berth is some distance from the existing boring point, BH-2 (See Fig. 8.1.1.) and the soil conditions at the planned site are assumed to be very complicated; thus the structure type of −4.5 m general cargo berth should be reviewed after detailed soil investigations are made.

The small craft berth was also designed as a sheet pile type. The sheet pile wall is utilized as the anchoring system of the −4.5 m general cargo berth and the small craft berth for reasons of economy.

(3) Results

The standard cross-sections of the Ro-Ro vessel berth (marginal wharf) are shown in Fig. 8.1.3 ~ 8.1.5 and those of the −10.0 m general cargo berth are presented in Fig. 8.1.6 ~ 8.1.8.

The standard cross-sections of the Ro-Ro vessel berth (pier), the −4.5 m general cargo berth, and the small craft berth are shown in Fig. 8.1.9 ~ 8.1.11.

Determination of a basic type for the Ro-Ro vessel berth (marginal wharf) and the −10.0 m general cargo berth entailed a comparison among the three selected common types based on the respective design results. The comparison was made from the viewpoint of economy in construction cost, simplicity in execution, construction speed, adaptability to soil conditions, and durability of the structure.

The construction cost estimate and comparative constructional and structural characteristics are summarized in Table 8.1.5. The results of the cost estimate are expressed in terms of a construction cost ratio with the construction cost for the sheet pile type representing 1.0.

According to the table, the sheet pile type was found to be superior in terms of economy in construction cost and constructional and structural characteristics. The sheet pile type has been therefore determined as the basic type for both the Ro-Ro vessel berth (marginal wharf) and the −10.0 m general cargo berth.

Table 8.1.5 Comparison Table

		Gravity (Caisson) Type	Gravity Sheet Pile Type	Open Type
Simplicity of Works		△	◎	○
Simplicity of Excecution Management		○	◎	◎
Amount of Works		△	◎	○
Construction Speed		△	◎	◎
Adaptability to Soil Condition		△	○	◎
Durability		◎	△	△
Construction Cost Ratio	Ro-Ro Vessel Berth	1.04	1.00	1.05
	−10.0 m General Cargo Berth	1.09	1.00	1.10

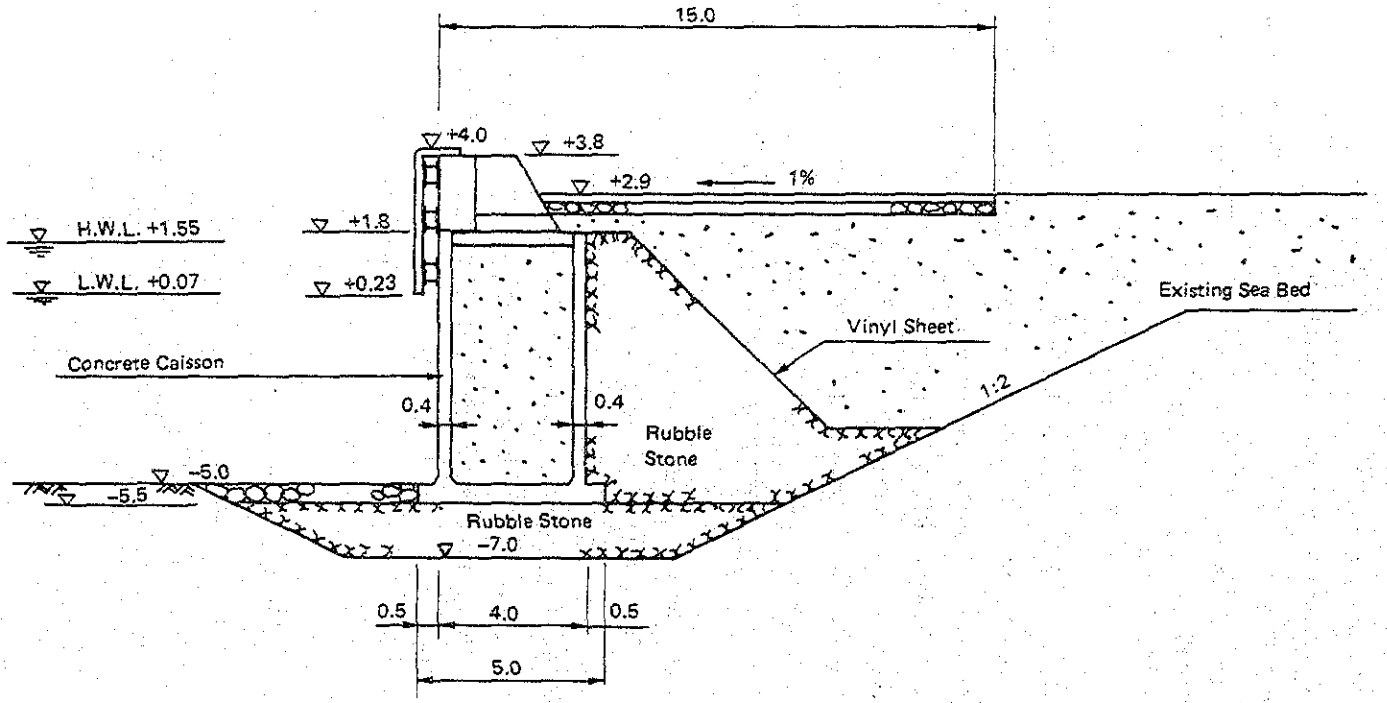


Fig. 8.1.3 Ro-Ro Vessel Berth (Marginal Wharf) (Gravity Type)

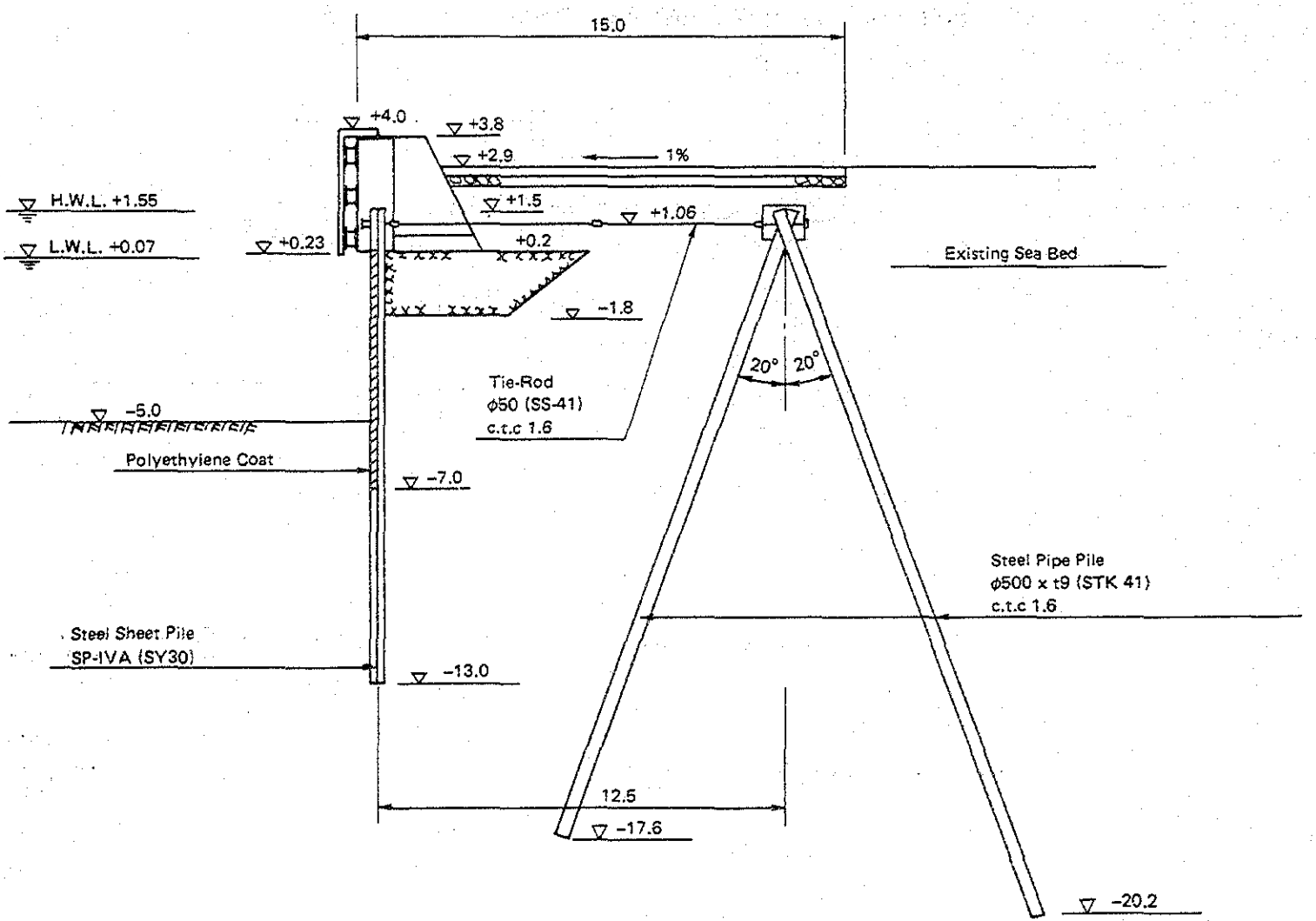


Fig. 8.1.4 Ro-Ro Vessel Berth (Marginal Wharf) (Sheet Pile Type)

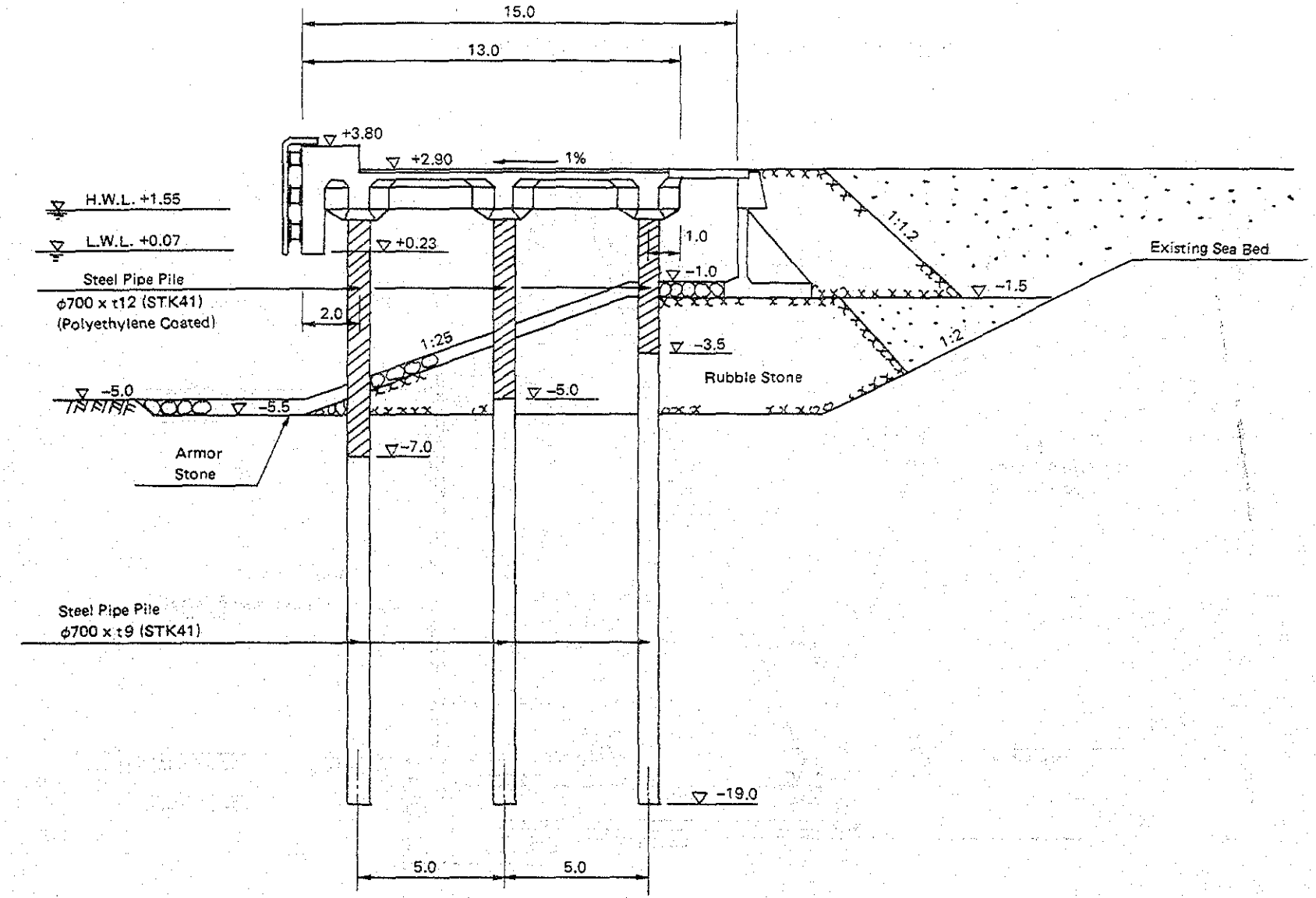


Fig. 8.1.5 Ro-Ro Vessel Berth (Marginal Wharf) (Open Type)

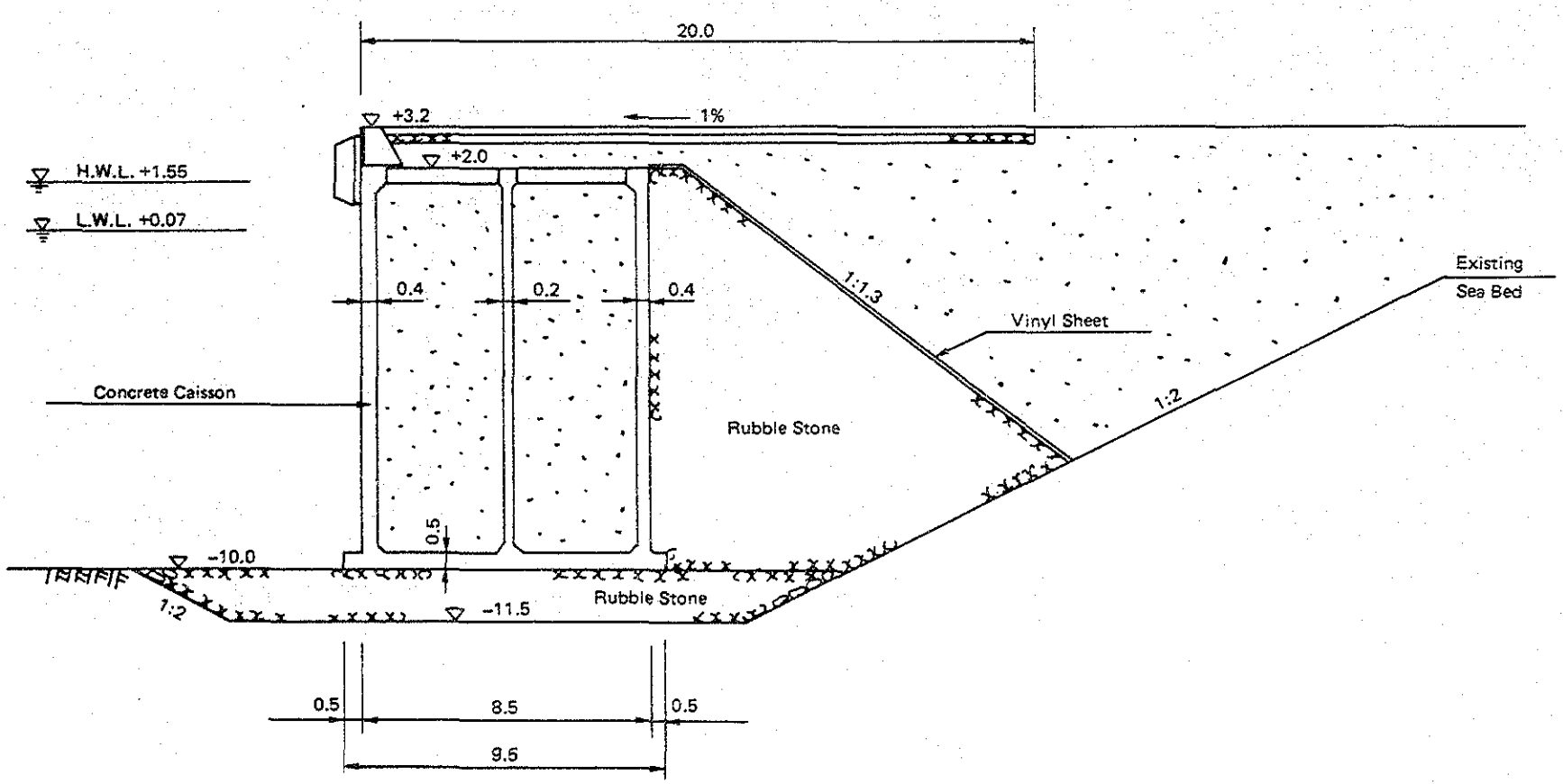


Fig. 8.1.6 –10.0M General Cargo Berth (Gravity Type)

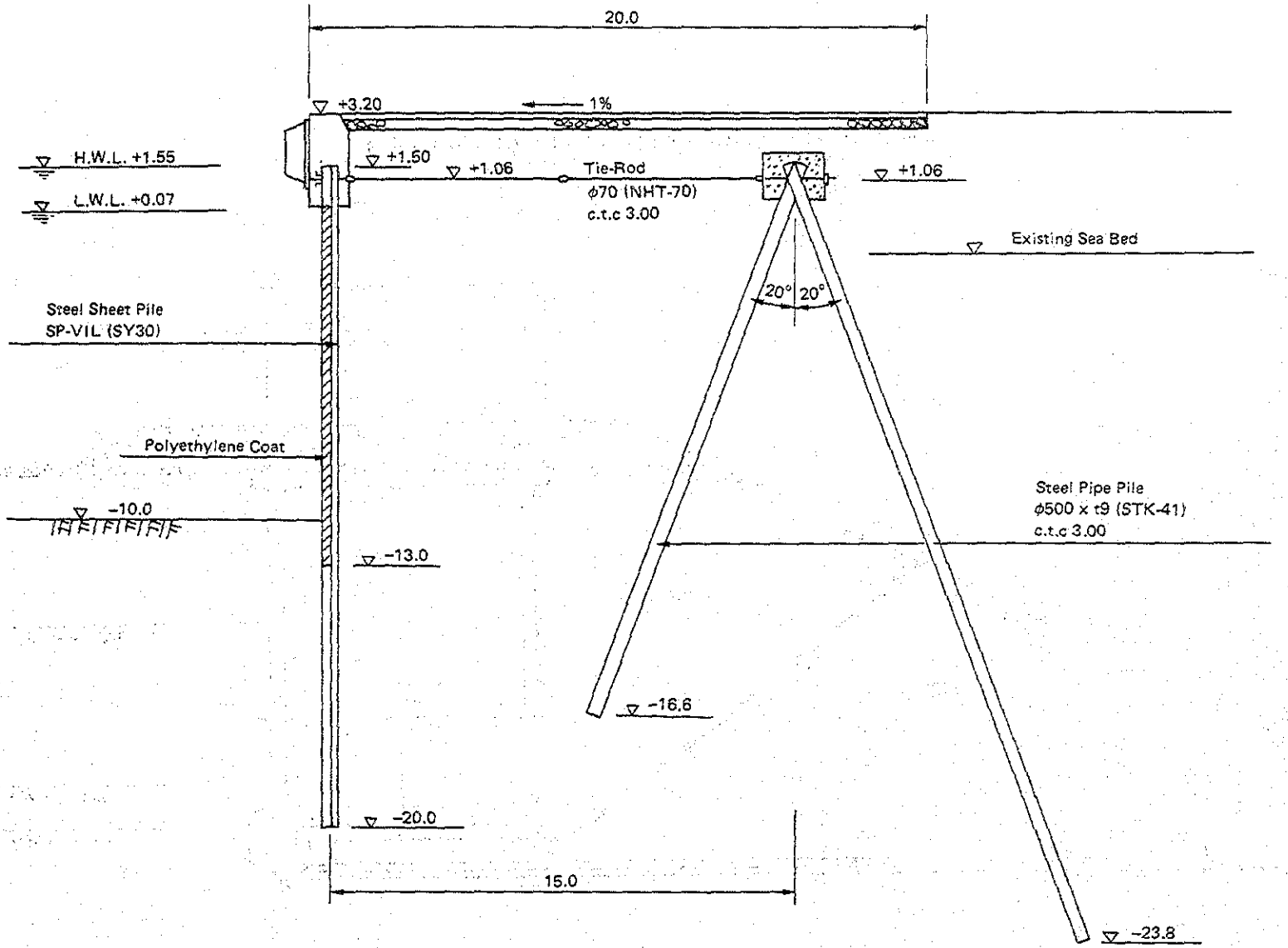


Fig. 8.1.7 –10.0M General Cargo Berth (Sheet Pile Type)

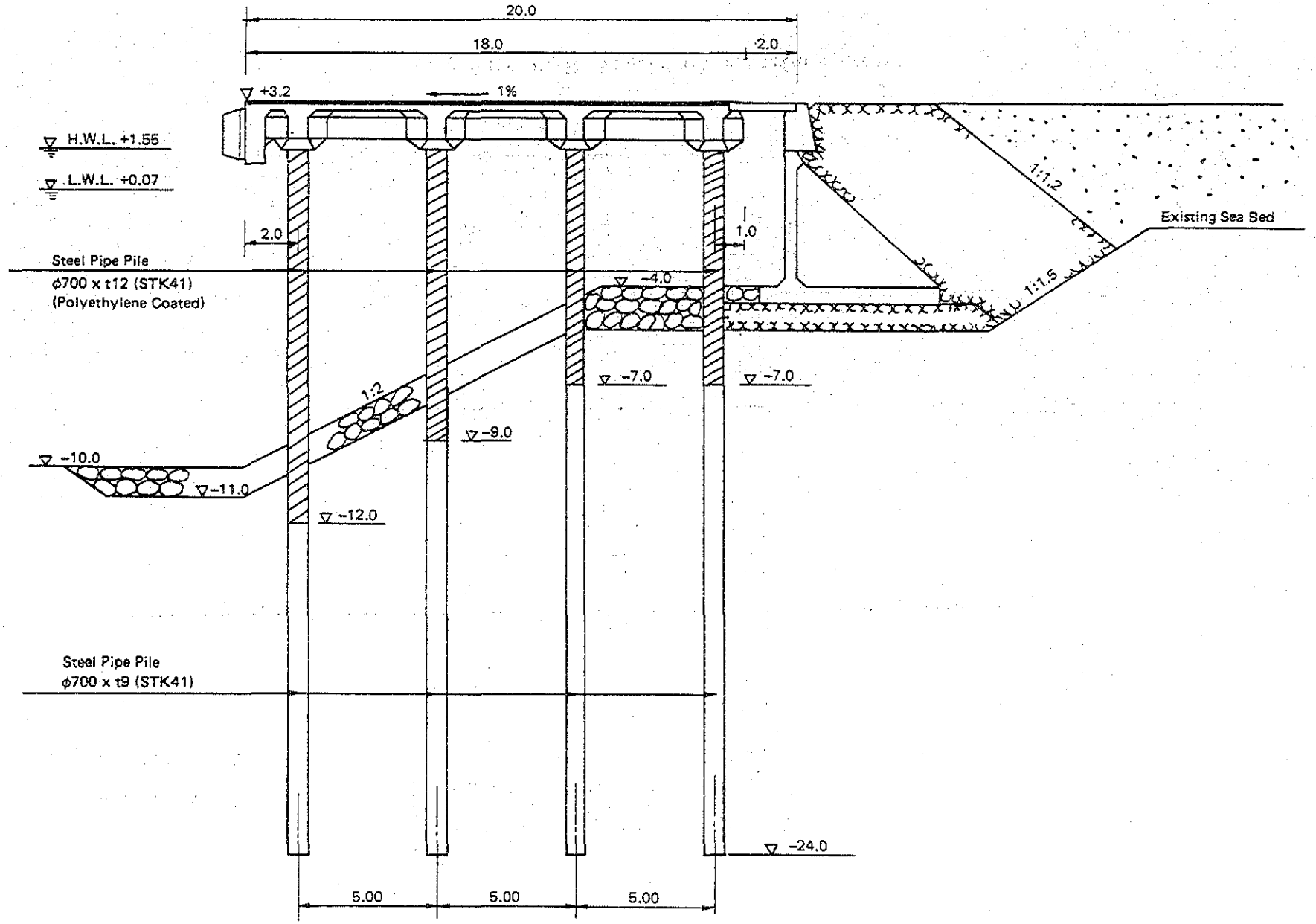


Fig. 8.1.8 –10.0M General Cargo Berth (Open Type)

