CHAPTER 16 PORT MANAGEMENT AND OPERATION PLAN

16.1 Administration System

The Vietnam National Maritime Bureau, which is under the Ministry of Transport and accountable to the Prime minister, charged with the Administration of the shipping industry in Vietnam. The Chairman of the Bureau oversees the administration of the maritime sector throughout the country including all state-run maritime units(belonging both to central and local authorities) and non state-run maritime enterprises, organizations and individuals (foreign organizations and individuals functioning in the territory of Vietnam are also included).

Present organization of VINAMARINE is shown in Figure 16-1-1. This organization chart clearly depicts wide ranging responsibilities of VINAMARINE.

The chart also shows that there is a clear distinction between a "port" and a "port authority", seen as in the case of "Haiphong Port" and "Haiphong Port Authority". A "port" manages affairs after a ship has berthed. Figure 16-1-2 shows the organization of Haiphong Port. The organization is focused on cargo handling, and has a number of divisions and departments to carry out this task. Some of them are independent as "enterprises".

On the other hand, a port authority mainly controls and manages 'navigable zone' on the sea water surface. Quang Ninh Port Authority has already been controlling the navigable zone from Cam Pha port to Cai Lan port. Figure 16-1-3 shows the navigable zone under the control of Quang Ninh Port Authority.

So far the Construction Board No.213 has been executing Cai Lan port construction. After completion "Cai Lan Port" (named tentatively) like other "ports" is assumed to manage the port.

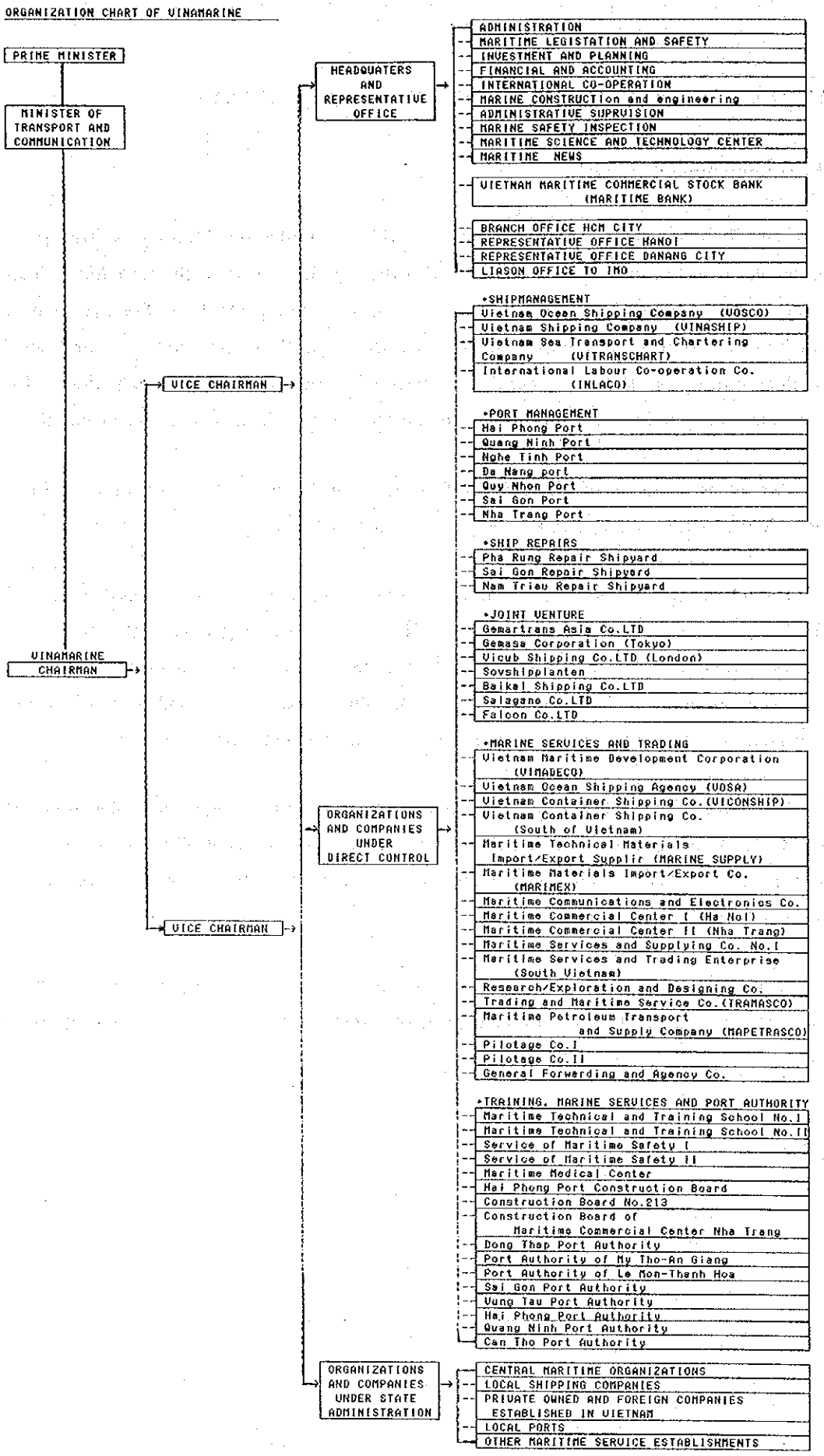

Figure 16-1-1 ORGANIZATION CHART OF VINAMARINE

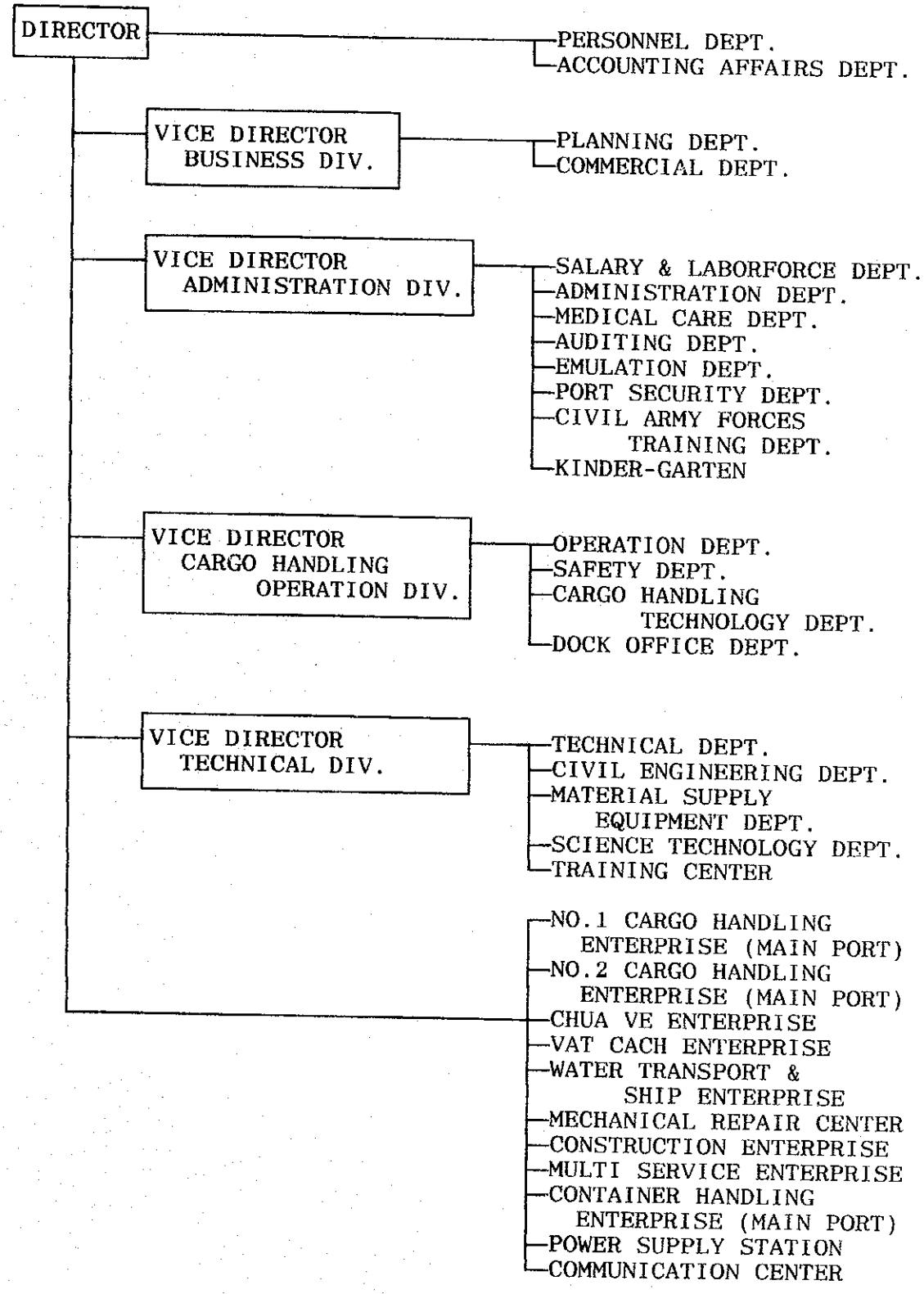

Figure 16-1-2 ORGANIZATION CHART OF HAIPHONG PORT

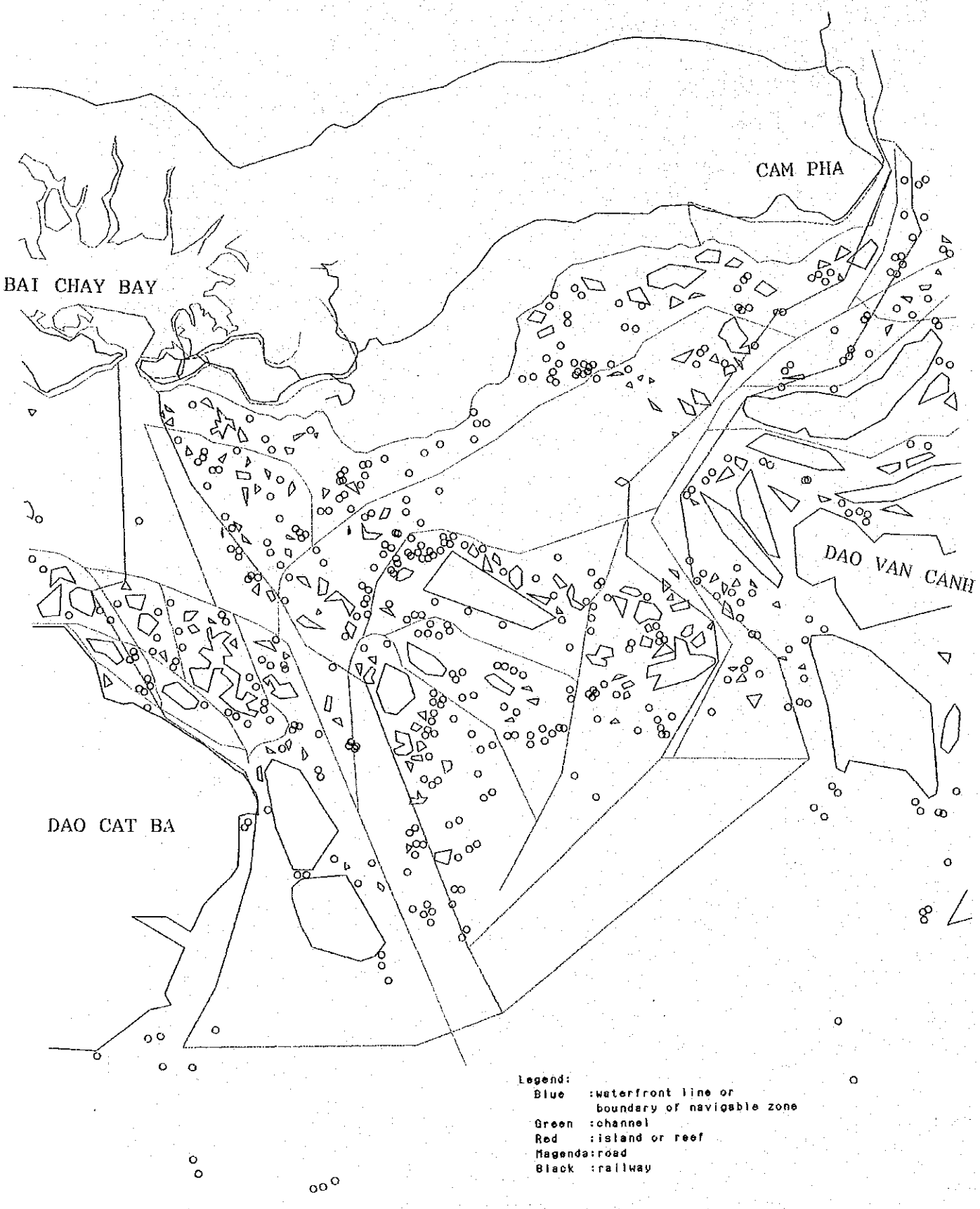

Figure 16-1-3 Navigable Zone under Control of Quang Ninh Port Authority

16.2 Operation System

The main operation system in a port is the cargo handling system, as discussed in Chapter 12.

Based on the type of system to be adopted at Cai Lan port, the required number of workers is estimated. As a result, it is assumed that 580 workers will be required at Cai Lan port.

