10.2 Administrative Recommendations

The main elements of port management and operation systems consist of an appropriate form and structure of the port administrative body, efficient port operations, a sound financial system using modern accounting methods, a reasonable level of port dues, accurate port statistics, skillful promotion and publicity, development of the port city and of auxiliary commercial services, and regional cooperation with neighboring ports.

However, port administration and operation systems throughout the world vary greatly from country to country and from port to port. Furthermore, administrative and operating systems at individual ports change over time in response to changing circumstances.

Based on the analyses of the present situation of the port, the following items are recommended for improvement of the port administration.

1) Basic structure and responsibility for the port administration

It is basically recommended to maintain the existing administrative structure of the port.

However, a clear-cut delineation of responsibility and authority for port security and traffic control in the port area should be formulated in close coordination with Customs officials.

2) Appropriate coordination of port services

PPA encourages private parties to provide various port services which can be conducted by private firms. This policy should basically be continued.

There are many activities and services at the port, and they are closely related with each other.

So, harmonious coordination is essential to realize efficient port use. PPA takes the overall responsibility for all port operations and should coordinate the various activities conducted by public agencies and private firms. For this purpose, a great deal of planning, a timely information system and appropriate supervision of each activity are required.

3) Improvement of human resources

The development of human resources including both officials and port workers, and especially the training of coordinators and supervisors, is the key for successful port operation. Fundamental knowledge of

the entire operational flow, the relationships among the many port activities, and the promotion of ethics should be included in the educational programs for port workers and managers.

4) Improvement of port statistics

If a port is to be operated with efficiency and foresight, the management must be accurately informed all the time about every aspect of port traffic and port operations. This information must be based on correct figures and it should be available promptly, as otherwise it loses part of its usefulness.

A substantial increase in a certain sphere of port traffic may require urgent improvements, additional storage space or more mechanical equipment.

The port statistics can be roughly divided into two categories. One comprises statistics concerning the number and volume of vessels, cargo and passengers in the harbor, and the other comprises statistics concerning the port management. The former statistics can be used to determine the scale of construction to be carried out in the future, while the latter serve to indicate the efficiency rates of important works as well as the coefficient of utilization of the facilities.

PPA and the individual port management units have various useful source documents and prepare some statistical reports. However, the present port statistics in some categories are insufficient. Especially, at the Port of Manila, the details of cargo flow by commodity are quite important for formulating the development plan of the port. Judging from the volume of traffic passing through the Port of Manila, it is recommendable to introduce an electronic computer for the processing of port statistics. To introduce a computer, the formulation of data input sheets is necessary considering the desirable output formats. Samples of the data input sheets which were used in this study are attached in Appendix 10.2.1.

5) Simplification for formalities and administrative procedures

To expedite the clearance of cargoes, the port administration body should make an effort to simplify the formalities and procedures in close cooperation with customs officials.

Two special projects concerning the simplification of port documents are currently being undertaken in the Philippines in cooperation with international cooperation agencies: The Study of Simplification of

Port Documents is being conducted by the ASEAN Port Authorities Association (APAA), and the Development of Manila International Container Terminal is being carried out by UNDP/UNCTAD/ILO.
On the basis of these studies, PPA should make efforts to simplify the formalities and administrative procedures at Philippine ports.

6) Improvement of maintenance work

Poor maintenance of port facilities and handling equipment directly reduces the working capacity, resulting in a lower overall operating efficiency. Thus, maintenance and repair work must be sufficient.
In particular, periodic inspection and maintenance work for preventing trouble in advance should be conducted. Maintenance inspections should take place regularly. For this purpose, it is necessary to maintain a sufficient financial fund, sufficient engineering and mechanical staff, and proper supplies of mechanical parts.

10.3 Proposed Operation System

10.3.1 General

Generally, port cargo operations consist of ① stevedoring, ② shore-side cargo operations, and ③ moving cargo in and out of sheds, warehouses and open yards.

When cargo is handled at anchorage, barges are used between operations ① and ②.

The three operations are closely related, and problems in any one operation adversely affect the other operations. Thus, all of the cargo handling operations must be carefully coordinated.

Based on the analyses of the present operational problems, the following basic measures are proposed to improve the efficiency of the cargo handling operations and the traffic flow:

① Some of the cargoes which are presently handled at Achorage will be transferred to pier side handling.
The majority of dry bulk, liquid and grain cargoes which are handled at Anchorage are directly transferred to consignees' facilities using barges. However the majority of bagged fertilizer and other break bulk cargoes are transferred from Anchorage to landing stages along the Pasig River, and then these cargoes are transported to consignees using trucks. In order to reduce the demerit of double handling, these cargoes will be directly handled at pier side.

② A preferential berthing system is being adopted for berth allotment at the Port of Manila. From the viewpoint of significantly raising cargo handling efficiency, cargo with a sizable amount of volume and special size cargoes like iron and steel products and timber will be handled at specific facilities with proper handling equipment.
Vessels carrying these cargoes will be assigned to specific berths on a preferential basis.

③ The improvement of cargo handling machines and the rearrangement of physical facilities at the wharf are proposed to raise the efficiency of cargo handling.

10.3.2 Proposed Operation System and Handling Productivity

10.3.2.1 Cargo handling at pier side

1) Loose (break bulk) cargo

Basically, the cargo handling operation for loose cargo involves lifting the cargo up and down using ship gear (cargo derricks or deck cranes).

Ordinarily, ships have one or two sets of cargo gear at each hatch. The cargo operation at each hatch is conducted by a gang of stevedore workers. A gang is ordinarily composed of a hatch boss, a signal man, a winch man and some hatch workers.

As unitized cargo (palletized cargo or large size case goods) is handled, it is necessary to use forklifts inside the hatch, and each gang has one forklift and one driver.

The cargo handling rate per gang can normally be estimated using the following formula:

$$Qc = 60\ W\ e/Ct$$

Where
- Qc: cargo handling volume per real operation hour (t/gang hour)
- W : Unit weight per sling (tons)
- e : working efficiency
- Ct: cycle time per sling (min)

The present cargo handling rate per gang at the piers of South Harbor is about 15 tons/gang hour on the average. Based on field observations and interviews with stevedoring and arrastre companies, the inadequate physical conditions of the piers somewhat affect the cargo handling productivity.

Specifically, there is no area for marshalling along the quaywall and there is an excessive distance between the ship side and the quaywall. After the completion of the rehabilitation plan, the cargo handling productivity will be improved. The future rate of loose cargo handling is estimated as follows, considering the standard figures in other countries.

$$Qc = 60\ W\ e/Ct = 13 - 24;\ \text{average } 17 \text{ tons/gang hour}$$

where
- W : average unit load 1.5 tons
- e : working efficiency 0.7 - 0.8

Ct: standard cycle time 3 - 5 min.

2) Containers

The containers which will be handled at South Harbor in the future will be transported by conventional ships, semi-container ships and self-sustaining container ships. As containers arrive, they will be lifted down directly onto chassis at quay side using ship gear or shiptainers.

The chassis will be used for transfer the containers to the storage yard. Under the rehabilitation plan, CY-01 will be used as a container storage yard in the future. It is not necessary to change the current container handling method in the yard. There is sufficient handling equipment and the productivity is reasonable.

Thus, the containers will continue to be handled using the transfer crane (shifter) system in the yard.

The future cargo handling rate (Qc) is estimated as follows:

(a) Using ship gear

Qc = 60 e/Ct = 8 - 10; average 9 units/gang hour

where e : working efficiency 0.8

Ct: standard cycle time 4 - 6 min.

(b) Shiptainer handling

Normally, one shiptainer is used for container handling at the Port of Manila. The actual average handling productivity is estimated at 14.5 units per ship gross hour based on the stevedoring performance record. The future handling capacity is estimated at 15 units/ship gross hour.

3) Specific loose cargoes

① Timber

Judging from the estimated volume of cargo, it is not necessary to introduce any shore cranes or mobile cranes for stevedoring work. The cargoes are carried to quay side using forklifts or trucks and then are loaded onto ships using ship gear.

The cargo handling rate per gang (Qc) is estimated as follows:

Qc = 60 e/Ct = 16 - 24; average 20 t/gang hour

where W: average unit load 2 tons
e: working efficiency 0.8
Ct: standard cycle time 4 - 6 min.

② Iron & steel

The iron & steel products which are imported through Manila are mainly sheet (55%), section and bar (15%) and plate (10%). Thus, the unit load of the majority of the cargoes is estimated as under 3 tons. These cargoes are generally discharged using ship gear and are handled with forklifts on the shore. The existing operation method will continue in the future, considering the estimated volume of cargoes.

The cargo handling rate per gang (Qc) is estimated as follows:

Qc = 60 W e/Ct = 29 - 36; average 32 t/gang hour

where W: average unit load 3 tons
e: working efficiency 0.8
Ct: standard cycle time 4 - 5 min.

③ Bagged fertilizer

At present, bagged fertilizer is handled at Anchorage. After being transferred to a landing stage along the Pasig river by barge, most of the cargoes are immediately loaded onto trucks to be transferred to consignees.

In order to reduce the demerits of the existing operation system for bagged fertilizer, that is double handling and a high rate of lost time, pier side handling is proposed.

The cargoes will be discharged using ship gear directly onto quaywall apron or onto a temporary stage on the quaywall apron for manual loading to trucks immediately. For on shore handling, 2 - 4 ton forklifts are available.

The cargo handling rate per gang (Qc) is estimated as follows:

Qc = 60 W e/Ct = 20 - 32; average 24 t/gang hour

where W: average unit load 2 tons
e: working efficiency 0.8
Ct: standard cycle time 3 - 5 min.

4) Bulk (except grain)

Around 30 percent of the dry bulk cargoes except grain are presently handled at the piers of South Harbor. The majority of the import bulk cargo at the piers is discharged directly from ships to trucks on the quaywall apron using glob buckets and hoppers.

The estimated volume of bulk cargo which will be handled at the piers in 1995 is about 300 thousands tons. Considering this figure, it is not recommendable to introduce an exclusive bulk terminal at the port. Fundamentally, the present operation system for bulk cargo will be continued up to 1995. Only some larger hoppers are proposed as a buffer against any delay in the timely arrival of transfer vehicles. These hoppers will expedite the transfer system and help to reduce the time loss.

The cargo handling rate per gang (Qc) is estimated as follows:

Qc = 60 W e/Ct = 25 - 32; average 28 t/gang hour

where	W:	grab bucket capacity	3.5 tons
	e:	working efficiency	0.6
	Ct:	cycle time	4 - 5 min.

