3.8 Evaluation and Conclusion

3.8.1 Calculation of the EIRR

151. Here, the lifetime of the facilities is taken as 30 years, the same as the project lifetime. The cost-benefits analysis is carried out starting in 1996 (the first year of the investment schedule) and ending in 2025 (the 30th year form the start from the operations of the new terminal in 2000). The economic internal rate of return (EIRR) is calculated by using the formula which was mentioned chapter 3.2. The calculation for the EIRR is shown in Table 3-8-1 and the results of it is as follows : EIRR = 22.73%

3.8.2 Sensitivity Analyses

152. In order to estimate the variation for the EIRR, sensitivity analyses are made for three each alternative.

(1) Case A : The forecast benefits decreases by 10 %
(2) Case B : The construction costs increase by 10 %
(3) Case C : The benefits decreases by 10 % and the construction costs increase by 10 % and

153. The calculation for the EIRR is shown table 3-8-2, 3-8-3 and 3-8-4. The results of the sensitivity analyses are shown as the follows.

Results of Sensitivity Analyses

Base	EIRR (%)
Original	22.73
Case A	21.25
Case B	21.04
Case C	19.08

3.8.3 Results and Conclusion

154. From the above calculations, the EIRR of this project is in any cases more than 19.08%. There are various views concerning the appropriate IRR level used to guide the judgment as to whether a project is feasible or not. The leading view is that the project is feasible if the IRR exceeds the opportunity cost of capital. The results of the EIRR calculation, only taking into account the four major quantitative benefits, shows more

than 10% under every probable case. Therefore, this Short-term Development Project is feasible from the viewpoint of the national economy.

Table 3-3-6 No.of Calling Vessels and Required Berthing Time (Without Case)

(Unit : Hours)

	Unit Cargo Vessels			Conventional Cargo Vessels			Dry Bulk Cargo Vessels			Domestic Vessels	Conversion to General Cargo		Total
	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships FC=1/3	Berth T	Occupati	(Hours)
1992	730	12.3	8,990	264	43.2	11,413	40	132.2	5,287	396 132	24.0	3,168	28,858
1993	764	12.3	9,405	269	43.2	11,608	48	132.2	6,278	432 144	24.0	3,456	30,748
1994	798	12.3	9,821	273	43.2	11,802	55	132.2	7,270	450 150	24.0	3,600	32,493
1995	831	12.3	10,237	278	43.2	11,997	63	132.2	8,261	469 156	24.0	3,752	34,247
1996	865	12.3	10,652	282	43.2	12,191	70	132.2	9,252	489 163	24.0	3,912	36,008
1997	899	12.3	11,068	287	43.2	12,386	78	132.2	10,244	510 170	24.0	4,080	37,777
1998	933	12.3	11,483	291	43.2	12,581	85	132.2	11,235	532 177	24.0	4,256	39,555
1999	966	12.3	11,899	296	43.2	12,775	93	132.2	12,226	555 185	24.0	4,440	41,340
2000	1000	12.3	12,315	300	43.2	12,970	100	132.2	13,218	579 193	24.0	4,632	43,134
2001	1025	12.3	12,622	310	43.2	13,402	104	132.2	13,786	605 202	24.0	4,840	44,651
2002	1050	12.3	12,930	320	43.2	13,834	109	132.2	14,354	632 211	24.0	5,056	46,175
2003	1075	12.3	13,238	330	43.2	14,267	113	132.2	14,923	661 220	24.0	5,288	47,716
2004	1100	12.3	13,546	340	43.2	14,699	117	132.2	15,491	691 230	24.0	5,528	49,264
2005	1125	12.3	13,854	350	43.2	15,131	121	132.2	16,060	723 241	24.0	5,784	50,829
2006	1150	12.3	14,162	360	43.2	15,564	126	132.2	16,628	757 252	24.0	6,056	52,409
2007	1175	12.3	14,470	370	43.2	15,996	130	132.2	17,196	793 264	24.0	6,344	54,006
2008	1200	12.3	14,778	380	43.2	16,428	134	132.2	17,765	831 277	24.0	6,648	55,618
2009	1225	12.3	15,085	390	43.2	16,860	139	132.2	18,333	871 290	24.0	6,968	57,247
2010	1250	12.3	15,393	400	43.2	17,293	143	132.2	18,901	913 304	24.0	7,304	58,891

Source : Estimated by The Study Team

Table 3-3-7 No.of Calling Vessels and Required Berthing Time (With Case)

(Unit : Hours)

	Unit Cargo Vessels			Conventional Cargo Vessels			Dry Bulk Cargo Vessels			Domestic Vessels	Conversion to General Cargo		Total
	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships FC=1/3	Berth T	Occupati	(Hours)
1992	730	12.3	8,990	264	43.2	11,413	40	132.2	5,287	396 132	24.0	3,168	28,858
1993	764	12.3	9,405	269	43.2	11,608	48	132.2	6,278	432 144	24.0	3,456	30,748
1994	798	12.3	9,821	273	43.2	11,802	55	132.2	7,270	450 150	24.0	3,600	32,493
1995	831	12.3	10,237	278	43.2	11,997	63	132.2	8,261	469 156	24.0	3,752	34,247
1996	865	12.3	10,652	282	43.2	12,191	70	132.2	9,252	489 163	24.0	3,912	36,008
1997	899	12.3	11,068	287	43.2	12,386	78	132.2	10,244	510 170	24.0	4,080	37,777
1998	933	12.3	11,483	291	43.2	12,581	85	132.2	11,235	532 177	24.0	4,256	39,555
1999	966	12.3	11,899	296	43.2	12,775	93	132.2	12,226	555 185	24.0	4,440	41,340
2000	1000	9.1	9,100	300	37.5	11,250	100	122.8	12,280				32,630
2001	1025	9.1	9,328	310	37.5	11,625	104	122.8	12,808				33,761
2002	1050	9.1	9,555	320	37.5	12,000	109	122.8	13,336				34,891
2003	1075	9.1	9,783	330	37.5	12,375	113	122.8	13,864				36,022
2004	1100	9.1	10,010	340	37.5	12,750	117	122.8	14,392				37,152
2005	1125	9.1	10,238	350	37.5	13,125	121	122.8	14,920				38,283
2006	1150	9.1	10,465	360	37.5	13,500	126	122.8	15,448				39,413
2007	1175	9.1	10,693	370	37.5	13,875	130	122.8	15,976				40,544
2008	1200	9.1	10,920	380	37.5	14,250	134	122.8	16,504				41,674
2009	1225	9.1	11,148	390	37.5	14,625	139	122.8	17,032				42,805
2010	1250	9.1	11,375	400	37.5	15,000	143	122.8	17,560				43,935

Source : Estimated by The Study Team

Table 3-3-8 Adjusted Number of Calling Vessels and Required Berthing Time (Without Case)

	Unit Cargo Vessels			Conventional Cargo Vessels			Dry Bulk Cargo Vessels			Domestic Vessels	Conversion to General Cargo			Total
	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships	Berth T	Occupati	Ships	FC=1/3	Berth Ti	Occupation	(Hours)
1992	730	12.3	8,990	264	43.2	11,413	40	132.2	5,287	396	132	24.0	3,168	28,858
1993	764	12.3	9,405	269	43.2	11,608	48	132.2	6,278	432	144	24.0	3,456	30,748
1994	798	12.3	9,821	273	43.2	11,802	55	132.2	7,270	450	150	24.0	3,600	32,493
1995	831	12.3	10,237	278	43.2	11,997	63	132.2	8,261	469	156	24.0	3,752	34,247
1996	865	12.3	10,652	282	43.2	12,191	70	132.2	9,252	489	163	24.0	3,912	36,008
1997	899	12.3	11,068	287	43.2	12,386	78	132.2	10,244	510	170	24.0	4,080	37,777
1998	933	12.3	11,483	291	43.2	12,581	85	132.2	11,235	532	177	24.0	4,256	39,555
1999	966	12.3	11,899	296	43.2	12,775	93	132.2	12,226	555	185	24.0	4,440	41,340
2000	1000	12.3	12,315	300	43.2	12,970	100	132.2	13,218	400	133	24.0	3,200	41,702
2001	992	12.3	12,217	296	43.2	12,797	104	132.2	13,786	400	133	24.0	3,200	42,000
2002	975	12.3	12,010	288	43.2	12,435	109	132.2	14,354	400	133	24.0	3,200	42,000
2003	959	12.3	11,804	279	43.2	12,073	113	132.2	14,923	400	133	24.0	3,200	42,000
2004	942	12.3	11,598	271	43.2	11,711	117	132.2	15,491	400	133	24.0	3,200	42,000
2005	925	12.3	11,391	263	43.2	11,349	121	132.2	16,060	400	133	24.0	3,200	42,000
2006	908	12.3	11,185	254	43.2	10,987	126	132.2	16,628	400	133	24.0	3,200	42,000
2007	892	12.3	10,979	246	43.2	10,625	130	132.2	17,196	400	133	24.0	3,200	42,000
2008	875	12.3	10,773	237	43.2	10,263	134	132.2	17,765	400	133	24.0	3,200	42,000
2009	858	12.3	10,566	229	43.2	9,901	139	132.2	18,333	400	133	24.0	3,200	42,000
2010	841	12.3	10,360	221	43.2	9,539	143	132.2	18,901	400	133	24.0	3,200	42,000

Table 3-3-9 Cargo Flow for Other Ports (Without Case)

(Unit : MT)

	Unit Cargo			Conventional Cargo			Dry Bulk Cargo			Domestic Cargo			Total
	Ships	Cargo/V	Cargo Vo	Ships	Cargo/V	Cargo Vo	Ships	Cargo/V	Cargo Vo	Ships	Cargo/V	Cargo Vol.	
1992	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1993	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1994	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1995	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1996	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1997	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1998	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
1999	0	2,000	0	0	1,500	0	0	7,000	0	0	120	0	0
2000	0	2,000	0	0	1,500	0	0	7,000	0	179	120	21,480	21,480
2001	33	2,000	65,934	14	1,500	20,975	0	7,000	0	205	120	24,600	111,509
2002	75	2,000	149,435	32	1,500	48,538	0	7,000	0	232	120	27,840	225,814
2003	116	2,000	232,937	51	1,500	76,101	0	7,000	0	261	120	31,320	340,358
2004	158	2,000	316,438	69	1,500	103,664	0	7,000	0	291	120	34,920	455,022
2005	200	2,000	399,940	87	1,500	131,227	0	7,000	0	323	120	38,760	569,927
2006	242	2,000	483,441	106	1,500	158,790	0	7,000	0	357	120	42,840	685,071
2007	283	2,000	566,942	124	1,500	186,353	0	7,000	0	393	120	47,160	800,456
2008	325	2,000	650,444	143	1,500	213,916	0	7,000	0	431	120	51,720	916,080
2009	367	2,000	733,945	161	1,500	241,479	0	7,000	0	471	120	56,520	1,031,945
2010	409	2,000	817,447	179	1,500	269,042	0	7,000	0	513	120	61,560	1,148,049