16.3 Maintenance System

Many preliminary problems must be solved besides financial problem. In addition, a training systems for workers should be established since the 2.7 million tons of cargo forecast for the year 2001 is to be handled efficiently.

CHAPTER 17 ROUGH COST ESTIMATION

17.1 Unit Cost of Major Construction Materials

The unit cost of major construction materials was surveyed in June and July 1994 directly from the State contractor, some private companies as well as TEDI's Cost Estimator. IN VIETNAM most dealers apply a two-price system, one is for the State contractor and second is for joint venture companies. The tabulated one is based on the second price.

Table 17-1-1 Unit Cost of Construction Material

No	Type of Material	Unit	Cai Lan (1,000VND)	Hai Phong (1,000VND)
1	Rock 30cmx30cm	m3	105	133.50
2	Crushed stone 6cmx8cm	m3	185	163.20
3	Crushed stone 4cmx6cm	m3	210	171.20
4	Crushed stone 0.5cmx1cm	m3	236	183.30
	Crushed stone 2cmx3cm			
5	Crushed	kg	1	0.67
6	Clay sand	m3	105	60.20
7	Sand for concrete	m3	149	99.00
8	Cement P400	kg	2	2.00
9	Tube steel	ton	15,000	14850.00
10	Angle steel	ton	9,000	9150.00
11	Sheet steel	ton	9,450	13974.00
12	Bitumen	kg	8	5.70
13	Round Steel Bar :			
	Diameter 6-8 mm	ton	9,675	9732.45
	Diameter 10-14 mm	ton	9,312	8824.50
	Diameter 16-18 mm	ton	8,993	8521.50
	Diameter > 18	ton	8,993	7917.00
14	Deformed Steel Bar :			
	Diameter 6-8	ton	9,975	10032.45
	Diameter 10-14 mm	ton	9,612	9124.50
	Diameter 16-18 mm	ton	9,293	8821.50
	Diameter > 18	ton	9,293	8217.00
15	Graded wood Board VII	m3	1,477	1320.00
16	Boulder 500kg -> 2 tons	m3	230	250.00
17	Electricity	kwh	2	1.50
18	Petrol	kg	8	8.20
19	Diesel	kg	7	6.61
20	Mazut	kg	3	3.31
21	Iron wood 1-2 groups	m3	5,850	
22	Iron wood 3-4 groups	m3	3,500	
23	Iron wood 5-6 groups	m3	3,000	

17.2.1 General

The construction quantities for each facility in the Short-Term Plan are shown in Table 17-2-1. The main construction materials which have been estimated based upon the foregoing preliminary design are listed in Table 17-2-2.

An economical construction plan shall be developed making full use of local equipment. To complete the project within three years, the implementation of the construction and the supply of construction equipment and materials should be carefully planned.

Table 17-2-1 Construction Quantities

Description	Unit	Quantities
1. Berth (B-2 to B-7)		
1.1 Dredging for Foundation	cum	465,000
1.2 Rubble Mound	cum	68,000
1.3 Leveling Rubble Mound	sqm	37,000
1.4 Concrete Caisson	nos	87
1.5 Backfilling	cum	145,000
1.6 Coping and others	L.S	1
2. Access channel/ Turning basin	cum	1,943,000
3. Cua Luc Channel	cum	5,997,000
4. Revetment -1	m	210
5. Revetment -2,-3	m	747
6. Port Office	sqm	3,000
7. Transit Sheds	sqm	42,000
8. C.F.S	sqm	4,400
9. Utilities	L.S	1

Table 17-2-2 Main Materials

Materials	Unit	Berths	Revetment	Yard	Total
Concrete	cum	49,000	18,000	12,000	79,000
Steel Bar	ton	6,245	-	1,200	7,445
Rubble Stone	cum	213,000	100,000	-	313,000
Armor Stone	cum	6,000	3,000	-	9,000
Filling Sand	cum	127,000	-	-	127,000

17.2.2 Preliminary Study on Construction Procedure

The construction method of major works is briefly described below:

(1) Dredging and Reclamation

The required dredging volume for the removal of seabed foundation is estimated to be 506,000 m3. Dredging work will be conducted by a 8 cu m grab dredger with a monthly output of around 35,000 cu m and the dredged material will be dumped into the access channel for temporary stock piling. This material will be dredged together with the access channel dredging materials by 4,000 HP pump dredger with a monthly output of around 230,000 cu m and the material will be dumped into the recalmation behind the backfilling stone of the wharfs.

The balance of reclamation work will be conducted by borrow materials to be obtained from the land borrow area. The top 1.2 m of the land reclamation fill will be sufficiently compacted to provide sufficient bearing capacity for heavy traffic load of cargo handling equipment.

(2) Wharfs

After finishing the dredging work of the foundation, installation of base rubble should begin.

The fablication of concrete caissons should be conducted parallel with dredging works utilizing floating docks, which will be brought from outside Vietnam together with other heavy construction equipment.

After fnishing the dredging work of the foundation, the fabricated caissons should be placed in the posisions.

After that, backfilling, placing of coping concrete and pavement should be carried out.

Finally, a reinforcement concrete pipe piling and a concrete beam will be constructed as the base of the container crane.

For the concrete block revetments, the same procedures should be applied, excepting placing the concrete fablication.

17.2.3 Construction Schedule

Considering the construction schedule, working days and productivity have been set as follows:

(1) Assessment of Working Days

The annual working days for the onshore and off-shore work at the site have been estimated as mentioned in Section 14.4.

(2) Productivity

The targeted productivity of major works in the Project has been compiled as follows:

a.	Dredging Work	
	Grab dredger (8 cu m)	35,000 cu m/month
	Pump dredger (3,000 HP)	230,000 cu m/month
b.	Dumping of rubble and armored stone	1,500 m3/day
c.	Leveling works of rubble mound	9 sq m/day/ gang
d.	Fablication of concrete caisson	39 day/ Caisson
e.	Placing concrete caisson	1 nos/day
f.	Leveling of rubble stone for backfilling	16 sq m/ day/ gang
g.	Fablication of concrete block	15 nos/ 10 days
h.	Installation of concrete block	4 units/day
i.	Reclamation by Borrow Materials	3,000 m3/day

(3) Construction Schedule

The construction schedule of the Project is shown in Fig.17-2-1.

Work Items	Unit	Q'ty
1. Detail Design / Tendering	L.S.	1
2. Mobilization	L.S.	1
3. Dredging Works		
(1) Access channel	cu.m	1,943,000
(2) Cua Luc Channel		5,997,000
4. Wharfs		
(1) Excavation for Foundation	cu.m	465,000
(2) Fablication of Concrete Caissin	nos.	87
(3) Placing Caisson	nos.	87
(4) Rubble Mound & Leveling	sq.m	37,000
(5) Backfilling & Leveling	sq.m	27,000
(6) Coping and Others	L.S.	1
5. Revetments		
(1) Fablication Concrete Blocks	nos.	600
(2) Placing Blocks	nos.	600
(3) Rubble Mound & Leveling	sq.m	10,000
(4) Backfilling & Leveling	sq.m	17,000
(5) Coping and Others	L.S.	1
(6) Reclamation	L.S.	1
6. Pavement (Yard, Inner Roads)	L.S.	1
7. Transit Sheds & C.F.S.	L.S.	1
8. Utilities	L.S.	1
9. Port Office	L.S.	1

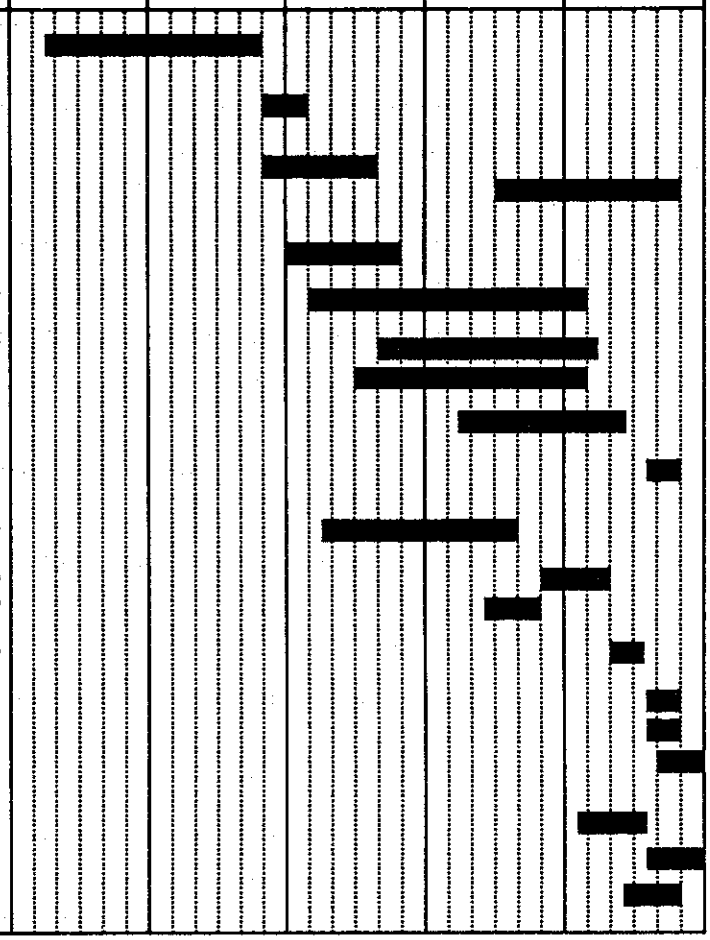

Fig. 17-2-1 Construction Schedule of Main Facilities

17.3 Cost Estimation

17.3.2 Basic Conditions for Cost Estimation

The main conditions for the cost estimation are as follows:

(1) Construction costs have been estimated in principle using the prices and rates obtained in July 1994.

(2) The inflation factor has been excluded from estimation.

(3) The exchange rates of $ U.S. against the Vietnam Don (VON) and the Japanese Yen (JY) are as follows:

$ U. S. 1 = DA 10,953.90 = J Y 100.10

(4) Rents or compensation for land and fishing activities have been excluded from the estimation.

(5) In general, the costs of the foreign portion of the operation include the following.

i) Foreign currency portion of equipment (depreciation cost for imported equipment)
ii) Imported materials and products
iii) Foreign currency portion of indirect cost
iv) Cost of engineering services by foreign consultants

(6) The construction costs of water and electricity supply, drainage and communication facilities are included in the utilities works.

(7) Physical contingency is 5%. Price contingency 3.3 %.

(8) The engineering services fee is 10 %.

17.3.3 Results of Estimation

A summary of the estimation results is presented in Table 17-3-1 and the result for each item is presented in Table 17-3-2. On the basis of the construction schedule shown in Fig. 17-2-1, the yearly disbursement schedule has been estimated as shown in Table 17-3-3. And estimation of cargo handling equipment shown in Table 17-3-4.

Table 17-3-1 Summary of Construction Cost

Unit : US$

Items	TOTAL		
	Foreign	Local	Total
I. CONSTRUCTION			
1. BERTHS			
1.1 Excavation	2,728,851	218,308	2,947,159
1.2 Transport & Dumping	665,265	1,758,157	2,423,422
1.3 Leveling	508,694	292,509	801,203
1.4 Armor Stone for Toe	341,817	493,756	834,773
1.5 Concrete Caisson			
1.5.1 Mobilization F.D	8,545,347	0	8,545,347
1.5.2 Floating Dock	8,934,642	161,750	9,096,392
1.5.3 Scaffolding	494,674	91,516	586,190
1.5.4 Formwork	9,542,211	476,052	10,018,263
1.5.5 Fabrication	2,291,389	444,931	2,736,331
1.5.6 Casting Concrete	133,912	2,757,196	2,891,108
1.5.7 Launching Caiss.	56,634	4,413	61,047
1.5.8 Towing,Setting	1,033,658	47,899	1,081,557
1.5.9 Fulling Sand	791,118	625,303	1,416,420
1.5.10 Cover Con.	99	54,696	54,794
1.5.11 Coping Con.	648	387,075	387,723
1.5.12 Formwork of C.C	6,119	33,431	39,550
1.6 Backfill			
1.6.1 Dumping	981,358	3,998,564	4,959,922
1.6.2 Leveling	236,127	135,778	371,905
1.6.3 Placing Geo.	2,067,847	15,516	2,083,363
1.7 Foundation, Crane			
1.7.1 RC Pile	12,580	41,990	54,570
1.7.2 Con. Foundation	150	89,670	89,820
1.8 Con. Pave.	163,568	377,721	541,289
1.9 Rubber Fenders	1,272,375	0	1,272,375
1.10 Bollards etc.	366,225	1,240	367,465
Sub total	41,209,951	12,452,037	53,661,988
2. DREDGING			
2.1 Acc.Channel,Tur.Bas	11,051,081	225,532	11,276,613
2.2 Cua Luc Channel	14,692,650	299,850	14,992,500
3. YARD PAVEMENT	439,137	1,500,007	1,939,144
4. TRANSIT SHEDS	1,575,000	3,354,969	4,929,969
5. CFS	247,500	527,209	774,709
6. INNER ROADS	375,539	867,217	1,242,756
7. UTILITIES	31,500	73,500	105,000
8. REVETMENTS	3,552,804	4,047,130	7,599,935
9. PORT OFFICE	198,000	462,000	660,000
SUB TOTAL 2	73,373,162	23,809,451	97,182,614
Phis. Contingency	3,736,707	1,122,423	4,859,131
Price Contingency	12,731,727	4,046,689	16,777,916
Tax			
SUB Total 3	91,202,957	27,617,603	118,819,661
II. HANDLING EQUIPMENT	36,793,000	0	36,793,000
III. ADMINISTRATION (Including EIA Monitoring)	500,000	100,000	600,000
IV. ENGINEERING SERVICE	11,500,000	0	11,500,000
GRAND TOTAL	139,995,150	27,704,511	167,712,661
without Contingency	122,540,215	23,535,399	146,075,614
for TRAINING (1 - 5year)	50,000	328,000	378,000
TOTAL	122,590,215	23,863,399	146,453,614