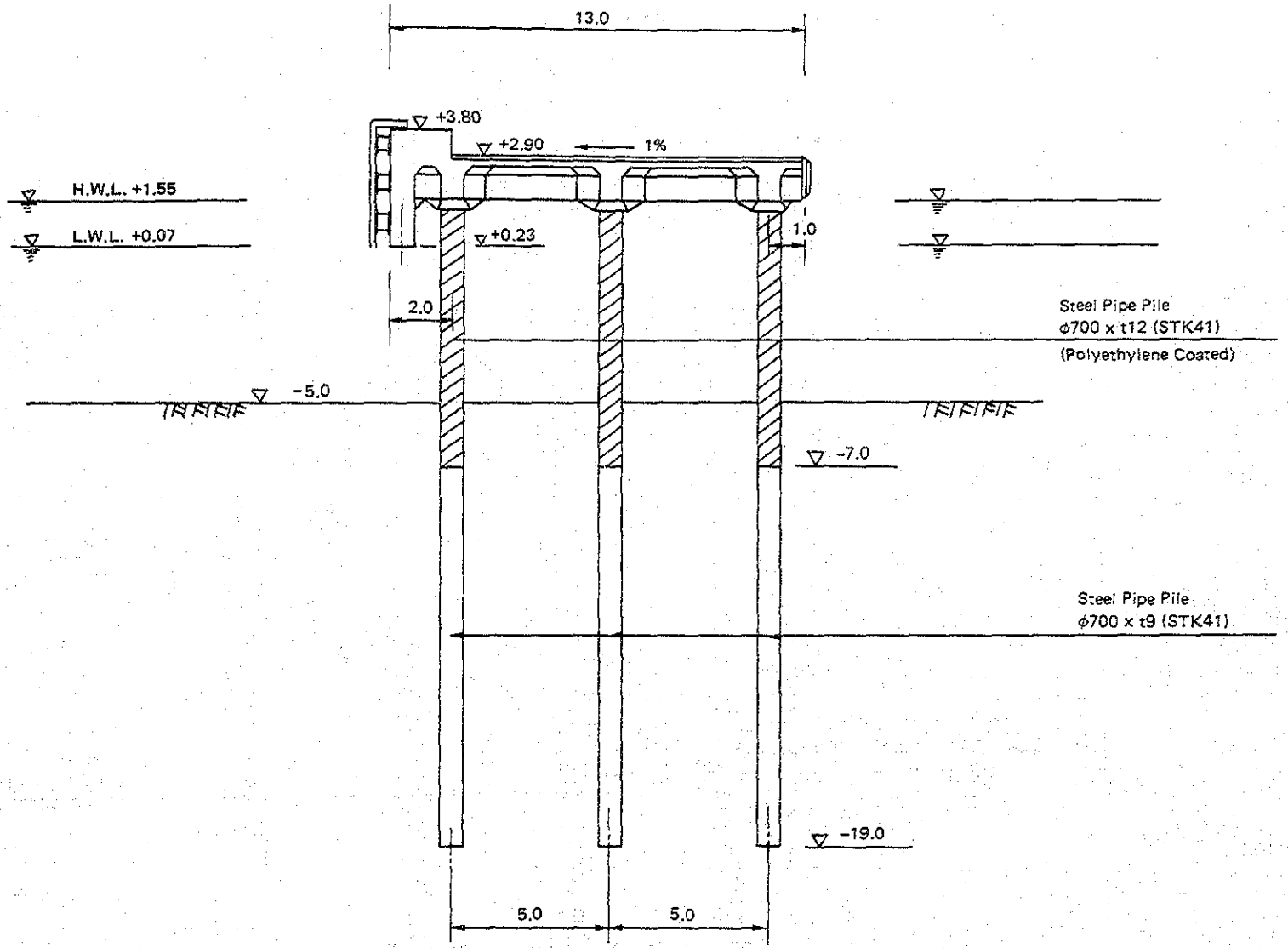


Fig. 8.1.9 Ro-Ro Vessel Berth (Pier) (Open Type)

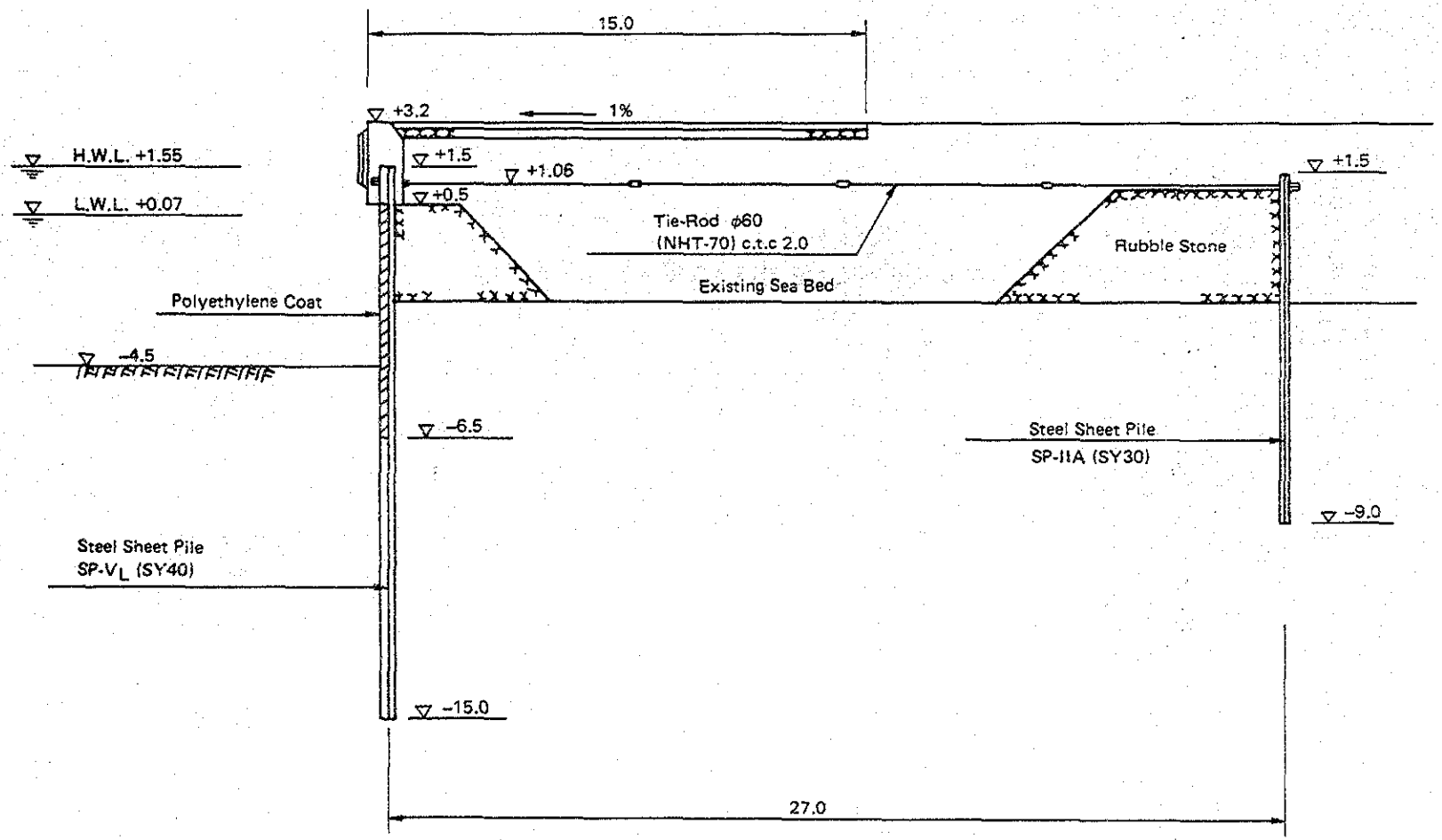


Fig. 8.1.10 –4.5M General Cargo Berth (Sheet Pile Type)

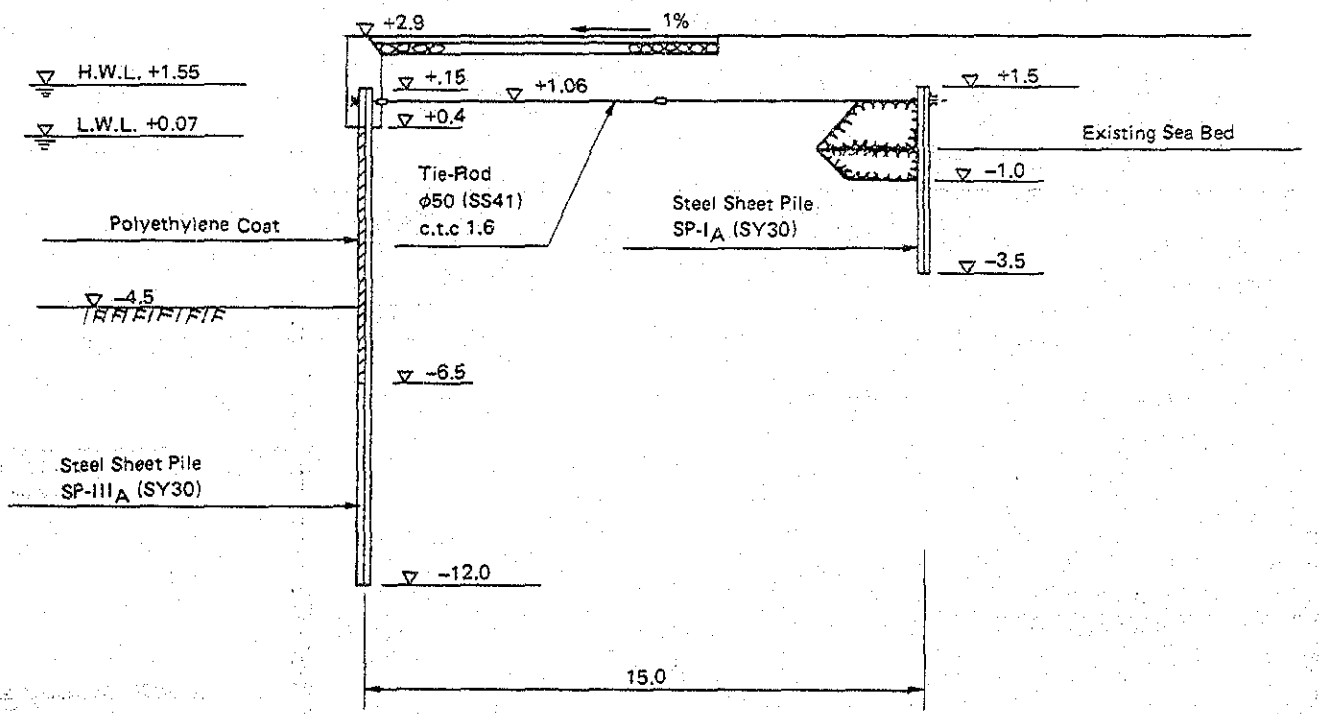


Fig. 8.1.11 Small Craft Berth (Sheet Pile Type)

8.1.3 Preliminary Structural Design of Jetty and Breakwater

(1) Design Conditions

i) Design water depth and crown height of structures

Design water depth and crown height of the structures are determined as shown in Table 8.1.6.

The design water depth of the jetty (east part) and breakwater are equal to the control water depth of the small craft basin. On the other hand, the design water depth of the west part of the jetty is representative of the existing water depth.

The crown height of the jetty and breakwater is basically in accordance with "Technical Standards," which presents the guideline:

$$\text{(Crown Height)} = \text{H.W.L.} + 0.6\ H_{1/3}$$

Although the assumed crown height of the structures is consistent with the above guideline, the crown height of the east part of the jetty was determined as +2.90 in consideration of its connection to the small craft berth. The crown height of the west part of jetty was determined by the required height plus a marginal height of 0.12 M.

Table 8.1.6 Design Water Depth and Crown Height of Structures

Structure		Design Water Depth (m)	Crown Height (m)
Jetty	East Part	-4.5	+2.9
	West Part	-4.5	+3.0
Breakwater		-4.5	+2.7

ii) Wave conditions

The wave conditions at the design site are shown in Table 8.1.7. Long-term records of wave conditions at Batangas Port, particularly those inclusive of typhoon seasons, were not available. Therefore, the preliminary design used the most influential wave conditions (Ho = 3.24 m, To = 5.2 sec, SW) among the wave hindcasting results obtained from the synoptic charts of typhoon 7025. (See Chap. 3.)

The wave conditions for the jetty were computed from said waves by considering refraction effect in shallow water areas. The wave conditions for the breakwater were computed from the same waves by considering both the refraction effect in shallow water areas and the diffraction effect from the jetty.

Table 8.1.7 Wave Conditions

Structure		Significant Wave Height H 1/3 m	Significant Wave Period T 1/3 m	Wave Direction
Jetty	East Part	1.26	3.5	N208°
	West Part	2.21	4.6	N208°
Breakwater		1.92	4.0	N232°

iii) Seismic coefficient

Seismic force was not considered in the preliminary structure design of the jetty or breakwater so as to minimize construction cost. Thus, the seismic coefficient here is zero.

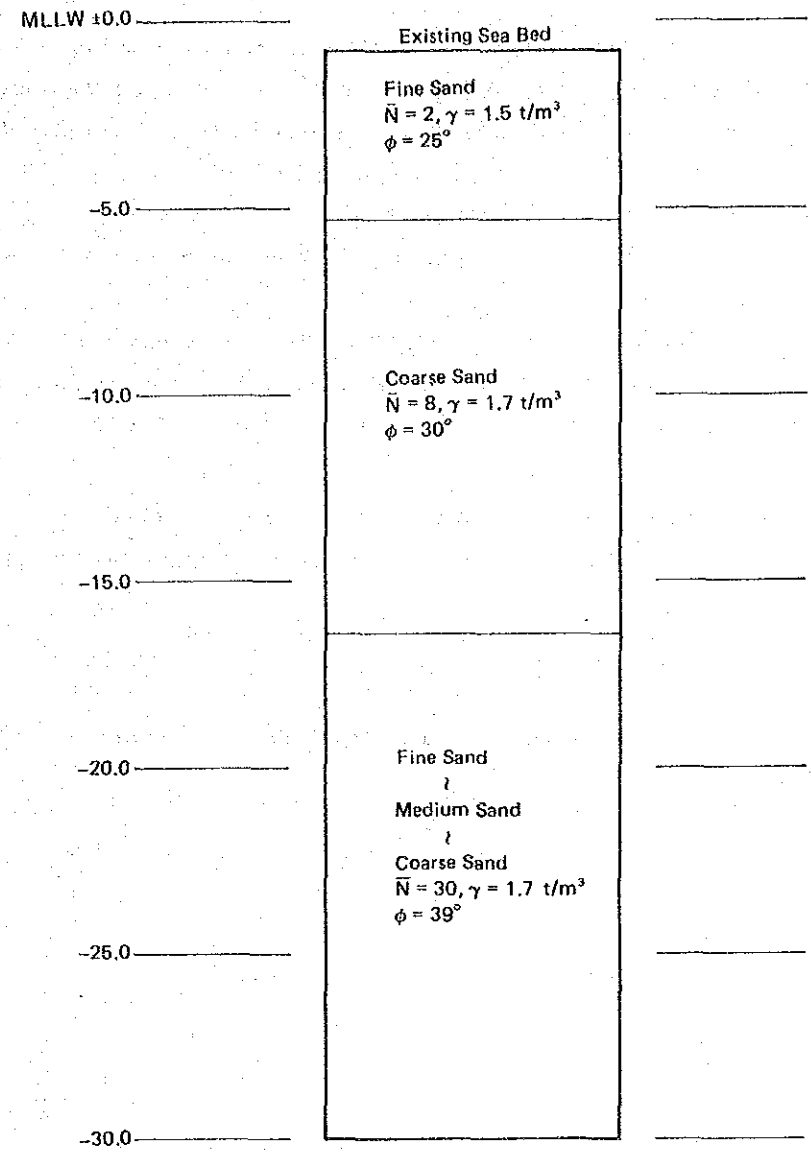
iv) Soil conditions

Based on the soil investigation results described in Chap. 3, the supposed soil conditions are shown in Fig. 8.1.12 (The location of the bores in the Master Plan is shown in Fig. 8.1.1).

The Study Team's soil investigation does not cover the entire area of the Master Plan. The soil conditions around the western edge of the jetty are especially difficult to predict because abrupt increases in the thickness of the alluvial clay layer (very soft clay) may exist offshore. The design soil conditions for the jetty and breakwater therefore, are assumed from the soil data of the boring point nearest the planned site, BH-5.

v) Other design conditions

Tide levels, allowable stress of steel and concrete, corrosion rate of steel, and design lifetime of the structures have been determind to be the same as in the design of the mooring facilities.



Note: The symbols, N, γ, ϕ and C have the following meaning:

- N : Average N-value by Standard Penetration Test
- γ : Unit Weight of Soil
- ϕ : Internal Angle of Friction of Soil
- C : Cohesion of Soil

Fig. 8.1.12 Soil Conditions

(2) Type of Structure for Preliminary Design

i) Jetty

The east part of the jetty, which faces the small craft basin, was preliminarily designed as a sheet pile type combined with a sloping type. The sheet pile type was chosen for the inside retaining wall of the jetty because this inside wall will be utilized as a small craft berth. Also the existing seabed is assumed to be shallow and the sheet pile type will reduce soil works. On the other hand, the sloping type was chosen for the outside structure of the jetty because of simplicity of maintenance and economy of construction cost.

The west part of the jetty which extends offshore was designed as a sloping type again because the sloping type is easy to maintain, reduces construction cost, and is adaptable to a variety of soil conditions as compared with the other types.

ii) Breakwater

The breakwater was preliminarily designed as a concrete block type. This type facilitates the use of the inside as a small craft berth, reduces construction cost, and is easy to construct.

(3) Results

The standard cross-sections of the east part and west part of the jetty and of the breakwater are presented in Fig. 8.1.13 ~ 8.1.15.

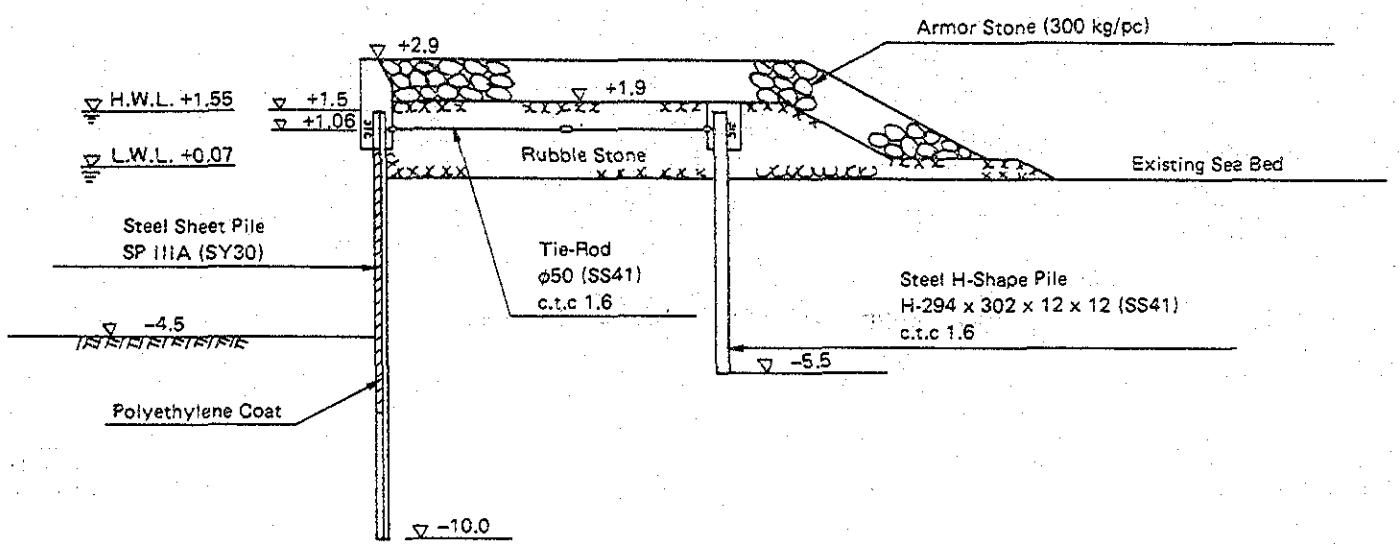


Fig. 8.1.13 Jetty (East Part) (Sheet Pile Type + Sloping Type)

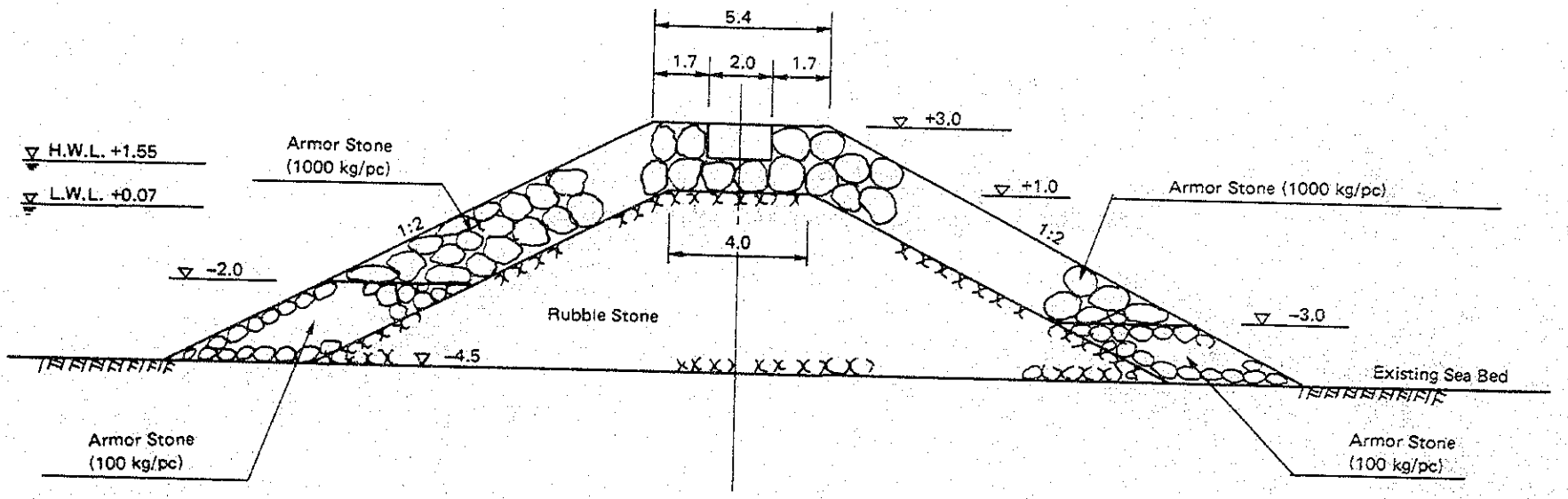


Fig. 8.1.14 Jetty (West Part) (Sloping Type)

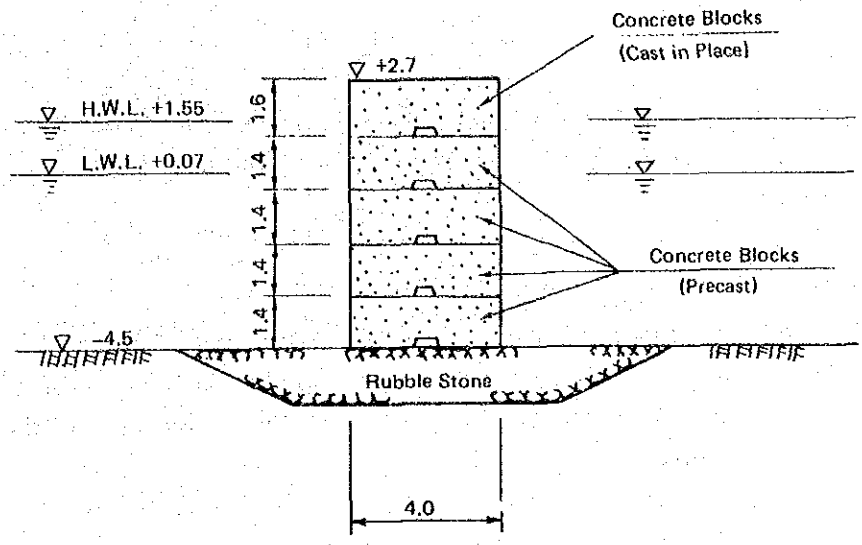


Fig. 8.1.15 Breakwater (Concrete Block Type)

8.2 Construction Schedule and Cost Estimate

8.2.1 General

In this section the construction cost and schedule for both the Master Plan and the Short-term Plan are presented. Following are the general conditions, assumed for the construction schedule and cost estimate.

(1) Restriction of Working Days

The construction schedule and cost of the port are in part contingent upon prevailing weather conditions at the site such as sea turbulence and rainfall. At Batangas Bay, sea conditions are comparatively good due to the surrounding capes and islands. For most of the year, the Bay is very calm and there is little rain.

However, according to available weather data, a south-west wind prevails at Batangas during the season from May to September making for occasional rough seas and bringing a good deal of rain.

Notwithstanding this, the overall conditions at Batangas Bay are considered favorable, and the average number of days available for construction work is estimated at 22 days a month throughout the year.

(2) Construction Materials

Some of the construction materials, such as wood, sand, stone and cement can be procured in Batangas and its vicinity. However, steel sheet piles, steel pipe piles, tie-rods, rubber fenders, bollards and some of the steel products will have to be imported as they are not available in the Philippines. For the cost estimate, it is assumed that they will be imported from Japan.

(3) Construction Equipment

The onshore construction equipment, such as pile drivers, bulldozers, road rollers and dump trucks, is available in Batangas and its vicinity. Offshore equipment, such as pile driving barges, tug boats and flat barges will be mobilized from Manila. However, as there is no large pump dredger and mixing plant available in the Philippines, these must also be brought in from abroad. For the cost estimate, again it is assumed that they will be transported from Japan.

(4) Labor Force

Most of the labor force is readily available in Batangas. Some engineers, however, will be needed from abroad.

8.2.2 Conditions of the Cost Estimate

The cost estimate has been performed under the following conditions:

(1) The cost of materials, equipment and labor is based on Philippine price-data as of October 1984.

(2) The exchange rates have been assumed as follows:

1 US$ = ₱19 = ¥246

(3) Customs duties for imported materials and equipment are not included in the cost estimate.

(4) As for taxes, only the sales tax on domestic materials is included.

(5) Inflation is not taken into account.

(6) Cost and transportation charges for imported construction materials and equipment as well as rental fees are estimated in foreign currency.

(7) Engineering fees include such items as soil investigations, the engineering study and overall supervision.

8.2.3 Cost Estimate for the Master Plan

(1) Construction Schedule

The rough construction schedule for the Master Plan is shown in Table 8.2.1.

(2) Cost Estimate

The rough construction costs for the Master Plan are shown in Table 8.2.2.

The rough cost estimate for this plan is based on the assumptions outlined above.

For the implementation of the Master Plan, further detailed engineering studies will be required.

8.2.4 Cost Estimate for the Short-term Plan

(1) Construction Procedure for Major Items

The construction procedure for major items is summarized as follows:

First, the site of the −10 m general cargo berth is dredged up to a depth of −4 m to allow clearance for the pile-driving barges. Then, the −10 m and −4.5 m general cargo berths, the Ro-Ro vessel berth (marginal), and the jetty (east part) are constructed. Next, the site of the Ro-Ro vessel berth is dredged up to a depth of −4.5 m.

After that, the Ro-Ro vessel berth (Pier) is constructed, followed by the facilities such as the passenger terminal, the transit shed and access roads. Typical construction methods for the principal items are outlined below.

i) −10 m general cargo berth

After dredging up to a −4 m water depth, steel sheet piles and steel pipe piles are driven offshore by a piling barge equipped with a diesel pile hammer of 3.2 tons in ram weight.

Tie-rods are then installed. Backfilling and dredging work for deepening the berth and approach channel up to −10 m are carried out simultaneously. The cost estimate assumes that nine sheet piles or three pipe piles are driven per day.