Table 3-3-10 Cargo Flow for Each Ports (Without Case)

(Unit : MT)

	Unit Cargo			Conventional Cargo					Domestic Cargo			Total
	Castilla	Sento To	Total	Castilla	Santo To	Tela	La Ceiba	Total	Tela	La Ceiba	Total	
2000	0	0	0	0	0	0	0	0	6,444	15,036	21,480	21,480
2001	26,374	39,560	65,934	8,390	8,390	2,098	2,098	20,975	7,380	17,220	24,600	111,509
2002	59,774	89,661	149,435	19,415	19,415	4,854	4,854	48,538	8,352	19,488	27,840	225,814
2003	93,175	139,762	232,937	30,441	30,441	7,610	7,610	76,101	9,396	21,924	31,320	340,358
2004	126,575	189,863	316,438	41,466	41,466	10,366	10,366	103,664	10,476	24,444	34,920	455,022
2005	159,976	239,964	399,940	52,491	52,491	13,123	13,123	131,227	11,628	27,132	38,760	569,927
2006	193,376	290,065	483,441	63,516	63,516	15,879	15,879	158,790	12,852	29,988	42,840	685,071
2007	226,777	340,165	566,942	74,541	74,541	18,635	18,635	186,353	14,148	33,012	47,160	800,456
2008	260,178	390,266	650,444	85,567	85,567	21,392	21,392	213,916	15,516	36,204	51,720	916,080
2009	293,578	440,367	733,945	96,592	96,592	24,148	24,148	241,479	16,956	39,564	56,520	1,031,945
2010	326,979	490,468	817,447	107,617	107,617	26,904	26,904	269,042	18,468	43,092	61,560	1,148,049

Table 3-3-11 Cargo Flow for Each Ports (Without Case)

(Unit : MT)

	Castilla	Santo To	Tela	La Ceiba	Cargo Vol.
2000	0	0	6,444	15,036	21,480
2001	34,764	47,950	9,478	19,318	111,509
2002	79,189	109,077	13,206	24,342	225,814
2003	123,615	170,203	17,006	29,534	340,358
2004	168,041	231,329	20,842	34,810	455,022
2005	212,467	292,455	24,751	40,255	569,927
2006	256,893	353,581	28,731	45,867	685,071
2007	301,318	414,707	32,783	51,647	800,456
2008	345,744	475,833	36,908	57,596	916,080
2009	390,170	536,959	41,104	63,712	1,031,945
2010	434,596	598,085	45,372	69,996	1,148,049

Table 3-5-1 Estimation for Convertion Factors

(Unit : Thousand Lempiras)

	1989	1990	1991	1992	Average
Total Import	2,896.1	3,426.7	4,226.6	4,819.9	
Import Tax	386.5	493.4	691.1	803.8	
Consume Goods	763.0	894.4	1,099.9	1,231.4	
Consume Goods Import Tax	386.5	493.4	691.1	803.8	
Export	2,566.9	3,714.4	4,278.9	4,513.4	
Export Tax	57.7	246.6	238.0	148.9	
Consume Goods	?	?	?	?	
Consume Goods Export Tax	?	?	?	?	
S.C.F.	0.943	0.967	0.949	0.934	0.948
C.F.C	0.910	0.949	0.922	0.898	0.920
C.F.L	0.592	0.617	0.599	0.583	0.598

Source : Banco Central de Honduras

Estimated by The Study Team

Table 3-6-1 Investment Cost in Economic Prices

(Unit:Thousand Lempiras)

Work	Cost of Investment in Market Prices	Foreign Portion (CIF)	Local Portion			Overall Conversion Factor	Investment Costs in Economic Prices
			Non-traded Goods	Skilled Labour	Unskilled Labour		
			(SCF)	(CFC)	(CFL)		
		1.000	0.948	0.920	0.598		
1996							
*Eng. Service	5,547	100.00%				1.00	5,547
Total	5,547	100.00%					
1997							
*Container Terminal	14,438	33.11%	54.37%	4.90%	7.61%	0.94	13,531
*Domestic Terminal	9,404	16.09%	67.45%	5.33%	11.14%	0.92	8,613
*By Pass Road	7,419	15.11%	68.12%	4.99%	11.78%	0.91	6,775
*Eng. Service	2,400	100.00%				1.00	2,400
*Physic. Contingency	4,000	35.00%	54.85%	3.67%	6.48%	0.94	3,770
Total	37,661	29.78%	56.93%	4.58%	8.71%	0.93	35,089
1998							
*Container Terminal	58,911	36.56%	55.16%	2.72%	5.55%	0.95	55,778
*Domestic Terminal	5,853	18.83%	66.99%	4.70%	9.48%	0.92	5,404
*By Pass Road	814	21.74%	69.40%	3.27%	5.59%	0.94	764
*Eng. Service	1,800	100.00%				1.00	1,800
*Physic. Contingency	4,000	35.00%	54.85%	3.67%	6.48%	0.94	3,770
Total	71,378	36.45%	54.88%	2.88%	5.79%	0.95	67,516
1999							
*Container Terminal	61,132	36.64%	55.65%	2.74%	4.98%	0.95	58,005
*Building	15,400	24.00%	53.21%	10.14%	12.66%	0.91	14,066
*Utility	7,061	33.31%	57.02%	3.04%	6.64%	0.94	6,646
*Equipment	84,206	100.00%				1.00	84,206
*Eng. Service	1,800	100.00%				1.00	1,800
*Physic. Contingency	4,304	32.76%	56.73%	3.80%	6.71%	0.94	4,048
Total	173,903	66.62%	27.99%	2.08%	3.31%	0.97	168,771
Grand Total	288,489	54.99%	37.89%	2.56%	4.56%	0.96	276,923

Source : Estimated by The Study Team

Table 3-6-2 Total Costs in Economic Price

(Unit : Thousand Lempiras)

	Years	Costs								
		Container Terminal			By-Pass Road		Domestic Terminal			Total
		Investme	Mainte.	Operatio	Investme	Mainte.	Investme	Mainte.	Operation	
1	1996	5,547								5,547
2	1997	19,701			6,775		8,613			35,089
3	1998	61,348			764		5,404			67,516
4	1999	168,771								168,771
5	2000		2,932	5,887		78		145	0	9,042
6	2001		2,932	5,887		78		145	0	9,042
7	2002		2,932	5,887		78		145	0	9,042
8	2003		2,932	5,887		78		145	0	9,042
9	2004		2,932	5,887		78		145	0	9,042
10	2005		2,932	5,887		78		145	0	9,042
11	2006		2,932	5,887		78		145	0	9,042
12	2007	34,706	2,932	5,887		78		145	0	43,748
13	2008	45,000	2,932	5,887		78		145	0	54,042
14	2009		2,932	5,887		78		145	0	9,042
15	2010		2,932	5,887		78		145	0	9,042
16	2011		2,932	5,887		78		145	0	9,042
17	2012		2,932	5,887		78		145	0	9,042
18	2013		2,932	5,887		78		145	0	9,042
19	2014	45,000	2,932	5,887		78		145	0	54,042
20	2015	34,706	2,932	5,887		78		145	0	43,748
21	2016		2,932	5,887		78		145	0	9,042
22	2017		2,932	5,887		78		145	0	9,042
23	2018		2,932	5,887		78		145	0	9,042
24	2019		2,932	5,887		78		145	0	9,042
25	2020		2,932	5,887		78		145	0	9,042
26	2021		2,932	5,887		78		145	0	9,042
27	2022		2,932	5,887		78		145	0	9,042
28	2023	79,706	2,932	5,887		78		145	0	88,748
29	2024		2,932	5,887		78		145	0	9,042
30	2025	-77,030	2,932	5,887		78		145	0	-67,987
	Total	417,456	76,236	153,064	7,539	2,021	14,017	3,771	0	674,104

Source : Estimated by The Study Team

Table 3-7-1 Calculation for Waiting Time (Without Case)

(Unit : Hours)

	Container Ships			Conventional			Dry Bulk			Domestic		
	Ships	Waiting	Total	Ships	Waiting	Total	Ships	Waiting	Total	Ships	Waiting	Total
2000	1,000	30.6	30,600	300	34.5	10,350	100	38.7	3,870	400	5.7	2,280
2001	992	30.6	30,355	296	34.5	10,212	104	38.7	4,025	400	5.7	2,280
2002	975	30.6	29,835	288	34.5	9,936	109	38.7	4,218	400	5.7	2,280
2003	959	30.6	29,345	279	34.5	9,626	113	38.7	4,373	400	5.7	2,280
2004	942	30.6	28,825	271	34.5	9,350	117	38.7	4,528	400	5.7	2,280
2005	925	30.6	28,305	263	34.5	9,074	121	38.7	4,683	400	5.7	2,280
2006	908	30.6	27,785	254	34.5	8,763	126	38.7	4,876	400	5.7	2,280
2007	892	30.6	27,295	246	34.5	8,487	130	38.7	5,031	400	5.7	2,280
2008	875	30.6	26,775	237	34.5	8,177	134	38.7	5,186	400	5.7	2,280
2009	858	30.6	26,255	229	34.5	7,901	139	38.7	5,379	400	5.7	2,280
2010	841	30.6	25,735	221	34.5	7,625	143	38.7	5,534	400	5.7	2,280

Table 3-7-2 Calculation for Waiting Time (With Case)

(Unit : Hours)