Table 17-3-2 Construction Cost

Item	Wharf	Yard Pavement	Transit Sheds	O.F.S	Inner Roads (width:22m)	Utilities	Access Channel and Turning Basin	Dua Luc Channel (-11m)	Cargo Handling Equipment	Revetments	Port Office
	(L.m)	(sq m)	(sq m)	(sq m)	(L.m)	(L.S)	(cu m)	(cu m)		(L.m)	(sq m)
1. Berth-1	186		7,200		186						
2. Berth-2	160	4,000	5,000		160						
3. Berth-3	185	4,550	5,200		185						
4. Berth-4	210	11,500			210						
5. Berth-5	240	42,200	4,000	4,400	240						
6. Berth-6	240	8,800	9,800		190						
7. Berth-7	260		11,000		250						
8. Cargo Handling Equipment									L.S		
9. Revet-1										210	
10. Revet-2										240	
11. Revet-3										507	
12. Channel/Turning Basin Dredging							1,943,000	5,987,000			
											3,000
13. Port Office											

	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)
1. Berth-1					270,000	575,138			36,659	54,654												
2. Berth-2	4,945,630	1,557,191	2,315	77,738	187,500	399,401			35,334	81,594	2,100	4,900										
3. Berth-3	5,807,806	1,744,847	2,633	88,425	195,000	415,377			40,854	94,343	2,100	4,900										
4. Berth-4	6,747,283	1,924,683	6,654	223,492					46,375	107,092	2,100	4,900										
5. Berth-5	7,614,966	2,289,581	423,601	978,203	150,000	319,521	247,500	527,209	53,000	122,391	21,000	49,000										
6. Berth-6	7,828,676	2,869,462	3,935	132,152	360,000	766,850			41,959	96,893	2,100	4,900										
7. Berth-7	8,133,239	2,198,825			412,500	878,682			121,359	280,248	2,100	4,900										
8. Cargo Handling Equipment																	36,793,000					
9. Revet-1																			1,745,021	2,134,027		
10. Revet-2																			1,219,615	1,502,978		
11. Revet-3																			822,597	677,174		
12. Channel/Turning Basin Dredging													11,051,081	225,532	14,982,650	299,850						
13. Port Office																					198,000	462,000
Total	41,077,599	12,584,389	439,137	1,500,007	1,575,000	3,354,969	247,500	527,209	375,539	887,218	31,500	73,500	11,051,081	225,532	14,982,650	299,850	36,793,000	0	3,787,233	4,314,179	198,000	462,000
		53,661,988		1,939,144		4,929,969		774,709		1,242,756		105,000		11,276,613		14,982,500		36,793,000		8,101,412		660,000
																				Grand Total =		134,477,091

Table 17-3-3 Yearly Disbursement Schedule

Unit : US$

Items	TOTAL			1st YEAR			2nd YEAR			3rd YEAR			4th YEAR			5th YEAR		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
1. CONSTRUCTION																		
1. BERTHS																		
1.1 Excavation	2,728,851	218,308	2,947,159							2,728,851	218,308	2,947,159						
1.2 Transport & Dumping	665,265	1,758,157	2,423,422							332,632	879,079	1,211,711	332,632	879,079	1,211,711			
1.3 Leveling	508,694	292,509	801,203							152,608	87,753	240,361	305,216	175,505	480,722	50,869	29,251	80,120
1.4 Armor Stone for Toe	341,017	493,756	834,773													341,017	493,756	834,773
1.5 Concrete Caisson																		
1.5.1 Mobilization F.D	8,545,347	0	8,545,347							8,545,347	0	8,545,347						
1.5.2 Floating Dock	8,934,642	161,750	9,096,392							3,752,548	67,937	3,820,485	4,467,320	80,876	4,548,196	714,774	12,937	727,711
1.5.3 Scaffolding	494,674	91,516	586,190							207,763	38,437	246,200	247,337	45,758	293,095	39,574	7,321	46,895
1.5.4 Formwork	9,542,211	476,052	10,018,263							4,007,728	199,942	4,207,670	4,771,105	238,026	5,009,131	763,377	38,084	801,461
1.5.5 Fabrication	2,291,399	444,931	2,736,331							962,387	186,871	1,149,259	1,145,700	222,466	1,368,165	183,312	35,594	218,907
1.5.6 Casting Concrete	133,912	2,757,196	2,891,108							56,243	1,158,023	1,214,265	66,956	1,378,598	1,445,554	10,713	220,575	231,289
1.5.7 Launching Caiss.	56,634	4,413	61,047							23,786	1,854	25,640	28,317	2,206	30,523	4,531	353	4,884
1.5.8 Towing,Setting	1,033,658	47,899	1,081,557							217,068	10,059	227,127	651,205	30,176	681,381	165,385	7,664	173,049
1.5.9 Fulling Sand	791,118	625,303	1,416,420							166,135	131,313	297,448	498,404	393,941	892,345	126,579	100,048	226,627
1.5.10 Cover Con.	99	54,696	54,794							21	11,486	11,507	62	34,458	34,520	16	8,752	8,767
1.5.11 Coping Con.	648	387,075	387,723													648	387,075	387,723
1.5.12 Formwork of C.C	6,119	33,431	39,550													6,119	33,431	39,550
1.6 Backfill																		
1.6.1 Dumping	861,358	3,098,564	4,959,922										615,269	2,559,081	3,174,350	346,089	1,439,483	1,785,572
1.6.2 Leveling	236,127	135,778	371,905										151,121	86,898	238,019	85,006	48,880	133,886
1.6.3 Placing Geo.	2,067,847	15,516	2,083,363										1,323,422	9,930	1,333,352	744,425	5,586	750,011
1.7 Foundation, Crane																		
1.7.1 RC Pile	12,580	41,990	54,570										12,580	41,990	54,570			
1.7.2 Con. Foundation	150	89,670	89,820										150	89,670	89,820			
1.8 Con. Pave.	163,568	377,721	541,289													163,568	377,721	541,289
1.9 Rubber Fenders	1,272,375	0	1,272,375													1,272,375	0	1,272,375
1.10 Bollards etc.	366,225	1,240	367,465													366,225	1,240	367,465
Sub total	41,209,951	12,452,037	53,661,988							21,005,851	3,138,328	24,144,179	14,809,245	8,076,209	20,885,455	5,394,855	3,237,499	8,632,354
2. DREDGING																		
2.1 Acc.Channel,Tur.Bas	11,051,081	225,532	11,276,613				2,210,217	45,106	2,255,323	8,840,864	180,426	9,021,290						
2.2 Cua Luc Channel	14,692,850	299,650	14,992,500										5,509,744	112,444	5,622,188	9,182,906	187,406	9,370,313
3. YARD PAVEMENT	439,137	1,500,007	1,939,144													439,137	1,500,007	1,939,144
4. TRANSIT SHEDS	1,575,000	3,354,969	4,929,969													1,575,000	3,354,969	4,929,969
5. CFS	247,500	527,209	774,709													247,500	527,209	774,709
6. INNER ROADS	375,539	867,217	1,242,756													375,539	867,217	1,242,756
7. UTILITIES	31,500	73,500	105,000													31,500	73,500	105,000
8. REVETMENTS	3,552,804	4,047,130	7,599,935							1,243,482	1,416,495	2,659,977	1,243,482	1,416,495	2,659,977	1,065,841	1,214,140	2,279,981
9. PORT OFFICE	198,000	462,000	660,000													198,000	462,000	660,000
SUB TOTAL 2	73,373,162	23,809,451	97,182,614				2,210,217	45,106	2,255,323	31,090,197	4,735,250	35,825,447	21,562,471	7,605,149	29,167,619	18,510,278	11,423,947	29,934,225
Phis. Contingency	3,736,707	1,122,423	4,859,131				110,511	2,255	112,766	1,482,906	309,266	1,791,272	1,067,123	391,258	1,458,381	1,077,068	419,644	1,496,711
Price Contingency	12,731,227	4,046,689	16,777,916				226,112	4,614	230,726	4,110,461	857,774	4,968,235	3,761,720	1,379,229	5,140,949	4,632,935	1,805,072	6,438,007
Tax																		
SUB Total 3	91,202,057	27,617,603	118,819,661				2,546,840	51,975	2,598,815	35,232,566	7,352,368	42,584,954	26,171,286	9,595,663	35,766,949	27,251,345	10,617,598	37,868,943
II. HANDLING EQUIPMENT	36,793,000	0	36,793,000										5,518,950	0	5,518,950	31,274,050	0	31,274,050
III. ADMINISTRATION (Including EIA Monitoring)	500,000	100,000	600,000	500,000	20,000	520,000	0	20,000	20,000	0	20,000	20,000	0	20,000	20,000	0	20,000	20,000
IV. ENGINEERING SERVICE	11,500,000	0	11,500,000	2,500,000	0	2,500,000	3,000,000	0	3,000,000	1,800,000	0	1,800,000	1,800,000	0	1,800,000	2,400,000	0	2,400,000
GRAND TOTAL	139,008,150	28,704,511	167,712,661	3,000,000	20,000	3,020,000	5,546,840	71,975	5,618,815	37,032,566	7,372,368	44,404,954	33,490,236	9,615,663	43,105,899	59,938,488	11,624,506	71,562,993
without Contingency	122,540,215	23,535,399	146,075,614	3,000,000	20,000	3,020,000	5,210,217	65,106	5,275,323	31,440,119	6,205,327	37,645,447	28,661,394	7,845,175	36,506,569	54,228,485	9,399,790	63,628,275
for TRAINING (1 - 5year)	50,000	328,000	378,000	10,000	41,000	51,000	10,000	41,000	51,000	10,000	41,000	51,000	10,000	82,000	92,000	10,000	123,000	133,000
TOTAL	122,590,215	23,863,399	146,453,614	3,010,000	61,000	3,071,000	5,220,217	106,106	5,326,323	31,450,119	6,246,327	37,696,447	28,671,394	7,927,175	36,598,569	54,238,485	9,522,790	63,761,275

Table 17-3-4 Estimation of Cargo Handling Equipment

Equipment	Capacity	Perchase Cost (1,000 US$)	Total Unit	B-1 Bag G.C		B-2 Bag Steel		B-3 Sreel		B-4 Asphalt Drm Coal Bulk Scrap Loose		B-5 Container, G.C		B-6 Bag, Drum, Cement Bulk		B-7 Bulk		Common		Total
				Unit	Cost	Unit	Cost	Unit	Cost	Unit	Cost	Unit	Cost	Unit	Cost	Unit	Cost	Unit	Cost	
1. Shore Crane	40 ton	7,000	2									2	14,000							14,000
2. Level Luffing Crane	40 ton	7,000																		
3. Forklift	2 ton	21	2									2	42							42
	3 ton	30	25	4	120	3	90	3	90	4	120	6	180	5	150					750
	5 ton	46	9	2	92	2	92	2	92			3	138							414
	15 ton	100	1									1	100							100
4. Top Lifter	30.5 ton	600	2									2	1,200							1,200
5. Reach Stacker	30.5 ton	400	4									4	1,600							1,600
6. Side Lifter	4.5 ton	300	1									1	300							300
7. Yard Lifter	(CTR & CFS)	70	11									11	770							770
8. Yard Trailer	(CTR & CFS)	40	16									16	640							640
9. Trailer	28 ton	75	15															15	1,125	1,125
10. Tractor		70	5															5	350	350
11. Shovel Loader	3 cu m	270	2							2	540									540
12. Grab Bucket																				
Grain	8 cu m	14	2													2	28			28
Cement	5 cu m	13	2											2	26					26
Scrap	3 cu m	14	2							2	28									28
13. Two-way Dozer		70	2							1	70					1	70			140
14. Grain Truck(22 cu m)		100	6													6	600			600
15. Movable Hopper		100	4													4	400			400
16. Beltconveyer		500	2													2	1,000			1,000
17. Pallet for one Transit Shed (1.14 nos per sq*15 US$)		54	10	2	108	1.5	81	1.5	81			1.5	81	2	108	2	108			540
18. Mobile Crane		300	4															4	1,200	1,200
19. Service Boat																				
Tug boat	2000 PH	5,000	2															2	10,000	10,000
Service Boat	100 PH	1,000	1															1	1,000	1,000
TOTAL			132	8	320	7	263	7	263	9	758	50	19,051	9	284	17	2,206	27	13,675	36,793

CHAPTER 18 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR SHORT TERM PORT DEVELOPMENT PLAN

18.1 TERMS OF REFERENCE FOR PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED CAI LAN PORT CONSTRUCTION PROJECT.

18.1.1 Introduction

18.1.1.1 Purpose of Terms of Reference (TOR)

The purpose of the TOR is to describe the requirements for the preliminary Environmental Impact Assessment (EIA) for the Feasibility Study to be prepared by the sponsoring agency, Japan International Co-operation Agency (JICA). The EIA will be used by JICA and the Transport Engineering Design Institute of Vietnam (TEDI) to review and evaluate the environmental implications of the proposed project.