The piling barge will require certain supporting equipment such as a tug boat, a flat barge and an anchor boat.

ii) Ro-Ro vessel berth

Steel sheet piles and steel pipe piles for the marginal wharf type are driven onshore by a diesel hammer of 2.5 tons in ram weight mounted on a crawler crane. For the pier portion, steel pipe piles are driven offshore by a piling barge equipped with a diesel hammer of 3.2 tons in ram weight.

iii) Jetty

The east part of the jetty is designed as a sheet pile type combined with a sloping type; the west part is designed as a sloping type.

Stones are brought overland from Ambulong near Batangas and from Lipa city located about 25 km north of the site. At the existing pier, the stones are then transferred to a flat barge for transportation to the construction site. The cost estimate assumes a supply capacity of stones of about 320 m^3 per day.

iv) Dredging

The dredging work is executed by a 2,600 PS pump dredger. The cost estimate assumes an average dredging capacity of about 7,000 m^3 of soil per day. The dredged soil will be discharge into the planned site.

v) Passenger terminal and transit shed

The terminal building for passengers-in-transit is assumed to be of a reinforced concrete type. The transit shed is assumed to be of a steel structure type.

vi) Roads

The road design calls for concrete pavement 25 cm thick over a base 25 cm thick. The width of the pavement is assumed to be from 11 to 18 meters.

vii) Truck scale and sidwalk bridge

The weighting capacity of the truck scale is assumed to be 50 t; the dimensions of the platform are assumed to be 12 m x 3 m. The overhead sidewalk bridge for passengers is designed to be a steel type bridge with plastic sheets. It will be supported by steel or concrete posts.

(2) Construction Schedule

The construction schedule for the Short-term Plan is shown in Table 8.2.3.

Under this construction program, a survey of natural conditions and an engineering study will be conducted in the first and second year. Everything up to the detailed design, preparation of tender documents, tender evaluation and selection of contractors will be completed by the second year. Actual construction will be start in the third year and be completed by the end of the fourth year; the total construction period is thus estimated to be four years, assuming no extraordinary delays.

(3) Cost Estimate

The cost estimate is calculated based on the assumptions outlined above. The total construction costs amount to 259 million pesos. Details are shown in Tables 8.2.4 and 8.2.5.

Table 8.2.1 Construction Schedule for the Master Plan

Item				1980's				1990's									
No.	Description	Unit	Quantity	86	87	88	89	90	91	92	93	94	95	96	97	98	99
1	−12 m Wharf	m	265														
2	−10 m Wharf	m	370														
3	−7.5 m Wharf	m	550														
4	−5 m Wharf	m	230														
5	−4.5 m Wharf	m	155														
6	Revetment	m	500														
7	Breakwater	m	60														
8	Jetty	m	400														
9	Dredging	m^3	1,414,000														
10	Reclamation	m^3	731,000														
11	Passenger Terminal	m^2	2,500														
12	Transit Sheds	m^2	43,500														
13	Green Belt, Park	m^2	47,000														
14	Pavement (Ro-Ro)	m^2	40,000														
15	Pavement (Open Yard)	m^2	66,000														
16	Road	m^2	142,000														
17	Handling Equipment	Ls	1														
18	Ro-Ro Related Facilities	Ls	1														
19	Compensation	Ls	1														
20	Others	Ls	1														
21	Mobilization/Demobilization	Ls	1														
22	Engineering	Ls	1														

Table 8.2.2 Construction Costs for the Master Plan

Item No.	Description	Unit	Quantity	Unit Price ('000 ₱)	Amount ('000 ₱)
1	-12 m Wharf	m	265	310	82,150
2	-10 m Wharf	m	370	220	81,400
3	-7.5 m Wharf	m	550	170	93,500
4	-5 m Wharf	m	230	135	31,050
5	-4.5 m Wharf	m	155	120	18,600
6	Revetment	m	500	80	40,000
7	Breakwater	m	60	69	4,140
8	Jetty	m	400	50	20,000
9	Dredging	m^3	1,414,000	0.036	50,904
10	Reclamation	m^3	731,000	0.05	36,550
11	Passenger Terminal	m^2	2,500	5	12,500
12	Transit Sheds	m^2	37,200	4.1	152,520
13	Green Belt	m^2	47,000	0.15	7,050
14	Pavement (Ro-Ro)	m^2	40,000	0.38	15,200
15	Pavement (Open Yard)	m^2	66,000	0.04	2,640
16	Roads	m^2	142,000	0.47	66,740
17	Handling Equipment	Ls	1		289,400
18	Ro-Ro Related Facilities	Ls	1		74,050
19	Compensation	Ls	1		45,645
20	Others	Ls	1		33,000
21	Mobilization/Demobilization	Ls	1		45,000
22	Engineering (5%)	Ls	1		59,930
	Sub-total				1,261,969
23	Physical Contingency (15%)	Ls	1		188,031
	Total				1,450,000

Note:
- o Handling Equipment includes cranes and forklifts.
- o Ro-Ro Related Facilities include the truck scale, lighting and the sidewalk bridge.
- o Compensation shows the acquisition cost of fish pond areas and the cost of moving squatters from around Batangas Port.
- o Roads include about 1.8 km of access road.

Table 8.2.3 Construction Schedule for the Short-term Development Plan

Item				1st Year						2nd Year						3rd Year						4th Year					
No.	Description	Unit	Quantity	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12
1	-10 m Wharf	m	185																								
2	-5 m Wharf	m	105																								
3	-5 m Wharf (Pier)	m	105																								
4	-4.5 m Wharf	m	155																								
5	Revetment	m	200																								
6	Breakwater	m	60																								
7	Jetty (East Part)	m	130																								
8	Jetty (West Part)	m	270																								
9	Dredging	m^3	430,000																								
10	Passenger Terminal	m^2	1,200																								
11	Transit Shed	m^2	5,000																								
12	Green Belt	m^2	6,600																								
13	Pavement (Parking Lot)	m^2	16,000																								
14	Pavement (Open Yard)	m^2	12,000																								
15	Roads	m^2	33,000																								
16	Forklifts	Ls	1																								
17	Truck Scale	Ls	1																								
18	Lighting	Ls	1																								
19	Sidewalk Bridge	Ls	1																								
20	Temporary Facilities	Ls	1																								
21	Mobilization/Demobilization	Ls	1																								
22	Compensation	Ls	1																								
23	Engineering Study	Ls	1																								
24	Engineering Supervision	Ls	1																								

Table 8.2.4 Construction Costs for the Short-term Development Plan

Item No.	Description	Unit	Quantity	Unit Price (₱)			Amount (1,000 ₱)		
				L.C	F.C	Total	L.C	F.C	Total
1	-10 m Wharf	m	185	51,000	130,000	181,000	9,435	24,050	33,485
2	-5 m Wharf	m	105	30,100	123,700	153,800	3,160	12,988	16,148
3	-5 m Wharf (Pier)	m	105	35,900	81,600	117,500	3,769	8,568	12,337
4	-4.5 m Wharf	m	155	37,300	83,200	120,500	5,781	12,896	18,677
5	Revetment	m	200	18,100	43,200	61,300	3,620	8,640	12,260
6	Breakwater	m	60	68,500	500	69,000	4,110	30	4,140
7	Jetty (East Part)	m	130	23,200	37,600	60,800	3,016	4,888	7,904
8	Jetty (West Part)	m	270	44,300		44,300	11,961		11,961
9	Dredging	m^3	430,000	9	27	36	3,870	11,610	15,480
10	Passenger Terminal	m^2	1,200	2,500	2,500	5,000	3,000	3,000	6,000
11	Transit Shed	m^2	5,000	1,750	1,750	3,500	8,750	8,750	17,500
12	Green Belt	m^2	6,600	150		150	990		990
13	Pavement (Parking Lot)	m^2	16,000	380		380	6,080		6,080
14	Pavement (Open Yard)	m^2	12,000	40		40	480		480
15	Roads	m^2	33,000	430		430	14,190		14,190
16	Forklifts	Ls	1				10	2,450	2,460
17	Truck Scale	Ls	1				230	580	810
18	Lighting	Ls	1				1,700	3,540	5,240
19	Sidewalk Bridge	Ls	1				6,300	17,100	23,400
20	Temporary Facilities	Ls	1				760		760
21	Mobilization/Demobilization	Ls	1				1,540	11,770	13,310
22	Compensation	Ls	1				645		645
23	Engineering (5%)	Ls	1				4,669	6,542	11,211
	Sub-total						98,066	137,402	235,468
24	Physical Contingency (10%)	Ls	1				9,934	13,598	23,532
	Total						108,000	151,000	259,000

Table 8.2.5 Cost Distribution for the Short-term Development Plan

(Unit: 1,000 ₱)

Site	No.	Description	Amount			1986	1987	1988	1989
			Total	L/C	F/C	Total	Total	Total	Total
General Site	1	−10 m Wharf	33,485	9,435	24,050			33,485	
	2	−4.5 m Wharf	18,677	5,781	12,896			18,677	
	3	Dredging	9,792	2,448	7,344			9,792	
	4	Transit Shed	17,500	8,750	8,750				17,500
	5	Pavement	480	480	0				480
	6	Roads	3,612	3,612	0				3,612
	7	Forklift	2,460	10	2,450				2,460
	8	Temporary Facilities	760	760	0			532	228
	9	Mobilization	8,420	975	7,445			4,210	4,210
	10	Engineering	4,759	1,982	2,777	1,427	1,428	952	952
		Sub Total (1)	99,945	34,233	65,712	1,427	1,428	67,648	29,442
	11	Physical Contingency	9,988	4,216	5,772	142	142	6,760	2,944
		Total (1)	109,933	38,449	71,484	1,569	1,570	74,408	32,386
Ro-Ro Site	1	−5m Wharf	16,148	3,160	12,988			16,148	
	2	−5 m Wharf (Pier)	12,337	3,769	8,568			12,337	
	3	Revetment	12,260	3,620	8,640			12,260	
	4	Breakwater	4,140	4,110	30				4,140
	5	Jetty (East Part)	7,904	3,016	4,888			7,904	
	6	Jetty (West Part)	11,961	11,961	0			5,980	5,981
	7	Dredging	5,688	1,422	4,266			5,688	
	8	Passenger Terminal	6,000	3,000	3,000				6,000
	9	Green Belt	990	990	0				990
	10	Pavement	6,080	6,080	0				6,080
	11	Roads	10,578	10,578	0				10,578
	12	Truck Scale, Lighting, Sidewalk Bridge	29,450	8,230	21,220				29,450
	13	Mobilization	4,890	565	4,325			2,445	2,445
	14	Compensation	645	645	0			645	
	15	Engineering	6,452	2,687	3,765	1,936	1,936	1,290	1,290
		Sub Total (2)	135,523	63,833	71,690	1,936	1,936	64,697	66,954
	16	Physical Contingency	13,544	5,718	7,826	194	194	6,434	6,722
		Total (2)	149,067	69,551	79,516	2,130	2,130	71,131	73,676
		Grand Total	259,000	108,000	151,000	3,699	3,700	145,539	106,062

CHAPTER 9
ECONOMIC ANALYSIS

CHAPTER 9 ECONOMIC ANALYSIS

9.1 General

The purpose of this chapter is to appraise the economic feasibility of the Short-term Development Plan, explained in Chapter 7, from the point of view of the national economy. Thus, the basic purpose of this chapter is to investigate the economic benefits as well as the 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 in the Philippines (i.e. the opportunity cost of capital).

The economic internal rate of return (EIRR) based on cost-benefit analysis is used in order to appraise the feasibility of the project. In estimating the economic costs of the Short-term Development Plan, shadow rates are applied to the foreign exchange rates and to unskilled labour wages to convert the market prices into the economic costs. Fig. 9-1-1 shows the process of the economic analysis in the study.

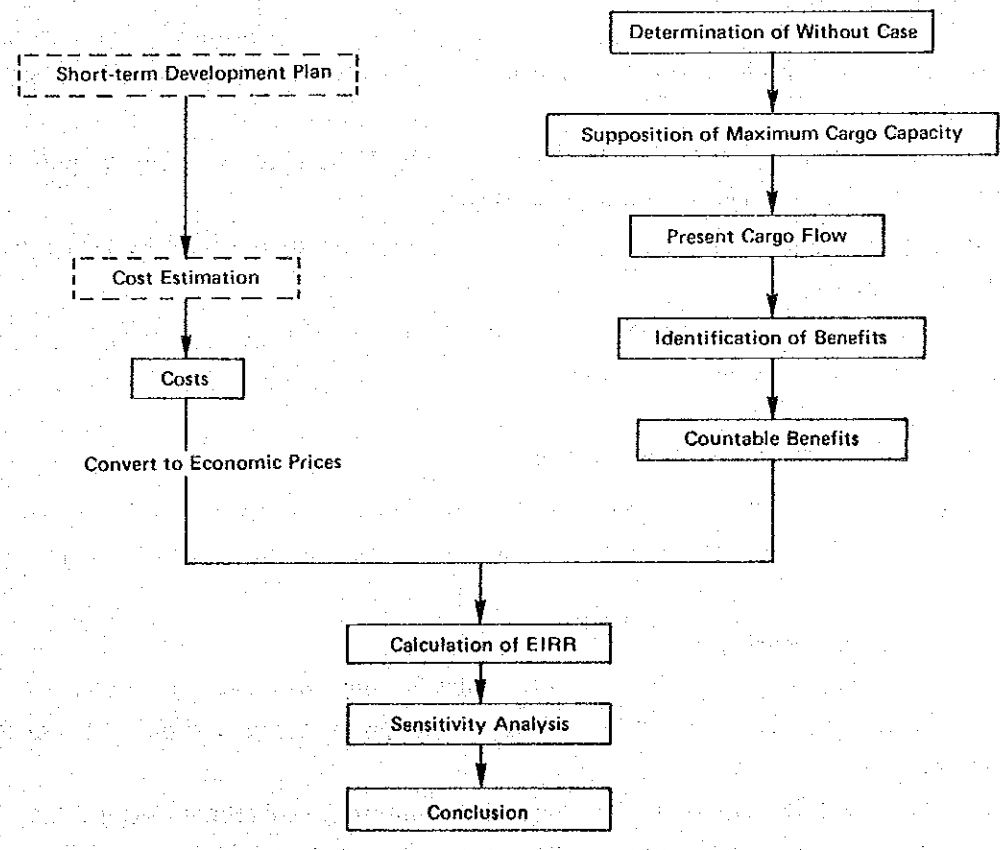


Fig. 9.1.1 Process of the Economic Analysis

9.2 Pre-requisites of the Economic Appraisal

9.2.1 "Without" Case

A cost-benefit analysis is conducted on the difference between "With" and "Without" investment cases. In other words, incremental benefits and costs arising from the proposed investment are compared, and it is examined whether or not the net benefits generated by the project exceed the cost of capital in the Philippines. Therefore, determining the "Without" case is one of the key points in the economic appraisal.

In this study, the following pre-requisites are adopted as the "Without" case after various possibilities are discussed.

① No investment is made except for ② as below.
② The "Without" case includes the completion of shore-protection works and the parking area currently under construction behind pier I.
③ Piers I and III can continue to be used for 30 more years.
④ Ro-Ro ships are under operation temporarily without exclusive wharves.

9.2.2 Prices

(1) Base Year

All costs and benefits are expressed in prices as of October 1984, when the price survey was conducted.

As far as the foreign exchange rate is concerned, the peso was weak against the U.S. dollar when the price survey started at 20 pesos to the dollar.

Thereafter domestic high interest rates pushed the peso up to the level of 17 to the dollar under the floating currency system.

This uptrend of the peso was temporary and therefore the rates of ₱19/$ and ¥246/$ as of September 1984 are used in this study.

(2) Method for Converting to Economic Prices

As the construction costs are estimated at market prices, it is necessary to convert them to economic prices for economic analysis by excluding transfer items and partially applying shadow prices.

a) Shadow Exchange Rate

In the Philippines, as well as in other developing countries, the official exchange rates were set higher than the real value of foreign exchange in order to lower the cost of imports.

In 1984 the IMF recommended that the Philippines government adopt the floating currency system, and the present exchange rate is close to the real level. This floating system, however, is still controlled by the monetary authorities and the peso exchange rate does not accurately reflect its real value.

NEDA recommends the application of a shadow price of 1.20. Thus, the foreign

currency portions are calculated at the rate of 22.8 pesos/1 U.S. dollar in this study.

b) Shadow Wage Rate of Unskilled Labour

Although minimum wages are set by Presidential Decrees in the Philippines, some actual wages are lower than the official minimum wages, due to the high unemployment level. Accordingly, unskilled labour wages should be adjusted by the shadow rate.

According to the guideline provided by NEDA, this shadow rate is 80% of the official wages. Therefore, in this study, the wage rate for unskilled labour will be adjusted by multiplying the minimum wage by 0.8.

c) Exclusion of Transfer Items

Of the construction costs given in Chapter 8, the foreign currency portion for the imported materials does not include import duties or sales taxes. On the other hand, the local currency portion includes both sales tax and import duties which do not represent actual consumption of resources in the national economy. Therefore, these taxes and duties should be excluded from the construction costs for the purpose of economic analysis.

(3) Opportunity Cost of Capital

According to NEDA in the Philippines almost all feasibility studies are adopting the rate of 15% as the cost of capital. Therefore, the EIRR of this project is evaluated in comparison with an opportunity cost of 15%.

9.2.3 Throughput at the Base Port

(1) "With" Case

The cargo volume at the Base Port in 1990, which is forecast in Chapter 6, is 871 thousand tons including 316 thousand tons of vehicles weight. The following Table 9.2.3 expresses the breakdown of cargo volume by mode and year.

Table 9.2.3 Cargo Volume by the Mode and Year

(Unit: '000 tons)

Cargo	Mode	in/out	Base Year	1985	1986	1987	1988	1989	1990 ~ 2019
Palay & Rice	Ro/Ro	in	31	42	50	59	69	81	95
	Non Ro/Ro	in	3	4	5	6	7	8	10
	S.T		34	46	55	65	76	89	105
Copra	Ro/Ro	in	19	23	25	27	29	32	35
	Non Ro/Ro	in	1	1	1	1	2	2	2
	S.T		20	24	26	28	31	34	37
Cement	Foreign	out	35	48	56	66	77	89	105
	Ro/Ro	out	15	18	20	23	25	28	31
	Non Ro/Ro	out	9	11	12	14	15	17	19
	S.T		59	77	88	103	117	134	155
Minerals	Foreign	in	5	7	8	9	10	11	13
	Non Ro/Ro	in	16	13	11	10	9	8	7
	S.T		21	20	19	19	19	19	20
Logs & Wood Products	Ro/Ro	out	2	2	2	2	2	2	2
	Non Ro/Ro	in	18	25	30	36	43	51	60
	S.T		20	27	32	38	45	53	62
Fertilizer	Ro/Ro	out	4	6	8	9	12	15	18
	Non Ro/Ro	out	1	1	2	2	3	3	4
	S.T		5	7	10	11	15	18	22
Others	Foreign	in/out	25	29	31	33	35	37	40
	Ro/Ro	in	52	59	63	67	71	76	81
		out	11	13	13	15	16	17	18
	Non Ro/Ro	in	5	6	6	7	8	8	9
		out	4	4	5	5	5	6	6
	S.T		97	111	118	127	135	144	154
Vehicles	Ro/Ro	in/out	137	173	196	221	249	280	316
Total	Foreign	in/out	65	84	95	108	122	137	158
	Ro/Ro	in	(102) 178	(124) 210	(138) 236	(153) 263	(169) 293	(189) 329	(211) 369
		out	(32) 93	(39) 126	(43) 141	(49) 160	(55) 180	(62) 202	(69) 227
		in/out	(134) 271	(163) 336	(181) 377	(202) 423	(224) 473	(251) 531	(280) 596
	Non Ro/Ro	in	43	49	53	60	69	77	85
		out	14	16	19	21	23	26	32
		in/out	57	65	72	81	92	103	117
			(256) 393	(312) 485	(348) 544	(391) 612	(438) 687	(491) 771	(555) 871

Note: i) ( ) exclusive of Vehicles Weight
ii) The cargo volumes by year are calculated based on the average annual increase rate.

(2) "Without" Case

(a) Maximum Handling Capacity by Mode

The cargo volume for the "Without" case is determined by the maximum handling capacity of the existing Base port piers, which are described in detail in Chapter 2. The maximum handling capacity by mode of the existing facilities is presented below.

Table 9.2.4 Maximum Handling Capacity by Mode

(Unit: '000 tons)

Mode	Volume (exclusive of vehicles)	
Ro-Ro (inwards)	315	(180)
Domestic (Non Ro-Ro)	80	(80)
Foreign	110	(110)
Total	505	(370)

So, the maximum handling capacity of existing Base port piers is 505 thousand tons, or 370 thousand tons excluding the weight of vehicles (calculated using the ratio of 1 : 0.75 for vehicles cargo to net cargo, being the same ratio used for cargo volume forecasting). The maximum handling capacity of Ro-Ro is only considered in one direction (inwards).

(b) Maximum Handling Capacity by Type of Cargo

The maximum handling capacity by type of cargo is calculated as shown in Table 9.2.5.

Table 9.2.5 Maximum Hnadling Capacity by Type of Cargo (excluding vehicle weight)

(Unit: '000 tons, %)

Mode / Cargo	Ro-Ro (inwards only)		Non Ro-Ro		Foreign	
	Volume	Ratio	Volume	Ratio	Volume	Ratio
Palay and Rice	81	45.0	7	8.5	–	–
Copra	30	16.6	1	1.7	–	–
Cement	–	–	5	6.8	73	66.5
Minerals	–	–	2	2.5	9	8.2
Logs and Wood Products	–	–	41	51.3	–	–
Fertilizer	–	–	3	3.4	–	–
Others	69	38.4	11	12.8	28	25.8
Total	180	100.0	80	100.0	110	100.0

Note: The above allotment is based upon the ratio of the projected cargo volumes in 1990.

(3) Present Cargo Flow

Table 9.2.6 shows the present cargo flow by mode and type of cargo, as indicated in Chapter 6.

Table 9.2.6 Present Cargo Flow

Cargo	Mode	Transport Route
Palay & Rice	Ro-Ro	Ori. Mindoro --→ [Calapan] → [Batangas] <→ Manila / Batangas Prov.
	Domestic	– ditto –
	Domestic	South Occi. Mindoro --→ [Sablayan] → [Batangas] <→ Manila / Batangas Prov.
	Domestic	North Occi. Mindoro --→ [Manburao] → [Batangas] <→ Manila / Batangas Prov.
Copra	Ro-Ro	Ori. Mindoro --→ [Calapan] → [Batangas] --→ Manila
	Domestic	– ditto –
Cement	Ro-Ro	Fortune Cement --→ [Batangas] → [Calapan] --→ Ori. Mindoro
	Domestic	– ditto –
	Domestic	Fortune Cement --→ [Batangas] → [S. Jose] --→ Occi. Mindoro
	Foreign	Fortune Cement --→ [Batangas] → Southeast Asia
Minerals	Domestic	Baturn → [Batangas] --→ Fortune Cement
	Domestic	Region 6. 7. 8 → [Batangas] --→ Fortune Cement
	Foreign	Other country → [Batangas] --→ Fortune C.
Logs & Wood Products	Ro-Ro	Batangas City --→ [Batangas] → [Calapan]
	Domestic	South Philippines → [Batangas] --→ Batangas City
Fertilizer	Ro-Ro	Minila --→ [Batangas] → [Calapan] --→ Ori. Mindoro
	Domestic	Manila --→ [Batangas] → [S. Jose] --→ Occi. Mindoro
Others	Ro-Ro	Ori-Mindoro --→ [Calapan] → [Batangas] --→ Batangas Prov.
	Ro-Ro	Batangas Prov. --→ [Batangas] → [Calapan] --→ Ori Mindoro
	Domestic	Other area → [Batangas] --→ Batangas Prov.
	Domestic	Batangas Prov. → [Batangas] → Other area
	Foreign	Other Countries → [Batangas] --→ Batangas Prov.
	Foreign	Batangas Prov. --→ [Batangas] → Other countries
Vehicles	Ro-Ro	[Batangas] → [Calapan]
	Ro-Ro	[Calapan] → [Batangas]

Note: --→ Land Transport, → Sea Transport, [ ] Port

9.3 Benefits

9.3.1 Kinds of Benefits

As mentioned in Chapter 5, Batangas Base port functions as:

(a) The gateway to Mindoro Island

(b) The central port for the development of Southern Tagalog.

(c) The second port serving Metro Manila

Futhermore, judging from the present cargo flow, which is summarized in above Table 9.2.6, the execution of the Short-term Development Plan will aid the development of the regional area.

In line with the functions of the Base Port and the significance of the Short-term Development Plan, the following items are identified as benefits arising from the short-term development.

① Industrial development in Southern Tagalog caused by the growth of port-related industries.
② Development of rice and copra production and increase of employment opportunities and income on Mindoro Island.
③ Expansion of commercial functions in Batangas City.
④ Expansion of tourism from an increased number of passengers.
⑤ Regular and safe Ro-Ro operation from improved Ro-Ro facilities and avoidance of heavy land traffic.
⑥ Improvement of handling operations for domestic and foreign cargoes.
⑦ Increase of value added by providing more efficient transportation for the industries which depend upon seaborne cargoes.
⑧ Savings in transportation costs by using Ro-Ro vessels rather than conventional ships.
⑨ Savings in berth waiting cost for foreign trade ships.

Although benefits ①~⑤ are considered uncountable and ⑥~⑨ are considered countable, only three benefits ⑦ ~ ⑨, are calculated in monetary terms in this report. These three are direct, measurable results of the Short-term Development. Fig. 9.3.1 shows the relation of these three benefits and the Short-term Plan.