	Container Ships			Conventional			Dry Bulk			Domestic		
	Ships	Waiting	Total	Ships	Waiting	Total	Ships	Waiting	Total	Ships	Waiting	Total
2000	1,000	2.4	2,400	300	2.8	840	100	5.9	590	579	0.0	0
2001	1,025	2.5	2,606	310	3.4	1,043	104	6.8	705	605	0.0	0
2002	1,050	2.7	2,827	320	4.0	1,293	109	7.8	849	632	0.0	0
2003	1,075	2.9	3,066	330	4.9	1,601	113	8.9	1,011	661	0.0	0
2004	1,100	3.0	3,323	340	5.8	1,981	117	10.3	1,202	691	0.0	0
2005	1,125	3.2	3,600	350	7.0	2,450	121	11.8	1,428	723	0.0	0
2006	1,150	3.4	3,940	360	8.5	3,051	126	13.6	1,716	757	0.0	0
2007	1,175	3.7	4,309	370	10.3	3,796	130	15.7	2,045	793	0.0	0
2008	1,200	3.9	4,712	380	12.4	4,719	134	18.2	2,433	831	0.0	0
2009	1,225	4.2	5,149	390	15.0	5,863	139	21.0	2,914	871	0.0	0
2010	1,250	4.5	5,625	400	18.2	7,280	143	24.2	3,461	913	0.0	0

Table 3-7-3 Estimation for Cost of Ships

Container Ship		15,000 DWT		12,000 HP		
Build Cost		90,000,000 Lempiras				
Depriciation		12,857,143 Lempiras		35,225 Lmp./day		
Cost for Container Ship		3,600 Lmp./hour				
				(/day)		
	Unit	Quantity	Unit Price	Price		
Depriciation	-	1	35,225	35,225		
Fuel Oil	Liter	19,200	1.5	28,800		
Man Power		16	500	8,000		
Miscellaneous	-	1	2,880	2,880		
Expence	%	10		7,491		
Total				82,396	3,433	Lmp./hour
			US$	14,085		

Conventional Ship		10,000 DWT		8,000 HP		
Build Cost		50,000,000 Lempiras				
Depriciation		7,142,857 Lempiras		19,569 Lmp./day		
Conventional Ship		2,400 Lmp./hour				
				(/day)		
	Unit	Quantity	Unit Price	Price		
Depriciation	-	1	19,569	19,569		
Fuel Oil	Liter	12,800	1.5	19,200		
Man Power		20	500	10,000		
Miscellaneous	-	1	1,920	1,920		
Expence	%	10		5,069		
Total				55,758	2,323	Lmp./hour
			US$	9,531		

Dry Bulk Cargo		7,000 DWT		5,000 HP		
Build Cost		35,000,000 Lempiras				
Depriciation		5,000,000 Lempiras		13,699 Lmp./day		
Dry Bulk Cargo Ship		1,800 Lmp./hour				
				(/day)		
	Unit	Quantity	Unit Price	Price		
Depriciation	-	1	13,699	13,699		
Fuel Oil	Liter	8,000	1.5	12,000		
Man Power		25	500	12,500		
Miscellaneous	-	1	1,200	1,200		
Expence	%	10		3,940		
Total				43,338	1,806	Lmp./hour
			US$	7,408		

Domestic Cargo		120 DWT		100 HP		
Build Cost		900,000 Lempiras				
Depriciation		90,000 Lempiras		247 Lmp./day		
Cost for Domestic Ship		50 Lmp./hour				
				(/day)		
	Unit	Quantity	Unit Price	Price		
Depriciation	-	1	247	247		
Fuel Oil	Liter	200	1.5	300		
Man Power		3	167	500		
Miscellaneous	-	1	30	30		
Expence	%	10		108		
Total				1,184	49	Lmp./hour
			US$	202		

Source : Estimated by The Study Team

Table 3-7-4 Calculation for Saving Ships' Staying Costs (Whit Case)

(Unit : Thousand Lempiras)

	Container Ships			Conventional			Dry Bulk			Domestic			Total Benefits	Benefits for Honduras
	Save Waiting	Ship Unit Cost	Total	Save Waiting	Unit Cost	Total	Save Waiting	Unit Cost	Total	Save Waiting	Unit Cost	Total		
2000	28,200	3.6	101,520	9,510	2.4	22,824	3,280	1.8	5,904	2,280	0.05	114	130,362	65,238
2001	27,750	3.6	99,898	9,169	2.4	22,007	3,320	1.8	5,976	2,280	0.05	114	127,995	64,054
2002	27,008	3.6	97,228	8,643	2.4	20,744	3,370	1.8	6,066	2,280	0.05	114	124,151	62,133
2003	26,279	3.6	94,606	8,024	2.4	19,258	3,363	1.8	6,053	2,280	0.05	114	120,031	60,072
2004	25,502	3.6	91,807	7,368	2.4	17,683	3,326	1.8	5,987	2,280	0.05	114	115,591	57,853
2005	24,705	3.6	88,938	6,624	2.4	15,896	3,255	1.8	5,859	2,280	0.05	114	110,807	55,461
2006	23,845	3.6	85,842	5,712	2.4	13,710	3,160	1.8	5,687	2,280	0.05	114	105,354	52,734
2007	22,986	3.6	82,749	4,691	2.4	11,259	2,986	1.8	5,376	2,280	0.05	114	99,498	49,806
2008	22,063	3.6	79,428	3,457	2.4	8,298	2,753	1.8	4,955	2,280	0.05	114	92,795	46,454
2009	21,106	3.6	75,980	2,037	2.4	4,889	2,466	1.8	4,438	2,280	0.05	114	85,422	42,768
2010	20,110	3.6	72,395	345	2.4	827	2,074	1.8	3,732	2,280	0.05	114	77,068	38,591

Table 3-7-5 Saving Interest of Cargo Cost

(Unit : Thousand Lempiras)

	Number of Vessels Container	Number of Vessels Conventina	Number of Vessels Dry Bulk	Total Calling Ships	Total Save Hours	Total Cargo Volume	Average Cargo Volume	Total Save TonxDay	Total Save TonxYear	Unit Price FOB:CIF	Offer Interest Rate	Total Save Cost
2000	1,000	300	100	1,400	40,990	3,650,000	2,607	4,452,783	12,199	2.18	6.00%	1,595
2001	1,025	310	104	1,439	40,239	3,795,000	2,637	4,420,743	12,112	2.18	6.00%	1,584
2002	1,050	320	109	1,479	39,021	3,940,000	2,665	4,332,412	11,870	2.18	6.00%	1,552
2003	1,075	330	113	1,518	37,666	4,085,000	2,691	4,223,668	11,572	2.18	6.00%	1,513
2004	1,100	340	117	1,557	36,196	4,230,000	2,716	4,096,811	11,224	2.18	6.00%	1,468
2005	1,125	350	121	1,597	34,583	4,375,000	2,740	3,948,804	10,819	2.18	6.00%	1,415
2006	1,150	360	126	1,636	32,717	4,520,000	2,763	3,766,802	10,320	2.18	6.00%	1,349
2007	1,175	370	130	1,675	30,664	4,665,000	2,785	3,558,139	9,748	2.18	6.00%	1,275
2008	1,200	380	134	1,714	28,273	4,810,000	2,806	3,305,227	9,055	2.18	6.00%	1,184
2009	1,225	390	139	1,754	25,608	4,955,000	2,825	3,014,815	8,260	2.18	6.00%	1,080
2010	1,250	400	143	1,793	22,528	5,100,000	2,844	2,669,891	7,315	2.18	6.00%	956

Table 3-7-6 Benefits from Saving of Labor Working Time

(Unit : Thousand Lempiras)

	Unit Cargo			Total	ConvenUnit Cargo			Total	Dry BuUnit Cargo			Total	Grand
	Save Berthing (Hours)	Save Manpower (Manhours)	Unit Cost (9Lmp.)	Save Cost	Save Berthing (Hours)	Save Manpower (Manhours)	Unit Cost (9Lmp.)	Save Cost	Save Berthing (Hours)	Save Manpower (Manhours)	Unit Cost (9Lmp.)	Save Cost	Total Save Cost
2000	3,215	48,219	9.00	434	1,720	25,794	9.00	232	938	28,132	9.00	253	919
2001	3,295	49,425	9.00	445	1,777	26,654	9.00	240	978	29,341	9.00	264	949
2002	3,375	50,630	9.00	456	1,834	27,514	9.00	248	1,018	30,551	9.00	275	978
2003	3,456	51,836	9.00	467	1,892	28,374	9.00	255	1,059	31,761	9.00	286	1,008
2004	3,536	53,041	9.00	477	1,949	29,233	9.00	263	1,099	32,970	9.00	297	1,037
2005	3,616	54,247	9.00	488	2,006	30,093	9.00	271	1,139	34,180	9.00	308	1,067
2006	3,697	55,452	9.00	499	2,064	30,953	9.00	279	1,180	35,390	9.00	319	1,096
2007	3,777	56,658	9.00	510	2,121	31,813	9.00	286	1,220	36,599	9.00	329	1,126
2008	3,858	57,863	9.00	521	2,178	32,673	9.00	294	1,260	37,809	9.00	340	1,155
2009	3,938	59,069	9.00	532	2,235	33,532	9.00	302	1,301	39,019	9.00	351	1,185
2010	4,018	60,274	9.00	542	2,293	34,392	9.00	310	1,341	40,228	9.00	362	1,214

Source : Estimated by The Study Team

Remarks: Unit cost is expressed in economic price.

Table 3-7-7 Inland Transportation Cost for Containers
(for 20feets Containers)

From port of Cortes To	Cost US$/unit	Unit Cost US$/t	Unit Cost Lempira/t	Distance km	Unit Cost US$/km	Unit Cost US$/t·km	Unit Cost Lemp/t·km
Choloma	125	12.50	73.13	40.0	3.125	0.313	1.828
San Pedro Sula	145	14.50	84.82	57.0	2.544	0.254	1.488
Villanueva	170	17.00	99.45	83.0	2.048	0.205	1.198
Tegucigalpa	530	53.00	310.05	303.0	1.749	0.175	1.023
La Ceiba	420	42.00	245.70	253.0	1.660	0.166	0.971
La Lima	155	15.50	90.68	71.0	2.183	0.218	1.277
Bufalo	155	15.50	90.68	70.0	2.214	0.221	1.295
Estimation							
From San Pedro Sula To							
Tela	191	19.11	111.79	91.0	2.100	0.210	1.229
La Ceiba	392	39.20	229.32	196.0	2.000	0.200	1.170
From Port of Castilla To							
Tegucigalupa	700	70.00	409.50	400.0	1.750	0.175	1.024
From Port of Castilla To							
San Pedro Sula	656	65.63	383.91	375.0	1.750	0.175	1.024
From Port of Santo Tomas To							
San Pedro Sula	210	21.00	122.85	100.0	2.100	0.210	1.229

Source : FIDE(DataBank 1992)
Estimated by The Study Team
Remark : Unit cost is expressed in ecnomic price.