This EIA is intended to provide sufficient information for these agencies to understand the effects of the project on the environment. Thus they will be able to identify any environmental constraints and incorporate appropriate measures into the detailed design phase of the project to avoid, remedy, minimize and/or mitigate any negative effects of the development.

This EIA will form one component of the Feasibility Study for the development of Cai Lan Port. The Feasibility Study will address other issues, including the requirements for port development in Vietnam, alternatives for development and an economic analysis. Therefore, this EIA will not address those issues except in summary form.

18.1.1.2 Project to be Assessed

The project to be assessed is the CAI LAN PORT CONSTRUCTION PROJECT.

18.1.1.3 Objectives of EIA

The objective of the preliminary EIA is to provide timely environmental information which can then be incorporated into the Feasibility Study to be completed in December, 1994.

The outcome of the EIA and the recommendations developed within can then be applied at the stage of detailed port design and during implementation of the project (construction and

operation of Cai Lan Port).

18.1.2 Background Information

18.1.2.1 Location of Cai Lan Port

Cai Lan Port is situated in the Bai Chay district of Quang Ninh Province in northern Vietnam. The port is approximately 150 km east of Hanoi City and 50 km east of Hai Phong Port.

The Port is within Bai Chay Bay, an estuary which covers an area of some 33 km^2. The estuary drains via Cua Luc Strait, approximately 2 km east-south-east of the port site. The port is situated on the landward side of a peninsula separating Bai Chay Bay from the coastal waters of Ha Long Bay.

A single berth structure has already been constructed at the site. Some buildings are present in the area of the port.

The immediate vicinity of Cai Lan is sparsely populated. Main centres of population are the Bai Chay area and the town of Hong Gai, which are on either side of Cua Luc Strait, the tourist center and associated population in the area lining Ha Long Bay, and the Gieng Day area which is approximately 3 km west of Cai Lan.

18.1.2.2 Proposed Port Development

The port development will involve activities associated with port construction and port operation.

During the construction phase, activities are likely to include:

- Reclamation along the shoreline.
- Earthworks to supply fill for the reclamation, and to prepare the cargo handling and storage areas.
- Construction of quaywalls, revetments and parapets.
- Dredging of the channel adjacent to the port.
- Construction of onshore facilities including offices, warehouses and utility areas, roads and railways.

Once the port is operational, activities are likely to include:

- Transportation of personnel and cargo to and around the port site.
- Activities associated with the handling and disposal of liquid and solid wastes and any hazardous materials.
- Activities associated with shipping movement through Ha Long Bay, Cua Luc channel and Bai Chay Bay.

18.1.2.3 Scale of Development

By the year 2000, Cai Lan Port is expected to comprise 7 berths. Between 2000 and 2010, further development is expected to increase the size of the port.

18.1.2.4 Previous Investigations

An Initial Environment Evaluation (IEE) was carried out at the inception of the project by JICA. This provided a breakdown of factors which could be affected by the development. Factors were ranked according to the level of impact expected on each, according to JICA's guideline for environmental consideration. The results of the IEE have been incorporated into the EIA study.

18.1.3 Study Area

It is important to ensure that the EIA is properly focussed onto the key areas which may be affected by different components of the port development project.

Different components of port development have the potential to affect the environment at varying geographical scales. These range from the local area of Cai Lan itself, at the smallest scale, to the broader extent of Bai Chay Bay, and in the largest context, to Ha Long Bay and Ha Long City.

The key components of the development project and the focus of assessment for each of these is as follows:

1. Construction Phase	- Effects on the local Cai Lan area. - Effects on Bai Chay Bay. - Effects on any dredging disposal areas.
2. Port Operation Phase	
Land-based	- Effects on the local Cai Lan area. - Effects on Bai Chay Bay.
Shipping activities	- Effects on the local Cai Lan area. - Effects on Bai Chay Bay. - Effects on Ha Long Bay (particularly/water quality and shipping traffic effects).

18.1.4 Scope of Work

The EIA will focus on port development up until the year 2000.

The time frame for collection and analysis of data and to prepare the EIA is limited. The level of information supplied in the EIA and the methods of assessment will reflect those limitations.

The EIA will be carried out as a preliminary assessment by environmental specialists, based on information supplied by the Vietnamese counterpart organizations Institute of Ecological Economy (EcoEco) and Transport and Engineering Design Institute (TEDI). The information supplied will include the following:

- Water quality surveys to be carried out in Bai Chay Bay and Ha Long Bay as per a contract between JICA and EcoEco.
- A sediment quality survey to be carried out in Bai Chay Bay and Ha Long Bay as per the above contract.
- Information about the physical, biological and social environment collected by EcoEco, under the terms of the same contract.

Additional information will be gathered by the environmental specialists during field visits to the study area.

Another factor of importance to this project is the likelihood of further development in the Ha Long City and Bai Chay Bay areas. This may include further port development and industrial development. While the EIA will focus mainly on the effects of port development to the year 2000, a discussion of the port development in the context of likely future development will be included in the EIA document. This will form only a small component of the total EIA document.

18.1.5 Tasks to be Carried out in EIA

18.1.5.1 Description of the Proposed Project

This will describe relevant components of the port development project, incorporating maps at an appropriate scale where relevant. The following information will be included:

- Location of the proposed port and the scale of development.
- Dredging required.
- Earthworks and reclamation.
- Facilities to be built onshore.
- Water resources required and proposed sources.
- Stormwater generation and disposal.
- Products to be stored and shipped.
- Hazardous substances to be stored and shipped.
- Solid and liquid waste generation and management.
- Traffic volumes predicted, and proposed routes (land and sea).
- Implementation plan and timing of development.
- Dust suppression measures to be employed.
- Hours of operation.
- Likely employment requirements for local workforce.

As noted in section 12.4, the EIA will focus on activities which will occur up until 2000.

18.1.5.2 Description of the Existing Environment

This will include information about the following:

1. Physical Resources

- Seabed topography and sediments.
- Oceanographic conditions (tides, waves, currents).
- Seawater quality and sediment quality.
- Meteorological conditions (temperature, wind, rainfall, fog, storm events).
- Seismicity.

2. Natural Resources

- Marine (plankton, benthic organisms, shrimp, squid, other economic species, spawning grounds, algae of economic importance, seabirds).
- Coastal (physical features, river influx and sedimentation regimes, biota, mangrove ecosystem and resources, coastal use for fisheries and recreation, shoreline types and sediments, aquaculture).
- Terrestrial (flora and fauna, landscape values, topography).

3. Social Environment

- Socio-cultural (population size density, distribution and demography, social structure organization, cultural and religious areas of importance).

- Socio economic (economic activities such as fishing, industry, farming, tourism, aquaculture, other land use, living standards, transportation network.

4. Wastes

- Liquid, solid and hazardous waste handling and disposal systems.

5. Disaster and Risk

- History of natural disasters and accidents.
- Storage of hazardous materials.
- Location of fuel depots, pipelines, transmission lines.
- Oil spill history and existing contingency measures.

18.1.5.3 Legislative and Regulatory Considerations

This will describe the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species.

The national law governing environmental matters is the newly enacted "Environment Protection Law" (1994) of Vietnam.

18.1.5.4 Determination of the Potential Effects of the Proposed Port

For each component of the project, the EIA report will identify significant positive and negative impacts, and immediate and long-term impacts.

18.1.5.5 Remediation and Mitigation Measures

The EIA will outline methods which should be incorporated at the design stage of port development to avoid, remedy, minimize and/or mitigate any negative environmental impacts of the project.

Recommendations will be made for management plans which may be required to implement the mitigation and remediation measures outlined.

Recommendations for further study will be made as necessary.

18.1.5.6 Monitoring Plan

Monitoring will be required to measure the success of any mitigation measures recommended in the EIA and to assess effects of the project on the environment. A monitoring plan will be recommended within the context of the EIA. If necessary recommendations may be made to include the design of a monitoring program in management plans to be provided at the stage of detailed design.

18.1.6 EIA Document

The EIA document will be presented under the following broad section headings. These may change somewhat as information about the project becomes available:

- Introduction.
- Development activities involved in the port project.
- Description of the physical and biological environment.
- Potential effects of development on the physical and biological environment.
- Description of the social environment.
- Potential effects of development on the social environment.
- Mitigation.
- Monitoring proposed.
- Summary.

18.2 SUMMARY OF ENVIRONMENTAL EFFECTS

The Cai Lan Port Construction Project should be allowed to proceed provided that measures are adopted to minimise and mitigate some of the effects and that stringent management plans are devised and implemented prior to the construction and operation phases of the project. Preparation of Management Plans should be an integral part of the detailed design phase for the port.

18.2.1 Introduction

The environmental impact assessment (EIA) presents the likely effects of Cai Lan Port Construction Project on the human and physical / biological environments (Chapters 4 and 7). Chapter 6 of the EIA deals specifically with the mangrove ecosystem and the possible effects on it if the environment is not wisely managed. Methods for mitigating all of the effects which could be considered negative are presented in Chapter 8 of the EIA, along with suggested management methods for implementing such mitigation.

A summary of the effects of constructing Cai Lan Port (to 2000) and the mitigation required in order that the environmental effects can be minimised or avoided are presented in this section.

The far right column of Table 18-2-1 shows the net effects of port construction and operation to 2,000 following mitigation. This shows that all of the physical and biological effects can be successfully managed.

Table 18-2-1 provides an evaluation of the key impacts of the project, and the net effects provided that mitigation works are implemented effectively. Table 18-2-2 gives an overall summary of the long-term effects after mitigation.

Effects on the human environment which require further consideration are the effects of removing or relocating the shoreline pagoda (the final effect will depend on the success of negotiation with local people and on reaching agreement as to the relocation and / or protection measures).

Table 18-2-1 Impact evaluation matrix of direct impacts

Project activity in port construction	Phase of project (1)	Factor affected	Degree of impact on human (H) or natural (N) environment	Duration of impact	Methods that can be used to minimize or mitigate impacts	"Success" of mitigation or minimisation of impacts	Degree of long term impact after mitigation
Reclamation	C	Water quality	high (N)	short	Sediment containment	high	low
		Landscape	high (N&H)	long	Enhancement	medium	medium
		Access to shoreline	low (H)	long	Not needed	-	low
		Ecology (mangroves)	low (N)	long	Not needed	-	low
		Noise and dust in Cai Lan	low (H)	short	Not needed	-	low
		Noise and dust at houses below Route 18	high (H)	short	Regulation & controls needed	medium	low
Excavation (on land)	C	Pagoda	high (H)	long	Relocation	high	low
		Water quality	high (N)	short	Sediment containment	high	low
		Terrestrial ecology	low (N)	short	Not needed	-	low
		Surface hydrology	low (N)	long	Not needed	-	low
		Landscape	medium (N&H)	long	Enhancement	medium	medium
		Noise and dust in Cai Lan	low (H)	short	Not needed	-	low
		Noise and dust at houses below Route 18	high (H)	short	Regulations & controls needed	medium	low
Dredging (sea)	C&O	Water quality	high (N)	short	Sediment containment	medium	low
		Sea floor fauna	low (N)	short	Not needed	-	low
		Current dynamics	low (N)	long	Not needed	-	low

Note: (1) (Phase) C = Port construction phase O = Port operation phase.

Table 18-2-1 cont.

Project activity in port construction	Phase of project (1)	Factor affected	Degree of impact on human (H) or natural (N) environment	Duration of impact	Methods that can be used to minimize or mitigate impacts	"Success" of mitigation or minimisation of impacts	Degree of long term impact after mitigation
Cargo storage and handling	O	Water quality	high (N)	long	Site runoff containment	high	low
		Noise and dust in Cai Lan	low (H)	long	Regulation and controls	medium	low
		Noise and dust for houses below Route 18	high (H)	long	Regulation and controls; consultation re. relocation	medium	high
Manpower	C&O	Social impact on existing population	high (H)	long	Provide services; Positive impact of economic growth and employment	medium	medium
Use of road through Cai Lan until new road constructed	C&O	Dust and noise in Cai Lan	high (H)	short	Dust suppression	medium	low
	C&O	Traffic increase (increased risk of accident)	medium (H)	short	Traffic control	high	low
Construction and use of new road and railway	C&O	Dust and noise on houses below Route 18	high (H)	long	Dust suppression, noise regulation, consultation with residents re. relocation	medium	medium
	C	Water quality (rainfall runoff)	medium (N)	short	Runoff control	high	low
Shipping - use of harbour	O	Traffic and risks increase	medium (H)	long	Traffic management	high	low
	O	Water quality	high (N)	long	Regulation and controls	high	low
Shipping - discharges of ballast water, oily wastes	O	Water quality	high (N)	long	Regulation and controls	high	low
Waste management (sewage and solid waste)	C&O	Water quality	high (N)	long	Treatment of storm water, sewage and solid waste	high	low
	C&O	Odour	low (H)	long	"	low	low

Note: (1) (Phase) C = Port construction phase O = Port operation phase.