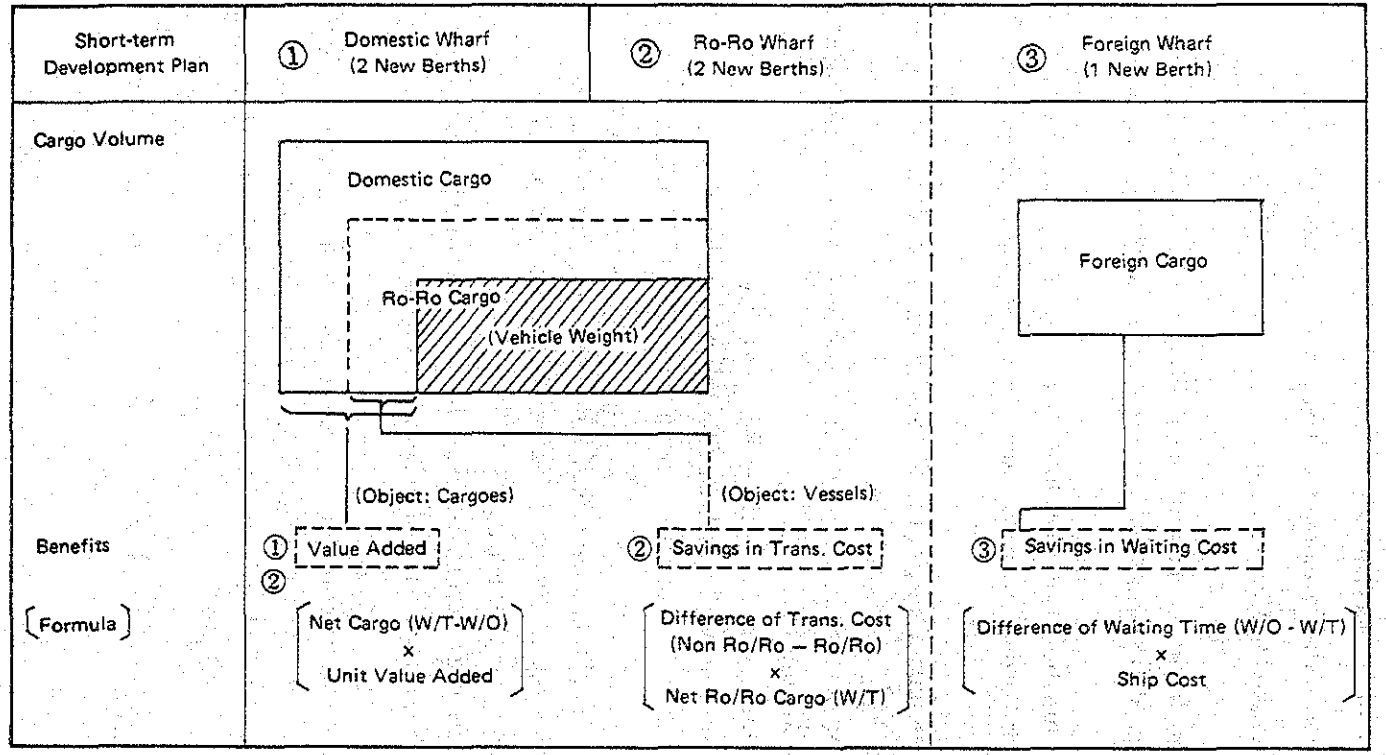
9.3.2 Calculation of Benefits

(1) Direct Benefits

The following two assumptions are made for the calculation of these direct benefits.

① The present cargo flow remains unchanged for both the "With" and "Without" cases.
② The port of Calapan is able to handle the Ro-Ro cargo which comes from or goes to the Port of Batangas in 1990.

Fig. 9.3.1 Relationship Between Measured Benefits and the Short-term Development Plan



Concerning assumption ①, cargo which exceeds the handling capacities of most ports generally overflows into neighboring ports in order to avoid excessive waiting costs. However, in the case of Batangas Port, there is no neighboring port that can actually handle such a cargo overflow. Thus a cargo flow in excess of the handling capacity at Batangas would, in fact, result in increased waiting costs, so improving the handling capacity of the Port results in real benefits by avoiding such excessive waiting costs.

Presently there is no significant volume of vessels waiting to enter berths at Batangas. The Port must continue to be developed in consideration of the future cargo volume so that such a situation will not arise. This is one of the basic concepts for the development of the Port.

Concerning assumption ②, a feasibility study for the Port of Calapan is now taking place under the direction of the World Bank. There is no real doubt that the port of Calapan will be able to handle the Ro-Ro cargo to or from Port of Batangas in 1990. The two ports should be developed simultaneously so that they will both be able to function efficiently.

(2) Benefits included in the Calculation of the EIRR.

a) Value Added (Domestic, Ro-Ro Cargos)

i) Ports are defined as places where cargo necessary for economic activities is handled. From this viewpoint, it is useful to measure the economic effects of port development projects which aim at the industrialization of port areas by the increased value added which can be ascribed to such development projects.
In the case of Batangas, there are two major categories of industries connected with the Port. One is the so called port-related industries, such as domestic shipping. The other is those industries which rely directly on the port, that is those industries with raw materials or finished products or both which pass through the Port as domestic cargoes.
In this report, the analysis is limited to the second category, as we were unable to collect sufficient data on port-related industries throughout the region.

ii) Unit Value Added for Each Type of Cargo
The following Table 9.3.2 shows unit value added for each type of domestic cargo (including Ro-Ro cargo) handling at the Base Port. This value added is calculated based on the Philippines input-output analysis (Appendix 9.3.2 and 9.3.3).

Table 9.3.2 Unit Value Added

(Unit: ₱/ton)

Kinds of Cargo	Value Added
Palay and Rice	800
Copra	1,400
Cement	100
Minerals	30
Logs and Wood Products	1,000
Fertilizer	480
Others (in)	1,300
(out)	1,000

The projected benefit is used to estimate the effects of the Short-term Development Plan.
Accordingly, the object for calculation of value added is the cargo which exceeds the handling capacity of the Base Port ("without" case), that is, the difference between the "With" and "Without" cases.
The calculation formula is as follows:

$$V_p = C_p \times v_p$$

V_p : Value added arising from the port cargo movement
C_p : Cargo volume (with – without) passing through the Base Port.
v_p : Unit value added of each cargo

Table 9.3.3 shows the difference of cargo volumes between "with" and "without" case, providing that Ro-Ro cargo is limited to one direction (inwards only).

Table 9.3.3 Difference in Cargo Volume between "With" and "Without" Cases

(Unit: '000 tons)

Cargo	Ro-Ro (inwards)			Non Ro-Ro			(A) + (B)
	W/T	W/O	W/T – W/O (A)	W/T	W/O	W/T – W/O (B)	
Palay and Rice	95	81	14	10	7	3	17
Copra	35	30	5	2	1	1	6
Cement	–	–	–	19	5	14	14
Minerals	–	–	–	7	2	5	5
Logs/Word Products	–	–	–	60	41	19	19
Fertilizer	–	–	–	4	3	1	1
Others (in)	81	69	12	9	7	2	14
(out)	–	–	–	6	4	2	2
Total	211	180	31	117	80	37	68

iii) Adjustment Considering other Infrastructures

The entire value added calculated above cannot be considered as a benefit arising from the Short-term Development Plan. The value added of each cargo arises not only from development of the port, but also from other infrastructures like roads. So, the amount of the value added calculated above should be divided into the value added from the port development and the value added from the development of infrastructures other than the port.

As our cargo forecasting does not consider the development of roads in Mindoro Island, the calculated amount of the value added for palay and rice should be only adjusted to consider the value added from irrigation investments.

The ratio of the value added from short-term plan versus the value added from the irrigation plan in Mindoro Island up to 1990 is 22.6% for the development plan and 77.4% for the irrigation projects. (Appendix 9.3.4)

iv) Calculation of Value Added

The following Table 9.3.4 shows the amount of the value added for each type of cargo which can be attributed to the Short-term Development Project. The total amount of values added is 51,703 thousand pesos.

Table 9.3.4 Calculation of Value Added

	Unit (₱) Value Added	Volume ('000 t)	Adjusted	Total Volume Added ('000 ₱)
Palay & Rice	800	17	x 22.64%	3,073
Copra	1,400	6	–	8,400
Cement	100	4	–	400
Minerals	30	5	–	150
Logs/Wood Products	1,000	19	–	19,000
Fertilizer	480	1	–	480
Others (in)	1,300	14	–	18,200
(out)	1,000	2	–	2,000
		68		51,703

b) Savings in Transportation Costs (Ro-Ro ships)

i) There are no special piers for Ro-Ro ships at the Base port at present.
Nevertheless, the volume of cargoes carried by Ro-Ro, have increased significantly since 1980 when the Ro-Ro ships started to call at port on a temporary basis. This shows that the Ro-Ro ships are more efficient than the conventional ships, even if there are no exclusive Ro-Ro piers.
However, exclusive Ro-Ro facilities are necessary to ensure safe, regular Ro-Ro operations. Thus all the benefits arising from Ro-Ro operations, that is, the difference between Ro-Ro transportation costs and the transportation costs utilizing conventional vessels, can be attributed to the development of exclusive Ro-Ro facilities. It should be noted that this benefit arises from savings in transportation costs, not from cargoes. So, this benefit is separate and distinct from benefit a), above.

ii) Selection of Standard Ships
As actual data are not available, the following vessels have been selected, based on the NTPP report, as standard ships for calculating the relative transportation costs using Ro-Ro and conventional vessels.

Table 9.3.5 Standard Ships

	Ro-Ro	Non Ro-Ro
Type of ship	Ferry boat	Passengers-cargo ships
Purchase Price	3,000,000 ₱	2,000,000 ₱
Speed	11 ~ 12 knots	12 knots
BHP	1,500	1,200
Capacity	14 trucks plus 400 passengers (1 truck 10 t load factor)	500 ~ 1,000 GRT (average 900 DWT)

iii) Calculations of Benefits
The calculation formula is as follows:

$$\text{Benefit} = \left[\begin{array}{c}\text{Operating Cost of Ro-Ro ships} - \text{Operating Cost of Non Ro-Ro ships} \\ + \\ \text{Handling Cost of Ro-Ro ships} - \text{Handling Cost of Non Ro-Ro ships}\end{array}\right] \times \text{Cargo Volume of Ro-Ro ships}$$

The following Table 9.3.6 shows the calculation of the difference between the transportation costs using Ro-Ro and conventional vessels.

Table 9.3.6 Comparison of Transportation Costs per Ton

(₱: 1984 prices)

Ship	Operating Cost (Batangas – Calapan)	Cargo Handling Cost	Transportation Cost (Batangas – Calapan)
Ro-Ro	38.22	0	38.22
Non Ro-Ro	8.40	31	39.40
Difference	–	–	△ 1.18

The detailed calculation is presented in Appendix 9.3.5.
Accordingly, the difference, that is the benefit, is calculated as follows:

1.18 (₱) x 280 thousand tons = 330 thousand (₱)

c) Savings in Berth Waiting Costs (Foreign Cargo)

i) Average Waiting Time and Calculation Formula

According to queuing simulation which considers the movement of foreign and domestic cargoes (except for Ro-Ro) in 1990, the average berth waiting time is calculated as shown in the following Table 9.3.7.

Table 9.3.7 Berth Waiting Time in 1990

Cargo	Volume ('000 t)	Berth Waiting Time (hrs)		No. of Vessels		Ave. Waiting Time (hrs)	
		W/O	W/T	W/O	W/T	W/O	W/T
Cement	105	4,672	983	25	27	186.9	36.4
Mineral & others	53	2,005	796	17	20	117.9	39.8
Foreign Total	158	6,677	1,779	42	47	159.0	37.8
Logs/Wood Products	60	6,964	750	36	38	193.4	19.7
Minerals	7	1,740	4	12	10	145.0	0.4
Other (1)	50	23,773	720	559	560	42.5	1.3
Other (2)		19,037	206	203	208	93.8	1.0
Domestic Total	117	51,514	1,680	811	863	63.6	1.7
Total	275	58,191	3,459	852	910	68.3	3.8

As far as the benefit for domestic cargo is concerned, the value added has been calculated in the previous section. Thus, in this section, the savings in berth waiting cost is only calculated for foreign cargo.

In the "With" case, all of the larger vessels will be able to berth, so all of the cargo can be handled at berth as opposed to the current system whereby some of the cargoes are handled at berth and others are handled at anchorage. Under the "With" case, the cargo handling efficiency will improve markedly, and berth waiting time will be significantly reduced.

The formula used to calculate this benefit is as follows:

[Decrease of waiting costs] = [Difference of waiting time between "with" and "without" cases] x [Ship cost (unit cost)] x [Total DWT in 1990] x [Share of benefits belonging to the Philippines]

ii) Difference of Waiting Time

As shown in Table 9.3.7 in the above as a result of our queuing simulation, the average berth waiting time will been reduced by 121 hours.

iii) Ship cost (unit cost)

The prevailing ocean going vessel charter rate can be used to estimated ship cost incurred while foreign trade vessels wait for berths. According to the SSE

statistics (1985/6 – Appendix 9.3.6) the charter rates have fluctuated widely over the past 4 years from 5.5$ to 16$ per month/DWT for multi-decker of 10,000 ~ 19,999 DWT vessels. From these statistics, $7/month/DWT, which is the average rate from Jan. 1982 to June 1985, is taken as the average ship waiting cost.

In order to check the sensitivity of the ship cost, a sensitivity test, at the rate of 5.5$/month/DWT/which is the minimum charter rate over the past years, is conducted in Section 9-6.

iv) Philippines' Share of the Benefits

Savings in berth waiting costs are primarily realized by shipping companies. For foreign ships, therefore, the benefits accrue to foreign countries.

However, some portion of these benefits should be returned to PPA, the investor of the development project. It is also possible for PPA to acquire some benefits by, for example, increasing tariffs, because the service level at the port will be improved.

In this study, we assume 50% of the savings in total berth waiting costs are treated as the benefits accruing to the Philippines, although most of the foreign cargoes are cement for export of which a large percentage will be handled by Philippines shipping companies under the government policy.

v) Calculation of Saving Waiting Costs

The savings for waiting cost are calculated as follows:

$$7(\$) \times 19(₱) \times \frac{6{,}677\ (\text{hrs}) - 1{,}779\ (\text{hrs})}{24\ (\text{hrs}) \times 30\ (\text{days})} \times 158\ (\text{thousand t})^{*} \times 50\%$$

$$= 71{,}447\ (\text{thousand } ₱)$$

Note: *) According to our simulation test, the total DWT in 1990 is 248.5 thousand DWT in the "without" case and 293 thousand DWT in "with" case.
Five types of ships are simulated, from 3,500 DWT to 15,000 DWT, while the ship-cost determined above, is for vessels between 10,000 DWT to 19,000 DWT. Accordingly, in this calculation, the cargo volumes in 1990 are used instead of the total DWT.

9.4 Costs

① construction costs, ② maintenance costs and ③ operation costs, are the costs considered in the section.

9.4.1 Construction Costs

As mentioned in 9.2.2, the amount of investment, estimated at market prices in Chapter 8, has to be converted into economic prices.

Table 9.4.1 shows the application of the shadow wage for unskilled labor and the removal of transfer items such as custom duties and sales tax from the local currency portion of the construction costs.

Table 9.4.2 shows the application of the shadow exchange rate for the foreign currency portion.

Table 9.4.1 Local Currency Portion

('000 P)

	Market Price L.C. Total (a)	Adjusted Items				Economic Price				
		Unskilled (b)	Unskilled (c)=(b)×0.8	Customs Duties (d)	Sales Tax (e)	L.C. Total (f)=(a)-(b)+(C) -(d)-(e)	1986	1987	1988	1989
Engineering	4,669	75	60	27	55	4,572	1,372	1,372	914	914
Dredging	4,515	180	144	32	321	4,126	0	0	4,126	0
Wharf	78,826	4,139	3,312	2,194	3,836	71,969	142	142	36,790	34,895
Transit	19,990	1,851	1,481	565	976	18,079	0	0	0	18,079
Total	108,000	6,245	4,997	2,818	5,188	98,746	1,514	1,514	41,830	53,888

Source: Market prices are taken from Table 8.2.5

Table 9.4.2 Foreign Currency Portion

('000 P)

	Market Price					Economic Price				
	F.C. Total	1986	1987	1988	1989	F.C. Total	1986	1987	1988	1989
Engineering	6,542	1,963	1,963	1,308	1,308	7,850	2,355	2,355	1,570	1,570
Dredging	11,610	0	0	11,610	0	13,932	0	0	13,932	0
Wharf	97,428	194	194	86,904	10,136	116,914	233	233	104,285	12,163
Transit	35,420	0	0	0	35,420	42,504	0	0	0	42,504
Total	151,000	2,157	2,157	99,822	46,864	181,200	2,588	2,588	119,787	56,237

Source: The market prices are taken from Table 8.2.5

9.4.2 Maintenance Cost

The maintenance costs for some selected wharves and sheds are set to be 1% of the economic cost of the original investments.

Calculation of this amount is given in Table 9.4.3.

Table 9.4.3 Maintenance Costs

('000 ₱)

	Wharf		Transit Shed		Total	
Total Investment at M.P.		176,254		55,410		231,664
Selected Investments at M.P.	L/C	32,079	L/C	41,730	L/C	73,809
	F/C	58,502	F/C	35,420	F/C	93,922
	T	90,581	T	77,150	T	167,731
Selected Investments at E.P. (A)	L/C	29,862	L/C	37,518	L/C	67,380
	F/C	70,202	F/C	42,494	F/C	112,696
	T	100,064	T	80,012	T	180,076
(A) x 1%		1,001		800		1,801

Note: Selected investments, taken from Table 8.2.4
Wharfs: Items No. 1 ~ 4 and 24
Transit sheds : Items No. 10 ~ 19

9.4.3 Operation Costs

The operation costs are composed of (1) personnel costs and (2) administrative costs.

(1) Personnel Costs

After the development of the port, 10 additional persons must be employed. The details on the proposed jobs for the 10 persons are given in Chapter 10. Two security guards are assumed to be unskilled workers.

Therefore, the shadow wage rate is applied only to the two guards.

₱30,945* x (8 + 2 x 0.8) = ₱297,072

Note: *) The actual average personnel costs at Batangas Base port in 1984 are used.

(2) Administrative Costs

Based upon the analysis of 1984 financial data, the added administration costs are assumed to be equal to 30% of the additional personnel costs.

₱297,072 x 30% = ₱89,122

The total operation costs are derived by adding these two costs as given in Table 9.4.4.

Table 9.4.4 Operation Costs

('000₱)

Cost Components	Amounts
Personnel Costs	297
Administration Costs	89
Total	386

9.5 Evaluation

9.5.1 Calculation of EIRR

The lifespans of wharves and transit sheds are 50 and 30 years respectively. Therefore, the economic cost/benefit evaluation is carried out starting in 1984 ("0" year) and ending in 2019 (the 30th year from the start of operations in 1990).

The residual value of wharves in 2019 is not taken into account.

Table 9.5.1 Calculation of EIRR

('000 ₱)

	1986	1987	1988	1989	1990~2019
Value Added	–	–	–	–	51,703
Saving in Trans. Cost	–	–	–	–	330
Saving in Waiting Cost	–	–	–	–	71,447
Total Benefits	0	0	0	0	123,480
Construct. Costs	4,102	4,102	161,617	110,125	–
Maintenance Costs	–	–	–	–	1,801
Operation Costs	–	–	–	–	386
Total Costs	4,102	4,102	161,617	110,125	2,187
Benefit-Cost	△4,102	△4,102	△161,617	△110,125	121,293

EIRR = 35.05% (Detailed in Appendix 9.5.1)

The EIRR is calculated using equation as shown below:

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

where, Bi : Benefit at i-th year
Ci : Cost at i-th year
r : Rate of discount

9.5.2 Results

The EIRR of the project is 35.05% for the base case (Table 9.5.1). Usually the EIRR is compared with the opportunity cost of the capital in the country. In the Philippines almost all feasibility studies are adopting the rate of 15% as the cost of capital.

From this point of view, this project can be judged as more than feasible.

9.6 Sensitivity Analyses

9.6.1 Identification of Cases

The different assumptions for the sensitivity test are as follows.

Cas A ..... The cargo volume in 1990 is decreased by 10%
(equal to a 2.3% annual increase of GRDP)

Case B ..... The construction costs are increased by 10%

Case C ..... The peso exchange rate is decreased by 10% (₱19/$ into ₱21/$)

Case D ..... The ship cost is decreased by about 20%, that is, an average time charter rate of $5.5/month/DWT is used.

Case E ..... Unit value added is decreased by 10%.

9.6.2 Results

The results of sensitivity tests are shown in Table 9.6.1, detailed in Appendix 9.6.1 ~ 5.

Table 9.6.1 Sensitivity Analysis

(1,000 ₱)

	Base Case	Case A	Case B	Case C	Case D	Case E
Benefit	123,480	64,798	123,480	130,025	108,170	118,310
① Value added (Domestic, Ro-Ro Cargos)	51,703	27,103	51,703	51,103	51,703	46,533
② Saving in Trans. Cost (Ro-Ro ships)	330	297	330	330	330	330
③ Saving in Waiting Time (Foreign cargo)	71,447	37,398	71,447	78,592	56,137	71,447
Cost						
① Construction Cost	279,946	279,946	307,941	298,066	279,946	279,946
② Maintenance Cost	1,801	1,801	1,981	1,913	1,801	1,801
③ Operation Cost	386	386	386	386	386	386
EIRR (%)	35.05	19.69	32.31	34.69	31.29	33.80

The sensitivity tests reveal that the EIRR is most sensitive to the 10% decrease in cargo volume (Case A) among the five different assumptions. Although the EIRR of Case A is lowest at the rate of 19.69%, that level is still over the 15% standard.

9.7 Conclusion

The Short-term Development Plan for the Base Port of Batangas is judged to be more than feasible from the viewpoint of the national economy based upon the EIRR of the project as well as the uncountable benefits arising from this project.

CHAPTER 10
FINANCIAL ANALYSIS

CHAPTER 10 FINANCIAL ANALYSIS

10.1 Purpose of Financial Analysis

The purpose of this chapter is to appraise the financial feasibility of the Short-term Development Plan, specially:

(1) The financial viability of the operating entity responsible for the Short-term Development Plan.

(2) The profitability of the Short-term Development Plan itself.

10.2 Approach and Methodology

10.2.1 Commercial Accounting System

PPA is authorized by Presidential Decree 857 to prescribe port tariff rates and raise necessary funds. Its accounting is based on a commercial accounting system. The individual PMU's, which comprise PPA also issue their own financial statements. Accordingly, all data in this chapter including financial projections are calculated based on a commercial accounting system.

10.2.2 Operating Entity

It is important to choose the appropriate operating entity for financial analysis. The following are selected as candidates:

- PPA
- PMU Batangas
- The Port of Batangas (Base Port and Private Ports along Batangas Bay)

After due consideration of the actual conditions listed below, PPA and The Port of Batangas are selected as the operating entities in this chapter, for the following reasons:

(1) Because the PMU can not be the borrowing body by the actual accounting system, it is necessary to appraise PPA's capacity to raise funds in foreign currency.

(2) The tariff rates at all the ports are unified, and the rates can only be changed based on the financial position of PPA.

(3) The PMU actually functions not only as an administrative unit, but also as a revenue and cost center; it issues its own financial statements. However, the Base Port does not handle most of the cargo at the PMU. Accordingly, the PMU data can not be regarded as representing the situation at the Port of Batangas itself.

(4) As the PMU head office actually operates both the Base Port and the private ports along Batangas Bay, it is difficult to separate the data concerning only the Base Port itself from the PMU's overall financial statements.

(5) Some of the sub-ports' financial data is available and can be used in calculating financial statements for the Port of Batangas.

10.2.3 Approach

(1) Flow Chart of the Financial Analysis in This Chapter

The process of the financial analysis is shown in Fig. 10.2.1.

(2) Common Assumptions in This Chapter

i) Foreign currency exchange rate

1 US $ = 19 ₱
1 US $ = 246 Yen

ii) Prices

All revenues and expenses are calculated at constant 1984 prices.

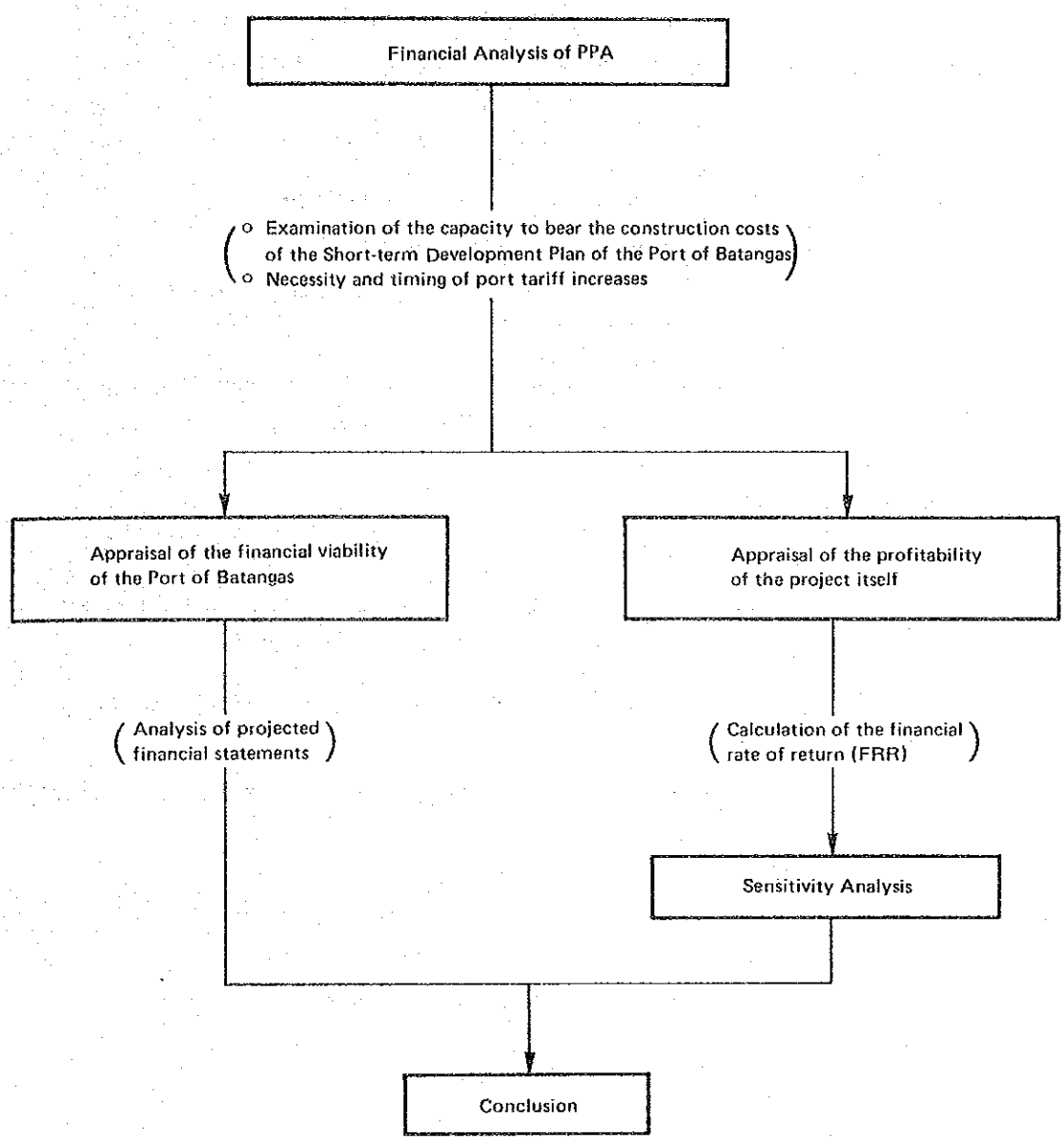


Fig. 10.2.1 Flow chart of the study

10.3 Financial Analysis of PPA

10.3.1 Assumptions Used for Financial Projections

(1) Revenues

i) Growth in cargo throughput and vessel traffic: 5% per year

ii) Increase in port tariff rate: April 1985 30%, October 1985 30% } already approved

iii) Fund management income: 7.5% of the current assets of the previous year, projected based on the actual record

(2) Operating Expenses

i) Personnel costs and other administrative costs: 5% increase per year

ii) Repairs and maintenance: 1.5% of the book value of the total gross depreciable assets, projected based on the actual record

iii) Taxes and licenses: 3% of the total revenue

iv) Depreciation rates of operating assets:

– Existing assets	3.1% (projected based on the actual record)
– Ongoing projects	
IBRD 3rd Project	2.5% (40 years)
Manila Int. Container	2.5% (40 years)
Cargo Handling Equipment	6.7% (15 years)
Port of Irene	2.5% (40 years)
– Future projects	
Manila North Harbor	6.7% (15 years)
Port of Tacloban	2.5% (40 years)
Port of San Fernando	2.5% (40 years)
IBRD 4th Project	2.5% (40 years)
– Dredging project	20% (5 years)
– Short-term development plan (Port of Batangas)	2.5% (40 years)

(3) Port Development Plan and Debt Service

i) Infrastructure investment projects are calculated based on "PPA's 5 year Development Plan 1984 ~ 1988".
(details are provided in Appendix Table 10.3.4)

ii) Dredging projects
Dredging costs are assumed to be 50 million pesos in 1984 and to increase 10% per year.

iii) Debt service

Loans for completed projects	– Based on corresponding contracts
Loans for ongoing projects	– Based on corresponding contracts and investment schedule shown in Appendix Table 10.3.4.
Loans for future projects	– Based on the following conditions and on the investment schedule shown in Appendix Table 10.3.4.