Table 3-7-8 Estimation for Additional Land Transportation Cost

(Unit : Thousand Lempiras)

	Castilla	Santo Tomas	Tela	La Ceiba	Total
Differrence	100	45	35	45	
2000	0	0	210	675	885
2001	3,500	2,160	315	855	6,830
2002	8,000	4,950	455	1,080	14,485
2003	12,400	7,650	595	1,350	21,995
2004	16,800	10,395	735	1,575	29,505
2005	21,200	13,140	875	1,800	37,015
2006	25,700	15,930	1,015	2,070	44,715
2007	30,100	18,675	1,155	2,340	52,270
2008	34,600	21,420	1,295	2,610	59,925
2009	39,000	24,165	1,435	2,880	67,480
2010	43,500	27,000	1,575	3,150	75,225

Source : The study Team Estimation

Table 3-8-1 Calculation of EIRR for Short Term Plan

EIRR = 22.731%

(Unit : Thousand Lempiras)

	Years	Costs									Benefits (Saving Cost)					Cash Flow	Cash Flow		
		Container Terminal			By-Pass Road		Domestic Terminal			Total	Save	Save	Save	Land	Total	Benefits			
		Investme	Mainte.	Operatio	Investme	Mainte.	Investme	Mainte.	Operation		Ship Cost	Interest	Labor	Tranport		- Costs	Costs	Benefits	Differen
1	1996	5,547								5,547						-5,547	4,520	0	-4,520
2	1997	19,701			6,775		8,613			35,089						-35,089	23,295	0	-23,295
3	1998	61,348			764		5,404			67,516						-67,516	36,521	0	-36,521
4	1999	168,771								168,771						-168,771	74,383	0	-74,383
5	2000		2,932	6,365		78		145		9,520	65,238	1,595	919	885	68,637	59,117	3,419	24,648	21,229
6	2001		2,932	6,365		78		145		9,520	64,054	1,584	949	6,830	73,417	63,897	2,785	21,481	18,696
7	2002		2,932	6,365		78		145		9,520	62,133	1,552	978	14,485	79,148	69,628	2,270	18,869	16,599
8	2003		2,932	6,365		78		145		9,520	60,072	1,513	1,008	21,995	84,588	75,068	1,849	16,431	14,582
9	2004		2,932	6,365		78		145		9,520	57,853	1,468	1,037	29,505	89,862	80,342	1,507	14,222	12,716
10	2005		2,932	6,365		78		145		9,520	55,461	1,415	1,067	37,015	94,957	85,437	1,228	12,245	11,018
11	2006		2,932	6,365		78		145		9,520	52,734	1,349	1,096	44,715	99,894	90,374	1,000	10,496	9,496
12	2007	34,706	2,932	6,365		78		145		44,226	49,806	1,275	1,126	52,270	104,476	60,250	3,786	8,944	5,158
13	2008	45,000	2,932	6,365		78		145		54,520	46,454	1,184	1,155	59,925	108,718	54,199	3,803	7,584	3,781
14	2009		2,932	6,365		78		145		64,040	42,768	1,080	1,185	67,480	112,512	48,473	3,640	6,395	2,755
15	2010		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	441	5,371	4,930
16	2011		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	359	4,376	4,017
17	2012		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	293	3,566	3,273
18	2013		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	238	2,905	2,667
19	2014	45,000	2,932	6,365		78		145		54,520	38,591	956	1,214	75,225	115,986	61,466	1,113	2,367	1,255
20	2015	34,706	2,932	6,365		78		145		44,226	38,591	956	1,214	75,225	115,986	71,760	735	1,929	1,193
21	2016		2,932	6,365		78		145		108,266	38,591	956	1,214	75,225	115,986	7,720	1,467	1,572	105
22	2017		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	105	1,280	1,175
23	2018		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	86	1,043	958
24	2019		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	70	850	780
25	2020		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	57	693	636
26	2021		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	46	564	518
27	2022		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	38	460	422
28	2023	79,706	2,932	6,365		78		145		89,226	38,591	956	1,214	75,225	115,986	26,760	288	375	86
29	2024		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	115,986	106,466	25	305	280
30	2025	-77,030	2,932	6,365		78		145		-67,510	38,591	956	1,214	75,225	115,986	183,496	-145	249	394
	Total	417,455	76,236	165,490	7,539	2,021	14,017	3,771	0	686,530	1,174,026	29,316	29,944		2,771,991		169,221	169,221	-0

Table 3-8-2 Calculation of EIRR for Short Term Plan (Case A)

EIRR = 21.249%

(Unit : Thousand Lempiras)

	Years	Costs									Benefits (Saving Cost)					Cash Flow Benefits	Cash Flow		
		Container Terminal			By-Pass Road		Domestic Terminal			Total	Save	Save	Save	Land	Total				
		Investme	Mainte.	Operatio	Investme	Mainte.	Investme	Mainte.	Operatio	X 1.1	Ship Cost	Interest	Labor	Tranport		- Costs	Costs	Benefits	Differen
1	1996	5,547								6,102						-6,102	5,032	0	-5,032
2	1997	19,701			6,775		8,613			38,598						-38,598	26,255	0	-26,255
3	1998	61,348			764		5,404			74,268						-74,268	41,664	0	-41,664
4	1999	168,771								185,648						-185,648	85,896	0	-85,896
5	2000		2,932	6,365		78		145		10,472	65,238	1,595	919	885	68,637	58,165	3,996	26,192	22,196
6	2001		2,932	6,365		78		145		10,472	64,054	1,584	949	6,830	73,417	62,945	3,296	23,106	19,810
7	2002		2,932	6,365		78		145		10,472	62,133	1,552	978	14,485	79,148	68,676	2,718	20,544	17,826
8	2003		2,932	6,365		78		145		10,472	60,072	1,513	1,008	21,995	84,588	74,116	2,242	18,108	15,867
9	2004		2,932	6,365		78		145		10,472	57,853	1,468	1,037	29,505	89,862	79,390	1,849	15,866	14,017
10	2005		2,932	6,365		78		145		10,472	55,461	1,415	1,067	37,015	94,957	84,485	1,525	13,827	12,302
11	2006		2,932	6,365		78		145		10,472	52,734	1,349	1,096	44,715	99,894	89,422	1,258	11,997	10,739
12	2007	34,706	2,932	6,365		78		145		48,649	49,806	1,275	1,126	52,270	104,476	55,826	4,819	10,348	5,530
13	2008	45,000	2,932	6,365		78		145		59,972	46,454	1,184	1,155	59,925	108,718	48,747	4,899	8,881	3,982
14	2009		2,932	6,365		78		145		10,472	42,768	1,080	1,185	67,480	112,512	102,040	706	7,580	6,875
15	2010		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	582	6,445	5,863
16	2011		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	480	5,316	4,836
17	2012		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	396	4,384	3,988
18	2013		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	326	3,616	3,289
19	2014	45,000	2,932	6,365		78		145		59,972	38,591	956	1,214	75,225	115,986	56,014	1,542	2,982	1,440
20	2015	34,706	2,932	6,365		78		145		48,649	38,591	956	1,214	75,225	115,986	67,338	1,032	2,459	1,428
21	2016		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	183	2,028	1,845
22	2017		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	151	1,673	1,522
23	2018		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	125	1,380	1,255
24	2019		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	103	1,138	1,035
25	2020		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	85	939	854
26	2021		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	70	774	704
27	2022		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	58	638	581
28	2023	79,706	2,932	6,365		78		145		98,149	38,591	956	1,214	75,225	115,986	17,838	446	527	81
29	2024		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	115,986	105,514	39	434	395
30	2025	-77,030	2,932	6,365		78		145		-74,261	38,591	956	1,214	75,225	115,986	190,247	-229	358	587
	Total	417,456	76,236	165,490	7,539	2,021	14,017	3,771	0	686,530	1,174,026	29,316	29,944		2,771,991		191,541	191,541	-0

Table 3-8-3 Calculation of EIRR for Short Term Plan (Case B)

EIRR = 21.037%

(Unit : Thousand Lempiras)

	Years	Costs									Benefits (Saving Cost)					Cash Flow Benefits	Cash Flow		
		Container Terminal			By-Pass Road		Domestic Terminal			Total	Save	Save	Save	Land	Total				
		Investme	Mainte.	Operatio	Investme	Mainte.	Investme	Mainte.	Operation		Ship Cost	Interest	Labor	Tranport	X 0.9	- Costs	Costs	Benefits	Differen
1	1996	5,547								5,547						-5,547	4,583	0	-4,583
2	1997	19,701			6,775		8,613			35,089						-35,089	23,952	0	-23,952
3	1998	61,348			764		5,404			67,516						-67,516	38,076	0	-38,076
4	1999	168,771								168,771						-168,771	78,636	0	-78,636
5	2000		2,932	6,365		78		145		9,520	65,238	1,595	919	885	61,774	52,253	3,665	23,780	20,115
6	2001		2,932	6,365		78		145		9,520	64,054	1,584	949	6,830	66,075	56,555	3,028	21,015	17,987
7	2002		2,932	6,365		78		145		9,520	62,133	1,552	978	14,485	71,233	61,713	2,502	18,718	16,216
8	2003		2,932	6,365		78		145		9,520	60,072	1,513	1,008	21,995	76,129	66,609	2,067	16,527	14,461
9	2004		2,932	6,365		78		145		9,520	57,853	1,468	1,037	29,505	80,876	71,356	1,708	14,506	12,799
10	2005		2,932	6,365		78		145		9,520	55,461	1,415	1,067	37,015	85,461	75,941	1,411	12,664	11,254
11	2006		2,932	6,365		78		145		9,520	52,734	1,349	1,096	44,715	89,905	80,384	1,166	11,007	9,842
12	2007	34,706	2,932	6,365		78		145		44,226	49,806	1,275	1,126	52,270	94,029	49,802	4,474	9,511	5,038
13	2008	45,000	2,932	6,365		78		145		54,520	46,454	1,184	1,155	59,925	97,847	43,326	4,556	8,177	3,621
14	2009		2,932	6,365		78		145		9,520	42,768	1,080	1,185	67,480	101,261	91,741	657	6,992	6,334
15	2010		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	543	5,955	5,412
16	2011		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	449	4,920	4,471
17	2012		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	371	4,065	3,694
18	2013		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	306	3,358	3,052
19	2014	45,000	2,932	6,365		78		145		54,520	38,591	956	1,214	75,225	104,388	49,867	1,449	2,775	1,325
20	2015	34,706	2,932	6,365		78		145		44,226	38,591	956	1,214	75,225	104,388	60,161	971	2,292	1,321
21	2016		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	173	1,894	1,721
22	2017		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	143	1,565	1,422
23	2018		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	118	1,293	1,175
24	2019		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	97	1,068	971
25	2020		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	80	882	802
26	2021		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	66	729	663
27	2022		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	55	602	547
28	2023	79,706	2,932	6,365		78		145		89,226	38,591	956	1,214	75,225	104,388	15,161	425	498	72
29	2024		2,932	6,365		78		145		9,520	38,591	956	1,214	75,225	104,388	94,867	37	411	374
30	2025	-77,030	2,932	6,365		78		145		-67,509	38,591	956	1,214	75,225	104,388	171,897	-220	340	559
	Total	417,456	76,236	165,502	7,539	2,021	14,017	3,771	0	686,543	1,174,026	29,316	29,944		2,494,792		175,545	175,545	0