10.3.2.2 Cargo handling at Anchorage

The cargo handling methods except for grain handling will not be changed in the future. For grain handling, two floating pneumatic unloaders will be introduced by 1995.

The future cargo handling rate at Anchorage is estimated based on the actual handling productivity at Anchorage.

1) Loose (break bulk) cargo

The actual handling productivity for loose cargo handling is estimated at 9 tons/gang hour based on the data of the stevedoring company. This figure is also used for the future handling rate.

2) Bulk (except grain)

The future handling rate for bulk cargo except grain at Anchorage is estimated as 22 t/gang hour, the same as the actual productivity.

3) Liquids

The future handling rate is estimated as 700 t/ship gross day based on the actual handling productivity of 670 t/ship gross day.

4) Grain

Grain is currently handled at Anchorage by ship gear using grab buckets. The problems of the current handling system are mentioned in Chapter 7, section 7.4.2, grain handling.

To solve the existing problems, the study team recommends the development of a grain terminal at the east end of MICT in the Master Plan. Before completion of the grain terminal, the introduction of floating unloaders at Anchorage is recommended in the Short-term Plan.

Considering the average discharging volume of grain per ship, two floating pneumatic unloaders with a capacity of 400t/hrs each should be provided. An outline of the operation of the floating unloaders is presented below.

① Floating unloaders, when not in operation, are expected to be moored inside the west breakwater.

② The two floating unloaders are towed separately by tug-boats to the site, and then moored to the bulk carrier; one unloader at the fore starboard and the other at stern port.

③ After setting the booms at the unloader positions, the nozzles are to be pushed into the grain in the hold up to 500 mm and deeper. When the floating unloaders heel due to unbalanced loads or external forces, they are to be adjusted to an upright position by transferring the ballast water in the pontoons.

④ The discharged grains are then transferred from Anchorage to flour mills along the Pasig river using barges. On the average, 32 barges would be required per arriving grain carrier based on an analysis of the transport capacity of barges and the capacity at flour mills.

The future cargo handling capacity is estimated as follows:

$Qs = 2\ Qu\ e = 480$ t/ship gross hour

where Qu: per unit capacity of pneumatic unloaders 400t/h

e: working efficiency including real operating time rate: 0.6

⑤ The component of labor for two floating unloader is shown as follows:

KIND OF WORKER	NUMBER OF WORKER
(1) Supervisor	1 (Skilled)
(2) Unloader Operator (Unloading from Bulk carrier)	1 (Skilled) 3
(3) Loader Operator (Loading to Barge)	2
(4) Stevedore	12
(5) Crew	6
T O T A L	25

10.3.2.3 Summary of cargo handling productivity

Based on the average number of gangs per ship and the real operating time rate, the cargo handling productivity by cargo mode at the Port of Manila is summarized in Table 10.3.1.

Table 10.3.1 Cargo Handling Productivity at the Port of Manila

Cargo Type	Item	Actual	Future
(At Piers)			
Loose (break bulk) cargo	Average handling performance	44 t/hour ship	51 t/hour ship
	Real operating time rate	0.8	0.85
	working conditions	2.9 gangs/ship (average) ship gear	3 gangs/ship (average) ship gear
Container			
self-sustaining ships	Average handling performance	16 units/hour ship	18 units/hour ship
	Real operating time rate	0.7	0.85
	working conditions	2 gangs/ship ship gear or ship-tainer	2 gangs/ship ship gear or ship-tainer
non-self-sust. ships	Average handling performance	32 units/hour ship	No operation at South Harbor
	Real operating time rate	0.7	
	working conditions	2 gangs/ship gantry crane	
Timber	Average handling performance	39 t/hour ship	60 t/hour ship
	Real operating time rate	0.85	0.85
	Working conditions	2.6 gangs/ship ship gear	3 gangs/ship ship gear
Iron & steel	Average handling performance	45 t/hour ship	80 t/hour ship
	Real operating time rate	0.75	0.85
	Working conditions ship gear	2.5 gangs/ship ship gear	2.5 gangs/ship
Bagged fertilizer (actually handled at anchorage)	Average handling performance	70 t/hour ship	85 t/hour ship
	Real operating time rate	0.75	0.85
	Working conditions	3.5, gangs/ship ship gear	3.5 gangs/ship ship gear
Bulk (except grain)	Average handling performance	78 t/hour ship	84 t/hour ship
	Real operating time rate	0.8	0.85
	Working conditions	3 gangs/ship ship gear	3 gangs/ship ship bear
(At Anchorage)			
Loose (break bulk) cargo	Average handling performance	28 t/hour ship	28 t/hour ship
	Real operating time rate	0.75	0.75
	Working conditions	3 gangs/ship ship gear with grab	3 gangs/ship ship gear with grab
Bulk (exxept grain)	Average handling perfomance	65 t/hour ship	65t/hour ship
	Real operation time rate	0.60	0.60
	Working conditions	3 gangs/ship ship gear with grab	3 gangs/ship shipgear with grab
Grain (wheat, soybean meal)	Average handling performance	88 t/hour ship	480 t/ship gross hour
	Real operating time rate	0.60	
	Working conditions	4 gangs/shjip ship gear with grab	2 pneumatic unloaders with a capacity of 900 t/hour each
Liquid	Average handling performance	670 g/ship gross day	700 t/ship gross day
	Real operating time rate		
	Working conditions	Suction pump	Suction pump

Note: (1) Actual figures show the 1985 data calculated from "Worksheet per vessel activity" (PPA)
(2) The real operating time rate shows the ratio of real operating time to total working time including standby/idle time caused by weather conditions, lack of equipment, waiting for cargo, meals, accidents, etc.
(3) Gross hours equal real operation time plus idle time.

10.3.3 Cargo Handling Equipment Requirements

The estimation of the required cargo handling equipment at South Harbor in 1995 is carried out using the following procedure:

① Determine the type and number of cargo handling machines requiret for each cargo mode operation per ship.
② Estimate the number of ships whose cargo will be handled simultaneously.
③ Determine the overall cargo handling equipment requirements at South Harbor considering flexibility for equipment management, fluctuation of ship arrivals and the repair and maintenance of equipment.

(1) Required cargo handling equipment by cargo mode.
Based on the proposed operation system by each cargo mode, the following equipment is required for standard cargo handling per ship:

① Loose (break bulk) cargo
2-3 ton forklifts 14 units/ship
(using 3 gangs per ship, 3 forklifts for stevedoring, 6 forklifts for arrastre and 5 forklifts for handling work at the storage area)

② Container cargo
Two gangs are employed for container handling per ship.
. Prime movers 10 units/ship
(8 units for transfer work between ship side and container yard, and 2 units for other transfer work in the port area).
. Container chassis 13 units/ship
(8 units for transfer work between ship side and container yard, and 5 units for other works in the port area)
. 35 ton shifters 4 - 6 units
(for container handling at C.Y.)
. Forklifts (30 ton capacity) 2 - 4 units
(for auxiliary container handling in the port area)

③ Specific loose cargoes (timber, iron & steel and bagged fertilizer)

. Forklifts (2-3 ton capacity) 14 units/ship

. Forklifts (10-15 ton capacity) 2 units/ship
(for heavy cargo handling)

. Mobile cranes (10-30 ton capacity) 2 units/ship
(for heavy cargo or irregularly sharped cargo handling)

④ Dry bulk except grain

. Payloaders (3.5 m^3 capacity) 3 - 4 units/ship

⑤ Grain

. Floating pneumatic unloaders (400 t/hr capacity) 2 units

(2) Estimated number of ships whose cargo will be handled simultaneously.

Using the same method used for the estimation of the required number of berths for the Master Plan described in Chapter 7, the number of ships whose cargo will be handled at the same time is estimated as follows:

Loose cargo including bagged fertilizer	4
Container cargo	2
Timber and steel	1 - 2
Dry bulk	1 - 2

(3) Conclusion

Considering the fluctuation of ship arrivals and the requirement of additional equipment to compensate for repair and maintenance works, the cargo handling equipment requirements are summarized as follows:

Equipment	Capacity	Number	Remarks
Forklifts	2 - 3 t	110 - 130	
	15 t	2 - 4	heavy cargo handling
	30 t	2 - 4	container handling
Mobile Cranes	10 - 30 t	2 - 3	heavy cargo, irregularly sharped cargo handling.
Shifters	35 t	4 - 6	container handling at C.Y.
Prime Movers		15 - 25	container handling
Container Chassis		25 - 35	container handling
Pneumatic Unloaders	400 t/hr	2	grain handling
Payloaders	3.5 m^3	6 - 8	bulk handling both on piers and on ships
Hoppers		4 - 6	bulk handling on piers

CHAPTER 11
ECONOMIC ANALYSIS

CHAPTER 11 ECONOMIC ANALYSIS

11.1 Purpose and Methodology of the Economic Analysis

11.1.1 Purpose

The purpose of this chapter is to appraise the economic feasibility of the Short-term Rehabilitation Plan of South Harbor explained in Chapter 8. (Economic analysis of the Floating Unloader Project is shown separately in Appendix 8.3.3).

The economic evaluation of a project should show whether the project is justifiable from the economic point of view by assessing its contribution to 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 (the opportunity cost of capital).

11.1.2 Methodology

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 costs and benefits of the Short-term Rehabilitation Plan of South Harbor, "economic pricing" is applied. "Economic pricing" here means the appraisal of costs and benefits in terms of international prices (border prices). Fig. 11.1.1 shows the process of the economic analysis in this study.