Table 18-2-2 Summary of long term effects if mitigation is successfully undertaken

	Long-term Effect on Environment after Mitigation													
Project activity	Natural environment						Human environment							
	Water quality	Terrestrial ecology	Inter tidal ecology (mangrove)	Sea floor fauna	Marine hydrology	Terrestrial hydrology	Population impacts	Landscape	Noise & dust (Cai Lan)	Noise & dust (below route 18)	Traffic risks	Loss of access to marine resources	Loss of pagoda	Odour
Construction Phase														
Reclamation	L	-	L	-	L	-	-	M	L	L	-	L	-	-
Excavation (on land)	L	L	-	-	-	L	-	M	L	L	-	-	L	-
Dredging	L	-	-	L	L	-	-	-	L	-	-	-	-	-
Use of road through Cai Lan	-	-	-	-	-	-	-	-	L	-	L	-	-	-
Construction of new road & rail	L	L	L	-	L	L	-	M	L	M	-	L	-	-
Manpower	-	-	-	-	-	-	M	-	-	-	-	-	-	-
Operation Phase														
Maintenance dredging	L	-	-	L	L	-	-	-	-	-	-	-	-	-
Use of new road & rail	-	-	-	-	-	-	-	-	L	M	-	-	-	-
Cargo storage & handling	-	-	-	-	-	-	-	-	L	H	-	-	-	-
Shipping - use of harbour	L	-	-	-	-	-	-	-	-	-	L	L	-	-
Shipping - discharge of wastes	L	-	L	L	-	-	-	-	-	-	-	-	-	-
Manpower	-	-	-	-	-	-	M	-	-	-	-	-	-	-
On-land waste management	L	-	L	L	-	-	-	-	-	-	-	-	-	L

Note: H = level of impact high M = level of impact medium L = level of impact low - = no impact expected

With regard to the residents living on the hillside below Route 18 and along the Cai Lan Estuary (a total of around 15 houses) the noise, dust and landscape effects of both the construction and operation of the port and road may be difficult to manage. Despite the fact that there may be no requirement for the houses to be removed, the residents may prefer to be relocated as the quality of their rural existence may be considerably diminished. However, they may consider that the benefits of living near to the port, in terms of possible economic opportunities, outweighs the negative effects. This can only be determined via consultation with the people affected.

18.2.2 Broader Issues

Table 16-2-1 focuses on the direct / immediate effects of the construction and operation phases. However there are broader issues to consider, which may be potentially affected by the port construction. The key issues are the overall potential effects of the development on water quality in Bai Chay Bay and the possible flow-on effects to the mangrove ecosystem and to tourism in Ha Long City. Clearly, water quality is of prime importance in designing management plans for the future. The effects of the port construction and these key issues are summarized below.

18.2.2.1 Bai Chay Bay Estuarine Environment

Cai Lan Port is located on the southern side of the estuary, next to a deep channel. It is distant from the mouths of the rivers that flow into the estuary. In the nature of estuaries, sediment-laden waters enter via rivers and streams and as the flow rate slows, sediment is deposited on the sea floor. The large expanses of mudflats around the northern shoreline of the estuary and the relatively smaller extent of mudflats on the southern shores, for example, around Cai Lan, indicate that the sedimentation rate near Cai Lan is relatively low.

Mangroves grow most readily where sediments accumulate and they are thus most widely present on the northern mudflats. But on the southern shoreline, mangroves are present only in the mouths of small streams and estuaries and as a sparse band along the rocky shoreline. The nearest large expanse of mangroves is some 1.8 km from Cai Lan.

During construction and operation of Cai Lan Port there could be a short term input of additional sediment during dredging and during port construction. However, if proper management methods are used as recommended in this EIA, it is unlikely that this will change the sediment budget of the bay sufficiently to increase the sedimentation rate in the mangrove forests along the northern shoreline. Similarly, the turbidity of the waters should be unaffected. More serious

effects on the continued health of the mangroves may come from continued cutting of firewood, grazing, unplanned reclamation and other activities upstream in the Bai Chay Catchment.

The small areas of mangrove on the Cai Lan Shoreline are of relatively minor ecological value in terms of their contribution to the overall ecological status of Bai Chay Bay. Their removal is not expected to affect the biodiversity or viability of the ecosystem.

The input of pollutants from ships and from the port area itself have also been considered in this document. It is important that careful management be employed to minimise such effluents to the greatest degree possible. It must be noted that existing sources of pollutant such as B-12 oil port may already be affecting water quality in Cua Luc Strait. Minimisation methods applied to vessels entering Bai Chay Bay on route to Cai Lan Port should also be applied to oil tankers. Sewage from residential areas is also having an effect on inshore waters.

18.2.2.2 Ha Long Bay Marine Environment

Dredging will be required along the Cua Luc - Hon Mot Channel and within Bai Chay Bay. No information is available as to the planned locations for disposal of dredged sediments. Experience elsewhere in the world has indicated that sediment disposal can affect water quality in the area surrounding a disposal site and this can have flow-on effects for the marine fauna. It will be important to ensure that the Ha Long Bay environment is not affected, and a long-term plan to control any such effects will be needed.

18.2.2.3 The Tourist Industry

Concerns about the effect of port construction on the tourist industry include the potential effects if Bai Chay Bay water quality were to become degraded, the effects of increased shipping in Ha Long Bay on tourist traffic, and a possible change in the character of the area.

As noted in section 9.2.1 above, provided management methods are implemented at the outset of port development and applied to all other industries which may establish around Bai Chay Bay in the future (refer Chapter 10) the water quality in Bai Chay Bay will remain in a state fit for aquaculture, fishing, and contact recreation.

The port itself is well removed from the main tourist area. Indeed, road traffic to Cai Lan will pass via a separate route to traffic going to the tourist area and ferry. Increases in population due to the port development may be felt in Cai Lan and also in Bay Chay. However, this is likely

to provide further stimulus to the local economy. Population increases both in permanent residents and the number of tourists will mean that together they will exert pressure for better services and facilities. As facilities develop to meet these requirements, some economy of scale may be evident and this can be seen as a likely positive effect for the local people. There may be some additional positive benefits to the tourist industry if passenger ships are attracted to the area by the improved facilities.

A further possible issue raised in connection with effects of the port on tourism, relates to a change in the nature of the Bai Chay - Hon Gai area. However, Hon Gai is already a busy port and the nautical flavour of this whole area is part of its charm. Thus while the number of ships passing through Cua Luc Strait will increase as Cai Lan Port is constructed, it can hardly be said that this will change the character of the area. Tourists in Ha Long Bay focus outward to the beauty of the islands and the perception of this will be unchanged.

A further point is that many large cities world-wide maintain flourishing ports and industries as well as a thriving tourist industry. Indeed the waterfront areas of many cities are becoming an increasing focus of tourism developments as people are attracted to the life and colour of the seafront. Promenades and restaurants can link the working areas of such ports with the more conventional tourist areas.

18.2.3 Benefits of Planning and Management

The benefits of careful forward planning of all constituents of the Cai Lan Port Construction Project have been emphasised in this assessment. The use of Management Plans to specify mitigation methods for all aspects of construction and operation are a key to this development's proceeding with the minimum possible environmental effect. These plans should be prepared during the detailed design phase of the project, prior to work beginning at the port.

It is also important to ensure that similar planning applies to the overall development of Ha Long City in future. Chapter 9 outlines the future developments which are known to be under consideration at present, and outlines a suggested approach for planning.

CHAPTER 19 ECONOMIC ANALYSIS

19.1 General

In this chapter, an economic evaluation is conducted for the short-term development plan and related industrial factories from the view point of the Vietnamese economy. Economic effects of the port project are evaluated by the value amounts of values added which can be imputed to Cai Lan port. Added value generated by port can be classified into two categories. The first category is generated by the investment cost of Cai Lan port. The second one is caused by the industrial factories which depend upon seaborne cargoes in Cai Lan port.

Then the economic feasibility of short term port development plan is appraised by the economic internal rate of return (EIRR) based on a cost-benefit analysis. The following flow chart shows the economic analysis procedure.

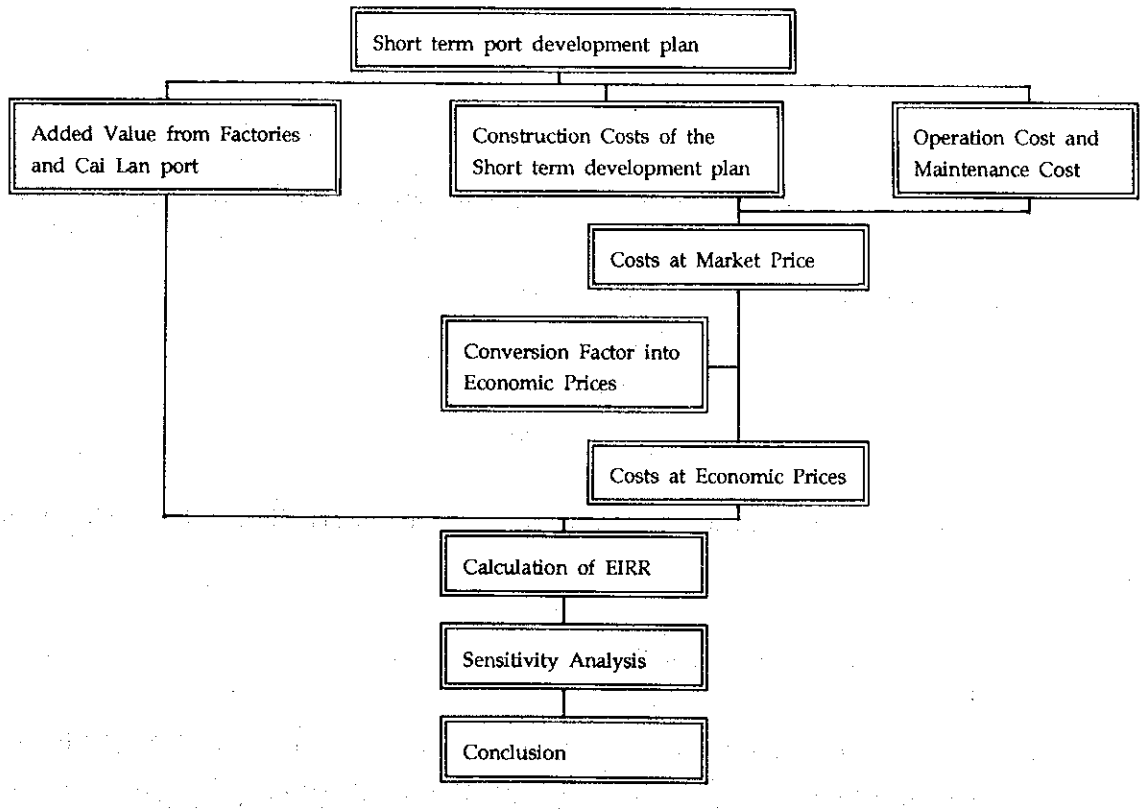

Figure 19-1-1 The Procedure of the Economic Analysis

19.2 Premise of Economic Analysis

19.2.1 Base Year

The "Base Year" here means the starting year of the economic analysis. Construction at Cai Lan port is expected to begin in 1996, which is set as the "Base Year" for this Study.

19.2.2 Project Life

Consideration that the depreciation period of civil engineering structures is around 30 years in Viet Nam, the project life in the economic analysis is assumed to be 36 years including the five-year of the construction period.

19.2.3 Foreign exchange rate

The exchange rate adopted for the economic analysis is US$1.00 = VND 10,953.90 (as of 4th August, 1994), that is, the same rate as used in the cost estimation.

19.3 Benefit

The following benefits are considered to be generated from the Short-Term Plan in Cai Lan port.

(1) Value added by direct income from Cai Lan port
(2) Value added related from industrial factories
(3) Promotion of regional economic development
(4) Increase in employment opportunities and incomes

Among the above benefit items, (1) and (2) are evaluated monetarily as added value from the Cai Lan port projects.

(1) Value added by direct income from Cai Lan port

According to the port management and operation plan in Cai Lan port (Part 2 Chapter 17), income generated from port operations will reach US$14,1790,000 per year after 2000.

(2) Value added from industrial factories

The type and size of the industries having high possibility of being located around Cai Lan port in the year 2000 are shown in Table 14-3-1. Value added per unit weigh of produced commodity of each factory is multiplied by the production scale. And based on interviews with government agencies concerned each added value is estimated as Table 19-3-1. However, it should be necessary for each industry; in this report the procedure has been rather simplitied.

Table 19-3-1 Value Added by New Industries

Kind of Industry	Investment Mill. US$	Production	Vol./Year 1,000 tons	US$/ton	Amount Mill. US$	Material	Vol./Year 1,000 tons	US$/ton	Amount Mill. US$	Values Added Mill. US$
Wheat Meal Factory	5	Wheat Flour	192	350	67	Wheat	240	170	41	26
Steel Billet Factory	100	Steel Billet	500	260	130	Scrap	600	160	96	34
Cement Factory	240	Cement	1,400	70	98	Gypsum	4	29	0.1	98
Fertilizer Factory	90	Fertilizer	74	300	22	NH3	33	300	10	
						H2S04	56	90	5	
						Apatite	200	10	2	
		Sub-Total					289		17	5
Total	435		2,166		317		844		137	158

After estimating value added from factories to Cai Lan port project, the share of Cai Lan port project investment in total investment of Cai Lan Port project, road construction of about 40km long connecting four factories and four factories is calculated.