Table 3-8-4 Calculation of EIRR for Short Term Plan (Case C)

EIRR = 19.084%

(Unit : Thousand Lempiras)

	Years	Costs									Benefits (Saving Cost)					Cash Flow Benefits	Cash Flow		
		Container Terminal			By-Pass Road		Domestic Terminal			Total	Save	Save	Save	Land	Total	-			
		Investme	Mainte.	Operatio	Investme	Mainte.	Investme	Mainte.	Operatio	X 1.1	Ship Cost	Interest	Labor	Tranport	X 0.9	Costs	Costs	Benefits	Differen
1	1996	5,547								6,102						-6,102	5,124	0	-5,124
2	1997	19,701			6,775		8,613			38,598						-38,598	27,218	0	-27,218
3	1998	61,348			764		5,404			74,268						-74,268	43,979	0	-43,979
4	1999	168,771								185,648						-185,648	92,317	0	-92,317
5	2000		2,932	6,365		78		145		10,472	65,238	1,595	919	885	61,774	51,301	4,373	25,796	21,422
6	2001		2,932	6,365		78		145		10,472	64,054	1,584	949	6,830	66,075	55,603	3,672	23,170	19,498
7	2002		2,932	6,365		78		145		10,472	62,133	1,552	978	14,485	71,233	60,761	3,084	20,976	17,892
8	2003		2,932	6,365		78		145		10,472	60,072	1,513	1,008	21,995	76,129	65,657	2,590	18,825	16,236
9	2004		2,932	6,365		78		145		10,472	57,853	1,468	1,037	29,505	80,876	70,404	2,175	16,794	14,619
10	2005		2,932	6,365		78		145		10,472	55,461	1,415	1,067	37,015	85,461	74,989	1,826	14,902	13,076
11	2006		2,932	6,365		78		145		10,472	52,734	1,349	1,096	44,715	89,905	79,432	1,533	13,165	11,631
12	2007	34,706	2,932	6,365		78		145		48,649	49,806	1,275	1,126	52,270	94,029	45,379	5,982	11,562	5,580
13	2008	45,000	2,932	6,365		78		145		59,972	46,454	1,184	1,155	59,925	97,847	37,874	6,193	10,104	3,911
14	2009		2,932	6,365		78		145		10,472	42,768	1,080	1,185	67,480	101,261	90,789	908	8,780	7,872
15	2010		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	763	7,601	6,838
16	2011		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	640	6,383	5,743
17	2012		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	538	5,360	4,822
18	2013		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	452	4,501	4,050
19	2014	45,000	2,932	6,365		78		145		59,972	38,591	956	1,214	75,225	104,388	44,415	2,172	3,780	1,608
20	2015	34,706	2,932	6,365		78		145		48,649	38,591	956	1,214	75,225	104,388	55,739	1,479	3,174	1,695
21	2016		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	267	2,665	2,398
22	2017		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	225	2,238	2,014
23	2018		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	189	1,880	1,691
24	2019		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	158	1,578	1,420
25	2020		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	133	1,325	1,192
26	2021		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	112	1,113	1,001
27	2022		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	94	935	841
28	2023	79,706	2,932	6,365		78		145		98,149	38,591	956	1,214	75,225	104,388	6,239	738	785	47
29	2024		2,932	6,365		78		145		10,472	38,591	956	1,214	75,225	104,388	93,915	66	659	593
30	2025	-77,030	2,932	6,365		78		145		-74,260	38,591	956	1,214	75,225	104,388	178,648	-394	553	947
	Total	417,456	76,236	165,502	7,539	2,021	14,017	3,771	0	686,543	1,174,026	29,316	29,944		2,494,792		208,605	208,605	-0

Chapter 4 Financial Analysis

4.1 Purpose of the Financial Analysis

155. The purpose of the financial analysis is to examine the viability of the project (container terminal, domestic terminal and by-pass road) of the short-term development plan.

4.2 Methodology of the Financial Analysis

4.2.1 Viability of the Project

156. The viability of the project is analyzed using the Financial Internal Rate of Return (FIRR) by means of the discount cash flow method. The FIRR is the discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula:

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

n : Project life
Bi : Revenue in the i-th year
Ci : Cost in the i-th year
r : Discount rate

157. Here, the revenues and the costs in this analysis cover the following items:

Revenues	:	Operating revenues
		(Berthage and Cargo handling charge)
		Residual value of the fixed assets at the end of the project life
Costs	:	Investments (initial investment and re-investment)
		Operating expense
		(personnel, administration and maintenance costs)

The following revenues and costs are exempted from calculation of the FIRR.

Revenues	:	Fund management income
Costs	:	Depreciation cost
		Repayment of the principal loan
		Interest on loan

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

4.2.2 Financial Soundness of the Implementation Body

159. The financial soundness of the implementation body is appraised based on its projected financial statements (Profit and Loss Statement, Cash Flow Statement and Balance Sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

(1) Profitability

Rate of Return on Net Fixed Assets:

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

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

(2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$\frac{\text{Net Operating Income before Depreciation}}{\text{Repayment of and interest on long-term loans}}$$

This indicator shows whether the operating income can cover the repayment and the interest on long-term loans. The ratio must be higher than 1.0.

(3) Operational Efficiency

Operating Ratio:

$$\frac{\text{Operating Expenses}}{\text{Operating Revenues}} \times 100\ (\%)$$

Working Ratio:

$$\frac{\text{Operating Expense - Depreciation Expense}}{\text{Operating Revenues}} \times 100\ (\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port. When the calculated operating ratios are less than 70-75%, and the working ratios are less than 50-60%, the operations of port are efficient.

4.3 Prerequisites of the Financial Analysis

4.3.1 Scope of the Financial Analysis

160. The short-term plan covers the container terminal, domestic terminal and by-pass road. The focus of the financial analysis is all projects of the short-term plan.

4.3.2 Project Life

161. Taking into account of the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined as 30 years from the beginning of the project including four years of detailed design and construction of the port facilities.

4.3.3 Base Year

162. For the estimate, all costs, expenditures and revenues analyzed quantitatively here are indicated in prices as of 1993, when the price survey was conducted. Neither price inflation nor increase in nominal wages are considered during the project life.

4.3.4 Number of Calling Ships and Handling Volume of Container

163. Number of calling ships and handling volume of container in 2000 and 2010 by demand forecast will be as follows;

Year	2000	2010
Number of calling ships	1,000	1,250
Handling cargo volume (Thousand MT)	1,850	2,500

After completion of construction of new container terminal, all containers including banana company's will be handled at this new terminal. On the above assumption, the volume handled at two new berths in the short-term plan is as follows.

2000	1,841 thousand MT	2001	1,901 thousand MT
2002	1,962	2003	2,024
2004	2,087	2005	2,152
2006	2,219	2007	2,289
2008	2,361 after	2009	2,402

These berths will reach maximum handling capacity in 2009 (berth occupancy : 65%).

4.3.5 Revenue (See Table 4-3-1 to 4-3-7)

164. The revenues from the port activities are calculated based on the present tariff system and future cargo handling volume. The following charges are the sources of revenue generated from the operation of the new terminal.

- Harbour dues
- Berthage charge
- Wharfage charge
- Loading/Unloading
- Cargo handling charge

4.3.6 Initial Investment and Re-investment (See Table 4-3-8)

The initial investment of the short-term plan is estimated in Chapter 1 in this Part.

(Unit : Thousand Lps.)

	1996	1997	1998	1999	Total
Container Terminal	0	14,438	58,911	61,132	134,481
Domestic terminal	0	9,404	5,853	0	15,257
By-Pass Road	0	7,419	814	0	8,233
CFS	0	0	0	15,400	15,400
Utilities	0	0	0	7,061	7,061
Equipment	0	0	0	84,206	84,206
Engineering Service	5,547	2,400	1,800	1,800	11,547
Physical Contingency	0	4,000	4,000	4,304	12,304
Total	5,547	37,661	71,378	173,903	288,489

The facilities and equipment will be renewed based on their service lives which are as follows:

depreciable assets excluding cargo handling equipment	: 40 years
CFS	: 30 years
gantry crane	: 15 years
cargo handling equipment excluding gantry crane	: 8 years

The fund for reinvestment will be financed by the internal resources of the management body.

4.3.7 Costs

(1) Personnel Costs (See Tale 4-3-9)

165. The annual personnel expense is estimated based on the required number of workers and existing pay scales. Number of workers are mentioned in Chapter 2 and personnel expense including social benefit and travelling allowance is about 1.7 times as wage based on the past conditions.

(2) Administration Costs (Table 4-3-9)

166. Administration cost is 8 % of personnel costs based on the past conditions.

(3) Maintenance Costs (Table 4-3-10)

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

Infrastructure, CFS	: 1 % of the construction cost
equipment	: 2 % of the procurement cost

4.3.8 Depreciation

168. The annual depreciation expenses of the port facilities and equipment are calculated by the straight line method, based on their service lives. Residual values after all depreciations are estimated as zero. At the end of the project life, fixed assets are assumed to be sold at their residual values.

4.3.9 Fund raising Plan

169. Generally, fund raising is mainly divided into two kinds, that is, foreign and domestic fund(government fund and domestic bank). In Honduras, however, there is no government fund. Interest rate of domestic bank is very high and ENP has no experience in using it. Low interest rates are required for implementation of the projects.

170. Thus, 85 % of the project costs is assumed to be raised by foreign fund and conditions are assumed as follows:

Soft Loan

Loan period	: 30 years
Grace period	: 10 years
Interest rate	: 3 %
Repayment	: Fixed amount repayment of principal

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

The rest of the project costs is assumed to be raised by internal resources of the implementation body.