	Interest Rate (%)	Repayment Term (years)	Grace Period (years)
– Manila North Harbor	10.7	15	5
– Port of Tacloban	3.25	30	7
– Port of San Fernando	4.25	25	7
– IBRD 4th Project	10.75	15	5
– Short term Development Plan (Port of Batangas)	4.25	25	7

10.3.2 Appraisal of the Financial Viability of PPA

The projected financial statements of PPA according to the above assumptions are given Table 10.3.2 (With Case) and Table 10.3.3 (Without Case).

Table 10.3.1 Definition of "With" and "Without" Cases (Port development Projects)

With Case	– Ongoing Project – Future Projects – Short-term Development Plan (Port of Batangas)
Without Case	– Ongoing Projects – Future Projects

Table 10.3.2 Projected Financial Statement of PPA (With case)

(million pesos)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Revenue from Operations													
Port Revenue	444.5	617.3	648.2	680.6	714.6	750.3	945.4	992.7	1042.3	1094.4	1149.1	1206.6	1266.9
Fund Management Income	58.8	58.1	63.4	61.8	58.9	53.9	44.9	45.5	46.2	51.7	61.7	74.3	89.9
Total Revenue	503.3	675.4	711.6	742.4	773.5	804.2	990.3	1038.2	1088.5	1146.1	1210.8	1280.9	1356.8
Operating Expenses													
Cash Operating Expenses													
Personnel Costs	62.9	66	69.3	72.8	76.4	80.2	84.2	88.4	92.8	97.5	102.4	107.5	112.8
Other Administrative Cost	46.4	48.7	51.1	53.7	56.4	59.2	62.2	65.3	68.5	72	75.5	79.3	83.3
Maintenance & Repairs	41.8	41.8	63.9	63.9	75.3	75.3	98.8	102.6	102.6	126.6	126.6	126.6	126.6
Tax,Licenses & Fees	15.5	20.3	21.3	22.3	23.2	24.1	29.7	31.1	32.7	34.4	36.3	38.4	40.7
Interest on Loans	128.2	150.2	177.1	207.2	245.3	280.2	303.6	322	329	316.2	292.8	266.4	231.2
Sub-Total	294.8	327	382.7	419.9	476.6	519	578.5	609.4	625.6	646.7	633.6	618.2	594.6
Non-Cash Charges													
Depreciation Expenses	88.9	88.9	129.7	129.7	148.8	148.8	242.5	248.9	248.9	288.9	288.9	288.9	288.9
Dredging Expenses	50.8	10	21	33.1	46.4	61	67.1	73.8	81.2	89.3	98.3	108.1	118.9
Sub-Total	139.7	98.9	150.7	162.8	195.2	209.8	309.6	322.7	330.1	378.2	387.2	397	407.8
Total Operating Expenses	434.5	425.9	533.4	582.7	671.8	728.8	888.1	932.1	955.7	1024.9	1020.8	1015.2	1002.4
Net Income from Operations	68.8	249.5	178.2	159.7	101.7	75.4	102.2	106.1	132.8	121.2	190	265.7	354.4

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cash Beginning	232.7	183.3	254.5	232.4	194.3	126.7	7.6	15.9	24.3	97.9	231.4	399.9	607
Cash Inflow													
Net Income from Operations	68.8	249.5	178.2	159.7	101.7	75.4	102.2	106.1	132.8	121.2	190	265.7	354.4
Depreciation	139.7	98.9	150.7	162.8	195.2	209.8	309.6	322.7	330.1	378.2	387.2	397	407.8
Long Term Loans	542.4	412.2	367.2	507.2	558.5	447.4	366.2	360.9	180.5	0	0	0	0
Total	750.9	760.6	696.1	829.7	855.4	732.6	778	789.7	643.4	499.4	577.2	662.7	762.2
Cash Outflow													
Repayment of Principal	45.6	72.3	73.6	83.4	108.9	130.6	158.4	173	207.1	248	279	312.9	348.6
Infrastructure Project	704.7	562.1	584.1	717.8	740.9	640.6	522.7	510.9	255.5	0	0	0	0
Dredging Project	50	55	60.5	66.6	73.2	80.5	88.6	97.4	107.2	117.9	129.7	142.7	157
Total	800.3	689.4	718.2	867.8	923	851.7	769.7	781.3	569.8	365.9	408.7	455.6	505.6
Cash Ending	183.3	254.5	232.4	194.3	126.7	7.6	15.9	24.3	97.9	231.4	399.9	607	863.6

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Assets													
Current Assets	774.6	845.8	823.7	785.6	718	598.9	607.2	615.6	689.2	822.7	991.2	1198.3	1454.9
Fixed Assets													
Non-Depreciable Assets													
Land	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7
Construction in Progress	948.1	1637.5	792.5	1510.3	1492.3	2132.9	1087.2	1344.5	1600	0	0	0	0
Depreciable Assets													
Depreciable Assets	2831.4	2831.4	4260.5	4260.5	5019.5	5019.5	6587.9	6841.5	6841.5	8441.5	8441.5	8441.5	8441.5
Accumulated Depreciation	1050.4	1139.3	1269	1398.7	1547.5	1696.3	1938.8	2187.7	2436.6	2725.5	3014.4	3303.3	3592.2
Net Depreciable Assets	1781	1692.1	2991.5	2861.8	3472	3323.2	4649.1	4653.8	4404.9	5716	5427.1	5138.2	4849.3
Total	3333.8	3934.3	4388.7	4976.8	5569	6060.8	6341	6603	6609.6	6320.7	6031.8	5742.9	5454
Deferred Charges													
Deferred Dredging	0	105	165.5	232.1	305.3	335.8	369.4	406.3	446.9	491.6	540.8	594.9	654.5
Other Assets	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Total Assets	4122.7	4899.4	5392.2	6008.8	6606.6	7009.8	7331.9	7639.2	7760	7649.3	7578.1	7550.4	7577.7
Liabilities & Net Worth													
Liabilities													
Current Liabilities	215	226.4	183.6	190.2	230.3	237.3	207.2	171.8	168.3	91.7	15	15	15
Long Term Liabilities	1066	1405.9	1699.5	2123.3	2572.9	2889.7	3097.5	3285.4	3258.8	3010.8	2731.8	2418.9	2070.3
Net Worth													
Capital Contributions	2390.8	2463.1	2536.7	2620.1	2729	2859.6	3018	3191	3398.1	3646.1	3925.1	4238	4586.6
Retained Earnings	450.9	804	972.4	1075.2	1074.4	1023.2	1009.2	991	934.8	900.7	906.2	878.5	905.8
Total Liabilities & Net Worth	4122.7	4899.4	5392.2	6008.8	6606.6	7009.8	7331.9	7639.2	7760	7649.3	7578.1	7550.4	7577.7

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Operating Ratio	0.863	0.631	0.75	0.785	0.869	0.906	0.897	0.898	0.878	0.894	0.843	0.793	0.739
Working Ratio	0.663	0.53	0.59	0.617	0.667	0.692	0.612	0.614	0.6	0.591	0.551	0.512	0.469
Return on Net Fixed Assets	0.133	0.157	0.148	0.137	0.128	0.124	0.149	0.15	0.158	0.173	0.191	0.21	0.232
Debt Service Ratio	1.937	2.241	2.018	1.823	1.531	1.376	1.548	1.517	1.477	1.446	1.522	1.604	1.713

Table 10.3.3 Projected Financial Statement of PPA (Without case)

(million pesos)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Revenue from Operations													
Port Revenue	444.5	617.3	648.2	680.6	714.6	750.3	866.6	909.9	955.4	1003.1	1053.3	1106	1161.3
Fund Management Income	58.8	58.1	63.4	62	59.1	57.5	53.7	50	45.7	45.7	49.4	54.9	62.9
Total Revenue	503.3	675.4	711.6	742.6	773.7	807.8	920.3	959.9	1001.1	1048.8	1102.7	1160.9	1224.2
Operating Expenses													
Cash Operating Expenses													
Personnel Costs	62.9	66	69.3	72.8	76.4	80.2	84.2	88.4	92.8	97.5	102.4	107.5	112.8
Other Administrative Cost	46.4	48.7	51.1	53.7	56.4	59.2	62.2	65.3	68.5	72	75.5	79.3	83.3
Maintenance & Repairs	41.8	41.8	63.9	63.9	75.3	75.3	94.9	98.7	98.7	122.7	122.7	122.7	122.7
Tax,Licenses & Fees	15.5	20.3	21.3	22.3	23.2	24.2	27.6	28.8	30	31.5	33.1	34.8	36.7
Interest on Loans	128.2	150.2	177	207.1	243	274.8	297.2	315.6	322.6	309.8	286.4	260.3	231.2
Sub-Total	294.8	327	382.6	419.8	474.3	513.7	566.1	596.8	612.6	633.5	620.1	604.6	586.7
Non-Cash Charges													
Depreciation Expenses	88.9	88.9	129.7	129.7	148.8	148.8	236	242.4	242.4	282.4	282.4	282.4	282.4
Dredging Expenses	50.8	10	21	33.1	46.4	61	67.1	73.8	81.2	89.3	98.3	108.1	118.9
Sub-Total	139.7	98.9	150.7	162.8	195.2	209.8	303.1	316.2	323.6	371.7	380.7	390.5	401.3
Total Operating Expenses	434.5	425.9	533.3	582.6	669.5	723.5	869.2	913	936.2	1005.2	1000.8	995.1	988
Net Income from Operations	68.8	249.5	178.3	160	104.2	84.3	51.1	46.9	64.9	43.6	101.9	165.8	236.2

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cash Beginning	232.7	183.3	254.5	234	196.8	175.8	124.8	75.5	18.2	17.4	67	141.2	247.7
Cash Inflow													
Net Income from Operations	68.8	249.5	178.3	160	104.2	84.3	51.1	46.9	64.9	43.6	101.9	165.8	236.2
Depreciation	139.7	98.9	150.7	162.8	195.2	209.8	303.1	316.2	323.6	371.7	380.7	390.5	401.3
Long Term Loans	542.4	412.2	365	505.1	457.1	400.6	366.2	360.9	180.5	0	0	0	0
Total	750.9	760.6	694	827.9	756.5	694.7	720.4	724	569	415.3	482.6	556.3	637.5
Cash Outflow													
Repayment of Principal	45.6	72.3	73.6	84.4	108.9	130.6	158.4	173	207.1	247.8	278.7	307.1	340.2
Infrastructure Project	704.7	562.1	580.4	714.1	595.4	534.6	522.7	510.9	255.5	0.	0	0	0
Dredging Project	50	55	60.5	66.6	73.2	80.5	88.6	97.4	107.2	117.9	129.7	142.7	157
Total	800.3	689.4	714.5	865.1	777.5	745.7	769.7	781.3	569.8	365.7	408.4	449.8	497.2
Cash Ending	183.3	254.5	234	196.8	175.8	124.8	75.5	18.2	17.4	67	141.2	247.7	388

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Assets													
Current Assets	774.6	845.8	825.3	788.1	767.1	716.1	666.8	609.5	608.7	658.3	732.5	839	979.3
Fixed Assets													
Non-Depreciable Assets													
Land	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7	604.7
Construction In Progress	948.1	1637.5	788.8	1502.9	1339.4	1873.9	1087.2	1344.5	1600	0	0	0	0
Depreciable Assets													
Depreciable Assets	2831.4	2831.4	4260.5	4260.5	5019.5	5019.5	6328.9	6582.5	6582.5	8182.5	8182.5	8182.5	8182.5
Accumulated Depreciation	1050.4	1139.3	1269	1398.7	1547.5	1696.3	1932.3	2174.7	2417.1	2699.5	2981.9	3264.3	3546.7
Net Depreciable Assets	1781	1692.1	2991.5	2861.8	3472	3323.2	4396.6	4407.8	4165.4	5483	5200.6	4918.2	4635.8
Total	3333.8	3934.3	4385	4969.4	5416.1	5801.8	6088.5	6357	6370.1	6087.7	5805.3	5522.9	5240.5
Deferred Charges													
Deferred Dredging	0	105	165.5	232.1	305.3	335.8	369.4	406.3	446.9	491.6	540.8	594.9	654.5
Other Assets	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Total Assets	4122.7	4899.4	5390.1	6003.9	6502.8	6868	7139	7387.1	7440	7251.9	7092.9	6971.1	6888.6
Liabilities & Net Worth													
Liabilities													
Current Liabilities	215	226.4	183.6	189.1	229.2	193.6	175.4	171.8	168.3	91.7	15	15	15
Long Term Liabilities	1066	1405.9	1697.3	2118	2466.2	2736.2	2944	3131.9	3105.3	2857.5	2578.8	2271.7	1931.5
Net Worth													
Capital Contributions	2390.8	2463.1	2536.7	2621.1	2730	2850.6	3019	3192	3399.1	3646.9	3925.6	4232.7	4572.9
Retained Earnings	450.9	804	972.5	1075.7	1077.4	1077.6	1000.6	891.4	767.3	655.8	573.5	451.7	369.2
Total Liabilities & Net Worth	4122.7	4899.4	5390.1	6003.9	6502.8	6868	7139	7387.1	7440	7251.9	7092.9	6971.1	6888.6

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Operating Ratio	0.863	0.631	0.749	0.785	0.865	0.896	0.944	0.951	0.935	0.958	0.908	0.857	0.807
Working Ratio	0.663	0.53	0.59	0.617	0.664	0.685	0.653	0.636	0.641	0.632	0.589	0.547	0.505
Return on Net Fixed Assets	0.133	0.157	0.148	0.137	0.132	0.129	0.142	0.143	0.15	0.165	0.181	0.2	0.222
Debt Service Ratio	1.937	2.241	2.019	1.818	1.541	1.403	1.43	1.389	1.342	1.3	1.361	1.439	1.52

Below are the results of analysis of the financial statements.

(1) Necessity of the Raising of Port Tariff Rates

The raising of port tariff rates after 1986 is considered necessary when Net Income or Cash Ending are minus value.

In both the "With" and "Without" case, Cash Ending in 1990 shows a minus value. So it is necessary to raise port tariff rates as follow:

"With" case	20% 1990
"Without" case	10% 1990

(Table 10.3.2 and 10.3.3 show the financial statements after raising port tariff rates.)

(2) Financial Ratios Analysis

Financial ratios are calculated by the following formulas.

$$\text{Operating Ratio} = \frac{\text{Total Operating Expenses}}{\text{Total Revenue}}$$

$$\text{Working Ratio} = \frac{\text{Total Operating Expenses} - \text{Non Cash Charges}}{\text{Port Revenue}}$$

$$\text{Return on Net Fixed Assets} = \frac{\text{Port Revenue}}{\text{Net Fixed Assets}}$$

$$\text{Debt Service Ratio} = \frac{\text{Net Income} + \text{Non Cash Charges} + \text{Interest on Loans}}{\text{Debt Service}}$$

The financial ratios of both cases are shown in Fig. 10.3.1.

(3) Evaluation of Financial Statements

As explained in the previous section, the "With" case requires a 20% raise of the port tariff rates in 1990, and this increase is 10% greater than the necessary raise for the "Without" case. The increase is considered reasonable to execute the Short-term Development Plan under which construction costs will be 259 million pesos. Further, all the financial ratios show good values. Accordingly, it can be said that the Short-term Development Plan will not create any serious financial problems for PPA.

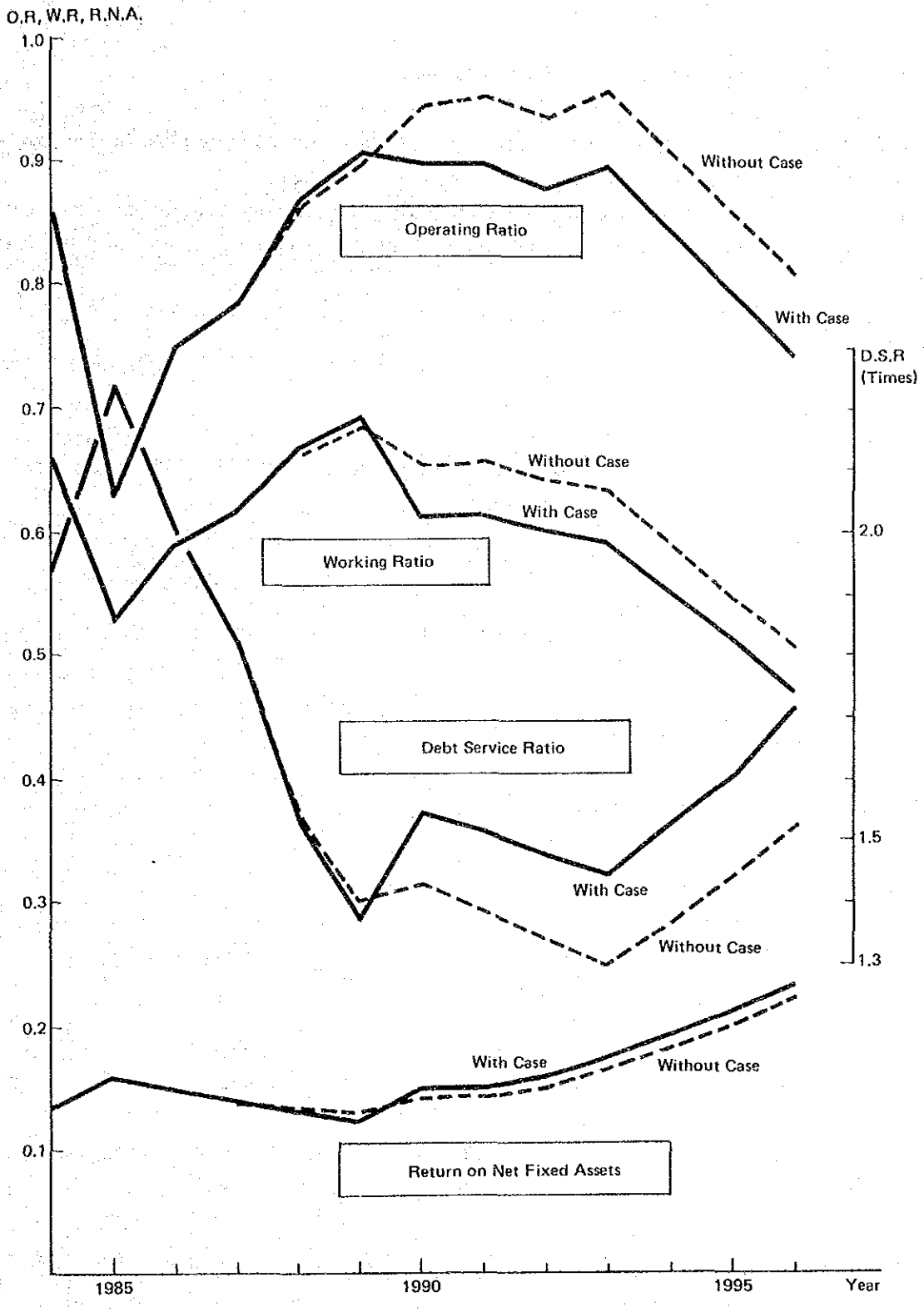


Fig. 10.3.1 Financial Ratios (PPA)

(With Case: 20% Tariff increase in 1990
Without Case: 10% Tariff increase in 1990)

10.4 Financial Analysis of the Port of Batangas

10.4.1 Actual Financial Situation of the Port of Batangas

PMUs are the smallest unit for which financial statements are made by PPA. In this chapter it is necessary to project financial statements for the Port of Batangas.

The statement of Income and Fixed Assets excluding the sub-ports is available in the IBRD 4th Project Study. These data represent the financial situation of the Base Port and the PMU head office.

The financial statements of the Port of Batangas based on the above data are shown in Table 10.4.1.

Table 10.4.1 PMU – Batangas Financial Statement 1983 & 1984

(1,000 pesos)

	1983			1984		
	The Port of Batangas	Sub-Port	Total	The Port of Batangas	Sub-Port	Total
Revenue						
Gross Revenue	2,475	3,368	5,843	2,176	4,242	6,418
Less Exemptions	278	1,431	1,709	–	1,433	1,433
Net Revenue	2,197	1,937	4,134	2,176	2,809	4,985
Operating Costs						
Personnel Costs	1,034	367	1,401	1,145	409	1,554
Repairs and Maintenance	210	306	516	2,329	307	2,636
Other Administrative Costs	410	125	535	339	121	460
3% Business Tax	1,183	63	1,246	1,561	82	1,643
Depreciation Charge	438	275	713	426	266	692
Total Operating Costs	3,275	1,136	4,411	5,800	1,185	6,985
Net Operating Revenue	-1,078	801	-277	-3,624	1,624	-2,000
Net Cash Flow						
Net Operating Revenue	-1,078	801	-277	-3,624	1,624	-2,000
Depreciation	438	275	713	426	266	692
Private Ports Revenue	37,164	312	37,476	47,301	372	47,673
Total	36,524	1,388	37,912	44,103	2,262	46,365
Fixed Assets						
Land & Land Improvement	1,338	90	1,428	1,338	90	1,428
Depreciable Fixed Asset	17,766	13,114	30,880	17,764	13,114	30,878
Accumulated Depreciation	3,549	2,571	6,120	3,975	2,837	6,812
Net Fixed Assets	15,555	10,633	26,188	15,127	10,367	25,494

Concerning the financial situation of the Port of Batangas:

(1) The port revenue comes from the Base Port and from private ports. The portion of revenue from private ports is too big: it amounts to over 95% of total revenues. On the other hand, the costs of operations and maintenance at the private ports are very small. Unfortunately, the revenue from the Base Port is insufficient to cover its expenses.

(2) The Port of Batangas shares the PPA head office costs. Batangas' share of these costs is projected as about 44 million pesos in 1984 (90% of the total revenue of the Port of Batangas). This figure is almost equal to the revenue from the private ports of PMU Batangas.

10.4.2 Assumptions Used for Financial Projections

(1) Revenue

i) Port tariff rates

Revenues from port charges in this section are calculated in accordance with the tariff rates as of October 1985, and a tariff rate increase of 20% in 1990 based on PPA's financial analysis.

ii) Cargo volume and Vessel traffic

(Cargo volume)

The cargo volume capacity in 1995 is estimated based on the capacity analysis in Chapter 7. We project that cargo volume at the Base Port will increase gradually from 1990 through 1995, but will remain constant after 1995. On the other hand, the cargo volume at the private ports is assumed to remain constant after 1990.

The estimated cargo volume in 1990 and 1995 are presented in Tables 10.4.2 ~ 10.4.3.

(Vessel traffic)

From the projected cargo volume and the port capacity analysis, the vessel traffic and other data are projected as shown in Table 10.4.4.

iii) Reduction of revenues

All revenues from cargoes of entities enjoying exemption from the payment of port charges are reduced in this projection.

iv) Fund management income

No income from application of the annual cash surplus is taken into account in this projection.

v) New income items

Additional income from new income items is projected based on the construction costs and economic lives of these items.