(3) Promotion of regional economic development

Cai Lan port project is one of the important infrastructures to promote regional economic development. Fig. 19-3-1 depicts the impact to the socio-economy under the regional development plan.

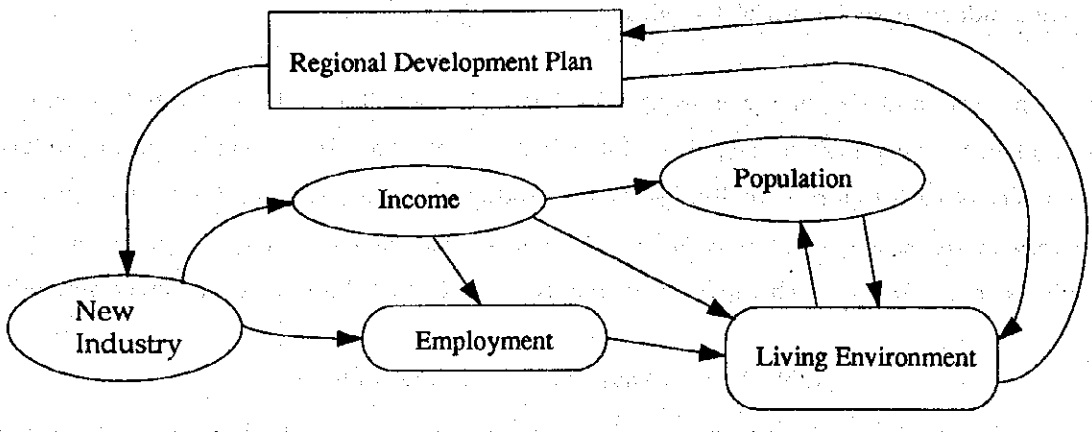

Figure 19-3-1 Socio-economic Effects under the Regional Development Plan

(4) Increase in employment opportunities

Construction works at Cai Lan port and the subsequent port operation will generate an increase in employment opportunities for both construction and port workers.

According to the cost estimation, total labor force of approx. 384 thousand man-days will be required for construction work. Further, operational labors of 580 workers/day will be employed at Cai Lan port after 2000 according to Chapter 20 described here under.

On the other hand, workers for four factories is estimated at about 2000 per day based on interviews with relevant government agencies. This can be also considered as one of the economic benefits of the projects.

19.4 Economic Price

19.4.1 Methodology for conversion of economic prices

For the economic analysis, prices are expressed in economic prices rather then prices based on the border price concept. There are various methods to convert the market prices into economic prices. Here, the economic prices are calculated by eliminating transfer items, such as taxes, subsidies, custom duties and so on. Following chart is conversion of economic prices from cost.

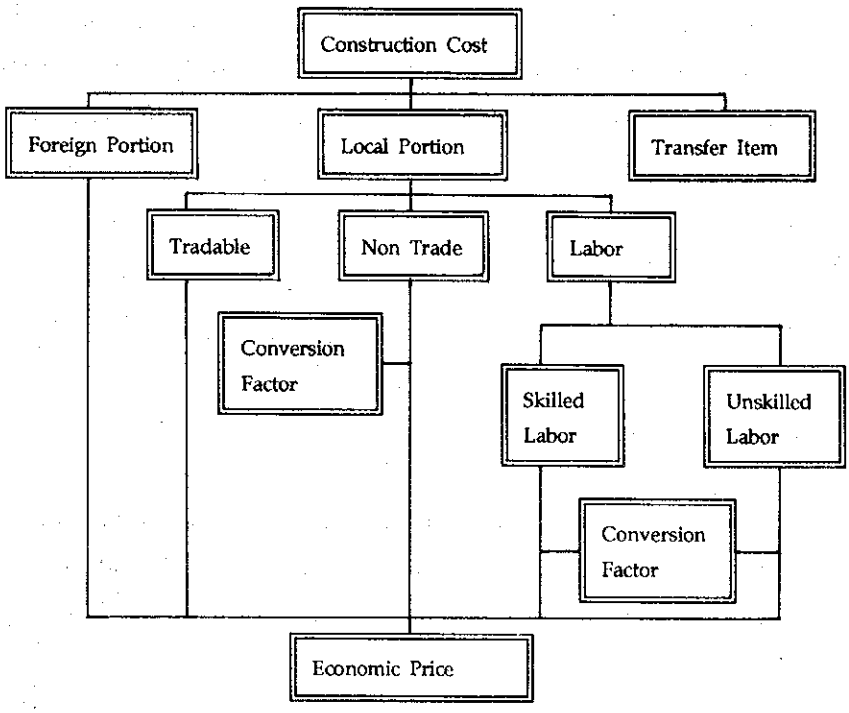

Figure 19-4-1 Conversion procedure of Economic Price

In general, all the costs and benefits are divided into three categories; traded goods and non-traded good and Labor. Labor is further divided into skilled labor and unskilled labor. The cost of skilled labor is obtained by multiplying its market price by the Conversion Factor for Consumption (CFC), and the cost of unskilled labor is calculated by multiplying its market price by a rate of the Shadow Wage Rate and the CFC. Traded goods are expressed by the C.I.F. value for imports and by the F.O.B. for exports. As for non-traded goods, the economic price is calculated by multiplying the Standard Conversion Factor(SCF).

19.4.2 Elimination of transfer items

Taxes, construction interest, subsides, etc., are not direct costs (consumption of resources) originating from the investment when viewed from the standpoint of state finances; they simply represent money transfers and thus are eliminated from cost and benefit.

Taxes levied in this country include turnover tax import/export tax, natural resource tax and others, comprising several tax rates which differ depending on construction material and construction-related transactions.

In order to convert to economic prices, 10% is withdrawn from material and service excluding personnel cost in the domestic currency part of construction cost, and 4% transaction tax is withdrawn from maintenance/repair cost and operating costs in management/operation cost as transfer items respectively.

19.4.3 Applying Conversion Factors

Conversion factors for goods and labor are determined as follows:

(1) Standard Conversion Factor (SCF)

The standard conversion factor is used to determine the economic prices of certain goods which cannot be directly revalued at border prices. These goods include most non-tradable goods and services. The standard conversion factor is expressed by the following equation:

$$SCF = \frac{X + M}{(X - Tx) + (M + Tm)}$$

Where, X : Value of exports
M : Value of imports
Tx : Value of taxes on exports
Tm : Value of taxes on imports

Standard conversion factors for the last two years for which data are available (1991,1992) are shown in Table. In this study, the average standard conversion factor over the two years, 0.997, is adopted.

Table 19-4-1 Standard Conversion Factor

Unit: Million $

Year	Total Import Value(CIF)	Total Export Value(FOB)	Total Import Tax	Total Export Tax	SCF in Each Year
1989	2,565.8	1,946.0	68.1	24.7	0.990
1990	2,752.4	2,404.0	81.8	39.7	0.992
1991	2,338.1	2,087.1	67.3	48.3	0.996
1992	2,558.0	2,571.0	175.2	170.4	0.999
Average					0.994

(2) Conversion Factor for Consumption

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

However in this case, it is difficult to directly calculate the CFC due to the shortage of necessary data such as import/export value and taxes on the consumption goods.

Therefore in this study the conversion factor for consumption goods is estimated by using statistics of foreign trade and Duties of Foreign Trade.

CFC of 0.985 is adopted.

Table 19-4-2 Reference for CFC

Unit:Million $

Item	1989	1990	1991	1992
Export				
Goods	571.3	635.8	300.1	350
Agriculture	742.4	783.2	638.0	1278
Forecast	86.7	126.5	175.5	132
Aqua	188.2	239.1	285.4	306
Total Tax	10.6	15.0	20.4	29.5
Total Vol.	1,588.6	1,784.6	1,399.0	2,066.0
Import				
Machine	172.5	179.4	119.6	250
Instrument	178.3	134.5	71.0	120
Material	1,377.2	1,589.6	1,530.7	1543
Goods	328.4	409.8	325.2	413
Total Tax	63.0	77.4	64.1	106.8
Total Vol.	2,056.4	2,313.3	2,046.5	2,326.0
C.F.C	0.986	0.985	0.987	0.983

(4) Conversion Factor for Labor

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

a. Conversion for Skilled Labor

The opportunity cost of skilled labor costs is assumed to be equal to the actual

wage rate, since the number of skilled laborers is limited and the market mechanism is functioning properly.

However, since these are domestic prices, they should be converted to border prices. Wages can be measured in terms of their purchasing power of consumer goods.

Therefore, the cost of skilled labor is calculated by multiplying the actual wage rate by the CFC; "the Conversion Factor of Skilled Labor," which is obtained as follows.

$$\text{Conversion Factor Skilled Labor} = \frac{\text{Skilled Labor Opportunity Cost}}{\text{Skilled Labor Wages}} \times \text{CFC}$$

$$= 1.0 \times 0.985$$

$$= 0.985$$

b. Conversion Factor for Unskilled Labor

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

When the project is conducted, the inflow of unskilled labor to the project is mainly from the agricultural sector which is relatively elastic in its use of labor. Therefore, it is often assumed that the opportunity cost of unskilled labor is equal to the per capita income of the agricultural sector. According to the agricultural statistics 1994, per capita income of the agriculture sector in 1992 is shown in the Table 19-4-3.

Table 19-4-3 Per Capita Income of Agriculture Sector

Labor Force of Agriculture Sector	22,998.3(Thous.per.)
National Income of Agriculture Sector	30,233 (Bill. Dong)
Per Capita Income of Agriculture Sector	58 (U.S Dollar)

The average wage of an unskilled laborer was $300/year. Thus, the conversion factor for unskilled labor is obtained using the following formula.

$$\text{Conversion Factor Unskilled Labor} = \frac{\text{Unskilled Labor Opportunity Cost}}{\text{Unskilled Labor Wages}} \times \text{CFC}$$

$$= \frac{\text{Per Capita of Agricultural Sector}}{\text{Unskilled Labor Wages}} \times \text{CFC}$$

$$= 0.193$$

19.4.4 Economic Price of Cost and Benefit

Economic prices used in the cost/benefit analysis were obtained by applying the above and various conversion factors.

(1) Investment Cost

In the economic analysis, investment costs must be divided into the foreign currency portion and the local currency portion. Moreover, the local currency portion can be divided into tradable goods, non-tradable goods, skilled labor and unskilled labor. Since the foreign currency portion is shown in CIF prices, there is no need for conversion into economic prices. The labor costs(skilled and unskilled) should be converted into economic prices by using the conversion factors. Table 19-4-4 shows the economic prices of the investment costs including investment schedule.