11.2 Prerequisites of the Economic Analysis

11.2.1 "Without" Case

A cost-benefit analysis is conducted on the difference between the "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 opportunity cost of capital in the Philippines. Therefore, determining the "Without" case is one of the key points of the economic

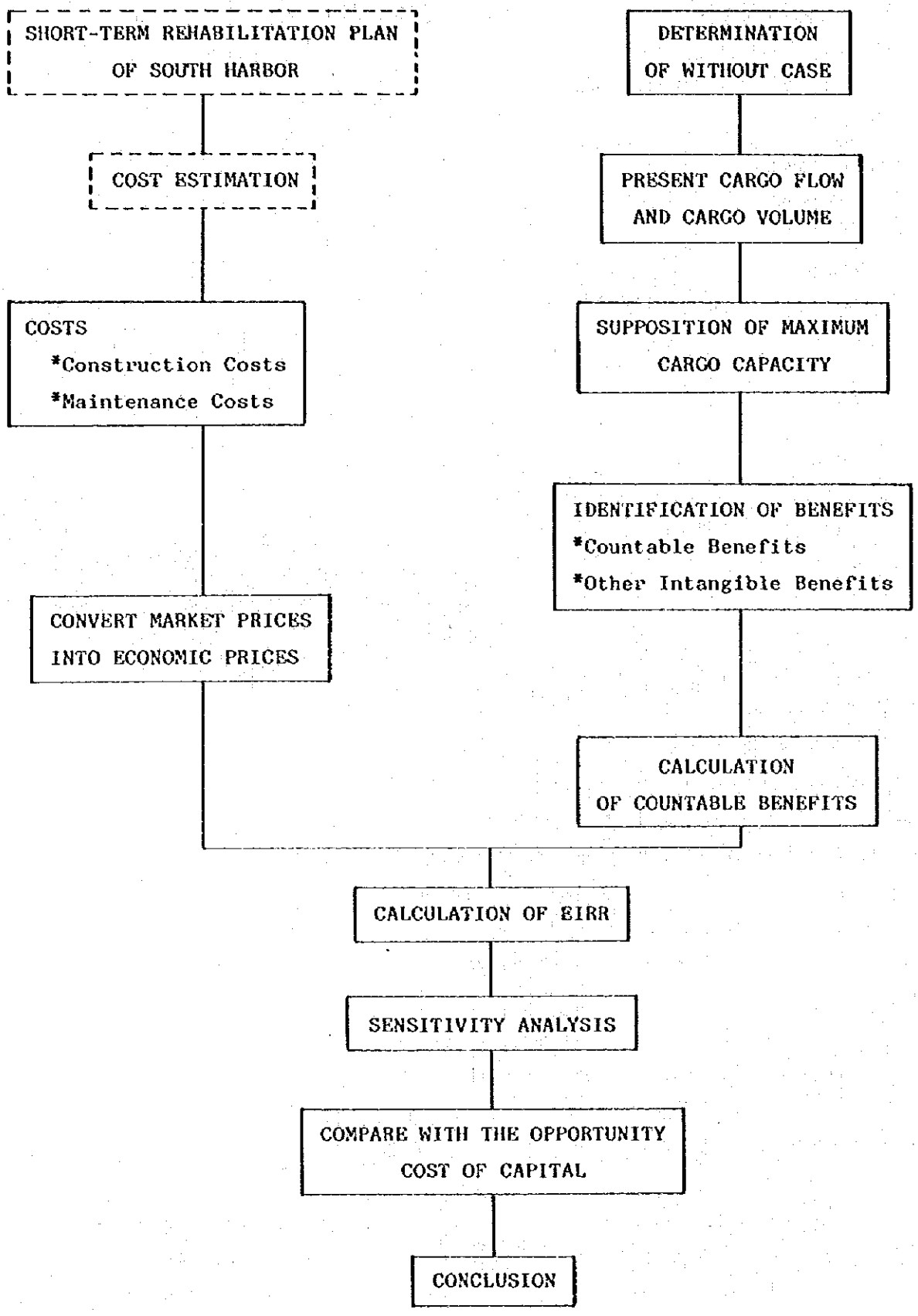

Fig. 11.1.1 Process of the Economic Analysis

appraisal. In this study, the following conditions are adopted as the "Without" case after various possibilities are discussed.

1) The "Without" case is based on existing facilities and operational efficiency levels.

2) Existing conditions will continue to exist in the future except for a) and b) below.

   a) Piers 13 and 15 will not be used from the year 1995.

   b) Some of Bagged fertilizer, iron and steel will be handled at pier side in the future.

3) No investment is to be made except for a), b) and c) as follows.

   a) Facilities under construction are considered as part of the existing facilities.

   b) Additional investment
   Because of insufficient past maintenance, the existing facilities and operational levels are not at a normal or sound level.
   So, the minimum investment should be made to recover the soundness of these facilities.
   Ex.
   - o Fenders
   - o Repair of Piers 3, 13, 15
   - o Dredging (slips and piers)

   c) Minimum maintenance to keep the existing facilities and operational efficiency levels.

4) Piers 3, 5, 9 can continue to be used for 30 more years.

11.2.2 Base Year

The general schedule of the Short-term Rehabilitation Plan of South Harbor is shown as follows:

(1) F/S starting year : April 1986
(2) Price surveying year : August 1986
(3) Engineering service starting year: 1988
(4) Construction starting year : 1989
(5) Operation starting year : 1993
(6) Target year : 1995

The "base year" here means the starting year of the economic evaluation, and therefore 1988 (the engineering service starting year) is set as the base year for this study.

11.2.3 Project Life

The economic service life of the main facilities such as the wharves and warehouse are 50 and 30 years respectively (Appendix 11.2.1). Therefore, the economic cost/benefit evaluation is carried out starting in 1988 and ending in 2017 (the 30th year from the engineering service starting year, 1988).

11.2.4 Foreign Currency Exchange Rate

As far as the foreign exchange rate is concerned, the value of the peso has been dropping for over 9 years (Appendix 11.2.2). Therefore, the rates of ₱20.5/$ and ¥154/$ as of August 1986 are used in this study.

11.2.5 Cargo Throughput at South Harbor

As for the cargo voloume to be handled at South Harbor in 1995 and 2005, the estimates presented in Chapter 6 are adopted. The estimated cargo volume is basically the same for both the "With" and "Without" cases except for the cargo flow as follows.

11.2.5.1 Cargo Flow under the "With" Case

Some of bagged fertilizer, and iron and steel will be handled at pier. The cargo handling volume and cargo flow under the "With" case are shown in Appendix 11.2.3.

11.2.5.2 Cargo Flow under the "Without" Case

Bagged fertilizer and some of iron and steel will be handled at anchorage. The cargo handling volume and cargo flow under the "Without" case are shown in Appendix 11.2.4.

11.3 Benefits

11.3.1 Benefit Items

As benefits brought about by the Short-term Rehabilitation Plan of South Harbor, the following items are identified;

① Savings in ships' staying costs.
② Savings in cargo handling costs (labor, tug & barge).
③ Savings in time costs.
④ Reduction in damages, accidents and pilferage.
⑤ Improvement of cargo handling safety.
⑥ Increase in employment opportunities
⑦ Promotion of regional economic development through development of port related industries and agricultures.
⑧ Other intangible benefits.

Some of the above-mentioned benefits (④ - ⑧) are difficult to be evaluated in strictly monetary terms.
Therefore, the three benefits (① - ③) which can be evaluated monetarily are considered as countable benefits in this report.

11.3.2 Savings in Ships' Staying Costs

The volume of cargo handled at South Harbor will increase in the future. If the increased volume were to be handled only by the existing facilities, and decreased piers (Without case), then the number of ships waiting for berth space would increase to the point where port congestion would become a serious problem.

Implementing the project will prevent this problem. Investment in improved port facilities will reduce the waiting time for berth space and the time for loading and unloading cargo. The staying time of ships will be reduced, and this cost reduction is a major benefit of the project. Benefits that will accrue to the Philippines from the improved facilities can be calculated by comparing the "With" case versus the "Without" case.

The formula used to calculate this benefit is as follows:

Savings in ships' staying costs = Difference of staying time between "With" & "Without" cases x Ship cost (Unit cost) x Share of benefits accruing to the Philipines

11.3.2.1 Difference of Staying Time

The waiting period is estimated using a queuing theory simulation.

The difference of the total staying period (waiting period + handling period) in 1995 and 2005 between the "With" and "Without" cases is shown in Table 11.3.1.

Table 11.3.1 Total Staying Period

Ship Type	Ship Class	Waiting Period(days)						Handling Period(days)						Total staying period (days)					
		Without		With		Difference		Without		With		Difference		Without		With		Difference	
		1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
1. Conventional	-10,000	26	175	4	21	22	154	285	390	255	340	30	50	311	565	259	361	52	204
2. Conventional	10,001-	30	228	4	20	26	208	371	533	339	452	32	81	401	757	343	472	58	285
3. Semi-container	-10,000	8	99	0	0	8	99	63	89	58	77	5	12	71	188	58	77	13	111
4. Semi-container	10,001-	14	162	0	1	14	161	31	41	27	34	4	7	45	203	27	35	18	168
5. Self-container	-10,000	12	117	0	1	12	116	65	99	60	89	5	10	77	216	60	90	17	126
6. Self-container	10,001-	58	663	1	6	57	657	96	69	94	60	2	9	154	732	95	66	59	666
7. Bulk	-10,000	2	29	0	3	2	26	64	89	50	69	14	20	66	118	50	72	16	46
8. Bulk	10,001-	13	311	1	6	12	305	211	305	167	250	44	55	224	616	168	256	56	360
9. Iron & Steel	-10,000	6	36	0	4	6	32	122	139	51	55	71	79	128	170	51	59	77	111
10. Iron & Steel	10,001-	4	91	1	4	3	87	89	98	35	40	54	58	93	189	36	44	57	145
11. Lumber	10,001-	15	127	1	2	14	125	74	56	50	42	24	14	89	183	51	44	38	139
12. Fertilizer	-10,000	0	0	0	0	0	0	108	137	89	87	19	50	108	137	89	87	19	50
13. Fertilizer	10,001-	0	0	0	0	0	0	111	109	91	72	20	37	111	109	91	72	20	37

11.3.2.2 Ship Cost (Unit Cost)

The ship cost by ship size is estimated based on charter rate statistics for the past 10 years (refer to Appendix 11.3.1) considering the composite ship costs in Japan (Table 11.3.2).

Table 11.3.2 Ship Costs

Ship Size (DWT)	12,000	20,000	35,000	50,000	80,000
Ship Cost ($/DWT/month)	13	11	10	8	6
Ship Cost ($/ship/day)	5,200	7,400	11,700	13,300	16,000

11.3.2.3 Share of Benefits Accruing to the Philippines

The savings in ships' staying 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 the Philippines. It is possible for the Philippines to acquire some of the benefits by, for example, increasing tariffs because the service level at the port will be improved or by decreasing freight rates reflecting the reduced incidence of delays at the port. In this study, we assume that 50% of the benefits attributed to foreign ship operators will be transferred to the Philippine economy.

The average share of Philippines vessels in the country's foreign trade from 1983 to 1985 is 27% (refer to Appendix 11.3.2).
Therefore, the total benefit to the Philippines economy from the reduced staying costs is the sum of the direct benefits (100%) from Philippines vessels and the indirect benefits (50%) from foreign vessels.

The formula used to calculate the share of the benefit to the Philippines is as follows:

Share of Benefit to the Philippines = Share of Philippines vessels x 100% + Share of foreign vessels x 50%

= 0.27 x 100% + 0.73 x 50%

= 65%

11.3.2.4 Calculation Result

Table 11.3.3 shows the savings in ships' staying costs (refer to Appendix 11.3.3).