- Land for port-related activities (Appendix Fig. 10.4.1)
- Forklifts
- A part of the Passenger Terminal

Table 10.4.2 Projected Cargo Volume at the Base Port

('000 tons)

	1990							1995						
	Foreign			Domestic			Total	Foreign			Domestic			Total
	Export	Import	Total	Out	In	Total		Export	Import	Total	Out	In	Total	
Palay/Rice					105 (95)	105 (95)	105 (95)					128 (111)	128 (111)	128 (111)
Copra					37 (35)	37 (35)	37 (35)					41 (39)	41 (39)	41 (39)
Cement	105		105	50 (31)		50 (31)	135 (31)	117		117	72 (45)		72 (45)	72 (45)
Minerals		13	13		7	7	20		16	16		7	7	23
Logs/wood				2 (2)	60	62 (2)	62 (2)				2 (2)	71	73 (2)	73 (2)
Fertilizer				22 (18)		22 (18)	22 (18)				31 (20)	5	36 (20)	36 (20)
Others	29	11	40	182 (176)	248 (239)	430 (415)	470 (415)	33	20	53	237 (223)	327 (295)	564 (518)	617 (518)
Total	134	24	158	256 (227)	457 (369)	713 (596)	871 (596)	150	36	186	342 (290)	579 (445)	921 (735)	1,107 (735)
Passengers ('000)	1,040							1,781						

( ) ..... Ro/Ro

Table 10.4.3 Projected Cargo Volume at the Private Ports in 1990

('000 tons)

	Foreign			Domestic			Total
	Export	Import	Total	Out	In	Total	
Crude Oil & Petroleum Products	140	4,321	4,461	1,368	652	2,020	6,481
Grain		140	140	5	32	37	177
Coconut Oil & Coco-chemical Products (UNICHEM)	37		37	30	69	99	136
Coal		336	336	154	395	549	885
Chemicals		51	51				51
Coconut Products	66		66				66
Steel & Steel Products	23		23	11	45	56	79
Others	10	32	42	38	85	123	165
Total	276	4,880	5,156	1,606	1,278	2,884	8,040

Table 10.4.4 Vessel Traffic at the Base Port

Average Ship Size	1990				1995			
	Cargo	Number of Ship Calls (times)	Service Time (hours)	Waiting Time (hours)	Cargo	Number of Ship Calls (times)	Service Time (hours)	Waiting Time (hours)
(Foreign Vessels)								
15,000 DWT	Cement	3	619	155	Cement	3	692	239
10,000 DWT	Cement	6	1,058	266	Cement	7	1,249	519
6,000 DWT	Cement	9	1,105	408	Cement	10	145	429
5,000 DWT	Minerals & Others	20	2,257	796	Minerals & Others	24	2,504	1,290
3,500 DWT	Cement	8	729	153	Cement	8	735	89
(Domestic Vessels)								
3,000 DWT	Logs & Wood	38	4,555	750	Logs & Wood	42	5,134	1,020
1,000 DWT	Minerals	10	811	3	Minerals	12	988	13
500 DWT	General	208	4,674	206	General	318	6,927	768
150 DWT	General	560	1,344	719	General	620	1,484	1,825
500 GRT	Ro/Ro	2,050	–	–	Ro/Ro	2,461	–	–
300 GRT	Ferry	2,080	–	–	Ferry	3,562	–	–

(2) Expenses

i) Personnel costs

Expenses associated with personnel are calculated based on the number of employees needed. In order to estimate the number of personnel, the future organization of the Port of Batangas was studied in consideration of projected cargo volume, allocation of facilities and so on.

As a result, the number of personnel in 1990 is estimated as 47. Until 1990, the present number of 37 personnel is used in the projections.

As a per capita annual personnel cost, ₱30,945, the actual average cost in 1984, is used.

ii) Repairs and maintenance

Repairs and maintenance costs of the existing facilities are taken as 3% of the book value of the total depreciable assets. As far as new port facilities are concerned, annual costs are forecast as a percentage of the value of the fixed assets requiring maintenance: 1% is assumed for wharves, the passenger terminal, transit sheds, pavement, roads, forklifts, truck scales, lighting facilities and the sidewalk bridge.

iii) Other administrative costs

Other administrative costs are assumed to be 30% of the annual personnel costs.

iv) Taxes and licences

Taxes and licenses are 3% of the total revenues.

(3) Others

i) Construction costs and depreciation of new assets

The annual depreciation of operating assets is computed by the straight line method with no residual value in accordance with the PPA guideline. The depreciation costs of the existing assets are calculated using the actual record of 2.4% of total gross depreciable assets. On the other hand, costs of the new assets are obtained using 1) the proposed amount of investment for the facilities, and 2) the economic lives of the facilities as assessed by PPA for depreciation purposes.

ii) Fund raising

It is assumed that the foreign currency portion of the construction costs will be met by OECF. On the other hand, the local currency portion is to be covered by the internally generated funds of PPA. The terms of foreign loans are determined as follows:

Maturity/Grace period	–	25 years including 7 years grace period
Repayment	–	Repayment of principal once a year
Interest rate	–	4.25%

Table 10.4.5 Construction Costs

('000 pesos)

	Economic Life (year)	Total*	1986	1987	1988	1989
Wharf	50	97,519	1,428	1,428	94,663	
Revetment	50	14,159	215	215	13,729	
Breakwater	50	4,781	74	74		4,633
Jetty	50	22,942	348	348	15,548	6,698
Passenger Terminal	30	6,930	104	104		6,722
Transit Shed	30	20,211	307	307		19,597
Pavement	20	8,719	133	133		8,453
Road	20	16,388	248	248		15,892
Forklift	8	2,841	44	44		2,753
Truck Scale	12	935	15	15		905
Lighting Facilities	25	6,052	92	92		5,868
Sidewalk Bridge	30	27,025	410	410		26,205
Dredging	-	30,498	281	282	21,599	8,336
Total		259,000	3,699	3,700	145,539	106,062
(Foreign Currency)		151,000	2,156	2,157	99,822	46,864
(Local Currency)		108,000	1,543	1,543	45,717	59,198

*includes engineering, physical contingency etc.

10.4.3 Appraisal of the Financial Viability of the Port of Batangas

The projected financial statements of the Port of Batangas based on the above assumptions are given in Table 10.4.6.

(1) Projected Net Income

Table 10.4.7 clearly shows that the new operating revenue will always exceed the total expenses from the beginning of construction to the end of the period of calculation. Even during the five years after 1990, when amortization of depreciation costs and interest on loans will impose the heaviest burden on the financial position, a net income of over ₱50 million will be generated annually. Thereafter, net income will gradually increase in accordance with the decrease in interest payments.

Table 10.4.6 Projected Financial Statement of the Port of Batangas

('000 pesos)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Revenue from Operations													
Base Port Revenue	2176	2541	2967	3465	4045	4724	7185	7614	8042	8469	8898	9326	9326
Private Port Revenue	47301	48703	50146	51631	53161	54736	67629	67629	67629	67629	67629	67629	67629
Total Revenue	49477	51244	53113	55096	57206	59460	74814	75243	75671	76098	76527	76955	76955
Operating Expenses													
Cash Operating Expenses													
Personnel Costs	1145	1145	1145	1145	1145	1145	1454	1454	1454	1454	1454	1454	1454
Other Administrative Cost	339	339	339	339	339	339	431	431	431	431	431	431	431
Maintenance & Repairs	2329	533	533	533	533	533	2269	2269	2269	2269	2269	2269	2269
Tax,Licenses & Fees	1561	1537	1593	1653	1716	1784	2244	2257	2270	2282	2295	2308	2308
Interest on Loans	0	0	46	137	2304	5421	6417	6417	6417	6412	6402	6156	5799
Sub-Total	5374	3554	3656	3807	6037	9222	12815	12828	12841	12848	12851	12618	12261
Non-Cash Charges													
Depreciation Expenses	426	426	426	426	426	426	426	6950	6950	6950	6950	6950	6950
Total Operating Expenses	5800	3980	4082	4233	6463	9648	13241	19778	19791	19798	19801	19568	19211
Net Income from Operations	43677	47264	49031	50863	50743	49812	61573	55465	55880	56300	56726	57387	57744
(Net income of Base Port)	-3624	-1439	-1115	-768	-2418	-4924	-6056	-12164	-11749	-11329	-10903	-10242	-9885

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cash Beginning	0	426	4439	10219	17831	25323	31884	50206	68944	88097	107551	127311	142186
Cash Inflow													
Net Income from Operations	43677	47264	49031	50863	50743	49812	61573	55465	55880	56300	56726	57387	57744
Depreciation	426	426	426	426	426	426	426	6950	6950	6950	6950	6950	6950
Long Term Loans	0	0	2156	2157	99822	46864	0	0	0	0	0	0	0
Equity of Head Office	0	0	1543	1543	45717	59198	0	0	0	0	0	0	0
Total	44103	47690	53156	54989	196708	156300	61999	62415	62830	63250	63676	64337	64694
Cash Outflow													
Repayment of Principal	0	0	0	0	0	0	0	0	0	119	239	5785	8388
Infrastructure Project	0	0	3699	3700	145539	106062	0	0	0	0	0	0	0
Share in Head Office Costs	43677	43677	43677	43677	43677	43677	43677	43677	43677	43677	43677	43677	43677
Total	43677	43677	47376	47377	189216	149739	43677	43677	43677	43796	43916	49462	52065
Cash Ending	426	4439	10219	17831	25323	31884	50206	68944	88097	107551	127311	142186	154815

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Assets													
Current Assets	426	4439	10219	17831	25323	31884	50206	68944	88097	107551	127311	142186	154815
Fixed Assets													
Non-Depreciable Assets													
Land	1338	1338	1338	1338	1338	1338	31836	31836	31836	31836	31836	31836	31836
Construction in Progress	0	0	3699	7399	152938	259000	0	0	0	0	0	0	0
Depreciable Assets													
Depreciable Assets	17764	17764	17764	17764	17764	17764	246266	246266	246266	246266	246266	246266	246266
Accumulated Depreciation	3975	4401	4827	5253	5679	6105	6531	13481	20431	27381	34331	41281	48231
Net Depreciable Assets	13789	13363	12937	12511	12085	11659	239735	232785	225835	218885	211935	204985	198035
Total	15127	14701	17974	21248	166361	271997	271571	264621	257671	250721	243771	236821	229871
Total Assets	15553	19140	28193	39079	191684	303881	321777	333565	345768	358272	371082	379007	384686
Liabilities & Net Worth													
Liabilities													
Current Liabilities	0	0	0	370	370	14554	10608	0	0	0	0	0	0
Long Term Liabilities	0	0	2156	4313	104135	150999	150999	150999	150999	150880	150641	144856	136468
Net Worth													
Capital Contributions	15127	15127	15127	15127	15127	15127	15127	15127	15127	15246	15485	21270	29658
Retained Earnings	426	4013	9367	16183	23249	15200	37044	59438	71641	84145	96955	104880	110559
CO/PHU Clearing Accounts	0	0	1543	3086	48803	108001	108001	108001	108001	108001	108001	108001	108001
Total Liabilities & Net Worth	15553	19140	28193	39079	191684	303881	321777	333565	345768	358272	371082	379007	384686

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Operating Ratio	0.117	0.078	0.077	0.077	0.113	0.162	0.177	0.263	0.262	0.26	0.259	0.254	0.25
Working Ratio	0.109	0.069	0.069	0.069	0.105	0.155	0.171	0.17	0.17	0.169	0.168	0.164	0.159
Return on Net Fixed Assets	3.271	3.486	2.955	2.593	0.344	0.219	0.275	0.284	0.294	0.304	0.314	0.325	0.335
Debt Service Ratio	N.D	N.D	1076.152	375.372	23.209	10.267	10.662	10.727	10.791	10.666	10.552	5.903	4.969

(2) **Projected Cash Flow Statement**

Fig. 10.4.1 presents the projected annual cash surplus. The solid line is always above the base line where cash income just offsets cash outlay. This demonstrates that it will not be necessary for the PPA head office to provide working funds in any year. Further, it means that the Port of Batangas will continue to supply surplus funds as it has in the past.

(3) **Financial Ratios**

The financial ratios are calculated by the same formulas presented in 10.3.2(2), and are given in Fig. 10.4.2. Each financial ratio is a very good value.

(4) Accordingly, it can be stated that the Short-term Development Plan will not cause any financial burden on PPA or the Port of Batangas.

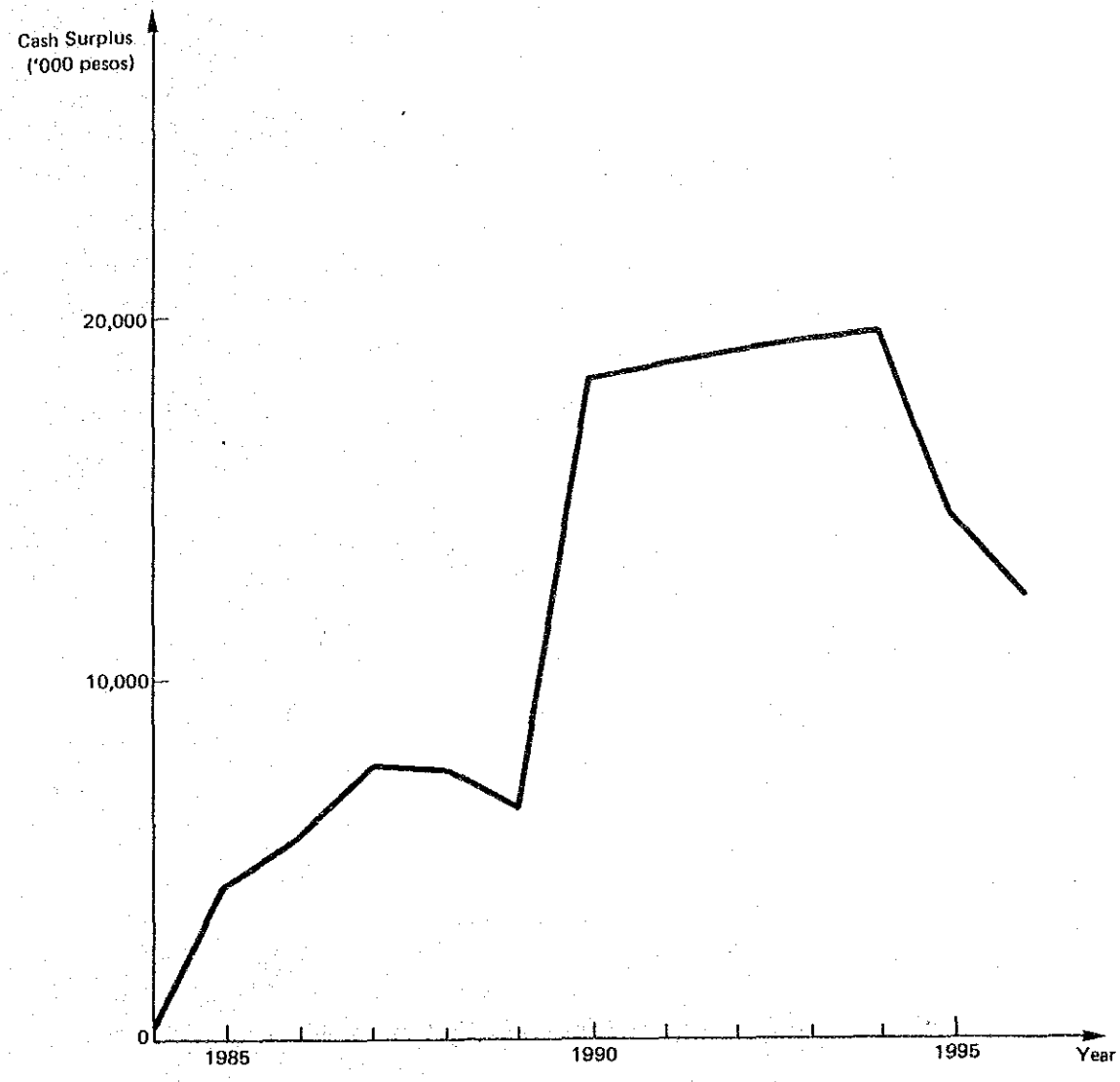


Fig. 10.4.1 Projected Annual Cash Surplus

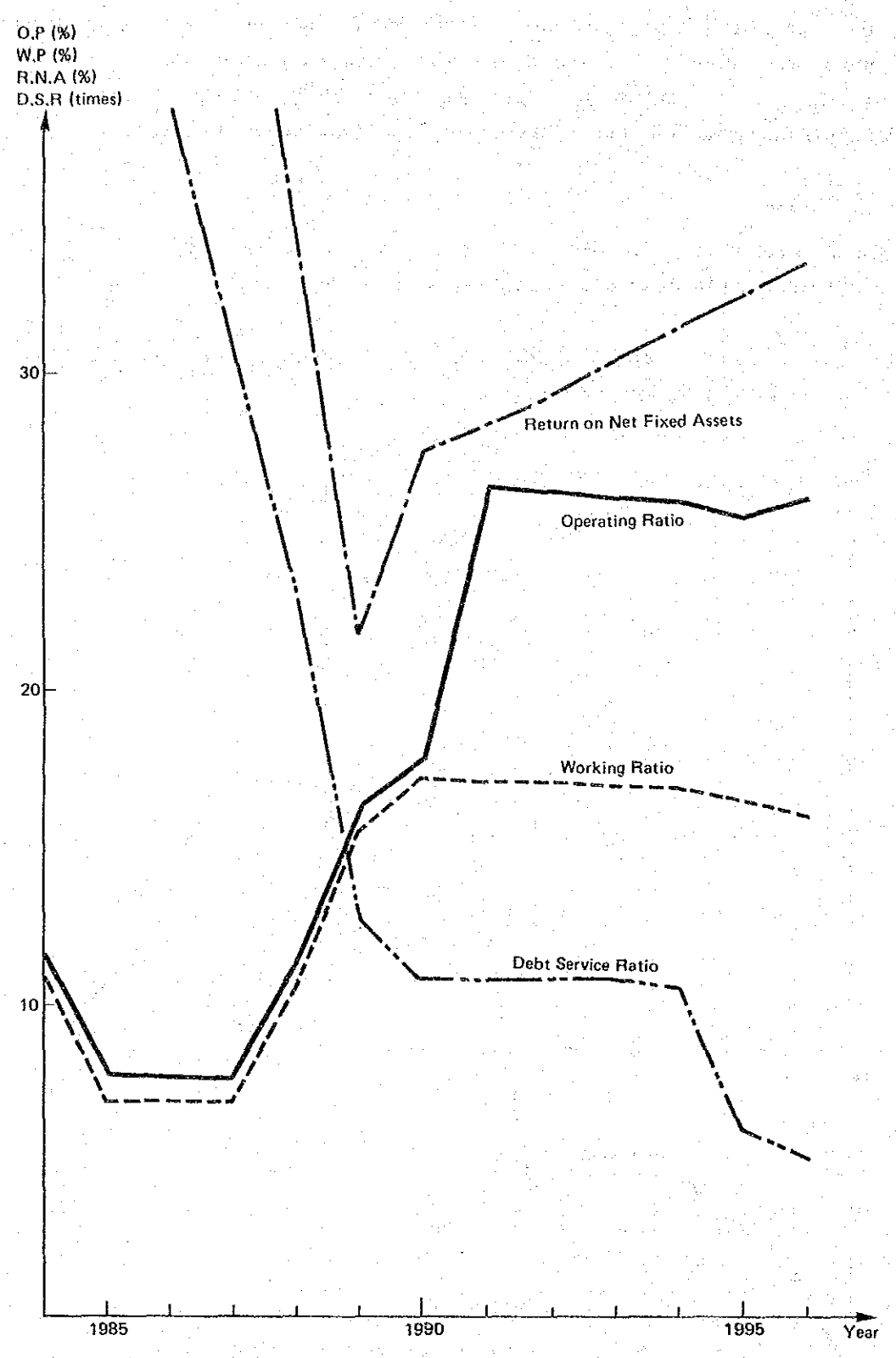


Fig. 10.4.2 Financial Ratios (The Port of Batangas)

10.5 Appraisal of the Profitability of the Project Itself

10.5.1 Financial Rate of Return (FRR)

The profitability of the project itself is appraised based on the FRR. For the calculation of the FRR, benefits are revenues from new port facilities (this means revenues excluding revenue from ferry operations), while costs are construction, maintenance and operating costs.

The FRR calculation for the "Without" case is explained in Chapter 9 above.

The only differences between the two IRR calculations are that under the "With" case:

- Market prices are used.
- The residual value of the new investment in 2019 is taken into account.

10.5.2 Results

(1) The FRR of this project is 0.48%.

(2) One of the main purposes of this project is to rehabilitate Ro/Ro related facilities. Accordingly, the construction costs of those facilities are over 50% of the total costs. Generally, Ro/Ro terminals are composed of various facilities (wharves, passenger terminals, parking lots and so on), and Ro/Ro terminals can only be operated efficiently by the complex of these facilities. But those facilities other than the wharf produce no direct profit in accordance with PPA's port tariff rates. Therefore the FRR of this project is low and this value does not reflect the real profitability of the project.

(3) The FRR without the non-profitable facilities (i.e., passenger terminal sidewalk bridge and jetty) is 2.2%.

Table 10.5.1 FRR (Base Case)

***** Batangas Port
***** FRR(%) = 0.48

NO.	YEAR	COST	BENEFIT	BNFT.-COST	P. COST	P. BNFT	P.VALUE
1	1984	0.00	0.00	0.00	0.00	0.00	0.00
2	1985	0.00	0.00	0.00	0.00	0.00	0.00
3	1986	3699.00	0.00	-3699.00	3663.59	0.00	-3663.59
4	1987	3700.00	0.00	-3700.00	3647.00	0.00	-3647.00
5	1988	145539.00	0.00	-145539.00	142766.00	0.00	-142766.00
6	1989	106062.00	0.00	-106062.00	103542.00	0.00	-103542.00
7	1990	2137.00	6903.00	4766.00	2076.22	6706.65	4630.44
8	1991	2137.00	7291.00	5154.00	2066.25	7049.63	4983.38
9	1992	2137.00	7680.00	5543.00	2056.34	7390.12	5333.78
10	1993	2137.00	8067.00	5930.00	2046.47	7725.27	5678.80
11	1994	2137.00	8456.00	6319.00	2036.66	8058.94	6022.29
12	1995	2137.00	8844.00	6707.00	2026.88	8388.29	6361.40
13	1996	2137.00	8844.00	6707.00	2017.16	8348.04	6330.88
14	1997	2137.00	8844.00	6707.00	2007.48	8307.99	6300.51
15	1998	2137.00	8844.00	6707.00	1997.85	8268.13	6270.28
16	1999	2137.00	8844.00	6707.00	1988.26	8228.46	6240.19
17	2000	2137.00	8844.00	6707.00	1978.73	8188.98	6210.25
18	2001	2137.00	8844.00	6707.00	1969.23	8149.69	6180.46
19	2002	2137.00	8844.00	6707.00	1959.78	8110.59	6150.81
20	2003	2137.00	8844.00	6707.00	1950.38	8071.68	6121.30
21	2004	2137.00	8844.00	6707.00	1941.02	8032.95	6091.93
22	2005	2137.00	8844.00	6707.00	1931.71	7994.41	6062.70
23	2006	2137.00	8844.00	6707.00	1922.44	7956.05	6033.61
24	2007	2137.00	8844.00	6707.00	1913.22	7917.88	6004.66
25	2008	2137.00	8844.00	6707.00	1904.04	7879.89	5975.85
26	2009	2137.00	8844.00	6707.00	1894.91	7842.09	5947.18
27	2010	2137.00	8844.00	6707.00	1885.81	7804.46	5918.65
28	2011	2137.00	8844.00	6707.00	1876.77	7767.02	5890.25
29	2012	2137.00	8844.00	6707.00	1867.76	7729.75	5861.99
30	2013	2137.00	8844.00	6707.00	1858.80	7692.67	5833.87
31	2014	2137.00	8844.00	6707.00	1849.88	7655.76	5805.88
32	2015	2137.00	8844.00	6707.00	1841.01	7619.03	5778.02
33	2016	2137.00	8844.00	6707.00	1832.17	7582.47	5750.30
34	2017	2137.00	8844.00	6707.00	1823.38	7546.09	5722.71
35	2018	2137.00	8844.00	6707.00	1814.64	7509.89	5695.25
36	2019	2137.00	99695.00	97558.00	1805.93	84249.90	82444.00
	TOTAL	323110.00	350348.00	27238.00	311760.00	311773.00	13.09

UNIT = 1000 Pesos

10.6 Sensitivity Analysis

10.6.1 Identification of Cases

Sensitivity analysis is made for the cases where the cargo volume or the peso exchange rate will decrease by 10%, or the construction cost will increase by 10%. The different assumptions for the sensitivity test are as follows:

Case A : Assuming cargo volume decreases by 10%.
Case B : Assuming construction cost increases by 10%.
Case C : Assuming peso exchange rate decreases by 10%.

10.6.2 Results

The FRR is computed for each of the cases mentioned above.

The results are shown in Fig. 10.6.1. Every FRR shows that this project will have a positive financial return. According to the results shown in Fig. 10.6.1, cargo volume, construction cost, and the peso exchange rate, in that order, have the greatest influence on the FRR when each factor is changed by 10%.

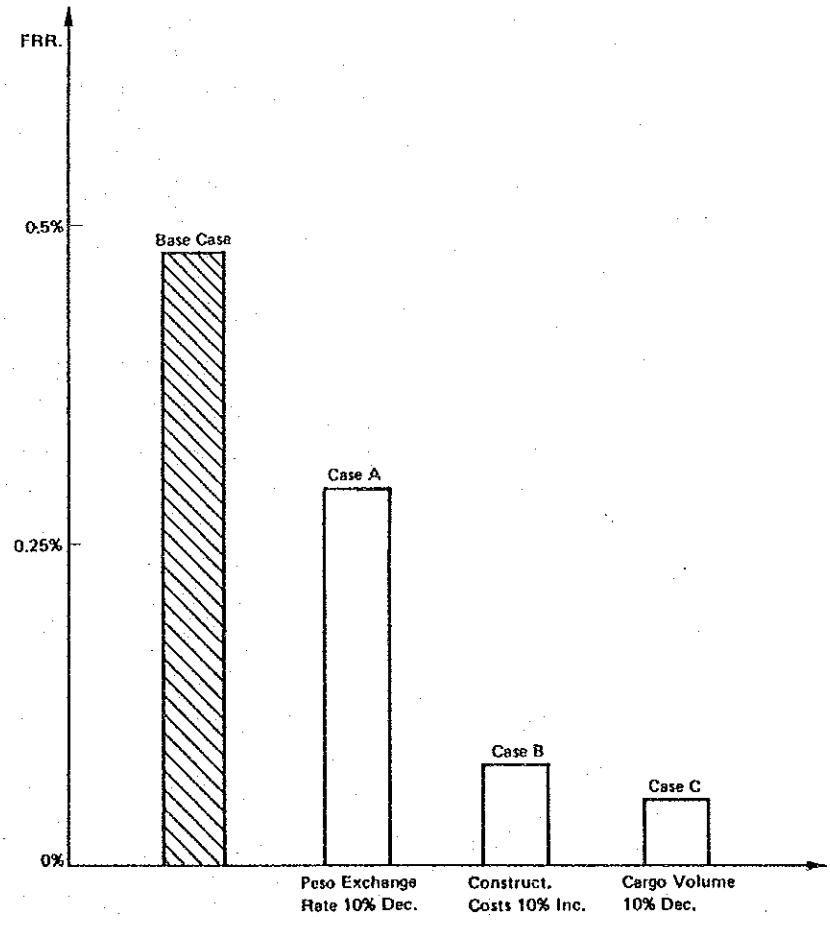


Fig. 10.6.1 Sensitivity Analysis

10.7 Financial Plan Based on PPA's Port Development Plan (1985 ~ 1992)

PPA drew up a financial plan (1985 ~ 1992) in November 1985. In this plan, the assumption for financial analysis are different from the assumptions used in this report. Further, the PPA plan does not include the Short-term Development Plan of the Port of Batangas. Therefore, it is impossible to judge the feasibility of this Project using the PPA financial plan.