171. As an example, another case is assumed. It is that all project costs are assumed to be raised by foreign fund which is usually used in ENP's projects.

Loan period : 20 years
Grace period : 5 years
Interest rate : 8 %
Repayment : Fixed amount repayment of principal
(Note) These conditions are referred from those of present situations.

4.4 Appraisal of the Project

4.4.1 Viability of the Project

172. The FIRR of this project is 23.09 %, as shown in Table 4-4-1. This rate exceeds the weighted average interest rate of funds during the project life.

4.4.2 Financial Soundness of the Management Body

173. The projected financial statements and financial indicators (Rate of return on net fixed assets, Debt service coverage ratio, Operating ratio and Working ratio) are shown in Table 4-4-5. The "Base Case" is appraised from the viewpoint of financial soundness of the organization.

(1) Profitability

174. The rate of return on net fixed assets exceeds the average interest rate of funds (2.55 %) after completing the construction of port facilities.

(2) Loan Repayment Capacity

175. Throughout the project life, the debt service coverage ratio exceeds 1.0. There will be no problem with the repayment of the long-term loans using the annual operating revenues. Even if the fund which is usually used in ENP's project is assumed, this indicator exceeds 1.0.

(3) Operational Efficiency

176. Both the operating ratio and the working ratio maintain positive levels.

177. Even if all costs are raised by foreign fund, all financial indicators is shown good levels. (See Table 4-4-6)

4.5 Sensitivity Analysis

178. A sensitivity analysis is made for the following three cases:

Case A : revenue decreases by 10 %

Case B : construction cost increases by 10 %

Case C : revenue decrease by 10 % and construction cost increases by 10%

The FIRR of each case is as follows. (Table 4-4-2 to 4-4-4)

	Base Case	Case A	Case B	Case C
FIRR	23.09 %	21.13 %	20.65 %	18.83 %

In each case, the rate exceeds the weighted average interest rate of funds (2.55%), which is also the floor limit during the project life.

4.6 Conclusion

179. Judging from the above analysis, this project can be regarded as financially feasible.

180. Furthermore, it is recommended that the following measures be taken to improve the financing during the project life.

(1) Implementation body should maintain its efforts to secure sufficient cargo volume to improve cargo handling efficiency and to reduce operating expenses constantly.

(2) Because internal resources of implementation body should be raised at the beginning of the project and when equipment will be renewed, implementation body should attempt to refinance with lower-cost funds, taking account of actual cash flow.

Table 4-3-1 Calculation of Harbour Dues

	Number of Vessels			Harbour Dues (Thousand Lps.)		
	Container	LO-LO	RO-RO	LO-LO	RO-RO	Total
2000	1,000	750	250	19,744	2,925	22,669
2001	1,025	769	256	20,237	2,998	23,235
2002	1,050	788	263	20,731	3,071	23,802
2003	1,075	806	269	21,225	3,144	24,369
2004	1,100	825	275	21,718	3,218	24,936
2005	1,125	844	281	22,212	3,291	25,502
2006	1,150	863	288	22,705	3,364	26,069
2007	1,175	881	294	23,199	3,437	26,636
2008	1,200	900	300	23,693	3,510	27,203
2009	1,225	919	306	24,186	3,583	27,769
2010	1,250	938	313	24,680	3,656	28,336
	Ave. Vessel Size (GRT)			10000	10000	
	Harbour Dues (US$)			0.45	0.2	

Table 4-3-2 Calculation of Berthage Charge

(Unit : Thousand Lps.)

2000	4,388
2001	4,497
2002	4,607
2003	4,717
2004	4,826
2005	4,936
2006	5,046
2007	5,155
2008	5,265
2009	5,375
2010	5,484

Vessel Length
150 m = 500 ft
Handling Time
10 hr
Berthage
1.50 US$/ft

Table 4-3-3 Calculation of Wharfage and Loading/Unloading Charge

	Container Volume (Thousand MT)			Wharfage	Loading /Unloading
	Import	Export	Total	(Thousand Lps.)	
2000	797	1,045	1,842	9,511	8,082
2001	831	1,070	1,901	9,858	8,341
2002	866	1,096	1,962	10,216	8,608
2003	904	1,120	2,024	10,592	8,880
2004	942	1,145	2,087	10,971	9,157
2005	983	1,169	2,152	11,371	9,442
2006	1,025	1,194	2,219	11,782	9,736
2007	1,070	1,219	2,289	12,217	10,043
2008	1,117	1,244	2,361	12,668	10,359
2009	1,167	1,270	2,437	13,146	10,692
2010	1,219	1,296	2,515	13,640	11,035
	8 Lps.	3 Lps.			0.75 US$

Table 4-3-4 Number of Container (Export)

	Export (LO/LO)								Export (RO/RO)					
	Full(40ft)			Empty(40ft)			20ft		Full(40ft)			Empty(40ft)		
	Total	Banana	Others	Total	Banana	Others	Full	Empty	Total	Banana	Others	Total	Banana	Others
2000	22,852	22,852	0	7,617	4,182	3,435	12,305	4,102	11,719	3,632	8,087	3,906	0	3,906
2001	23,996	23,996	0	7,999	4,242	3,756	12,544	4,182	12,180	2,976	9,204	4,060	0	4,060
2002	25,141	25,141	0	8,380	4,299	4,081	12,784	4,261	12,641	2,296	10,346	4,214	0	4,214
2003	26,285	26,285	0	8,762	4,354	4,408	13,023	4,341	13,103	1,594	11,509	4,367	0	4,367
2004	27,430	27,430	0	9,143	4,405	4,738	13,262	4,421	13,564	874	12,690	4,521	0	4,521
2005	28,574	28,574	0	9,525	4,455	5,069	13,501	4,500	14,025	140	13,885	4,675	0	4,675
2006	29,718	29,113	605	9,906	4,504	5,402	13,741	4,580	14,486	0	14,486	4,829	0	4,829
2007	30,863	29,505	1,358	10,288	4,551	5,737	13,980	4,660	14,947	0	14,947	4,983	0	4,983
2008	32,007	29,893	2,114	10,669	4,597	6,072	14,219	4,740	15,409	0	15,409	5,136	0	5,136
2009	33,152	30,278	2,874	11,051	4,643	6,407	14,459	4,819	15,870	0	15,870	5,290	0	5,290
2010	34,296	30,663	3,633	11,432	4,689	6,743	14,698	4,899	16,331	0	16,331	5,444	0	5,444
Handling Charge(US$)		22.5	87		22.5	62.5	87	62.5		56.5	56.5		56.5	56.5

Table 4-3-5 Number of Container (Import)

	Import (LO/LO)								Import (RO/RO)					
	Full(40ft)			Empty(40ft)			20ft		Full(40ft)			Empty(40ft)		
	Total	Banana	Others	Total	Banana	Others	Full	Empty	Total	Banana	Others	Total	Banana	Others
2000	19,805	18,498	1,307	10,664	10,664	0	10,664	5,742	10,156	1,504	8,652	5,469	1,504	3,965
2001	21,025	19,305	1,720	10,969	10,969	0	10,969	5,756	10,665	941	9,724	5,575	941	4,635
2002	22,246	20,147	2,098	11,275	11,275	0	11,275	5,769	11,173	314	10,860	5,682	314	5,368
2003	23,466	21,027	2,439	11,580	11,206	375	11,580	5,783	11,682	0	11,682	5,788	0	5,788
2004	24,687	21,945	2,742	11,886	10,764	1,122	11,886	5,797	12,191	0	12,191	5,895	0	5,895
2005	25,907	22,902	3,005	12,191	10,267	1,924	12,191	5,810	12,700	0	12,700	6,001	0	6,001
2006	27,127	23,901	3,227	12,496	9,716	2,780	12,496	5,824	13,208	0	13,208	6,107	0	6,107
2007	28,348	24,942	3,406	12,802	9,114	3,688	12,802	5,838	13,717	0	13,717	6,214	0	6,214
2008	29,568	26,027	3,541	13,107	8,463	4,644	13,107	5,852	14,226	0	14,226	6,320	0	6,320
2009	30,789	27,158	3,630	13,413	7,763	5,650	13,413	5,865	14,734	0	14,734	6,427	0	6,427
2010	32,009	28,337	3,672	13,718	7,015	6,703	13,718	5,879	15,243	0	15,243	6,533	0	6,533
Handling Charge(US$)		22.5	87		22.5	62.5	87	62.5		56.5	56.5		32.5	32.5

Table 4-3-6 Calculation of Cargo Handling Charge (Export)

(Unit : Thousand Lps.)

	Export (LO/LO)								Export (RO/RO)					
	Full(40ft)			Empty(40ft)			20ft		Full(40ft)			Empty(40ft)		
	Total	Banana	Others	Total	Banana	Others	Full	Empty	Total	Banana	Others	Total	Banana	Others
2000		3,008	0		550	1,256	6,263	1,500		1,201	2,673		0	1,291
2001		3,159	0		558	1,373	6,384	1,529		984	3,042		0	1,342
2002		3,309	0		566	1,492	6,506	1,558		759	3,419		0	1,393
2003		3,460	0		573	1,612	6,628	1,587		527	3,804		0	1,444
2004		3,610	0		580	1,732	6,750	1,616		289	4,194		0	1,494
2005		3,761	0		586	1,853	6,872	1,645		46	4,589		0	1,545
2006		3,832	308		593	1,975	6,993	1,675		0	4,788		0	1,596
2007		3,884	691		599	2,097	7,115	1,704		0	4,940		0	1,647
2008		3,935	1,076		605	2,220	7,237	1,733		0	5,093		0	1,698
2009		3,985	1,462		611	2,343	7,359	1,762		0	5,245		0	1,749
2010		4,036	1,849		617	2,465	7,481	1,791		0	5,398		0	1,799

Table 4-3-7 Calculation of Cargo Handling Charge (Import)

(Unit : Thousand Lps.)