Table 11.3.3 Savings in Ships' Staying Costs

Year	Staying Costs (P1000/year)	65% of Staying Costs (P1000/year)
1990	52,070	33,855
1995	57,384	37,310
2000	137,315	89,264
2005	299,840	194,904

11.3.3 Savings in Cargo Handling Costs

Another benefit of the project will be the reduction in handling costs due to the following improvements:

1) Specialization of berths (iron & steel, bulk, grain, container and timber)

2) Optimum handling distribution between anchorage and pier (Refer to Appendix 11.3.4).

3) Mechanization and rationalization of cargo handling procedures.

In line with the above-mentioned improvements, the savings in cargo handling costs are divided into two categories, and they can be estimated using the following equations.

1) Savings in labor cost.

$$\text{Savings in labor cost} = \text{Saved labor (man·days)} \times \text{Labor Wage Rate (₱/man·day)}$$

$$= \left\{ \left[\frac{V}{P} \times G \times L \div W \right]_{\text{(Without Case)}} - \left[\frac{V}{P} \times G \times L \div W \right]_{\text{(With Case)}} \right\} \times \text{Labor Wage Rate (₱/man.day)}$$

where, V: Cargo volume (tons)
P: Handling productivity (tons/ship·hour)
G: Number of gangs per ship (gangs/ship)
L: Number of workers per gang (men/gang)
W: Working hours per day (8 hours/day)
(refer to Appendix 11.3.5)

2) Savings in tug & barge cost between anchorage and pier.

$$\text{Savings in tug \& barge cost} = \left\{ \text{Cargo volume handled at anchorage (without case)} - \text{Cargo volume handled at anchorage (with case)} \right\} \times \text{Tug and barge cost (₱/ton)}$$

11.3.3.1 Labor Wage Rate

The legislated minimum daily wage rate in Metro Manila (₱57.08/man day) is applied as the labor wage rate (Refer to Appendix 11.3.6).

11.3.3. Tug and Barge Cost

Tug and barge cost is set based on the "NTPP Final Report Part V (1982)" considering the consumer price index (Refer to Appendix 11.3.7 & 11.3.8).

	1980 (By NTPP Report)	1986
Consumer price index	138.9	358.9
Tug and barge costs per ton of cargo (in port)	₱ 19 - ₱ 9.5 (average: ₱ 14)	₱ 49.1 - ₱ 24.6 (average: ₱ 37)

11.3.3.3 Calculation Result

Table 11.3.4 and 11.3.5 show the calculated savings in labor cost and savings in tug and barge cost.

Table 11.3.4 Savings in Labor Costs at Market Prices

Year	Saved Labor		Labor Wage Rate (₱/man·day)	Savings in Labor Costs (₱/year)
	man·hours	man·days		
1990	266,078	33,260	57.08	1,889,000
1995	301,546	37,694	57.08	2,152,000
2000	343,472	42,934	57.08	2,451,000
2005	445,190	55,649	57.08	3,177,000

Table 11.3.5 Savings in Tug and Barge costs at Market Prices

	Cargo volume handled at anchorage (Ton) (Without-with)		Tug and barge Costs	Savings in Tug and barge costs (P)		
	Bagged fertilizer	Iron and Steel	(P/ton)	Bagged fertilizer	Iron & Steel	Total
1990	32,000	30,000	37	1,184,000	1,110,000	2,294,000
1995	82,000	43,000	37	3,034,000	1,591,000	4,625,000
2000	114,000	33,000	37	4,218,000	1,221,000	5,439,000
2005	184,000	48,000	37	6,808,000	1,776,000	8,584,000

11.3.4 Savings in Time Costs

The reduction of staying period due to the implementation of the project brings about a remarkable reduction in the time required for imports and exports.

This will bring about a reduction in usance interest as goods and funds will be turned over faster. If the reduced time is converted into monetary terms, it can be estimated using the following equation:

$$STC = Q/365 \times D \times V \times I/365$$

Where, Q: Transport cargo volume (tons/year)
D: Reduction in export ships' Staying period (days)
V: Average cargo value (U.S.$/ton)
I: Usance interest (%/year) (Refer to Appendix 11.3.9)

However, for import cargoes, the reduction in time would be of benefits to the foreign consigners, and not the Philippine economy. Therefore, only the reduction of the transport period of export cargoes is calculated as a benefit to the Philippines.

Usance interest is estimated as 5.75% per year based on the American Bank Acceptance rate in Nov. 1986.

Table 11.3.6 presents the estimated reductions in time costs for export cargoes.

Table 11.3.6 Savings in Time Costs

Year	Export Cargo Volume: Q (1000 ton/year)	Cargo Value: V ($/ton)	Interest: I ($/year)	Reduction in Staying Period D (days)	Reduction in Time Costs: STC ($/year)	Reduction in Time Costs (¥1000/year)
1990	489	960	5.75	73	14,791	304
1995	526	960	5.75	75	16,346	336
2000	609	960	5.75	172	43,401	890
2005	746	960	5.75	368	113,747	2,332

11.4 Costs

Construction costs, maintenance costs and operation costs are the costs considered in this section.

11.4.1 Construction Costs

The annual construction costs, estimated at market prices in Chapter 9, are shown in Appendix 11.4.1. These costs are divided into the categories of foreign currency items, tradable goods, non-tradable goods, skilled labor, unskilled labor, and others (customs, duties and sales tax).

11.4.2 Maintenance Costs

The maintenance costs per year for the facilities are assumed to be 1.0 percent of the original ivestments, excluding consultant services and contingency.

Maintenance Costs	=	Maintenance Rate (=1%)	×	Cost of the Original Investments

These costs at market prices are given in Appendix 11.4.2.

11.4.3 Operation Costs

The operation costs under the "With" case are assumed to be the same as that under the "Without" case except for the handling costs explained in 11.3.3.

11.4.4 Calculation of Costs and Benefits at Market Prices

The costs and benefits at market prices are shown in Appendix 11.4.2

11.5 Economic Pricing

11.5.1 Methodology

The purpose of the economic analysis is to examine the value of a project, that is to see if it represents an efficient allocation of resources. The values of goods quoted at a given market price do not always represent the true value of those goods to the nation. Thus, planners often use "economic pricing" to examine the costs of labor, capital, and imported goods, as well as the benefits of development, to evaluate a project from the economic viewpoint.

All the costs and benefits examined in previous sections have been calculated based on market prices (world prices and domestic prices). There are several ways of applying the concept of economic pricing, but in this study, the prices of domestic goods and services are revised to border prices in an effort to determine a more rational valuation. In general, these border prices are intended to represent the international market value, or world prices, of these goods and services.

The market prices are changed to border prices using various conversion factors (C.F.). Specifically, transfer items are excluded and the concept of economic pricing is applied selectively. The concept of economic pricing is presented in Table 11.5.1.

Table 11.5.1 Concept of Economic Pricing

Market Prices (Costs & Benefits)							
	Foreign Currency Items	Local Currency Items (Includes sales tax and import duties)					
		Tradable Goods	Non-tradable Goods		Skilled Labor	Unskilled Labor	Others (Tax, duties)
			Tradable Goods	Non-Tradable Goods			
C.F.	1.0	1.0		SCF	CFC	Shadow Wage Rate	0.0
Border Prices (Costs & Benefits)							

11.5.2 Exclusion of Transfer Items

In the figures given for construction costs in Sec. 11.4.1 above, the foreign currency portion of imported materials and services do not include import duties or sales taxes. Thus, these figures are a reasonable statement of the economic value of these goods and services.

On the other hand, the local currency portion of the construction costs include both sales tax and import duties. These are merely transfer items which do not actually reflect the consumption of any national resources. Therefore, these transfer costs should be excluded from the economic analysis of the value of the project.

11.5.3 Method of Applying Conversion Factors

Generally, all benefits and costs are divided into labor, tradable goods and non-tradable goods. Labor is further divided into skilled labor and unskilled labor. The economic cost of skilled labor is obtained by multiplying its market price by the Conversion Factor for Consumption (CFC), and the cost of unskilled labor is calculated by multiplying its market price by a ratio of the shadow wage rate and the CFC. Tradable goods are expressed by the C.I.F. value for imports and by the F.O.B. value for exports. As border prices cannot be directly applied in the case of non-tradable goods, a second level analysis is made of the items required for the production of non-tradable goods. These items are, in turn, divided into the categories of labor, tradable goods and non-tradable goods. The Standard Conversion Factor (SCF) is then applied to the remaining value of non-tradable goods. The method of applying conversion factors is shown in the following Table.

BORDER PRICES	MARKET PRICE(MP)	X CONVERSION FACTOR
Skilled Labor	MP	Conversion Factor for Consumption (CFC)
Unskilled Labor	MP	Ratio of the shadow wage rate x CFC
Tradable Goods	CIF (imports) FOB (exports)	1.0 1.0
Non-Tradable Goods	MP	Standard Conversion Factor (SCF)
Foreign Currency	CIF FOB	1.0

11.5.4 Calculation of Conversion Factors

11.5.4.1 Standard Conversion Factor (SCF)

Import duties and export subsidies create a price differential between the domestic market and the international market. For the purpose of analysing benefits and costs within the domestic market, the standard conversion factor is applied in order to convert domestic market prices to border prices.

The standard conversion factor is the reciprocal of the shadow exchange rate, and is obtained by the following formula.

$$SCF = \frac{1}{\text{Shadow Exchange Rate}}$$

1) Shadow Exchange Rate (SER)

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

In 1984, the IMF recommended that the Philippine government adopt a 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.

In this study, the shadow exchange rate is set as 1.20 because NEDA recommends the application of a shadow price of 1.20.

2) Standard Conversion Factor

$$SCF = \frac{1}{1.20} = 0.833$$

11.5.4.2 Conversion Factor for Consumption (CFC)

This factor is used for converting the prices of consumer goods from domestic market prices to border prices. This is required to convert domestic labor costs to the corresponding border prices.

In this study, the conversion factor for consumption is set as equivalent to the standard conversion factor.

$$CFC = SCF = 0.833$$

11.5.4.3 Conversion Factor for Skilled Labor

The cost of skilled labor is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as these are domestic costs, they are converted to border prices by multiplying the local wage by the conversion factor for consumption (CFC). Thus, the conversion factor for skilled labor

= (Local Market Wage Rate) x (CFC)
= 1 x (CFC)
= CFC
= 0.833

11.5.4.4 Conversion Factor for Unskilled Labor

Although minimum wages are set by Presidential Decrees in the Philippines (Appendix 11.3.6), some of the actual wages are lower than the official minimum wages due to the high unemployment level.