In this section, the case with the Short-term Development Plan is analyzed based on the same assumptions used in the PPA Financial Plan. The calculated results are shown in Table 10.7.1 ~ Table 10.7.4 and also two financial ratios (Return on Net Fixed Assets and Debt Service Ratio) are shown in Fig. 10.7.1 and Fig. 10.7.2.

Juding from the results, it can be said that under the PPA Financal Plan, the Authority has a sufficient financial capacity to execute the Short-term Development Plan.

10.8 Conclusion

Considering the financial viability of PPA and of the Port of Batangas, and the profitability of the project itself, the Short-term Development Plan can be regarded as feasible.

Table 10.7.1 Projected Cash Flow Statement

(million pesos)

	1985	1986	1987	1988	1989	1990	1991	1992
Beginning Cash Balance	601.70	641.83	454.86	345.68	240.31	235.89	411.27	626.43
Cash-Internal Source								
Operating Revenue	599.83	691.44	732.93	956.73	1,142.16	1,210.69	1,283.33	1,360.33
Fund Management Inc.	109.26	49.60	68.23	51.85	36.05	35.38	61.69	93.96
Acct. Rec'ble – Beg.	49.34	46.69	54.93	58.63	76.54	91.37	96.86	102.67
Acct. Rec'ble – End.	-46.69	-54.93	-58.63	-76.54	-91.37	-96.86	-102.67	-108.83
Total	711.74	732.80	797.46	990.67	1,163.38	1,240.58	1,339.21	1,448.13
Cash-External Source								
Foreign Loan Avail.	533.34	358.83	341.40	549.32	488.44	278.30	255.07	255.07
Equity Contribution	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	533.34	358.83	341.40	549.32	488.44	278.30	255.07	255.07
Total Cash Available	1,846.78	1,733.46	1,593.72	1,885.67	1,892.13	1,754.77	2,005.55	2,329.63
Application of Cash								
Administrative Costs	141.14	185.86	231.53	264.91	310.40	345.78	386.47	451.83
Repairs & Main	30.00	116.86	62.09	63.28	66.81	81.02	90.53	94.70
Dredging	30.00	80.00	88.00	96.80	106.48	117.13	128.84	141.72
Debt Serv. – Interest	142.99	169.16	180.45	187.27	209.05	212.48	210.04	205.62
Debt Serv. – Principal	119.31	162.78	176.78	185.07	198.38	187.71	181.54	212.20
Infra Projects	677.51	498.51	507.60	855.56	777.19	408.93	390.62	390.62
Acct. Payable – Beg.	215.33	151.33	85.90	84.31	91.84	103.91	113.46	122.38
Acct. Payable – End.	-151.33	-85.90	-84.31	-91.84	-103.91	-113.46	-122.38	-134.08
Total	1,204.95	1,278.60	1,248.04	1,645.36	1,656.24	1,343.50	1,379.12	1,484.99
Ending Cash Balance	641.83	454.86	345.68	240.31	235.89	411.27	626.43	844.64
D/C Ratio	1.94	1.08	1.17	1.57	1.71	1.75	1.89	1.83

Table 10.7.2 Projected Income Statement

(million pesos)

	1985	1986	1987	1988	1989	1990	1991	1992
Operating Revenue								
Port Charges	450.81	533.48	565.49	599.42	826.00	1,011.27	1,071.95	1,136.26
A/S Income	115.61	122.55	129.90	137.69	145.95	154.71	163.99	173.83
Non-Traditional Income	33.41	35.41	37.54	39.79	42.18	44.71	47.39	50.24
Tariff Increase				179.83	129.03			
Total Port Revenue	599.83	691.44	732.93	956.73	1,142.16	1,210.69	1,283.33	1,360.33
Operating Expenses								
Personal Services	78.48	94.24	124.16	139.02	155.79	174.73	196.13	220.31
R & M	30.00	116.86	62.09	63.28	66.81	81.02	90.53	94.70
Other Admin. Costs	62.66	91.62	107.37	125.89	154.61	171.05	190.34	231.52
Dredging Costs	30.00	80.00	88.00	96.80	106.48	117.13	128.84	141.72
Depn-Operating Assets	80.89	86.55	124.51	125.64	139.98	161.23	179.18	180.28
Total Operating Exp.	282.03	469.27	506.13	550.63	623.67	705.16	785.02	868.53
Net Operating Revenue	317.80	222.17	226.80	406.10	518.49	505.53	498.31	491.80
Other Income/Charge								
Fund Mgt. Income	109.26	49.60	68.23	51.85	36.05	35.38	61.69	93.96
Interest on Loans	-142.99	-169.16	-180.45	-187.27	-209.05	-212.48	-210.04	-205.62
Currency Exchange Adj.	-44.64	-32.00	-52.62	-56.30	-64.58	-61.95	-60.20	-62.03
Depn Non-Oprtg. Assets	-7.78	-7.78	-7.78	-7.78	-7.78	-7.78	-7.78	-7.78
Amort. – Vitas Project	-14.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Income	217.45	62.83	54.18	206.60	273.13	258.70	281.98	310.33
Asset Base	1,710.93	1,716.46	2,483.41	3,164.05	3,340.61	4,051.00	4,526.50	4,735.00
Return On Assets (%)	18.57	12.94	9.13	12.83	15.52	12.48	11.01	10.39

Table 10.7.3 Asset Base

(million pesos)

	1985	1986	1987	1988	1989	1990	1991	1992
Net Operating Asset, Beginning	1,751.37	1,670.48	1,762.44	3,204.27	3,123.73	3,557.48	3,955.34	4,494.12
Add: Aquisitions	0.00	178.51	1,566.45	45.00	573.73	849.87	717.96	44.00
Less: Depreciation Charges								
– on Existing Assets	80.89	80.89	80.89	80.89	80.89	80.89	80.89	80.89
– on New Assets @ 2.5%		5.66	43.62	44.75	59.09	80.34	98.29	99.39
Net Book Value, End	1,670.48	1,762.44	3,204.37	3,123.73	3,557.48	3,955.34	4,494.12	4,357.87
Asset Base	1,710.93	1,716.46	2,483.41	3,164.05	3,340.61	4,051.00	4,526.50	4,735.00
R&M = 2.5% of Asset Base '86 & '87								
2% of Asset Base for 1988 ~ 1992	(30.00)	(116.86)	62.09	63.28	66.81	81.02	90.53	94.70
Cost of Completed Assets:								
Port Cargo Handling		158.51						
3rd IBRD Projects			1,546.45					
Port of Irene						308.09		
ICT					543.73			
Manila North Harbor Project						221.00		
4th IBRD Project							687.96	
Port of Davao				15.00				
Feasibility Studies								14.00
Capital Assets				10.00	10.00	10.00	10.00	10.00
Other Locally-Funded Project		20.00	20.00	20.00	20.00	20.00	20.00	20.00
Port of Batangas Project						290.78		
Total		178.51	1,566.45	45.00	573.73	849.87	717.96	44.00

Table 10.7.4 Infrastructure Program

(million pesos)

	1985	1986	1987	1988	1989	1990	1991	1992
3rd IBRD Projects	566.73	247.14						
Port Cargo Handling	110.61	39.68						
Port of Irene		22.42	23.95	142.07	142.07			
ICT		155.62	217.07	130.01				
Manila North Harbor Project				110.50	110.50			
4th IBRD Project			171.93	171.93	171.93	172.17		
Manila South Rehabilitation			51.00	102.50	204.76	204.76	358.62	358.62
Port of Davao Project		7.50	7.50					
Feasibility Studies		2.00	2.00	2.00	2.00	2.00	2.00	2.00
Acq. of Capital Assets			10.00	10.00	10.00	10.00	10.00	10.00
Locally-Funded Projects		20.00	20.00	20.00	20.00	20.00	20.00	20.00
Port of Batangas Project		4.15	4.15	166.55	115.93			
Total	677.34	498.51	507.60	855.56	777.19	408.93	390.62	390.62
Funding: Peso Equivalent of Loan	533.34	358.83	341.40	549.32	488.44	278.30	255.07	255.07
Peso Portion – Foreign Assisted	144.0	110.18	126.70	274.24	256.75	98.63	103.55	103.55
Locally – Funded Project		29.50	39.50	32.00	32.00	32.00	32.00	32.00
Total	677.34	498.51	507.60	855.56	777.19	408.93	390.62	390.62

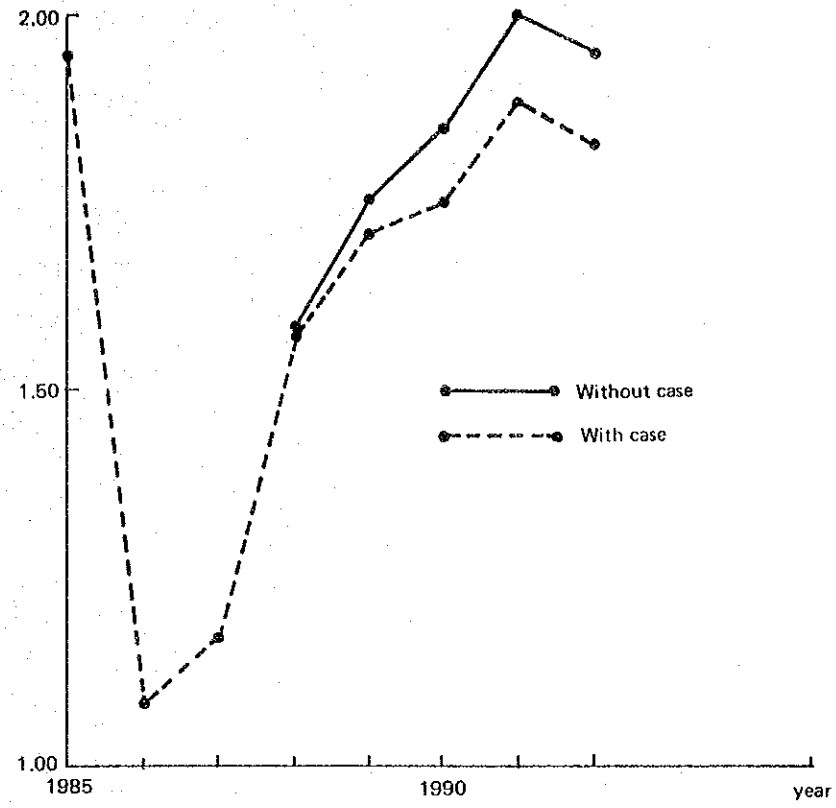


Fig. 10.7.1 Debt Service Ratio

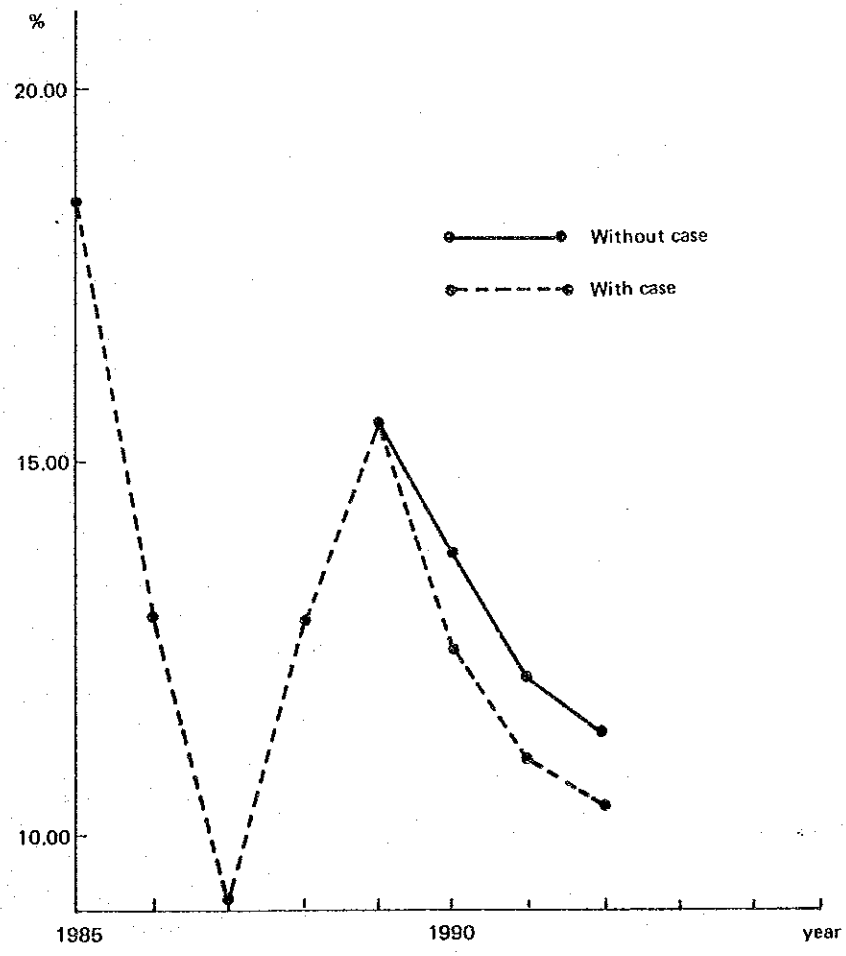


Fig. 10.7.2 Return on Net Fixed Assets

APPENDICES

Appendix 1.2.1 Population by Province, 1975 and 1980

(thousand persons)

	Population		Five Year Increase		Annual Growth Rate
	1975	1980	Number	Percent	
Philippines	42,072	48,098	6,026	14.32	2.7
Region IV	5,214	6,119	905	17.36	3.2
Batangas	1,032	1,174	142	13.76	2.6
Cavite	628	771	143	22.77	4.1
Laguna	804	973	169	21.02	3.8
Quezon – Aurora	1,116	1,236	120	10.75	2.0
Rizal	414	556	142	34.30	6.0
Marinduque	163	174	11	6.75	1.3
Occidental Mindoro	186	223	37	19.89	3.7
Oriental Mindoro	389	447	58	14.91	2.8
Palawan	300	372	72	24.00	4.4
Romblon	182	193	11	6.04	1.2

Source: NCSO

Appendix 1.2.2 Employed Population by Sector as of 3/Q 1982

(thousand persons)

	Philippines	Metro Manila	Region IV
(Percent of Labour Force)	(95.4)	(88.3)	(94.6)
Employed	18,614	1,999	2,370
Agriculture	9,696	31	1,097
Industry	2,642	603	426
Mining & Quarrying	78	4	4
Manufacturing	1,888	481	327
Utilities	61	26	6
Construction	615	92	89
Services	6,276	1,365	848
Commerce	2,110	371	311
Transport, Communications and Storage	740	176	131
Services	3,426	818	406

Source: NCSO

Appendix 1.2.3 Income by Urban and Rural Areas, Fourth Quarter, Region IV, 1981

Unit: Income in pesos
1,000 families

	Average family income			Number of families by income range										
	Rural	Urban	All	Below ₱1,000	1,000∿ 1,999	2,000∿ 2,999	3,000∿ 3,999	4,000∿ 4,999	5,000∿ 7,499	7,500∿ 9,999	10,000∿ 14,999	15,000∿ 19,999	20,000 and Over	All
Regional Total	3,396	5,465	4,012	176.08	219.42	190.64	122.18	84.87	163.98	46.85	48.83	12.89	11.50	1,077.24
				(16.35)	(20.37)	(17.70)	(11.34)	(7.88)	(15.22)	(4.35)	(4.53)	(1.20)	(1.07)	(100.00)
Growth Corridor	4,568.67	5,522.27	4,289.84	102.21	166.15	142.5	103.64	62.76	130.58	18.96	42.95	12.45	7.76	810.36
				(12.6)	(20.5)	(17.58)	(12.79)	(7.74)	(16.16)	(4.01)	(5.30)	(1.54)	(0.96)	(100.00)
Batangas	2,989.93	5,869.67	3,360.58	37.18	51.78	33.13	17.43	10.11	26.64	5.95	6.11	1.42	2.11	191.86
				(19.38)	(26.99)	(17.27)	(9.08)	(5.27)	(13.89)	(3.10)	(3.18)	(0.74)	(1.10)	(100.00)
Cavite	5,424.03	7,247.95	6,314.60	6.32	15.06	18.72	24.97	15.93	48.51	12.95	23.04	5.10	2.10	172.70
				(3.68)	(8.72)	(10.84)	(14.46)	(9.22)	(28.09)	(7.50)	(13.34)	(2.95)	(1.22)	(100.00)
Laguna	3,691.70	4,983.19	4,343.85	5.08	26.42	35.14	27.36	16.59	24.72	9.57	7.33	1.58	1.06	154.85
				(3.28)	(17.06)	(22.69)	(17.67)	(10.71)	(15.96)	(6.18)	(4.73)	(1.02)	(0.68)	(100.00)
Quezon	2,057.00	3,223	2,315	52.39	65.25	46.20	20.26	9.76	14.46	4.17	1.61	0.41	0.18	214.69
				(24.40)	(30.39)	(12.52)	(9.44)	(4.55)	(6.74)	(1.94)	(0.75)	(0.19)	(0.08)	(100.00)
Rizal	8,680.71	6,290.52	7,486.07	1.24	7.64	9.31	13.62	10.37	16.65	6.32	4.86	3.94	2.31	76.26
				(1.63)	(10.02)	(12.21)	(17.86)	(13.60)	(21.83)	(8.25)	(6.37)	(5.17)	(3.03)	(100.00)
Resource Sub-region	2,813.15	4,704.79	3,166.55	73.87	53.27	48.14	18.54	22.11	33.0	7.89	5.88	0.44	3.74	266.88
				(27.62)	(19.96)	(18.04)	(6.95)	(8.28)	(12.36)	(2.96)	(2.20)	(0.16)	(1.40)	(100.00)
Marinduque	1,887.00	5,586.00	2,298.00	14.50	7.14	6.05	1.24	0.28	3.16	0.93	1.51	-	-	34.81
				(41.65)	(20.51)	(17.38)	(3.56)	(0.80)	(9.09)	(2.67)	(4.34)			(100.00)
Occidental Mindoro	6,315.61	5,559.63	6,215.26	0.60	2.70	10.34	5.66	8.72	12.28	3.04	3.53	0.02	2.94	49.83
				(1.20)	(5.42)	(20.75)	(11.36)	(17.50)	(24.64)	(6.10)	(7.08)	(0.04)	(5.90)	(100.00)
Oriental Mindoro	2,470.42	4,072.90	2,838.33	20.29	17.06	19.43	5.52	10.21	12.87	2.32	-	-	-	87.70
				(23.14)	(19.45)	(22.16)	(6.29)	(11.64)	(14.68)	(2.64)				(100.00)
Palawan	1,823.67	4,350.11	2,346.29	22.63	18.71	10.83	4.88	2.04	2.88	1.12	0.84	-	0.80	64.73
				(34.96)	(28.90)	(16.73)	(7.54)	(3.15)	(4.45)	(1.73)	(1.30)		(1.24)	(100.00)
Romblon	1,569.07	3,955.31	1,833.10	15.85	7.66	1.49	1.24	0.06	1.81	0.48	-	0.42	-	29.61
				(53.17)	(25.70)	(5.00)	(4.16)	(2.88)	(6.07)	(1.61)		(1.41)		(100.00)

Note: No data for Aurora.
Figures in parentheses refer to per cent of total.
Source: NCSO.
Table source: NEDA Region IV

Appendix 1.4.1 GRDP 1978 ~ 1983 (at constant prices, in million pesos)

	1978	1979	1980	1981	1982	1983
National (GNDP)	82,784	87,963	92,637	96,210	99,004	100,118
(Percent of annual increase)	–	(6.2)	(5.3)	(3.9)	(2.9)	(1.1)
Metro Manila	25,729	27,476	29,224	30,521	31,511	32,383
(Percent of annual increase)	–	(6.8)	(6.4)	(4.4)	(3.2)	(2.8)
Region IV	11,886	12,265	12,951	13,239	13,520	13,877
(Percent of annual increase)	–	(3.2)	(5.6)	(2.2)	(2.1)	(2.6)
(Percent of GNDP)	(14.4)	(13.9)	(14.0)	(13.8)	(13.7)	(13.9)

Source: NEDA.

Appendix 1.4.2 Gross Regional Domestic Product by Sector and Per Capita Output, Region IV
(In million pesos at constant 1972 prices except per Capita Figures)

INDUSTRY	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Gross regional domestic product	(100) 7,556	8,028	8,472	(100) 8,363	10,375	(100) 11,123	11,955	12,304	12,975	13,251	(100) 13,598
Agriculture, Fishery and Forestry	(27.2) 2,055	2,224	2,394	(31.6) 2,645	2,929	(28.5) 3,168	3,324	3,524	3,717	3,839	(28.8) 3,916
Industrial Sector	(36.6) 2,763	2,875	3,006	(41.5) 3,473	3,012	(38.7) 4,302	4,660	5,117	5,324	5,368	(40.5) 5,503
a. Mining and Quarrying	251	257	267	209	276	316	441	419	410	280	242
b. Manufacturing	2,333	2,400	2,445	2,662	2,914	3,073	3,271	3,528	3,706	3,800	3,917
c. Construction	163	201	268	575	594	879	906	1,123	1,157	1,231	1,281
d. Electricity, Gas and Water	16	17	26	27	28	34	42	47	51	57	63
Service Sector	(36.2) 2,738	2,929	3,072	(38.8) 3,245	3,434	(32.8) 3,653	3,971	3,663	3,934	4,044	(30.7) 4,179
a. Transport, Communication and Storage	353	386	417	462	586	646	689	713	745	784	808
b. Commerce	1,710	1,862	1,937	2,080	2,223	2,334	2,567	2,215	2,410	2,434	2,518
c. Services	675	681	718	703	625	673	715	735	779	826	853
Per Capita GRDP (In pesos at 1972 prices)	1,584	1,631	1,668	1,786	1,917	1,990	2,072	2,065	2,103	2,087	2,081
Per Capita GNDP (ditto)	1,441	1,522	1,588	1,626	1,694	1,746	1,800	1,875	1,918	1,942	1,951

Source: National Accounts Staff (NAS), National Economic and Development Authority (NEDA)

Appendix 1.4.2 (1) Agricultural Production and Land Utilization by Kind of Corp, 1983

	Production (1,000 MT)			Value of Production (million ₱)			Cultivated Area (1,000 ha)		
	Philippines	Southern Tagalog	S.T/Phili. %	Philippines	Southern Tagalog	S.T/Phili. %	Philippines	Southern Tagalog	S.T./Phili. %
All Crops	27,261	2,930	10.7	43,457	4,548	10.5	11,656	1,393	12.0
Food Crops	20,116	1,652	8.2	26,739	2,646	9.9	7,727	800	10.4
Palay	7,730	796	10.3	10,721	1,063	9.9	3,239	374	11.5
Corn	3,125	257	8.2	3,949	344	8.7	3,157	272	8.6
Fruits & Nuts	5,474	368	6.7	5,549	562	10.1	483	76	15.7
Citrus	123	29	23.6	391	85	21.7	25	7	28.0
Root Crops	2,659	76	2.9	1,916	63	3.3	432	17	3.9
Vegetables	328	42	12.8	880	182	20.7	48	6	12.5
Onions	42	0.8	1.9	145	3	2.1	6	0.3	5.0
Ginger	35	4	11.4	152	15	9.9	5	0.7	14.0
Dry beans & peas	36	1.6	4.4	183	8	4.4	45	3.5	7.8
Coffee	138	25	18.1	1,842	218	11.8	137	30	21.9
Cacao	5	0.1	2.0	134	2	1.5	11	0.6	5.5
Peanuts	35	2.4	6.9	175	12	6.9	48	3.8	7.9
Others	386	50	13.0	702	89	12.7	91	9	9.9
Commercial Crops	7,144	1,278	17.9	16,718	1,902	11.4	3,928	592	15.1
Coconut	3,493	895	25.6	8,768	1,098	12.5	3,209	542	16.9
Sugar cane	3,432	380	11.1	7,181	791	11.0	423	47	11.1
Tobacco	44	1.4	3.2	293	8	2.7	54	1.3	2.4
Others	175	1.6	0.9	476	5	1.1	242	1.7	0.7

Source: BAECON

Appendix 1.4.2 (2) Catch 1982

	Philippines		Region IV	
	Quantity ('000 MT)	Value (million ₱)	Quantity ('000 MT)	Percent of National Total
Total	1,897	15,064	513	27.0
Marine Total	1,234	10,843	191	15.5
Commercial	526	4,355	58	11.0
Municipal	708	6,488	133	18.8
Inland Total	663	4,221	321	48.4
Municipal	270	828	223	82.6
Fish Ponds	392	3,393	19	25.0
Fish Pens and Cages			79	

Source: 1982 Fisheries Statistics of the Philippines Volume 32, BFAR

Appendix 1.4.2 (3) Land Classification by Region 1982 (In Hectares)

Region/Province		Total Area		Certified Alienable or Disposable Lands		Classified Forest Lands		Unclassified Forest Lands
		Hectares	%	Hectares	%	Hectares	%	
Philippine		30,000,000	100	13,370,546	100	11,076,276	100	5,553,178
Region 1		2,156,845	7.2	921,777	6.9	812,651	7.3	422,417
Region 2		3,640,300	12.1	1,023,265	7.7	1,789,196	16.2	827,839
Region 3		1,827,785	6.1	1,034,954	7.7	558,783	5.0	234,048
Region 4		4,751,314	15.8	1,996,229	14.9	2,265,678	20.5	489,407
Province	Batangas	316,581	6.7	209,662	10.5	15,883	0.7	91,036
	Cavite	128,755	2.7	71,970	3.6	2,799	0.1	53,986
	Laguna	175,973	3.7	109,097	5.5	14,341	0.6	52,535
	Manila	3,828	0.08	3,828	0.2	-	-	-
	Marinduque	95,925	2.0	73,720	3.7	18,310	0.8	3,895
	Quezon	1,194,615	25.1	585,862	29.4	389,378	17.2	219,375
	Rizal	185,961	3.9	118,958	6.0	67,003	3.0	-
	Mindoro Occidental	587,985	12.4	154,085	7.7	391,814	17.3	42,086
	Mindoro Oriental	436,472	9.2	222,433	11.1	214,039	9.4	-
	Romblon	135,593	2.9	99,244	5.0	9,855	0.4	26,494
	Palawan	1,489,626	31.4	347,370	17.4	1,142,256	50.4	-
Region 5		1,763,249	5.9	1,211,780	9.1	512,792	4.6	38,677
Region 6		2,022,311	6.7	1,380,210	10.3	510,857	4.6	131,244
Region 7		1,495,142	5.0	834,020	6.2	406,967	3.7	254,155
Region 8		2,143,169	7.1	964,934	7.2	369,412	3.3	808,823
Region 9		1,868,514	6.2	783,502	5.9	722,360	6.5	272,652
Region 10		2,832,774	9.4	1,040,006	7.8	1,080,189	9.8	712,579
Region 11		3,157,966	10.5	1,147,137	8.6	1,326,935	12.0	684,894
Region 12		2,340,631	7.8	942,732	7.1	721,456	6.5	676,443

Source: 1982 Philippine Forestry Statistics, BOFD

Appendix 1.4.2 (4) Wood Production 1982

	Log Production		Lumber Production		Plywood Production		Veneer Production	
	'000 m^3	%	'000 m^3	%	'000 m^3	%	'000 m^3	%
Philippines	4,514	100	1,200	100	422	100	428	100
Region 1	66	1.5	34	2.8	–	–	–	–
2	844	18.7	316	26.3	30	7.1	40	9.3
3	32	0.7	92	7.7	–	–	–	–
4	221	4.9	137	11.4	23	5.5	20	4.7
5	35	0.8	2	0.1	–	–	–	–
6	112	2.5	68	5.7	–	–	–	–
7	–	–	–	–	–	–	–	–
8	169	3.7	24	2.0	–	–	–	–
9	476	10.5	47	3.9	20	4.7	2	0.5
10	1,007	22.3	143	11.9	88	20.9	159	37.1
11	1,065	23.6	265	22.1	142	33.6	165	38.6
12	487	10.8	72	6.0	119	28.2	43	10.0

Source: 1982 Philippine Forestry Statistics, BOFD.