Table 19-4-4 Investment Cost in Economic Prices

Unit : US$ 1,000

Work	Investment Costs in Market Prices	Foreign Portion	Local Portion					Overall Conversion Factor	Investment Costs in Economic Prices
			Tradable Goods	Non-traded Goods	Skilled Labor	Unskilled Labor	Transfer Item		
		1.000	1.000	0.884	0.985	0.193			
1st Year									
Administration,EIA Monitoring	520	96.2%	0.0%	0.0%	3.8%	0.0%	0.0%	99.8%	520
Engineering Service	2,500	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	2,500
for Training	51	19.6%	0.0%	0.0%	80.4%	0.0%	0.0%	98.8%	50
Total	3,071							100.0%	3,070
2nd Year									
Dredging	2,255	99.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	2,251
Contingency	113	99.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	113
Administration,EIA Monitoring	20	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	98.5%	20
Engineering Service	3,000	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	3,000
for Training	51	19.6%	0.0%	0.0%	80.4%	0.0%	0.0%	98.8%	50
Total	5,439							99.9%	5,434
3rd Year									
Berths	24,144	97.0%	0.4%	0.8%	1.7%	1.1%	1.0%	98.0%	23,672
Dredging	9,021	99.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	9,005
Revetments	2,660	46.8%	1.6%	36.2%	6.7%	4.5%	4.2%	91.9%	2,443
Contingency	1,791	98.8%	0.4%	0.9%	1.8%	0.2%	0.0%	98.0%	1,756
Administration,EIA Monitoring	20	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	98.5%	20
Engineering Service	1,800	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	1,800
for Training	51	19.6%	0.0%	0.0%	80.4%	0.0%	0.0%	98.8%	50
Total	39,487							98.1%	38,745
4th Year									
Berths	20,885	70.9%	0.9%	21.7%	2.3%	1.7%	2.5%	96.0%	20,044
Dredging	5,622	99.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	5,612
Revetments	2,660	46.8%	1.7%	39.7%	4.4%	2.8%	4.6%	92.7%	2,467
Contingency	1,458	73.9%	0.9%	19.2%	2.2%	0.3%	0.6%	96.4%	1,406
Handling Equipment	5,519	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	5,519
Administration,EIA Monitoring	20	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	98.5%	20
Engineering Service	1,800	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	1,800
for Training	92	10.9%	0.0%	0.0%	89.1%	0.0%	0.0%	98.7%	91
Total	38,056							97.1%	36,958
5th Year									
Berths	8,632	82.5%	1.0%	30.2%	1.5%	1.3%	3.5%	95.3%	8,226
Dredging	9,370	99.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	9,353
Yard Pavement	1,939	22.6%	0.0%	65.5%	2.4%	2.1%	7.3%	90.6%	1,757
Transit Sheds	4,930	32.0%	6.1%	36.7%	6.1%	14.3%	4.8%	83.4%	4,112
C.F.S	774	31.9%	6.2%	36.7%	6.1%	14.3%	4.8%	83.4%	645
Inner Roads	1,243	30.2%	0.0%	60.0%	1.6%	1.5%	6.7%	91.7%	1,140
Utilities	104	29.8%	6.1%	38.1%	20.6%	0.6%	4.9%	94.0%	98
Revetments	2,280	46.8%	1.4%	42.8%	2.4%	1.6%	4.9%	93.5%	2,132
Port Office	660	30.0%	6.3%	37.8%	6.3%	14.7%	4.9%	82.9%	547
Contingency	1,497	61.8%	1.7%	26.9%	2.4%	0.7%	0.0%	93.6%	1,401
Handling Equipment	31,274	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	31,274
Administration,EIA Monitoring	20	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	98.5%	20
Engineering Service	2,400	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	2,400
for Training	133	7.5%	0.0%	0.0%	92.5%	0.0%	0.0%	98.6%	131
Total	65,257							96.9%	63,235
Total									
Berths	53,661	76.8%	0.7%	17.4%	1.8%	1.3%	2.0%	96.8%	51,940
Dredging	26,268	98.0%	0.1%	1.0%	0.7%	0.1%	0.1%	99.8%	26,220
Yard Pavement	1,939	22.6%	0.0%	65.5%	2.4%	2.1%	7.3%	90.6%	1,757
Transit Sheds	4,930	32.0%	6.1%	36.7%	6.1%	14.3%	4.8%	83.4%	4,112
C.F.S	775	31.9%	6.2%	36.7%	6.1%	14.3%	4.8%	83.3%	645
Inner Roads	1,243	30.2%	0.0%	60.0%	1.6%	1.5%	6.7%	91.8%	1,141
Utilities	195	29.8%	6.1%	38.1%	20.6%	0.6%	4.9%	93.2%	98
Revetments	7,000	46.8%	1.6%	39.4%	4.6%	3.1%	4.6%	92.7%	7,043
Port Office	660	30.0%	6.3%	37.8%	6.3%	14.7%	4.9%	82.9%	547
Contingency	4,850	75.4%	0.9%	17.5%	2.1%	0.4%	0.0%	96.2%	4,675
Handling Equipment	36,793	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	36,793
Administration,EIA Monitoring	600	83.6%	0.0%	0.0%	16.4%	0.0%	0.0%	99.8%	599
Engineering Service	11,500	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	11,500
for Training	378	13.2%	0.0%	0.0%	86.8%	0.0%	0.0%	98.7%	373
Total	151,312							97.4%	147,442

(2) Maintenance Costs

As will be mentioned in Chapter 20, 0.75% of the construction costs(excluding dredging cost) of structures and 5% of the handling equipment is to be considered as annual maintenance cost. The maintenance costs in economic prices are calculated in the same manner as the investment cost.

(3) Operation Costs

The operation costs consists of administration, operation and personnel costs. The operation in market prices should be converted to economic prices by using CFC regarding skilled labor.

19.5 Evaluation

19.5.1 Method of Evaluation

There are various methods to evaluate the feasibility of a development project. Here, the internal rate of return(IRR) based on a cost-benefit analysis is used to appraise the feasibility of the project. The IRR is a discount rate which makes the costs and the benefits of the project created from the investment during the project life equal, and it is calculated using the following formula:

$$C_0 = \sum_{i=1}^{n} \frac{B_i - C_i}{(1 + r)^{i-1}}$$

Where, C_0 : Investment Cost
B_i : Benefits in the i-th year
C_i : Cost in the i-th year
r : Period of project life

The resulting EIRR of this project is estimated as 21.78%(See Table 19-5-1) and it exceeds the criterion of around 10 % which is generally adopted to assess the economic justifiability of a project.

Table 19-5-1 Cost/Benefit Analysis (Economic Price)

Unit : US$ 1,000

Year	Cost					Benefit		Discount	21.782%
	Investment Cost	Operation Cost: Maintenance Dredging	Operation Cost: Maintenance & Management	Residual Value	Total	Values Added	Benefit-Cost	Cost	Benefit
1996	3,070				3,070		-3,070	3,070	0
1997	5,434				5,434		-5,434	4,462	0
1998	38,745				38,745		-38,745	26,124	0
1999	36,958				36,958		-36,958	20,462	0
2000	63,235				63,235		-63,235	28,749	0
2001		500	2,945		3,445	43,598	40,153	1,286	16,276
2002		500	2,945		3,445	43,598	40,153	1,056	13,365
2003		500	2,945		3,445	43,598	40,153	867	10,974
2004		500	2,945		3,445	43,598	40,153	712	9,011
2005		500	2,945		3,445	43,598	40,153	585	7,400
2006		500	2,945		3,445	43,598	40,153	480	6,076
2007		500	2,945		3,445	43,598	40,153	394	4,989
2008		500	2,945		3,445	43,598	40,153	324	4,097
2009		500	2,945		3,445	43,598	40,153	266	3,364
2010		500	2,945		3,445	43,598	40,153	218	2,762
2011		500	2,945		3,445	43,598	40,153	179	2,268
2012		500	2,945		3,445	43,598	40,153	147	1,863
2013		500	2,945		3,445	43,598	40,153	121	1,529
2014		500	2,945		3,445	43,598	40,153	99	1,256
2015		500	2,945		3,445	43,598	40,153	81	1,031
2016	36,793	500	2,945		40,238	43,598	3,360	782	847
2017		500	2,945		3,445	43,598	40,153	55	695
2018		500	2,945		3,445	43,598	40,153	45	571
2019		500	2,945		3,445	43,598	40,153	37	469
2020		500	2,945		3,445	43,598	40,153	30	385
2021		3496	2,945		6,441	43,598	37,157	47	316
2022		500	2,945		3,445	43,598	40,153	21	260
2023		500	2,945		3,445	43,598	40,153	17	213
2024		500	2,945		3,445	43,598	40,153	14	175
2025		500	2,945		3,445	43,598	40,153	11	144
2026		5804	2,945		8,749	43,598	34,849	24	118
2027		500	2,945		3,445	43,598	40,153	8	97
2028		500	2,945		3,445	43,598	40,153	6	80
2029		500	2,945		3,445	43,598	40,153	5	65
2030		500	2,945		3,445	43,598	40,153	4	54
2031	36,793	500	2,945	-35,273	4,965	43,598	38,633	5	44
Total	221,028	23,800	91,295	-35,273	300,850	1,351,538	1,050,688	90,794	90,794
						EIRR=	21.782%		

19.5.2 Sensitivity Analysis

(1) Identification of Cases

Various uncertain factors may enter in the appraisal of the project when estimating costs and benefit. Therefore, sensitivity tests are made to see if the project is justifiable when some of these factors are varied. Three sensitivity tests are made as follows:

a. Case 1 in which costs increase by 10%

b. Case 2 in which benefits decrease by 10%

c. Case 3 in which costs increase by 10 % and benefits decrease by 10%

(2) Results of the Sensitivity Analysis

The results of the sensitivity analysis are presented in Table 19-4-7. Even in Case 3 in which EIRR is minimized, it clearly exceeds 17%.

Table 19-5-2 Results of the Sensitivity Analysis

	Original Case	Case 1	Case 2	Case 3
EIRR	21.78 %	19.91 %	19.72 %	17.96 %

From the above calculations, even if only the two major quantitative benefits are taken into account, the EIRR exceeds 10% under every probable case. Thus, this Short-term Development Project is feasible from the viewpoint of the national economy.

CHAPTER 20 FINANCIAL ANALYSIS

20.1 General

Financial analysis of a project has mainly two objectives. One is to examine loan repayment capability and the other is to evaluate profitability and financial viability of the project.

For the first objective, a profit/loss table, a balance sheet and a cash flow table are commonly used. For the second one, a financial internal rate of return(FIRR) and some indices showing financial status of the project are used.

A management body must be assumed in order to calculate inflows or outflows of assets. As mentioned in CHAPTER 16, "Cai Lan port" is assumed as the port management body.

20.2 Premises of Financial Analysis

(1) Summary of Investment

1,000 US$

Berths	53,662
Dredging of channel etc.	26,269
Yard pavement and others	1,939
Transit sheds	4,930
Container freight station	775
Inner roads	1,243
Utilities	105
Revetments	7,600
Port office	660
Handling equipment	36,793
Administration (Inc. EIA Monitoring) Eng. service	12,100
Training (1-5 year)	378
TOTAL	146,453

Investment schedule is as follows:

1996	3.071million $
1997	5.326
1998	37.696
1999	36.599
2000	63.761
TOTAL	146.453

To calculate depreciation, facilities and equipment are assumed to have the following service lives:

Wharf, Revetment, Channel	40 years
Transit shed, C.F.S., Office	25 years
Yard pavement, Road, Utilities	20 years
Handling equipment	15 years

(2) Conditions of loan

1) Long term loan

"Cai Lan port construction project" is based on a low-rate long term loan of a foreign country's ODA. Its conditions are set as follows:

Interest	1 %/year
Repayment period	30 years
Grace period	10 years

2) City bank loan

Interest	6 %/year
Repayment period	5 -15 years

(3) Port income

Cargo volumes estimated in Chapter 10 bring various incomes to Cai Lan port. Ships which transport this cargo also provide the port with income via navigation charges and dues.

Port revenue is estimated by combining "Port Due and Charge Tariff" of Vietnam with the estimation of ship calls, cargoes and their handling styles described in CHAPTER 12, Section 12.3.

PORT REVENUE

ITEMS	1,000 US$
Navigation Charges and Dues	5,347
Berthage and Wharfage Dues	614
Charges for Discharge/Loading Cargoes	8,092
Storage Charges	231
Domestic	604
TOTAL	14,891

PORT OPERATION COST

ITEMS	1,000 US$
Salary	261.0
Social Insurance	52.2
Fuel	710.8
Electricity	117.4
Water	29.1
Maintenance Dredging	500.0
Maintenance and Repair(Equipment)	2,150.0
Maintenance and Repair(Facilities)	547.1
Tax(4% of Income)	595.6
TOTAL	4,963.2

20.3 Financial Evaluation

Cai Lan port construction is executed by the investment loaned on the premises mentioned in the previous section. Interest must be paid annually from the beginning of the loan and the principal part must be also repaid uniformly for twenty years after the initial ten years. If a shortage of money occurs, at least the same amount of money must be borrowed from a city bank with a higher interest rate and no grace period.

The financial status of Cai Lan port project has to be examined at least for thirty years after the last loan to confirm full repayment of all loans. A balance sheet and a profit/loss table are shown in Table 20-3-1.

This base case is calculated on the same conditions as the long term loans in the previous section. But city bank loans when cash shortage in the earlier 5 years have 5-year obligation of repayment. And a large scale replacement investment to handling equipments in 21st year, to yard pavement etc. in 26th year and to transit sheds etc. in 31st year are based on 15-year repayment. This financial planning pays the long term loans and the city bank loans as shown in Table 20-3-1 and Figure 20-3-1.

This case also produces a financial internal rate of return (FIRR) of 5.1% that is higher than the long term loan rate.

Table 20-3-1 FINANCIAL ANALYSIS OF CAI LAN PORT CONSTRUCTION PROJECT

YEAR ->	1	2	3	4	5	6	7	8
	1996	1997	1998	1999	2000	2001	2002	2003
** BALANCE SHEET ***								
Net Assets	3.077	8.418	46.121	82.710	146.521	147.276	148.099	148.101
Fixed asset	3.071	8.397	46.093	82.692	148.453	148.908	135.363	129.819
Land								
Depreciable Assets	3.071	8.397	46.093	82.692	146.453	148.908	135.363	129.819
*Depreciation total	0.000	0.000	0.000	0.000	0.000	-6.545	-5.545	-5.545
Current asset	0.006	0.021	0.028	0.018	0.068	6.367	12.736	19.283
Cash on hand(initial)	3.121	5.482	39.417	38.827	66.579	0.868	6.367	12.736
*Interest	-0.034	-0.095	-0.512	-0.951	-1.729	-1.668	-1.687	-1.549
*Revenue tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*Tax	0.000	0.000	0.000	0.000	0.000	-0.950	-0.971	-0.992
Investment	-3.071	-5.326	-37.696	-36.599	-63.761			
Principal repayment	-0.010	-0.040	-0.180	-0.460	-1.020	-1.010	-0.980	-0.840
*Operating cost	0.000	0.000	0.000	0.000	0.000	-4.963	-4.963	-4.963
*Income	0.000	0.000	0.000	0.000	0.000	14.891	14.891	14.891
Total Liability	3.111	8.519	46.634	83.668	149.251	145.511	146.296	147.259
Liability	3.111	8.547	46.763	84.302	149.843	148.833	147.853	147.813
Long term balance	3.071	8.397	46.093	82.692	146.453	146.453	146.453	146.453
Long term loan	3.071	5.326	37.696	36.599	63.761			
Replacement L. Bal.								
Replacement loan								
Short term balance	0.040	0.150	0.670	1.610	3.390	2.380	1.400	0.560
Short term loan	0.050	0.150	0.700	1.400	2.800			
Reserve		-0.034	-0.129	-0.642	-1.592	-3.322	-1.557	0.246
Equity								
Net Income(B/S)	-0.034	-0.096	-0.512	-0.951	-1.729	1.764	1.884	1.842
** Profit/Loss table **								
Total operating expend.	0.034	0.095	0.512	0.951	1.729	12.178	12.115	12.057
Operating cost	0.000	0.000	0.000	0.000	0.000	4.963	4.963	4.963
Interest	0.034	0.095	0.512	0.951	1.729	1.668	1.687	1.549
Depreciation total	0.000	0.000	0.000	0.000	0.000	5.545	5.545	5.545
Revenue tax (included in Operating cost)								
Tax	0.000	0.000	0.000	0.000	0.000	0.950	0.971	0.992
Income	0.000	0.000	0.000	0.000	0.000	14.891	14.891	14.891
Op. Revenue	0.000	0.000	0.000	0.000	0.000	14.891	14.891	14.891
Other Income								
Net Income(P/L)	-0.034	-0.095	-0.512	-0.951	-1.729	1.764	1.884	1.842

* : Items with asterisk mark are inadequate places, but for reference.