Accordingly, unskilled labor wages should be adjusted by the shadow rate. According to the guideline provided by NEDA, this shadow wage rate (SWR) is 80% of the nominal wage rate. Therefore, in this study, the wage rate for unskilled labor will be adjusted by multiplying the nominal wage rate by 0.8. However, as this is a domestic cost, it is then converted to the border price by multiplying the local wage rate by the conversion factor for consumption (CFC). Thus, the conversion factor for unskilled labor is

| Nominal Wage Rate | x | Shadow Wage Rate | x (CFC)

= 1 x 0.8 x 0.833
= 0.666

11.5.4.5 Conversion Factors for Costs and Benefits

The calculation of the conversion factors is based on the "1979 input-output table" published by NEDA.

1) Construction Costs

a) Short-term Rehabilitation Plan: Refer to Appendix 11.5.1.
b) Floating Unloader : 1.0

2) Maintenance Costs: 0.833

Maintenance costs include various indefinite elements. Therefore the conversion factor is estimated as equal to the SCF: 0.833

3) Savings in Ships' Staying Costs: 1.0

The calculation of the savings in ships' staying costs is based on charter rates and the cost of fuel, both quoted at world prices. Thus, this figure does not have to be converted to economic prices.

4) Savings in Cargo Handling Costs

a) Savings in Tug and Barge Costs: 0.904
(Refer to Appendix 11.5.1)

b) Savings in labor Costs: 0.666
This is the same as the conversion factor for unskilled labor.

5) Saving in Time Costs: 1.0

Since time costs are based on F.O.B. and American Bank Acceptance rates, this figure does not have to be converted to economic prices.

11.5.4.6 Calculation of Economic Prices

"Annual construction costs at economic prices" and "costs and benefits at economic price" are shown in Table 11.5.2 and 11.5.3.

Table 11.5.2 Annual Construction Costs at Economic Prices (1,000 Pesos)

	Without case	1988	1989	1990	1991	1992	1993	1994	1995
1) Pier 3									
o Repair of Slab and Beam	O			7,370					
o Fender	O				12,350				
2) Pier 5									
o Additional Central Upper Deck				40,370					
o Fender	O			16,100					
o Demolition of Transit Shed			6,050						
3) Pier 9									
o Central Upper Deck					29,600				
o Fender	O			8,850					
o Extension Work				63,840					
4) Pier 13									
o Repair of Slab and Beam	O		3,120						
o Fender	O		16,630						
5) Pier 15									
o Repair	O		2,800	2,810					
o Central Upper Deck			17,420	17,410					
o Fender			16,100						
o Demolition of Transit Shed			3,030						
6) Back-Up Area									
o Pavement (CY-01)				16,990	17,000				
o Demolition and Reconstruction (Block 141)					23,100				
o Demolition (Block 147,150)									
7) Grain Terminal									
o Floating Unloader									
8) Dredging									
o Slips/piers	O		5,310	5,310	5,310	5,320			
o Anchorage				10,990	10,990	10,990			
o Maintenance Dredging	O								
9) Engineering Fee (8%)		34,150							
Total (With Case)		34,150	70,460	190,040	98,350	16,310			
(Without Case)		7,700	27,860	40,440	17,660	5,320			

Table 11.5.3 Costs and Benefits at Economic Prices

Year	Costs (1000 pesos)							Benefits (1000 pesos)				
	With Case		Without Case (Avoidable Costs)		(With-Without) Case				Cargo Handling Costs			
	Construction Costs	Maintenance Costs	Construction Costs	Maintenance Costs	Construction Costs	Maintenance Costs	Total Costs	Ships' Staying Costs	Labor Costs	Tug & Barge Costs	Time Costs	Total Benefits
1988	34,150	0	7,700	0	26,450	0	26,450					
1989	70,460	19,320	27,860	19,320	42,600	0	42,600					
1990	190,040	19,620	40,440	19,490	149,600	130	149,730					
1991	98,350	21,250	17,660	19,760	80,690	1,490	82,180					
1992	16,310	22,200	5,320	19,860	10,990	2,340	13,330					
1993		22,200		19,860		2,340	2,340	35,928	1,367	3,339	324	40,958
1994								36,619	1,401	3,760	330	42,110
1995								37,310	1,434	4,181	336	43,261
1996								47,701	1,474	4,328	447	53,950
1997								58,092	1,514	4,476	558	64,640
1998								68,483	1,554	4,623	669	75,329
1999								78,874	1,593	4,770	780	86,017
2000								89,264	1,633	4,917	890	96,704
2001								110,392	1,730	5,486	1,179	118,787
2002								131,520	1,827	6,055	1,467	140,869
2003								152,648	1,923	6,623	1,756	162,950
2004								173,776	2,020	7,192	2,044	185,032
2005								194,904	2,116	7,760	2,332	207,112
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												
2015												
2016												
2017												

11.6 Evaluation

11.6.1 Calculation of the EIRR

As mentioned in Section 11.1.2, the economic profitability of the project is evaluated in terms of the economic internal rate of return. The internal rate of return is a discount ratio satisfying the following equation.

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

Where, Bi: Benefit at i-th year
Ci: Cost at i-th year
r: Rate of discount
n: Period of Economic Calculation

The calculation results are shown in Appendix 11.6.1.

11.6.2 Results

The EIRR of the Short-term Rehabilitation Plan is calculated as 18.46%. The leading view is that a project is feasible if the EIRR exceeds the opportunity cost of capital, which is estimated to be 12% in developing countries according to the IBRD and the ADB.

According to this standard, this project is considered feasible.

11.7 Sensitivity Analysis

11.7.1 Identification of Cases

In order to see if the project is still feasible when some factors are varied, several cases are examined as follows.

Case A: The construction costs are increased by 10%.
Case B: The benefits are decreased by 10%.
Case C: The construction costs are increased by 10% and the benefits are decreased by 10%.

11.7.2 Results

The results of the sensitivity tests are shown in Table 11.7.1.

Table 11.7.1 Sensitivity Analysis for EIRR

Case	(%) EIRR
Base Case	18.46
Case A: Increase in Costs by 10%	17.46
Case B: Decrease in Benefits by 10%	17.36
Case C: Increase in Costs by 10% and Decrease in Benefits by 10%	16.40

11.8 Conclusion

The Short-term Rehabilitation Plan is judged to be 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 12
FINANCIAL ANALYSIS

CHAPTER 12 FINANCIAL ANALYSIS

12.1 Purpose and Methodology of the Financial Analysis

12.1.1 Purpose

The purpose of this chapter is to appaise the financial feasibility of the Short-term Rehabilitation Plan, specifically:

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

(2) The profitability of the Short-term Rehabilitation Plan itself. (Financial Analysis of the Floating Unloader Project is shown separately in Appendix 8.3.4)

12.1.2 Methodology

(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.

(2) Operating Entity

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

- PPA
- PMU Manila

After due consideration of the actual conditions, PPA is selected as the operating entity for the following reasons:

(a) Although the PMU actually functions not only as an administrative unit but also as a revenue and cost center (it issues its own financial statements), the PMU can not borrow funds. It is thus

necessary to appraise PPA's capacity to raise funds in foreign currency.

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

(3) Process of the Financial Analysis

The process of the financial analysis is shown in Fig. 12.2.1.

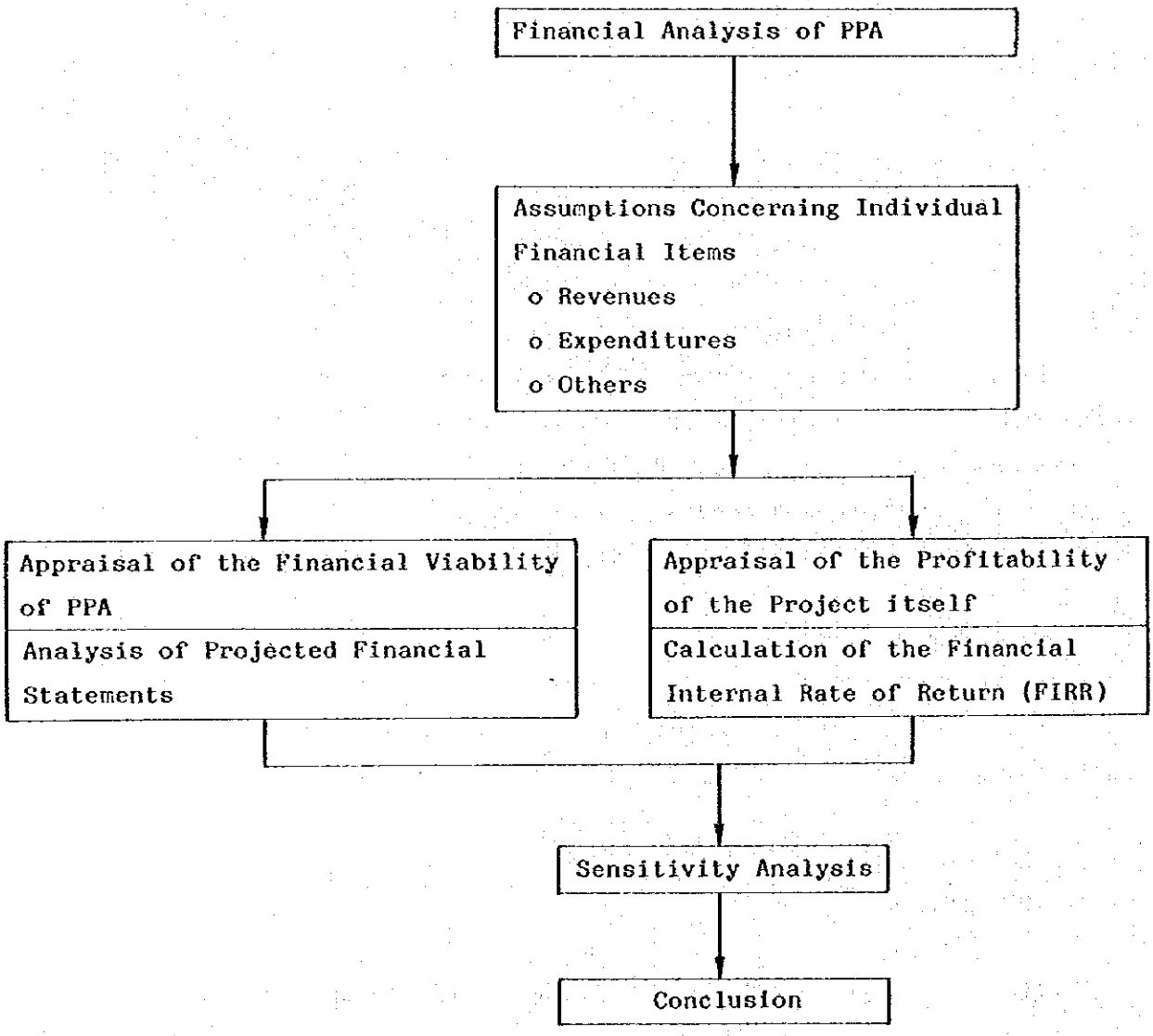

Fig.12.2.1 Flow Chart of the Financial Analysis

12.2 Financial Analysis of PPA

12.2.1 Prerequisites of Financial Projections of PPA

(1) Revenues

The following assumptions are the same as those used in "PPA Projected Income Statement" (1986-1992). It is assumed that the growth rates will remain constant from 1992 through 2005 (See Appendix 12.2.1).