Appendix 1.4.2 (5) All Manufacturing Establishments by Industry Major Group/ Industry Group, 1980

PSIC Code	Industry major group/ industry group	Philippines		Metro Manila		Region IV	
		Number of establish-ments	Gross out-put	Number of establish-ments	Gross out-put	Number of establish-ments	Gross out-put
	Total	85,236	137,535	15,568	64,849	12,435	26,137
311-312	Food	29,282	30,677	2,310	10,747	4,547	5,369
313	Beverages	1,076	5,675	35	3,050	351	231
314	Tobacco	45	4,721	33	4,499	-	-
321	Textiles	4,472	9,576	526	5,782	272	2,563
322	Clothing	28,200	4,137	6,295	2,498	3,716	722
323	Leather and leather prod.	251	202	146	118	17	25
324	Foot wear	1,370	367	547	269	503	62
331	Wood and cork products	2,432	5,495	299	849	715	279
332	M. and repair of furniture and fixtures	3,465	1,045	735	443	367	85
341	Paper and paper prod.	247	4,523	176	2,041	34	462
342	Printing, publishing and allied industries	1,364	1,721	727	1,590	72	3
351	Industrial chemicals	144	5,566	87	1,807	18	490
352	Other chemical products	342	6,504	265	5,990	14	31
353	Petroleum refineries	4	22,647	(s)	(s)	(s)	12,578 1/
354	Miscellaneous petroleum and coal products	13	51	6	41	-	-
355	Rubber products	769	2,865	152	2,607	439	83
356	Plastic products	286	1,696	237	1,424	21	102
361	Pottery, china and earthenware	721	339	36	277	69	22
362	Glass and glass prod.	82	1,142	56	979	12	75
363	Cement	19	2,811	(s)	(s)	4	953
369	Other non-metallic mineral products	1,681	1,258	198	884	260	161
371	Iron and Steel basic industries	252	7,626	179	5,539	22	237
372	Non-ferrous metal basic industries	64	1,103	38	846	6	192
381	Fabricated metal prod.	4,743	2,561	918	1,986	617	58
382	Machinery except electrical	1,238	1,395	571	998	86	131
383	Electrical machinery	294	3,593	232	2,848	12	384
384	Transport equipment	890	7,295	356	5,833	170	792
385	Professional and scientific and measuring and controlling	33	134	27	123	(s)	(s)
386	M. and repair of primarily metal furniture and fixtures	96	69	59	61	5	0
390	Other manufacturing industries	1,361	729	321	533	82	47

Source: 1980 Annual Survey of Establishments (Preliminary), NCSO
Note: (s) suppressed to avoid disclosure of individual establishment's information
- : Zero
1/ : estimated by study team

Appendix 2.1.1 (1) Ferry, RoRo Boat Traffic at Batangas Port, 1983

1983	Number of Voyages	Waiting time (hr.)	Service time (hr.)	Number of passengers	Cargo (M.T.)	REMARKS
Jan.	264	1,197.9	3,067.1	70,039	20,107	
Feb.	223	1,096.2	3,099.7	51,094	15,314	* average waiting time/ship 5.37 hr.
Mar.	280	1,486.7	3,760.0	69,756	20,301	
Apr.	277	1,228.0	3,685.4	72,613	21,527	* average ship load 92.2 M.Ton
May	290	1,390.3	4,400.2	74,049	22,431	
June	278	1,536.4	3,202.4	64,051	22,928	* average number of passengers/ship; 234 persons
Jul.	242	1,174.4	3,280.2	52,225	24,517	
Aug.	253	1,487.1	2,881.5	47,231	25,818	* average service time/ ship; 13.16 hr.
Sep.	240	1,536.9	2,701.5	50,373	25,982	
Oct.	271	2,044.7	3,229.2	54,115	29,192	
Nov.	244	1,488.6	2,979.2	54,397	30,310	
Dec.	275	1,198.8	4,988.3	75,650	30,797	
Total	3,137	16,866.0	41,274.7	735,593	289,224	

Source: Monthly Records, PMU Batangas, 1983

Appendix 2.1.1 (2) Ro-Ro Vessels and Ferry Boats Calling at Batangas Port

NAME OF VESSEL	SHIP SIZE					
	GRT	NRT	DWT	LOA	BEAM	DRAFT
Maynilad II	464.87	247.15	655.47	47.45	10.40	2.80
Maynilad III	488.20	118.97	688.36	38.00	14.60	-
Viva 22	325.91	159.96	365.48	39.65	8.40	3.04
Viva 44	167.30	93.43	273.68	42.29	9.25	2.08
Viva 66	181.51	111.64	271.09	46.46	8.25	2.74
Viva 99	201.09	121.61	265.08	67.29	7.32	3.17
Sto. Niño	486.81	128.66	686.40	45.15	11.80	3.25
Peña Francia	494.67	222.45	697.48	-	-	-
Princess AC IV	70.30	23.90	99.12	23.00	5.50	2.23
Doña Paula	38.05	18.05	53.65	9.00	4.27	2.74

Appendix 2.1.1 (4) Ship Size Distribution (Foreign), 1983

DWT	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
- 1,000							1				1		2
1,000 - 2,000	1					1						1	3
2,000 - 3,000	1	2	2		1						1		7
3,000 - 4,000													-
4,000 - 5,000	1	1	1										3
5,000 - 6,000	1	1	2				1						5
6,000 - 7,000			1										1
7,000 - 8,000				1									1
8,000 - 9,000													
9,000 - 10,000													
10,000 - 12,000													
12,000 - 15,000			1			1							2
15,000 - 20,000													
20,000 - 30,000													
30,000 - 50,000										2			2
50,000 - 75,000		2											2
75,000 -											1	1	2
TOTAL	4	6	7	1	1	2	2	0	0	2	3	2	30
Total Tonnage	15,208	128,353	41,046	7,003	2,014	13,423	5,855	-	-	39,705	156,524	99,200	508,331

NOTE: 1. Annual total tonnage (DWT): 508,331

2. Average Ship Size (DWT) : 16,944

Appendix 2.1.1 (3) Ship Size Distribution (Domestics), 1983

(Other Ships)

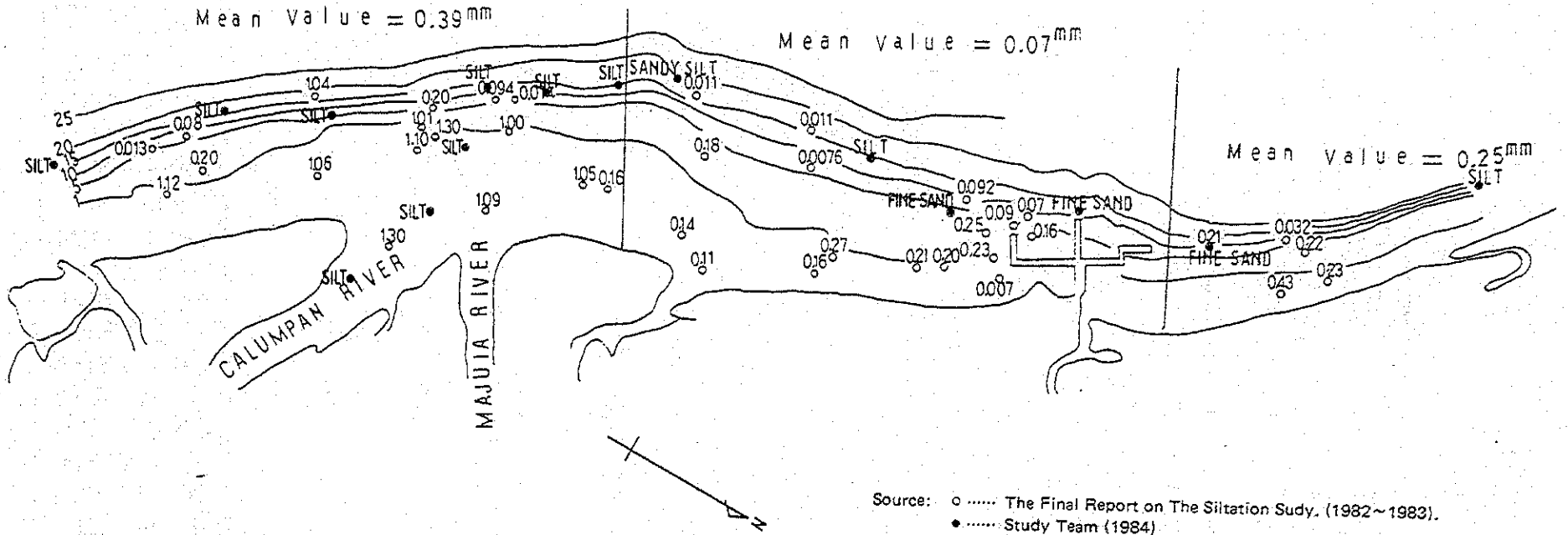
DWT	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
- 100	28	35	35	44	39	33	32	42	29	46	34	31	428
- 500	15	21	28	14	32	23	20	23	14	18	7	17	232
500 - 1,000	3	8	4		5	3	4	3	5	2	3	1	41
1,000 - 1,500	2	3	5	3	4	3	5	4	2	2	2	1	36
1,500 - 2,000	-	-	-	-	4	-	-	2	-	-	1	1	8
2,000 - 3,000	-	-	-	-	-	3	-	-	-	-	-	-	3
3,000 - 4,000	-	-	-	-	1	-	-	1	-	-	-	-	2
4,000 - 5,000	-	-	-	-	-	-	-	-	-	-	1	-	1
5,000 - 6,000	1	-	-	1	-	-	-	-	-	-	-	-	2
6,000 - 7,000													
7,000 - 8,000													
8,000 - 9,000													
9,000 - 10,000													
10,000 - 15,000													
15,000 - 20,000													
20,000 - 25,000													
25,000 - 30,000													
30,000 -													
TOTAL	49	67	72	62	85	65	61	75	50	68	48	51	753
Total Tonnage	92,378	83,825	16,244	107,556	125,830	18,135	97,667	18,883	10,488	10,901	117,852	9,394	709,132

NOTE: 1. Annual Total Tonnage (DWT) : 709,132

2. Average tonnage (DWT) : 942

Source: PMU Batangas monthly records 1983

Appendix 3.2.1 Location Map of Soil Sampling and Distribution of Grain Size[1)]



Source: ○ ····· The Final Report on The Siltation Sudy. (1982~1983).
● ····· Study Team (1984)

1) The grain size of bottom sediments in the mouth of the Calumpan River and its neighbouring area is about 1.0mm, and larger than in other areas. The grain size has a tendency to decrease approching the harbour from the mouth of the River. Fine sands of 0.2mm or so in grain size are distributed on the shallow bottom near the sea shore.
The bottom sediment in the coastal area deeper than five meters in water depth is silt of 0.01mm or so in grain size.

Appendix 3.2.2 Formula for Hindcasting Wave Height and Period (By Wilson)

$$\frac{gH\,1/3}{U^2} = 0.30\left\{1 - \frac{1}{\left[\,1 + 0.004\,(gF/U^2)\frac{1}{2}\,\right]^2}\right\}$$

$$\frac{gT\,1/3}{2\pi U} = 1.37\left\{1 - \frac{1}{\left[\,1 + 0.008\,(gF/U^2)\frac{1}{3}\,\right]^5}\right\}$$

Where H : Significant wave height (m)
T : Significant wave period (s)
U : Wind velocity at 10 m above sea surface (m/sec)
g : Acceleration of gravity (= 9.8 m/sec^2)
F : Fetch length (m)

Appendix 3.2.3 Diagrams for Wave Hindcasting and Littoral Drift

Appendix 3.2.3 (1) Results of Tidal Current Study (Raw Data Table 1)

at BATANGAS PORT

ITEM / STATION	MAX VEL. (CM/S)	MAX VEL. DIR. (DEG.)	V-MEAN VEL. (CM/S)	V-MEAN DIR. (DEG.)	S-MEAN VEL. (CM/S)
CS- I.1 (-1M)	48.640	162.0	2.795	215.1	14.343
CS- I.2 (-6M)	33.540	260.0	0.913	339.5	9.191
CS-II.1 (-1M)	37.550	316.6	1.832	190.5	10.420
CS-II.2 (-6M)	34.950	191.0	1.520	204.7	9.560

V-MEAN VEL.: MEAN VALUE OF VECTOR VELOCITY
V-MEAN DIR.: AVERAGE DIRECTION
S-MEAN : MEAN VALUE OF SCALAR VELOCITY
(SPRING) : SPRING TIDE
(NEAP) : NEAP TIDE

Source: Final Report on The Siltation Study

Appendix 3.2.3 (2) Results of Tidal Current Study (Raw Data Table 2)

at BATANGAS PORT

ITEM / STATION	MAX VEL. (CM/S)	MAX VEL. DIR. (DEG.)	V-MEAN VEL. (CM/S)	V-MEAN DIR. (DEG.)	S-MEAN VEL. (CM/S)
CS- I.1 (-1.5M)	35.620	146.6	0.109	294.5	8.495
CS- I.2 (- 7M)	37.430	347.6	1.240	64.6	8.072
CS-II.1 (-1.5M)	34.400	340.6	1.120	181.0	6.226
CS-II.2 (- 7M)	32.800	359.6	1.010	106.0	5.309
CS-III.1(- 2M) (SPRING)	28.000	129.6	1.810	40.1	7.490
CS-III.1(- 2M) (NEAP)	20.000	181.6	2.313	171.9	5.392
CS-III.2(- 7M)	17.000	149.6	1.718	15.3	5.392
CS-III.2(- 7M)	18.000	153.6	2.520	126.5	4.510

V-MEAN VEL.: MEAN VALUE OF VECTOR VELOCITY
V-MEAN DIR.: AVERAGE DIRECTION
S-MEAN : MEAN VALUE OF SCALAR VELOCITY
(SPRING) : SPRING TIDE
(NEAP) : NEAP TIDE

Source: Final Report on The Siltation Study

Appendix 3.2.3 (3) Results of Tidal Current Study (Raw Data Table 3)

at Batangas Port

ITEM / STATION	MAX VEL. (CM/S)	MAX VEL. DIR. (DEG.)	V-MEAN VEL. (CM/S)	V-MEAN DIR. (DEG.)	S-MEAN VEL. (CM/S)
CS- I.1 (-1.5M)	41.890	341.6	3.265	151.1	8.831
CS- I.2 (-8M)	39.200	139.6	4.758	136.1	8.843
CS-II.1(-1.5M)	28.340	161.6	6.172	163.3	8.353
CS-II.2(-8M)	22.240	156.6	6.175	155.9	7.546
CS-III.1(-2M) (NEAP)	27.000	111.6	4.983	143.6	6.980
CS-III.1(-2M) (SPRING)	38.000	101.6	3.898	129.2	4.980
CS-III.2(-6M)	24.000	134.6	3.334	145.5	5.549
CS-III.2(-6M)	30.000	181.6	1.841	160.3	3.765

V-MEAN VEL.: MEAN VALUE OF VECTOR VELOCITY

V-MEAN DIR.: AVERAGE DIRECTION

S-MEAN : MEAN VALUE OF SCALAR VELOCITY

(SPRING) : SPRING TIDE

(NEAP) : NEAP TIDE

Source: Final Report on The Siltation Study

Appendix 3.2.3 (4) Results of Tidal Current Study (Raw Data Table 4)

at Batangas Port

ITEM / STATION	MAX VEL. (CM/S)	MAX VEL. DIR. (DEG.)	V-MEAN VEL. (CM/S)	V-MEAN DIR. (DEG.)	S-MEAN VEL. (CM/S)
CS-I.1 (-1.5M)	31.190	142.6	0.031	123.2	11.128
CS-I.2 (- 8M)	30.070	139.6	3.692	135.1	9.989
CS-II.1 (-1.5M)	23.900	149.6	4.801	168.6	10.640
CS-II.2 (- 8M)	23.300	155.6	6.978	147.1	8.404
CS III.1 (- 2M) (NEAP)	19.670	309.6	2.295	212.3	8.333
CS-III.1 (- 2M) (SPRING)	15.860	159.6	3.173	136.8	6.728
CS III.2 (- 6M) (NEAP)	-	-	-	-	-
CS III.2 (- 6M) (SPRING)	-	-	-	-	-

V-MEAN VEL.: MEAN VALUE OF VECTOR VELOCITY

V-MEAN DIR.: AVERAGE DIRECTION

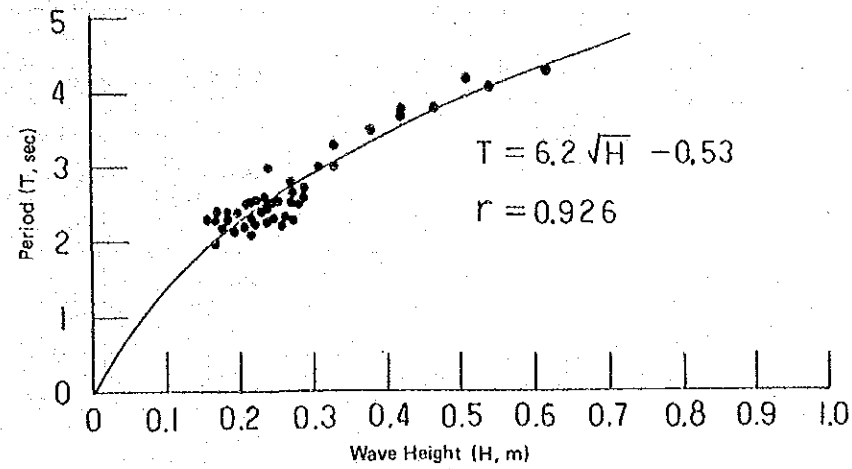
S-MEAN : MEAN VALUE OF SCALAR VELOCITY

(SPRING) : SPRING TIDE

(NEAP) : NEAP TIDE

Source: Final Report on The Siltation Study

Appendix 3.2.3 (5) Relation between Wave Height and Period[1)]



1) Observation Period: from October 3 to November 1, 1984.
Source: Study Team (1985)

Appendix 3.2.3 (6) Effective Fetch

Direction	WNW	W	WSW	SW	SSW	S
Distance (km)	6	11	16	21	20	14

Source: Study Team (1985)

Appendix 3.2.3 (7) Relation between Marine and Gradient Wind

Latitude (°)	Angle (α°)	Ratio of Wind Velocity U_{10}/Ugr[1)]
10	24	0.51
20	20	0.60
30	18	0.64
40	17	0.67
50	15	0.70

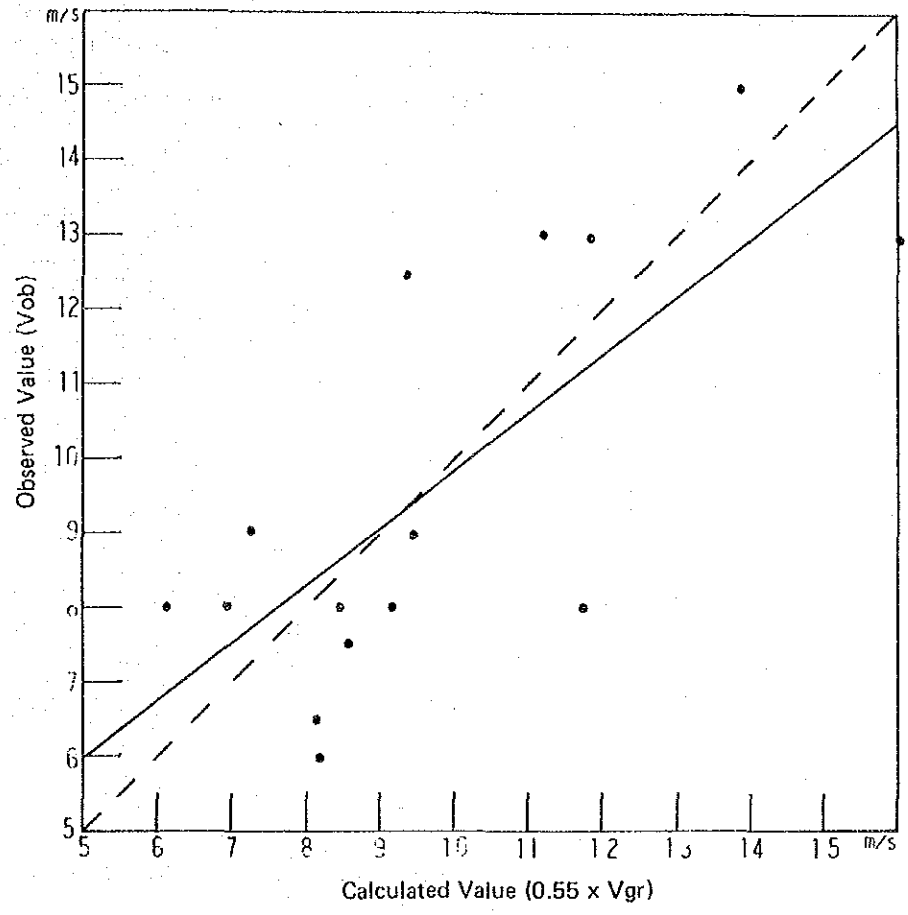
1) U_{10} : Wind velocity at 10 meters above the sea surface.
Ug : Gradient wind.
Source: Study Team (1985)

Appendix 3.2.3 (8) Relation Between Observed and Gradient Wind

Item / Number	Observed Wind (Vob) m/sec	Gradient Wind (Vgr) m/sec	Vob/Vgr	0.55 x Vgr m/sec
1	WSW 7.5	SSW 15.5	0.484	8.5
2	W 13.0	W 20.1	0.647	11.1
3	WSW 13.0	W 21.5	0.605	11.8
4	WSW 12.5	WSW 17.0	0.735	9.3
5	SSW 9.0	WSW 17.1	0.526	9.4
6	SW 6.0	WSW 14.8	0.405	8.1
7	SW 8.0	SW 16.6	0.482	9.1
8	WSW 8.0	SW 15.3	0.523	8.4
9	SW 8.0	SSW 21.3	0.376	11.7
10	SSW 13.0	SSW 29.1	0.447	16.0
11	WSW 6.5	WSW 14.8	0.439	8.1
12	SW 15.0	SW 25.1	0.598	13.8
13	WSW 8.0	WSW 12.6	0.635	6.9
14	WSW 8.0	WSW 11.1	0.721	6.1
15	WSW 9.0	WSW 13.1	0.687	7.2
Total	144.5	265.0	8.310	145.5
Mean	9.6	17.7	0.55	9.7

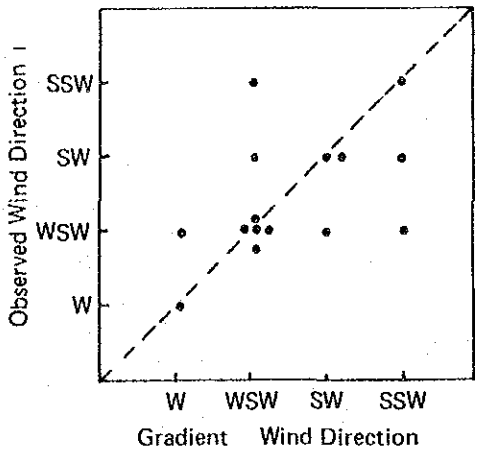
Source: 1) Final Report on The Siltation Study
2) Study Team (1985)

Appedix 3.2.3 (9) Relation between Observed and Calculated Wind Velocity [1)]



1) V_{ob} : Observed wind velocity
V_{gr} : Gadient wind velocity
Source : Study Team (1985)

Appendix 3.2.3 (10) Relation between Observed and Gradient Wind Direction



Source: Study Team (1985)

Appendix 3.2.3 (11) Results of Wave Hindcasting

Item / Date	Marine Wind		Offshore Waves	
	Direction	Velocity (m/s)	Height (m)	Period (sec)
Aug. 15, 1984				
8 h	SW	13	1.2	3.8
20	WSW	7	0.5	2.6
16				
8	WSW	7	0.5	2.6
20	WSW	7	0.5	2.6
17				
8	WSW	7	0.5	2.6
20	WSW	7	0.5	2.6
18				
8	SW	15	1.4	4.1
20	SW	8	0.7	3.0
19				
8	SW	8	0.7	3.0
Aug. 29, 1984				
8	W	15	1.1	3.4
20	WSW	13	1.1	3.6
30				
8	WSW	11	0.9	3.3
20	SW	8	0.7	3.0
31				
8	SSW	7	0.6	2.8

Remarks: Aug. 15 ~ 19: Typhoon No. 8409
Aug. 29 ~ 31: Typhoon No. 8412
Source: Study Team