	Import (LO/LO)								Import (RO/RO)						Export + Import
	Full(40ft)			Empty(40ft)			20ft		Full(40ft)			Empty(40ft)			
	Total	Banana	Others	Total	Banana	Others	Full	Empty	Total	Banana	Others	Total	Banana	Others	
2000		2,435	665		1,404	0	5,427	2,099		497	2,860		286	754	36,168
2001		2,541	876		1,444	0	5,583	2,104		311	3,214		179	881	37,505
2002		2,652	1,068		1,484	0	5,738	2,109		104	3,589		60	1,021	38,829
2003		2,768	1,241		1,475	137	5,894	2,114		0	3,861		0	1,100	40,228
2004		2,888	1,395		1,417	410	6,049	2,119		0	4,029		0	1,121	41,700
2005		3,015	1,529		1,351	704	6,205	2,124		0	4,198		0	1,141	43,170
2006		3,146	1,642		1,279	1,017	6,360	2,129		0	4,366		0	1,161	44,866
2007		3,283	1,733		1,200	1,348	6,515	2,134		0	4,534		0	1,181	46,614
2008		3,426	1,802		1,114	1,698	6,671	2,139		0	4,702		0	1,202	48,358
2009		3,575	1,848		1,022	2,066	6,826	2,145		0	4,870		0	1,222	50,098
2010		3,730	1,869		923	2,451	6,982	2,150		0	5,038		0	1,242	51,831

Table 4-3-8 Replacement Investment Schedule

	Gantry Crane	Straddle Carrier	Tractor Head	Chassis	Folklift (7.5t)	Folklift (4.0t)	Total
1995							0
1996							0
1997							0
1998							0
1999	45,000	23,500	7,140	2,060	918	1,088	79,706
2000							0
2001							0
2002							0
2003							0
2004							0
2005							0
2006							0
2007		23,500	7,140	2,060	918	1,088	34,706
2008	45,000						45,000
2009							0
2010							0
2011							0
2012							0
2013							0
2014	45,000						45,000
2015		23,500	7,140	2,060	918	1,088	34,706
2016							0
2017							0
2018							0
2019							0
2020							0
2021							0
2022							0
2023	45,000	23,500	7,140	2,060	918	1,088	79,706
2024							
2025	-51,000	-17,625	-5,355	-1,545	-689	-816	-77,030

Table 4-3-9 Personnel and Administration Costs

(Container Terminal)

Section	Number	Budget Wage/Year	Total (Thousand Lps)
Management	24	24,259	582
Operation	72	21,156	1,523
Gate, Police	12	17,318	208
CFS	40	18,132	725
Maintenance	20	19,898	398
	168		3,437
Personnel Costs : 3,437 * 1.70 = 5,841			
Administration Costs : 5,841 * 0.08 = 467			

(Domestic Terminal)

Section	Number	Budget Wage/Year	Total (Thousand Lps)
Management	5	24,259	121
Operation	10	21,156	212
	15		333
Personnel Costs : 333 * 1.70 = 566			
Administration Costs : 566 * 0.08 = 45			

(Total)

Personnel Costs : 6,407
Administration Costs : 512

Table 4-3-10 Maintenance Costs

(Unit : Thousand Lps.)

Facilities	Cost	Ratio	Maintenance Cost
Conteiner Terminal	134,481	0.01	1,345
CFS	15,400	0.01	154
Domestic Terminal	15,258	0.01	153
By-pass Road	8,233	0.01	82
Equipment	79,706	0.02	1,594
Total	253,078		3,328

Table 4-4-1 FIRR Calculation

<Basic Case> (Unit : Thousand Lps.)

Year	Revenue (1)	Cost(2)			(1)-(2)	Present Value in 1993		
		Investment	Expense	Total		Revenue	Cost	Difference
1996		5,547		5,547	-5,547	0	5,547	-5,547
1997		37,661		37,661	-37,661	0	30,596	-30,596
1998		71,378		71,378	-71,378	0	47,111	-47,111
1999		173,903		173,903	-173,903	0	93,248	-93,248
2000	80,818		10,247	10,247	70,571	35,206	4,464	30,742
2001	83,436		10,247	10,247	73,189	29,528	3,626	25,902
2002	86,063		10,247	10,247	75,816	24,744	2,946	21,798
2003	88,786		10,247	10,247	78,539	20,739	2,394	18,345
2004	91,589		10,247	10,247	81,342	17,380	1,945	15,436
2005	94,421		10,247	10,247	84,174	14,557	1,580	12,977
2006	97,499		10,247	10,247	87,252	12,212	1,283	10,928
2007	100,665	34,706	10,247	44,953	55,712	10,243	4,574	5,669
2008	103,853	45,000	10,247	55,247	48,606	8,585	4,567	4,018
2009	103,853		10,247	10,247	93,606	6,975	688	6,286
2010	103,853		10,247	10,247	93,606	5,666	559	5,107
2011	103,853		10,247	10,247	93,606	4,603	454	4,149
2012	103,853		10,247	10,247	93,606	3,740	369	3,371
2013	103,853		10,247	10,247	93,606	3,038	300	2,738
2014	103,853	45,000	10,247	55,247	48,606	2,468	1,313	1,155
2015	103,853	34,706	10,247	44,953	58,900	2,005	868	1,137
2016	103,853		10,247	10,247	93,606	1,629	161	1,468
2017	103,853		10,247	10,247	93,606	1,324	131	1,193
2018	103,853		10,247	10,247	93,606	1,075	106	969
2019	103,853		10,247	10,247	93,606	874	86	787
2020	103,853		10,247	10,247	93,606	710	70	640
2021	103,853		10,247	10,247	93,606	577	57	520
2022	103,853		10,247	10,247	93,606	468	46	422
2023	103,853	79,706	10,247	89,953	13,900	381	330	51
2024	103,853		10,247	10,247	93,606	309	31	279
2025	103,853	-77,030	10,247	-66,783	170,636	251	-162	413
Total	2,592,631	450,577	266,422	716,999	1,875,632	209,287	209,287	0

EIRR= 0.2309007

Table 4-4-2 FIRR Calculation

<Investiment +10%> (Unit : Thousand Lps.)

Year	Revenue (1)	Cost(2)			(1)-(2)	Present Value in 1993		
		Investment	Expense	Total		Revenue	Cost	Difference
1996		6,102		6,102	-6,102	0	6,102	-6,102
1997		41,427		41,427	-41,427	0	34,200	-34,200
1998		78,516		78,516	-78,516	0	53,511	-53,511
1999		191,293		191,293	-191,293	0	107,627	-107,627
2000	80,818	0	10,247	10,247	70,571	37,538	4,760	32,779
2001	83,436	0	10,247	10,247	73,189	31,993	3,929	28,064
2002	86,063	0	10,247	10,247	75,816	27,244	3,244	24,000
2003	88,786	0	10,247	10,247	78,539	23,202	2,678	20,525
2004	91,589	0	10,247	10,247	81,342	19,759	2,211	17,549
2005	94,421	0	10,247	10,247	84,174	16,817	1,825	14,992
2006	97,499	0	10,247	10,247	87,252	14,335	1,507	12,829
2007	100,665	38,177	10,247	48,424	52,241	12,219	5,878	6,341
2008	103,853	49,500	10,247	59,747	44,106	10,407	5,987	4,420
2009	103,853	0	10,247	10,247	93,606	8,591	848	7,744
2010	103,853	0	10,247	10,247	93,606	7,092	700	6,393
2011	103,853	0	10,247	10,247	93,606	5,855	578	5,277
2012	103,853	0	10,247	10,247	93,606	4,834	477	4,357
2013	103,853	0	10,247	10,247	93,606	3,990	394	3,597
2014	103,853	49,500	10,247	59,747	44,106	3,294	1,895	1,399
2015	103,853	38,177	10,247	48,424	55,429	2,720	1,268	1,452
2016	103,853	0	10,247	10,247	93,606	2,245	222	2,024
2017	103,853	0	10,247	10,247	93,606	1,853	183	1,671
2018	103,853	0	10,247	10,247	93,606	1,530	151	1,379
2019	103,853	0	10,247	10,247	93,606	1,263	125	1,139
2020	103,853	0	10,247	10,247	93,606	1,043	103	940
2021	103,853	0	10,247	10,247	93,606	861	85	776
2022	103,853	0	10,247	10,247	93,606	711	70	641
2023	103,853	87,677	10,247	97,924	5,929	587	553	33
2024	103,853	0	10,247	10,247	93,606	484	48	437
2025	103,853	-84,733	10,247	-74,486	178,339	400	-287	687
Total	2,592,631	495,635	266,422	762,057	1,830,574	240,868	240,868	-0

EIRR= 0.2113198

Table 4-4-3 FIRR Calculation

<Revenue -10%> (Unit : Thousand Lps.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Present Value in 1993 Revenue	Cost	Difference
1996		5,547		5,547	-5,547	0	5,547	-5,547
1997		37,661		37,661	-37,661	0	31,214	-31,214
1998		71,378		71,378	-71,378	0	49,033	-49,033
1999		173,903		173,903	-173,903	0	99,014	-99,014
2000	72,736		10,247	10,247	62,489	34,324	4,836	29,489
2001	75,092	0	10,247	10,247	64,845	29,371	4,008	25,363
2002	77,457	0	10,247	10,247	67,210	25,110	3,322	21,788
2003	79,907	0	10,247	10,247	69,660	21,470	2,753	18,717
2004	82,430	0	10,247	10,247	72,183	18,357	2,282	16,075
2005	84,979	0	10,247	10,247	74,732	15,685	1,891	13,794
2006	87,749	0	10,247	10,247	77,502	13,424	1,568	11,856
2007	90,599	34,706	10,247	44,953	45,646	11,487	5,700	5,788
2008	93,468	45,000	10,247	55,247	38,221	9,822	5,806	4,017
2009	93,468		10,247	10,247	83,221	8,141	893	7,249
2010	93,468	0	10,247	10,247	83,221	6,748	740	6,008
2011	93,468	0	10,247	10,247	83,221	5,593	613	4,979
2012	93,468	0	10,247	10,247	83,221	4,635	508	4,127
2013	93,468	0	10,247	10,247	83,221	3,842	421	3,421
2014	93,468	45,000	10,247	55,247	38,221	3,184	1,882	1,302
2015	93,468	34,706	10,247	44,953	48,515	2,639	1,269	1,370
2016	93,468		10,247	10,247	83,221	2,187	240	1,948
2017	93,468	0	10,247	10,247	83,221	1,813	199	1,614
2018	93,468	0	10,247	10,247	83,221	1,503	165	1,338
2019	93,468	0	10,247	10,247	83,221	1,245	137	1,109
2020	93,468	0	10,247	10,247	83,221	1,032	113	919
2021	93,468	0	10,247	10,247	83,221	856	94	762
2022	93,468	0	10,247	10,247	83,221	709	78	631
2023	93,468	79,706	10,247	89,953	3,515	588	566	22
2024	93,468		10,247	10,247	83,221	487	53	434
2025	93,468	-77,030	10,247	-66,783	160,251	404	-288	692
Total	2,333,368	450,577	266,422	716,999	1,616,369	224,655	224,655	-0

EIRR= 0.2065261

Table 4-4-4 FIRR Calculation

<Investment +10%, Revenue -10%> (Unit : Thousand Lps.)