(a) Operating Revenue

Projected 6% annual growth rate (consistent with "PPA Projected Income Statement" and necessary to achieve the specified rate of return on net fixed assets in operation of at least 7 percent and also to achieve a debt service ratio of at least 1.75 as agreed upon between PPA and IBRD).

(b) Increase in port tariff rate

1988	30%
1989	25%

(c) Non-operating Income

Nil after 1987

(2) Expenses

1986 - 1992: The same assumptions used in "PPA Projected Income Statement" except additional expenses for the South Harbor Rehabilitation Plan.

1993 - 2005:

(a) Personnel cost

Projected 8% annual growth rate (1980 - 1985: 6.2% annual growth rate).

(b) Repairs and Maintenance

Projected as 1.5% of depreciable assets (1980 - 1985: 1.1 percent of depreciable assets).

(c) Dredging cost

Projected 15% annual growth rate (1980 - 1992: 13.0% annual growth rate).

(d) Depreciation

On existing assets: 80.2 million pesos in 1985

On-going projects and proposed projects:(See Appendix 12.2.2)

(Unit: Million Pesos)

	Project	Year of Completion	Cost of Completed Assets	Depreciation Ratio (%)
On-going Projects	Port Cargo handling	1986	158.5	6.7
	3rd IBRD Projects	1987	1.546.5	2.5
	Port of Irene	1990	308.1	2.5
	ICT	1989	543.7	2.5
Proposed Project	Manila North Harbor	1990	221.0	6.7
	4th IBRD Projects	1991	688.0	2.5
	Port of Davao	1988	15.0	2.5
	Other Local projects	1986 - 1992	20.0	2.5

S.H. Rehabilitation Project

(Unit: Million Pesos)

	Year of Completion	Cost of Completed Assets	Depreciation Ratio (%)
Pier 3 - Pier 15	1989 - 1991	231.3	2.0
Fenders	"	76.9	20.0
Pavement (CY-01)	1990 - 1991	41.6	5.0
Reconstruction (Block 141)	1991	31.8	3.3

(e) Interest on Long-term Debt

Projected at 8% of Long-term Loans (1980-85: 8.7%)

Long-term Loans (1985) 1,512.4 million pesos

(Add) 1 Foreign Currency Portion of On-going and Proposed Projects (1986 - 1992)

2 Foreign Currency Portion of S.H. Rehabilitation Project (1989 - 1992)

(Less) Repayment (5% of the long-term loans in the previous year*)

*Average repayment ratio of long-term loans in the previous year from 1982 to 1985 is about 2%.

12.2.2 Appraisal of the Financial Viability of PPA

The projected financial performance of PPA according to the above assumptions is given Table 12.2.2 (With Case) (See Appendix 12.2.3).

Table 12.2.1 Definition of "With" and "Without" Cases
(Port development Projects)

With Case	- Ongoing Project - Future Projects - Short-term Rehabilitation Plan (South Harbor)
Without Case	- Ongoing Projects - Future Projects - Repair of South Harbor at Port of Manila

The financial projections of PPA (Table 12.2.2) indicate that PPA would need to increase its port tariffs by 30 per cent in 1988 and 25 percent in 1989 to achieve a debt service ratio of at least 1.75 as agreed upon between PPA and IBRD.

As for the specified rate of return on net fixed assets in operation (ROA) of at least 7 percent which is required by IBRD, PPA's projected ROA will be over 7 percent throughout the project life.

Accordingly, it can be stated that this project will not cause any serious financial problems for PPA.

Table 12.2.2 through 12.2.7 show projected the financial statements of PPA under the "with case" and the "Without case".

Table 12.2.2 Financial Projections of PPA (With case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Operating Revenue	612.1	710.8	776.5	1,018.2	1,303.3	1,381.5	1,464.4	1,552.3	1,645.4	1,744.1	1,848.8
Working Expenses	199.7	252.0	387.2	467.4	535.9	620.8	705.2	793.4	804.2	880.2	965.2
Depreciation	80.2	89.8	132.7	133.4	159.5	194.3	219.0	243.4	210.1	210.1	210.1
Total Operating Expenses	279.9	341.8	519.9	600.8	695.4	815.1	924.2	1,036.8	1,014.3	1,090.3	1,175.3
Operating Income	332.2	369.0	256.6	417.4	607.9	566.4	540.2	515.5	631.1	653.8	673.5
Non-Operating Income	102.1	50.0	-	-	-	-	-	-	-	-	-
Interest on Long-term Debt	141.7	158.6	202.2	227.8	251.0	261.8	267.5	274.7	308.5	293.8	279.9
Other Non-Operating Expenses	68.6	54.2	71.8	79.6	89.0	78.2	73.3	75.0	106.3	101.8	97.4
Net Income	224.0	206.2	17.4	110.0	267.9	226.4	199.4	165.8	216.3	258.3	296.2
Working Ratio (%)	32.6	35.5	49.9	45.9	41.1	44.9	48.2	51.1	48.9	50.5	52.5
Operating Ratio (%)	45.7	48.1	67.0	59.0	53.4	59.0	63.1	66.8	61.6	62.5	63.6
Rate of Return on Net Fixed Assets (%)	18.6	20.1	9.9	12.8	17.6	14.3	11.9	10.9	13.9	15.1	16.3
Debt Service Ratio (Times)	3.40	1.61	1.00	1.22	1.57	1.59	1.60	1.47	1.68	1.81	1.95

	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05	
Operating Revenue	1,959.7	2,077.3	2,201.9	2,334.0	2,474.0	2,622.4	2,779.7	2,946.5	3,123.3	3,310.7	
Working Expenses	1,060.7	1,167.8	1,287.8	1,422.6	1,537.7	1,743.2	1,933.8	2,147.6	2,387.9	2,658.2	
Depreciation	210.1	210.1	210.1	210.1	210.1	210.1	210.1	210.1	210.1	210.1	
Total Operating Expenses	1,270.8	1,377.9	1,497.9	1,632.7	1,783.8	1,953.3	2,143.8	2,357.7	2,598.0	2,868.3	
Operating Income	688.9	699.4	704.0	701.3	690.2	669.1	635.9	588.8	525.3	442.4	
Interest on Long-term Debt	266.6	253.8	241.2	229.2	217.6	206.7	196.1	186.2	176.6	167.5	
Other Non-Operating Expenses	93.2	89.2	85.2	81.4	77.6	74.1	70.7	87.5	64.4	61.4	
Net Income	329.1	356.4	377.6	390.7	395.0	388.3	369.1	335.1	284.3	213.5	
Working Ratio (%)	54.1	56.2	58.5	61.0	63.6	66.5	69.6	72.9	76.5	80.3	
Operating Ratio (%)	64.8	66.3	68.0	70.0	72.1	74.5	77.1	80.0	83.2	86.6	
Rate of Return on Net Fixed Assets (%)	17.6	18.9	20.2	21.4	22.5	23.4	24.0	24.1	23.6	21.9	
Debt Service Ratio (Times)	2.07	2.19	2.28	2.37	2.46	2.52	2.55	2.53	2.45	2.28	

Table 12.2.3 Projected Balance Sheet of PPA (With Case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Assets	4,959.2	5,432.8	5,607.2	6,316.8	7,173.7	7,880.4	8,410.1	9,040.3	9,052.6	9,106.3	9,208.5
Net Fixed Assets	3,768.4	4,219.7	4,378.2	4,490.0	4,887.2	5,210.6	5,449.7	5,250.3	5,040.2	4,830.1	4,620.0
Current Assets	1,177.2	1,199.5	1,219.4	1,805.2	2,272.9	2,656.2	2,946.8	3,776.4	3,998.8	4,262.6	4,574.9
Other Assets	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
Equity and Liabilities	4,959.2	5,432.8	5,607.2	6,316.8	7,173.7	7,880.4	8,410.1	9,040.3	9,052.6	9,106.3	9,208.5
Capital and Retained Earnings	3,083.8	3,286.3	3,268.9	3,378.9	3,646.8	3,873.2	4,072.6	4,238.4	4,454.7	4,712.9	5,009.1
Long-Term Debt	1,512.3	1,696.9	1,861.9	2,392.6	2,923.0	3,402.2	3,723.7	4,134.5	3,941.6	3,758.3	3,584.2
Current Liabilities and Other Liabilities	363.0	449.6	476.4	555.3	603.0	605.0	613.8	667.4	656.3	635.1	615.2

	'96	'97	'98	'99	2000	'01	'02	'03	'05	'05	
Assets	9,353.4	9,533.4	9,740.8	9,963.5	10,195.6	10,428.1	10,648.4	10,841.9	10,991.1	11,075.7	
Net Fixed Assets	4,409.9	4,199.8	3,989.7	3,779.6	3,569.5	3,359.4	3,149.3	2,939.2	2,729.1	2,519.0	
Current Assets	4,929.9	5,320.0	5,737.5	6,170.3	6,612.5	7,055.1	7,485.5	7,889.1	8,248.4	8,543.1	
Other Assets	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	
Equity and Liabilities	9,353.4	9,533.4	9,740.8	9,963.5	10,195.6	10,428.1	10,648.4	10,841.9	10,991.1	11,075.7	
Capital and Retained Earnings	5,328.2	5,694.6	6,072.2	6,462.9	6,857.9	7,246.2	7,615.3	7,950.4	8,234.7	8,448.2	
Long-Term Debt	3,417.3	3,256.3	3,096.9	2,942.1	2,793.6	2,651.8	2,516.4	2,387.1	2,263.5	2,145.4	
Current Liabilities and Other Liabilities	597.9	582.5	571.7	558.5	544.1	530.1	516.7	504.5	492.9	482.1	