YEAR ->	9	10	11	12	13	14	15	16	17
	2004	2005	2006	2007	2008	2009	2010	2011	2012
** BALANCE SHEET ***									
Net Assets	150.416	152.313	154.057	155.538	155.148	152.956	147.623	142.338	137.100
Fixed asset	124.274	118.729	113.184	107.640	102.095	96.550	91.005	85.461	79.916
Land									
Depreciable Assets	124.274	118.729	113.184	107.640	102.095	96.550	91.005	85.461	79.916
*Depreciation total	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545
Current asset	26.142	33.584	40.873	47.898	53.053	56.406	56.618	56.877	57.184
Cash on hand(initial)	19.283	26.142	33.584	40.873	47.898	53.053	56.406	56.618	56.877
*Interest	-1.498	-1.465	-1.463	-1.459	-1.436	-1.394	-1.321	-1.248	-1.175
*Revenue tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*Tax	-1.010	-1.021	-1.022	-1.023	-1.031	-1.046	-1.071	-1.097	-1.123
Investment									
Principal repayment	-0.580	0.000	-0.154	-0.420	-2.385	-4.135	-7.323	-7.323	-7.323
*Operating cost	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963
*Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Total Liability	148.541	150.416	152.160	153.637	153.233	151.014	145.633	140.300	135.015
Liability	146.453	146.453	146.300	145.888	143.576	139.441	132.118	124.796	117.473
Long term balance	146.453	146.453	146.300	145.888	143.576	139.441	132.118	124.796	117.473
Long term loan									
Replacement L. Bal.									
Replacement loan									
Short term balance	0.000								
Short term loan									
Reserve	2.088	3.963	5.860	7.757	9.657	11.573	13.515	15.505	17.542
Equity									
Net Income(B/S)	1.875	1.897	1.897	1.900	1.915	1.942	1.990	2.037	2.085
** Profit/Loss table **									
Total operating expend.	12.006	11.973	11.971	11.967	11.944	11.903	11.829	11.756	11.683
Operating cost	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963
Interest	1.498	1.465	1.463	1.459	1.436	1.394	1.321	1.248	1.175
Depreciation total	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545
Revenue tax (included in Operating cost)									
Tax	1.010	1.021	1.022	1.023	1.031	1.046	1.071	1.097	1.123
Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Op. Revenue	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Other Income									
Net Income(P/L)	1.875	1.897	1.898	1.900	1.916	1.942	1.990	2.037	2.085

* : Items with asterisk mark are inadequate places, but for reference.

YEAR ->	18	19	20	21	22	23	24	25	26	27
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
** BALANCE SHEET ***										
Net Assets	131.918	126.788	121.873	149.531	140.739	132.891	123.585	115.223	109.944	101.536
Fixed asset	74.371	68.826	63.282	94.530	88.985	83.440	77.896	72.351	66.806	61.261
Land										
Depreciable Assets	74.371	68.826	63.282	94.530	88.985	83.440	77.896	72.351	66.806	61.261
*Depreciation total	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545
Current asset	57.538	57.941	58.391	55.001	51.754	48.658	45.690	42.873	43.138	40.269
Cash on hand(initial)	57.184	57.539	57.941	95.184	55.001	51.754	48.658	45.698	46.159	43.138
*Interest	-1.102	-1.028	-0.955	-3.889	-2.869	-2.649	-2.428	-2.208	-2.185	-1.951
*Revenue tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*Tax	-1.148	-1.174	-1.208	-0.453	-0.538	-0.607	-0.684	-0.761	-0.769	-0.851
Investment				-36.793						
Principal repayment	-7.323	-7.323	-7.323	-9.776	-9.776	-9.776	-9.776	-9.776	-9.995	-9.995
*Operating cost	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963
*Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Total Liability	129.779	124.598	119.445	148.698	139.755	130.984	122.315	113.818	108.516	99.958
Liability	110.150	102.827	95.685	122.522	112.747	102.971	93.196	83.428	76.712	66.718
Long term balance	110.150	102.827	95.685	88.182	80.859	73.537	66.214	58.891	51.569	44.246
Long term loan										
Replacement L. Bal.				34.340	31.887	29.434	26.982	24.529	22.076	19.623
Replacement loan				36.793						
Short term balance									3.068	2.849
Short term loan									3.287	
Reserve	19.627	21.768	23.940	26.168	27.008	27.992	29.119	30.390	31.803	33.232
Equity										
Net Income(B/S)	2.133	2.189	2.228	0.841	0.984	1.127	1.270	1.414	1.429	1.589
** Profit/Loss table **										
Total operating expend.	11.618	11.536	11.483	13.598	13.377	13.157	12.936	12.715	12.683	12.459
Operating cost	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963
Interest	1.102	1.028	0.955	3.889	2.869	2.649	2.428	2.208	2.185	1.951
Depreciation total	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545
Revenue tax (included in Operating cost)										
Tax	1.148	1.174	1.208	0.453	0.538	0.607	0.684	0.761	0.769	0.851
Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Op. Revenue	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Other Income										
Net Income(P/L)	2.133	2.189	2.228	0.841	0.984	1.127	1.270	1.414	1.429	1.589

* : Items with asterisk mark are inadequate places, but for reference.

YEAR ->	28	29	30	31	32	33	34	35	36
	2023	2024	2025	2026	2027	2028	2029	2030	2031
** BALANCE SHEET ***									
Net Assets	93.268	85.157	77.198	75.236	67.341	61.484	57.598	56.788	91.482
Fixed asset	55.717	50.172	44.627	39.082	33.538	27.993	22.448	16.903	48.151
Land									
Depreciable Assets	55.717	50.172	44.627	39.082	33.538	27.993	22.448	16.903	48.151
*Depreciation total	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545	-5.545
Current asset	37.551	34.985	32.571	30.153	33.803	33.491	35.150	39.885	43.331
Cash on hand(initial)	48.269	37.551	34.985	38.936	36.153	33.803	33.491	35.158	76.678
*Interest	-1.718	-1.484	-1.258	-1.488	-1.145	-0.918	-0.692	-0.865	-2.848
*Revenue tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*Tax	-0.933	-1.014	-1.096	-1.044	-1.133	-1.216	-1.292	-1.231	-0.537
Investment									-36.793
Principal repayment	-9.995	-9.995	-9.995	-18.265	-9.999	-8.114	-6.284	-3.996	-3.996
*Operating cost	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963	-4.963
*Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Total Liability	91.535	83.273	75.162	73.297	65.237	59.226	55.199	54.502	90.485
Liability	56.723	46.728	36.734	32.833	22.834	14.719	8.435	5.339	39.895
Long term balance	36.923	29.681	22.279	15.189	8.286	3.188	-0.000	0.000	0.000
Long term loan									
Replacement L. Bal.	17.178	14.717	12.264	9.811	7.359	4.906	2.453	0.000	34.340
Replacement loan									36.793
Short term balance	2.630	2.419	2.191	7.913	7.289	6.626	5.982	5.339	4.695
Short term loan				6.365					
Reserve	34.812	36.545	38.429	40.464	42.403	44.507	46.764	49.163	51.458
Equity									
Net Income(B/S)	1.732	1.884	2.036	1.938	2.104	2.257	2.399	2.286	0.997
** Profit/Loss table **									
Total operating expend.	12.226	11.992	11.759	11.988	11.654	11.418	11.288	11.373	13.356
Operating cost	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963	4.963
Interest	1.718	1.484	1.258	1.488	1.145	0.918	0.692	0.865	2.848
Depreciation total	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545	5.545
Revenue tax (included in Operating cost)									
Tax	0.933	1.014	1.096	1.044	1.133	1.216	1.292	1.231	0.537
Income	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Op. Revenue	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891	14.891
Other Income									
Net Income(P/L)	1.732	1.884	2.036	1.938	2.104	2.257	2.399	2.286	0.997

* : Items with asterisk mark are inadequate places, but for reference.

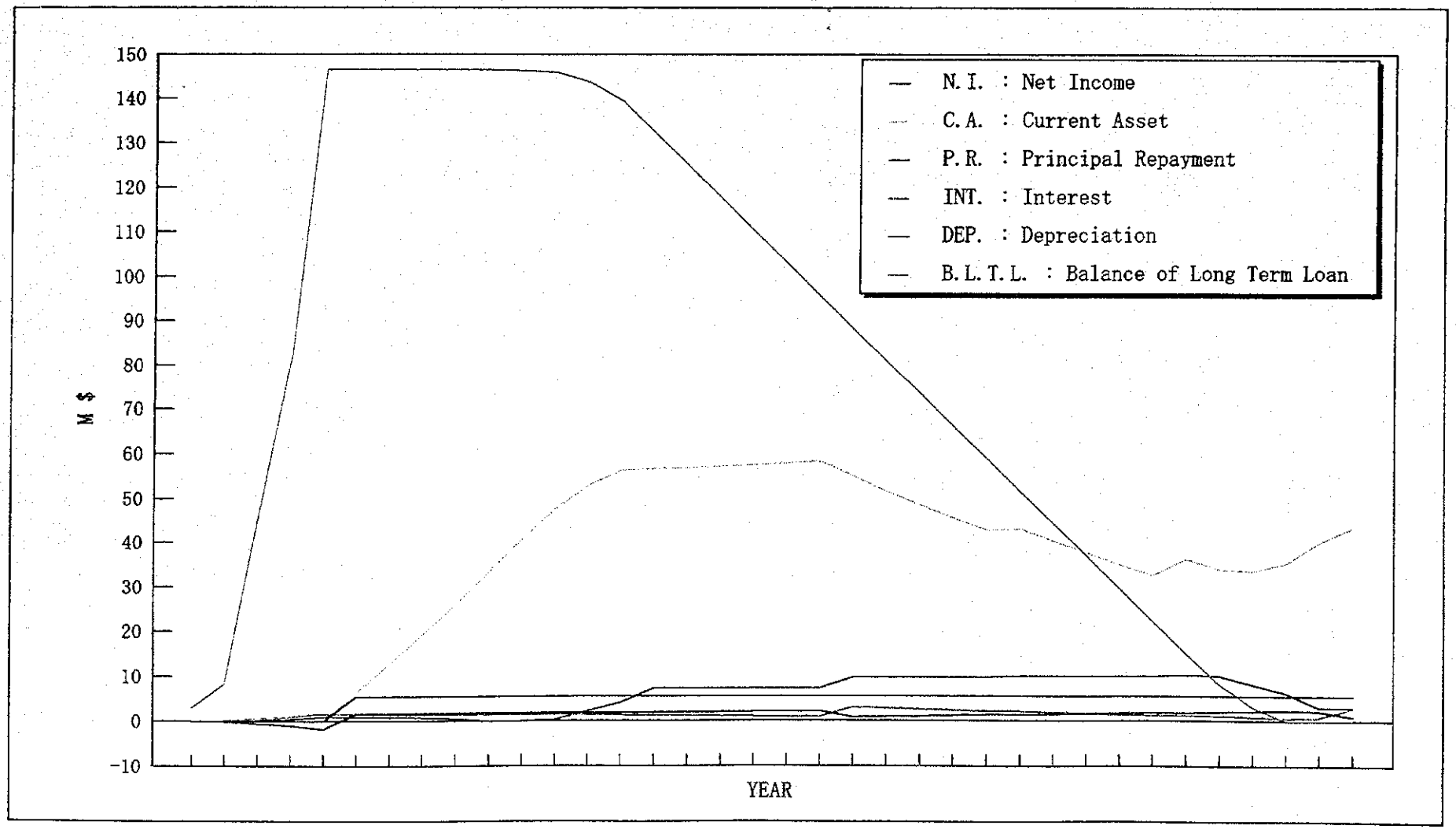

Figure 20-3-1 FINANCIAL STATUS

20.4 Sensitivity Analysis

Financial status is affected by various financial factors. Two main factors among them are selected and their influence on FIRR is examined.

CASE	FIRR
Base case	5.1%
Construction cost increases by 5%	4.7%
Construction cost increases by 10%	4.3%
Port revenue decreases by 5%	4.4%
Port revenue decreases by 10%	3.7%

It can be seen that decrease in port revenues affects FIRR to a greater extent than an increase in construction cost.