Table 12.2.4 Projected Cash Flow Statement (With Case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Beginning Cash Balance	183.3	621.0	612.4	267.3	97.5	33.6	75.9	46.2	26.0	190.2	539.4
Cash-Internal Source											
Operating Revenue	621.1	710.8	776.5	1,018.2	1,303.3	1,381.5	1,464.4	1,552.3	1,645.4	1,744.1	1,848.8
Fund Management Income	102.1	50.0	-	-	-	-	-	-	-	-	-
Acct. Rec'ble-Beg.	49.3	97.7	84.0	85.1	126.4	159.1	135.9	156.3	164.3	279.9	298.4
Acct. Rec'ble-End	- 97.7	- 84.0	- 85.1	- 126.4	- 159.1	- 135.9	- 156.3	- 164.3	- 279.9	- 298.4	- 320.2
Cash-External Source											
Foreign Loan Avail.	460.5	341.0	350.8	744.1	779.7	696.3	531.9	651.6	-	-	-
Total Cash Available	1,309.6	1,736.5	1,738.6	1,988.3	2,147.8	2,134.6	2,051.8	2,242.1	1,555.8	1,915.8	2,366.4
Application of Cash											
Working Expense	199.7	252.0	387.2	467.4	535.9	620.8	705.2	793.4	804.2	880.2	965.2
Debt Service-Interest	15.7	158.6	202.2	227.8	251.0	261.8	267.5	274.7	308.5	293.7	279.9
Debt Service-Principal	14.6	156.5	185.8	223.4	238.4	218.0	208.4	240.8	192.9	183.3	174.1
Infra Project	537.4	622.0	720.3	1,043.2	1,081.8	1,059.9	832.4	955.5	-	-	-
Acct. Payable-Beg.	260.8	339.6	404.6	428.8	499.8	492.7	594.5	602.4	650.7	590.7	571.6
Acct. Payable-End	- 339.6	- 404.6	- 428.8	- 499.8	- 492.7	- 594.5	- 602.4	- 650.7	- 590.7	- 571.6	- 553.7
Total Cash Application	688.6	1,124.1	1,471.3	1,890.8	2,114.2	2,058.7	2,005.6	2,216.1	1,365.6	1,376.4	1,437.1
Ending Cash Balance	621.0	612.4	267.3	97.5	33.6	75.9	46.2	26.0	190.2	539.4	929.3

Projected Cash Flow Statement (With Case)

(Unit: Million Pesos)

	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05
Beginning Cash Balance	929.3	1,354.3	1,806.9	2,282.4	2,767.7	3,258.0	3,745.1	4,217.4	4,661.6	5,061.2
Cash-Internal Source										
Operating Revenue	1,959.7	2,077.3	2,201.9	2,334.0	2,474.0	2,622.4	2,779.7	2,946.5	3,123.3	3,310.7
Fund Management Income	-	-	-	-	-	-	-	-	-	-
Acct. Rec'ble - Beg.	320.2	345.1	373.4	401.6	431.9	462.9	493.9	524.0	552.2	577.4
Acct. Rec'ble - End	- 345.1	- 373.4	- 401.6	- 431.9	- 462.9	- 493.9	- 524.0	- 552.2	- 577.4	- 598.0
Cash-External Source										
Foreign Loan Avail.	-	-	-	-	-	-	-	-	-	-
Total Cash Available	2,864.1	3,403.3	3,980.6	4,586.1	5,210.7	5,849.4	6,494.7	7,135.7	7,759.7	8,351.3
Application of Cash										
Working Expense	1,060.7	1,167.8	1,287.8	1,422.6	1,573.7	1,743.2	1,933.7	2,147.6	2,387.9	2,658.2
Debt Service-Interest	266.6	253.8	241.2	229.2	217.6	206.7	196.1	186.2	176.6	167.5
Debt Service-Principal	166.9	161.0	159.4	154.8	148.5	141.7	135.4	129.3	123.6	118.1
Infra Project	-	-	-	-	-	-	-	-	-	-
Acct. Payable - Beg.	553.7	538.1	524.3	514.5	502.7	489.7	477.1	465.0	454.0	443.6
Acct. Payable - End	- 538.1	- 524.3	- 514.5	- 502.7	- 489.7	- 477.1	- 465.0	- 454.0	- 443.6	- 433.9
Total Cash Application	1,509.8	1,596.4	1,698.2	1,818.4	1,952.7	2,104.3	2,277.3	2,474.1	2,698.5	2,953.5
Ending Cash Balance	1,354.3	1,806.9	2,282.4	2,767.7	3,258.0	3,745.1	4,217.4	4,661.6	5,061.2	5,397.8

Table 12.2.5 Financial Projections of PPA (Without Case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Operating Revenue	612.1	710.8	776.5	1,018.2	1,303.3	1,381.5	1,464.4	1,552.3	1,645.4	1,744.1	1,848.8
Working Expenses	199.7	252.0	387.2	467.4	535.9	609.3	692.2	779.1	801.4	877.4	962.4
Depreciation	80.2	89.8	132.7	133.4	156.3	187.9	209.0	233.4	200.1	200.1	200.1
Total Operating Expenses	279.9	341.8	519.9	600.8	692.2	797.2	901.2	1,012.5	1,001.5	1,077.5	1,162.5
Operating Income	332.2	369.0	256.6	417.4	611.1	584.3	563.2	539.8	643.9	666.6	686.3
Non-Operating Income	102.1	50.0	-	-	-	-	-	-	-	-	-
Interest on Long-term Debt	141.7	158.6	202.2	226.5	248.3	254.0	257.3	263.9	297.7	283.0	269.1
Other Non-Operating Expenses	68.6	54.2	71.8	79.6	89.0	78.2	73.3	75.0	101.4	96.9	92.5
Net Income	224.0	206.2	- 17.4	111.3	273.8	252.1	232.6	200.9	244.7	286.7	324.7
Working Ratio (%)	32.6	35.5	49.9	45.9	41.1	44.1	47.3	50.2	48.7	50.3	52.1
Operating Ratio (%)	45.7	48.1	67.0	59.0	53.1	57.7	61.5	65.2	60.9	61.8	62.9
Rate of Return on Net Fixed Assets (%)	18.6	21.0	9.9	12.8	17.8	15.1	13.0	12.0	15.0	16.3	17.6
Debt Service Ratio (Times)	3.40	1.61	1.00	1.22	15.8	1.64	1.66	1.53	1.72	1.86	2.00

	'96	'977	'98	'99	2000	'01	'02	'03	'04	'05	
Operating Revenue	1,959.7	2,077.3	2,201.9	2,334.0	2,474.0	2,622.4	2,779.7	2,946.5	3,123.3	3,310.7	
Working Expenses	1,057.9	1,165.0	1,285.0	1,419.7	1,570.9	1,740.4	1,930.9	2,144.7	2,385.1	2,655.4	
Depreciation	200.1	200.1	200.1	200.1	200.1	200.1	200.1	200.1	200.1	200.1	
Total Operating Expenses	1,258.0	1,365.1	1,485.1	1,619.9	1,771.0	1,940.5	2,131.0	2,344.9	2,585.2	2,855.5	
Operating Income	701.7	712.2	716.8	714.1	703.0	681.9	648.7	601.6	538.1	455.2	
Interest on Long-term Debt	25.9	243.2	231.0	219.5	208.5	198.1	188.0	178.6	169.6	161.1	
Other Non-Operating Expenses	88.4	84.4	80.6	76.9	73.5	70.2	67.0	64.1	61.2	58.5	
Net Income	357.4	384.6	405.2	417.7	421.0	413.6	393.7	357.9	307.3	235.6	
Working Ratio (%)	54.0	56.1	58.4	60.8	63.5	66.4	69.5	72.8	76.4	80.2	
Operating Ratio (%)	64.2	65.7	67.4	69.4	71.6	74.0	76.7	79.6	82.7	86.3	
Rate of Return on Net Fixed Assets (%)	19.0	20.3	21.7	23.0	24.2	25.3	25.9	26.1	25.6	24.0	
Debt Service Ratio (Times)	2.14	2.27	2.39	2.50	2.60	2.67	2.71	2.69	2.60	2.43	

Table 12.2.6 Projected Balance Sheet of PPA (Without Case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Assets	4,959.2	5,432.8	5,607.2	5,739.0	7,129.5	7,762.4	8,280.0	8,934.5	8,975.3	9,057.5	9,188.2
Net Fixed Assets	3,768.4	4,219.7	4,378.2	4,514.1	4,864.1	5,015.4	5,194.9	5,005.5	4,805.4	4,605.3	4,405.2
Current Assets	1,177.2	1,199.5	1,215.4	1,211.3	2,251.8	2,733.4	3,071.5	3,915.4	4,156.3	4,438.6	4,769.4
Other Assets	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
Equity and Liabilities	4,959.2	5,432.8	5,607.2	5,739.0	7,129.5	7,762.4	8,280.0	8,934.5	8,975.3	9,057.5	9,188.2
Capital and Retained Earning	3,083.8	3,286.3	3,268.9	3,380.2	3,654.0	3,906.1	4,138.7	4,339.6	4,584.4	4,871.1	5,195.8
Long-Term Debt	1,512.4	1,696.9	1,861.9	2,358.8	2,875.2	3,259.1	3,537.7	3,938.3	3,745.4	3,562.1	3,388.0
Current Liabilities and Other Liabilities	363.0	449.6	476.4	554.4	600.3	597.2	603.6	656.6	645.3	624.3	604.4

	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05	
Assets	9,361.5	9,571.0	9,808.8	10,066.1	10,334.1	10,602.2	10,857.4	11,085.0	11,267.6	11,384.7	
Net Fixed Assets	4,205.1	4,005.0	3,804.9	3,604.8	3,404.7	3,204.6	3,004.5	2,804.4	2,604.3	2,404.2	
Current Assets	5,142.8	5,552.4	5,990.3	6,447.7	6,915.8	7,384.0	7,839.3	8,267.0	8,649.7	8,966.9	
Other Assets	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	
Equity and Liabilities	9,361.5	9,571.0	9,808.8	10,066.1	10,334.1	10,602.2	10,857.4	11,085.0	11,267.6	11,384.7	
Capital and Retained Earnings	5,553.2	5,937.8	6,343.0	6,760.7	7,181.7	7,595.3	7,989.0	8,347.9	8,655.2	8,890.8	
Long-Term Debt	3,222.3	3,063.7	2,911.4	2,765.9	2,627.2	2,495.2	2,369.6	2,250.1	2,136.3	2,028.0	
Current Liabilities and Other Liabilities	586.0	569.5	554.4	539.5	525.2	511.7	498.8	487.0	476.1	465.9	

Table 12.2.7 Projected Cash Flow Statement (Without case)

(Unit: Million Pesos)

	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95
Beginning Cash Balance	183.3	621.0	612.4	267.3	143.4	123.2	106.8	152.4	106.9	433.6	795.1
Cash-Internal Source											
Operating Revenue	612.1	710.8	776.5	1,018.2	1,303.3	1,381.5	1,464.4	1,552.3	1,645.4	1,744.1	1,848.8
Fund Management Income	102.1	50.0	-	-	-	-	-	-	-	-	-
Acct. Rec'ble - Beg.	49.3	97.7	84.0	85.1	84.8	157.6	191.3	215.0	274.1	290.9	310.7
Acct. Rec'ble - End	- 97.7	- 84.0	- 85.1	- 84.8	- 157.6	- 191.3	- 215.0	- 274.1	- 290.9	- 310.7	- 333.9
Cash-External Source											
Foreign Loan Avail.	460.5	341.0	350.8	720.8	754.8	601.9	487.0	641.4	-	-	-
Total Cash Available	1,309.6	1,736.5	1,738.6	2,006.1	2,128.7	2,072.9	2,034.5	2,287.0	1,735.5	2,157.9	2,620.7
Application of Cash											
Working Expense	199.7	252.0	387.2	467.4	535.9	609.3	692.2	779.1	801.4	877.4	962.4
Debt Service-Interest	15.7	158.6	202.2	226.5	248.3	254.0	257.3	263.9	297.7	283.0	269.1
Debt Service-Principal	14.6	156.5	185.8	223.4	238.4	218.0	208.4	240.8	192.9	183.3	174.1
Infra Project	537.4	622.0	720.3	1,015.2	1,024.6	882.0	729.9	944.0	-	-	-
Acct. Payable - Beg.	260.8	339.6	404.6	428.8	498.6	540.3	537.5	543.2	590.9	581.0	561.9
Acct. Payable - End	- 339.6	- 404.6	- 428.8	- 498.6	- 540.3	- 537.5	- 543.2	- 590.9	- 581.0	- 561.9	- 544.0
Total Cash Application	688.6	1,124.1	1,471.3	1,862.7	2,005.5	1,966.1	1,882.1	2,180.1	1,301.9	1,362.8	1,423.5
Ending Cash Balance	621.0	612.4	267.3	143.4	123.2	106.8	152.4	106.9	433.6	795.1	1,197.2

Projected Cash Flow Statement (Without Case)

(Unit: Million Pesos)

	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05
Beginning Cash Balance	1,197.2	1,634.7	2,101.7	2,591.1	3,094.9	3,605.1	4,112.0	4,603.7	5,066.8	5,485.0
Cash-Internal Source										
Operating Revenue	1,959.7	2,077.3	2,201.9	2,334.0	2,474.0	2,622.4	2,779.7	2,946.5	3,123.3	3,310.7
Fund Management Income	-	-	-	-	-	-	-	-	-	-
Acct. Rec'ble - Beg.	333.9	360.0	388.7	419.3	451.3	484.1	516.9	548.8	578.7	605.5
Acct. Rec'ble - End	- 360.0	- 388.7	- 419.3	- 451.3	- 484.1	- 516.9	- 548.8	- 578.7	- 605.5	- 627.7
Cash-External Source										
Foreign Loan Avail.	-	-	-	-	-	-	-	-	-	-
Total Cash Available	3,130.8	3,683.3	4,273.0	4,893.1	5,536.1	6,194.7	6,859.8	7,520.3	8,163.3	8,773.5
Application of Cash										
Working Expense	1,058.9	1,165.0	1,285.0	1,419.8	1,570.9	1,740.4	1,930.0	2,144.8	2,385.1	2,655.4
Debt Service-Interest	255.9	243.2	231.0	219.5	208.5	198.1	188.0	178.6	169.6	161.1
Debt Service-Principal	165.7	158.6	152.3	145.5	138.7	132.0	125.6	119.5	113.8	108.3
Infra Project	-	-	-	-	-	-	-	-	-	-
Acct. Payable-Beg.	544.0	527.4	512.6	499.0	485.6	472.7	460.5	448.9	438.3	428.5
Acct. Payable-End	- 527.4	- 512.6	- 499.0	- 485.6	- 472.7	- 460.5	- 448.9	- 438.3	- 428.5	- 419.3
Total Cash Application	1,496.1	1,581.6	1,681.0	1,798.2	1,931.0	2,082.7	2,256.1	2,453.5	2,678.3	2,934.0
Ending Cash Balance	1,634.7	2,101.7	2,591.1	3,094.9	3,605.1	4,112.0	4,603.7	5,066.8	5,485.0	5,839.5

12.3 Appraisal of the Profitability of the Project Itself

12.3.1 Financial Internal Rate of Return (FIRR)

The profitability of the project itself is appraised based on the FIRR. For the calculation of the FIRR, constant prices (e.g. 1986) are used and incremental revenues and costs refrect the 'with' and 'without' comprison.

12.3.2 Prerequisites of the FIRR calculation

(1) Port tariff rates will increase in 1988 and 1989 in accordance with PPA's financial plans.

(2) Increamental revenues, costs and savings in maintenance cost are defined as follow.

① Incremental revenues

(a) Port operation revenue

It is assumed that under the 'without' case, South Harbor will essentially reach its optimum cargo handling capacity in 1995 when the berth occupancy ratio will be approximately 70%. All of the incremental revenue from additional cargo handled beyond this capacity is considered as a incremental revenue of the project. Thus benefits do not arise until 1995 in spite of the completion of rehabilitation of piers because of lower cargo handling capacity than its optimum.

The incremental revenue from the additional ship calling byond ship calling in 1995 under the "without" case is also considered as a incremental revenue of the project.

(b) Arrastre/stevedoring income

PPA receives 35% of the gross income of cargo-handling contractors at South Harbor. The income from the additional cargo handled beyond the above capacity is also considered as incremental revenue from the project.

② Incremental costs

(a) Construction cost

(b) Maintenance cost

(c) Tax on the incremental revenue

③ Savings in maintenance cost

The maintenance cost under the 'without' case is higher than under the 'with' case because additional maintenance will be required to keep certain facilities if the rehabilitation project is not implemented. In this project it is assumed that the required additional maintenance cost under the 'without' case is equal to 3% of the projected rehabilitation costs of these facilities.

(3) Funding Assumptions

1 Source of funds

Domestic portion: 43% (Government funds)

Foreign portion : 57% (Overseas loans)

2 Assumed loan agreement terms

(a) Loan amount : 275.6 million pesos

(b) Interest rate: 5.5 %

(c) Loan period : 27 years (1988-2008)

(d) grace period : 7 years

The above assumptions (a) - (b) are made based on the present terms of OECF and ADB loans.

Terms of OECF and ADB Loans

	Period (years)	Grace period (years)	Interest (%)
OECF	28*	9*	3.5
ADB	10 - 30	2 - 7	7.36

* Average period (years) for the loans approved in 1985.

(Appendix 12.3.1 presents the assumptions underlying the projections in detail).

12.3.3 Results

The FIRR of this project is 7.69% (Appendix 12.3.2). In this project, 57% of the overall construction cost (i.e. the foreign portion) is assumed to be raised by loans with a 5.5% interest rate. This is the average interest rate of OECF funds (3.5%) and funds from other international banks (7.36%). Thus, the FIRR is required to exceed 3.1%, which is the weighted average interest rate for all the project funds. Judging from this point of view, this project can be regarded as feasible.

12.4 Sensitivity Analysis

12.4.1 Identification of cases

Sensitivity analysis is made for the following cases:

Case A construction costs increase by 10%

Case B benefits decrease by 10%

Case C construction costs increase by 10% and benefits decrease by 10%

12.4.2 Results

The FIRR is computed for each of the cases mentioned above (Appendix 12.4.1).

The results are shown in Fig. 12.4.1. Every FIRR exceeds the lower limit of 3.1% The results of the sensitivity analysis prove that each case would be feasible.

12.5 Conclusion

From the viewpoint of the financial viability of PPA and the profitability of the project itself, this project can be regarded as feasible.

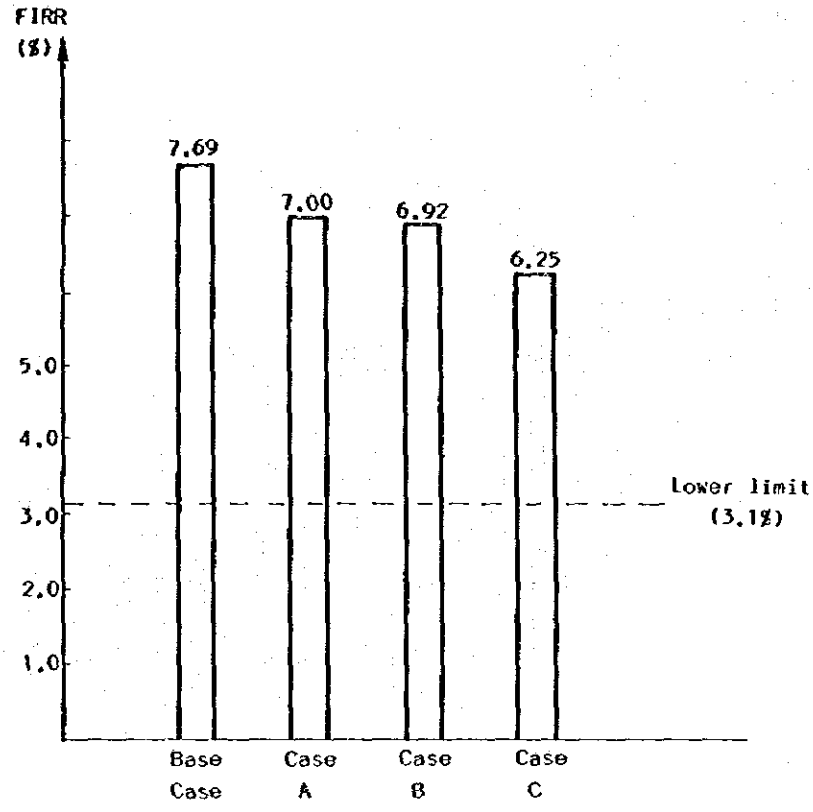

Fig. 12.4.1 Sensitivity Analysis

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