Year	Revenue (1)	Cost(2)			(1)-(2)	Present Value in 1993		
		Investment	Expense	Total		Revenue	Cost	Difference
1996		6,102		6,102	-6,102	0	6,102	-6,102
1997		41,427		41,427	-41,427	0	34,861	-34,861
1998		78,516		78,516	-78,516	0	55,600	-55,600
1999		191,293		191,293	-191,293	0	113,993	-113,993
2000	72,736	0	10,247	10,247	62,489	36,474	5,138	31,336
2001	75,092	0	10,247	10,247	64,845	31,688	4,324	27,364
2002	77,457	0	10,247	10,247	67,210	27,505	3,639	23,866
2003	79,907	0	10,247	10,247	69,660	23,878	3,062	20,816
2004	82,430	0	10,247	10,247	72,183	20,728	2,577	18,151
2005	84,979	0	10,247	10,247	74,732	17,982	2,168	15,814
2006	87,749	0	10,247	10,247	77,502	15,625	1,825	13,801
2007	90,599	38,177	10,247	48,424	42,175	13,576	7,256	6,320
2008	93,468	49,500	10,247	59,747	33,721	11,786	7,534	4,252
2009	93,468	0	10,247	10,247	83,221	9,918	1,087	8,831
2010	93,468	0	10,247	10,247	83,221	8,346	915	7,431
2011	93,468	0	10,247	10,247	83,221	7,023	770	6,253
2012	93,468	0	10,247	10,247	83,221	5,910	648	5,262
2013	93,468	0	10,247	10,247	83,221	4,974	545	4,428
2014	93,468	49,500	10,247	59,747	33,721	4,185	2,675	1,510
2015	93,468	38,177	10,247	48,424	45,044	3,522	1,825	1,697
2016	93,468	0	10,247	10,247	83,221	2,964	325	2,639
2017	93,468	0	10,247	10,247	83,221	2,494	273	2,221
2018	93,468	0	10,247	10,247	83,221	2,099	230	1,869
2019	93,468	0	10,247	10,247	83,221	1,766	194	1,572
2020	93,468	0	10,247	10,247	83,221	1,486	163	1,323
2021	93,468	0	10,247	10,247	83,221	1,251	137	1,114
2022	93,468	0	10,247	10,247	83,221	1,052	115	937
2023	93,468	87,677	10,247	97,924	-4,456	886	928	-42
2024	93,468	0	10,247	10,247	83,221	745	82	664
2025	93,468	-84,733	10,247	-74,486	167,954	627	-500	1,127
Total	2,333,368	495,635	266,422	762,057	1,571,311	258,492	258,492	-0

EIRR= 0.1883407

Table 4-4-5 Financial Statement [85%: foreign fund (3%), 15%: internal resources]

Income Statement

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operating Revenue	0	0	0	0	80,043	82,477	84,898	87,394	89,963	92,529	95,322	98,167	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008
Operating Expenditure	0	0	0	0	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528
Personnel					5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925
Maintenance					3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328
Administration					474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474
Depreciation	0	0	0	0	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,301	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801
Net Operating Income	0	0	0	0	55,515	57,949	60,370	62,866	65,435	68,001	70,794	73,639	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480
Non-operating Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Others																														
Non-operating Expenditure	166	1,296	3,438	8,655	8,655	8,655	8,655	8,655	8,655	8,655	8,646	8,582	8,410	7,977	7,544	7,111	6,679	6,246	5,813	5,381	4,948	4,515	4,082	3,650	3,217	2,784	2,351	1,919	1,486	1,053
Interest on Long-term Loans	166	1,296	3,438	8,655	8,655	8,655	8,655	8,655	8,655	8,655	8,646	8,582	8,410	7,977	7,544	7,111	6,679	6,246	5,813	5,381	4,948	4,515	4,082	3,650	3,217	2,784	2,351	1,919	1,486	1,053
Others																														
Net Income	-166	-1,296	-3,438	-8,655	46,860	49,294	51,715	54,211	56,780	59,346	62,148	65,058	68,070	68,503	68,936	69,369	69,801	70,234	70,667	71,100	71,532	71,965	72,398	72,831	73,263	73,696	74,129	74,561	74,994	75,427
Accumulated Earnings	-166	-1,463	-4,900	-13,555	33,306	82,600	134,315	188,527	245,307	304,654	366,802	431,859	499,930	568,433	637,369	706,738	776,539	846,773	917,440	988,540	1,060,072	1,132,037	1,204,435	1,277,265	1,350,529	1,424,225	1,498,353	1,572,915	1,647,909	1,723,336

Cash Flow

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Cash Beginning	0	-998	-7,944	-22,088	-56,828	4,833	68,928	135,445	204,457	276,038	350,186	426,857	504,555	546,447	570,327	639,639	709,384	779,562	850,173	921,216	947,692	984,351	1,056,692	1,129,466	1,202,673	1,276,313	1,350,385	1,424,891	1,499,829	1,575,199
Cash Inflow	4,715	32,012	60,671	147,818	70,316	72,750	75,171	77,667	80,236	82,802	85,595	88,440	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281
Net Operating Income	0	0	0	0	55,515	57,949	60,370	62,866	65,435	68,001	70,794	73,639	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480
Depreciation	0	0	0	0	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801
Long-term Loans	4,715	32,012	60,671	147,818		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cash Outflow	5,713	38,957	74,816	182,558	8,655	8,655	8,655	8,655	8,655	8,655	8,924	10,742	48,389	67,401	21,969	21,536	21,103	20,670	20,238	64,805	54,622	18,940	18,507	18,074	17,641	17,209	16,776	16,343	15,910	15,478
Investment	5,547	37,661	71,378	173,903									35,250	45,000						45,000	35,250									
Payment for Long-term Loans	0	0	0	0	0	0	0	0	0	0	277	2,160	5,729	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424	14,424
Interest on Long-term Loans	166	1,296	3,438	8,655	8,655	8,655	8,655	8,655	8,655	8,655	8,646	8,582	8,410	7,977	7,544	7,111	6,679	6,246	5,813	5,381	4,948	4,515	4,082	3,650	3,217	2,784	2,351	1,919	1,486	1,053
Other Non-operating Expenditure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Outflow	-998	-6,945	-14,144	-34,740	61,661	64,095	66,516	69,012	71,581	74,147	76,671	77,698	41,892	23,880	69,312	69,745	70,178	70,611	71,043	26,476	36,659	72,341	72,774	73,207	73,640	74,072	74,505	74,938	75,371	75,803
Cash Ending	-998	-7,944	-22,088	-56,828	4,833	68,928	135,445	204,457	276,038	350,186	426,857	504,555	546,447	570,327	639,639	709,384	779,562	850,173	921,215	947,692	984,351	1,056,692	1,129,466	1,202,673	1,276,313	1,350,385	1,424,891	1,499,829	1,575,199	1,651,003
Cash Excess	0	0	0	0	4,833	68,928	135,445	204,457	276,038	350,186	426,857	504,555	546,447	570,327	639,639	709,384	779,562	850,173	921,216	947,692	984,351	1,056,692	1,129,466	1,202,673	1,276,313	1,350,385	1,424,891	1,499,829	1,575,199	1,651,003
Cash Shortage	-998	-7,944	-22,088	-56,828	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Balance Sheet

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Current Assets	0	0	0	0	4,833	68,928	135,445	204,457	276,038	350,186	426,857	504,555	546,447	570,327	639,639	709,384	779,562	850,173	921,216	947,692	984,351	1,056,692	1,129,466	1,202,673	1,276,313	1,350,385	1,424,891	1,499,829	1,575,199	1,651,003
Cash & Deposit	0	0	0	0	4,833	68,928	135,445	204,457	276,038	350,186	426,857	504,555	546,447	570,327	639,639	709,384	779,562	850,173	921,216	947,692	984,351	1,056,692	1,129,466	1,202,673	1,276,313	1,350,385	1,424,891	1,499,829	1,575,199	1,651,003
Other Current Assets																														
Fixed Assets	5,547	43,208	114,586	288,489	273,688	258,887	244,086	229,286	214,485	199,684	184,883	170,082	190,531	220,730	205,929	191,129	176,328	161,527	146,726	176,925	197,374	182,573	167,772	152,972	138,171	123,370	108,569	93,768	78,967	64,165
Depreciable Assets	5,547	43,208	114,586	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489
Accumulated Depreciation	0	0	0	0	14,801	29,602	44,403	59,203	74,004	88,805	103,606	118,407	97,958	67,759	82,560	97,360	112,161	126,962	141,763	111,564	91,115	105,916	120,717	135,517	150,318	165,119	179,920	194,721	209,522	224,323
Total Assets	5,547	43,208	114,586	288,489	278,521	327,816	379,531	433,743	490,523	549,870	611,740	674,637	736,978	791,057	845,569	900,513	955,890	1,011,699	1,067,942	1,124,617	1,181,725	1,239,265	1,297,239	1,355,645	1,414,484	1,473,755	1,533,460	1,593,597	1,654,166	1,715,169
Liabilities	5,713	44,671	119,486	302,044	245,216	245,216	245,216	245,216	245,216	245,216	244,938	242,778	237,049	222,624	208,200	193,775	179,351	164,926	150,502	136,077	121,653	107,229	92,804	78,380	63,955	49,531	35,106	20,682	6,257	-8,167
Current Liabilities(Cross subsidy)	998	7,944	22,088	56,828	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fixed Liabilities(Long-term Loans)	4,715	36,727	97,398	245,216	245,216	245,216	245,216	245,216	245,216	245,216	244,938	242,778	237,049	222,624	208,200	193,775	179,351	164,926	150,502	136,077	121,653	107,229	92,804	78,380	63,955	49,531	35,106	20,682	6,257	-8,167
Capital																														
Accumulated Earnings	-166	-1,463	-4,900	-13,555	33,306	82,600	134,315	188,527	245,307	304,654	366,802	431,859	499,930	568,433	637,369	706,738	776,539	846,773	917,440	988,540	1,060,072	1,132,037	1,204,435	1,277,265	1,350,529	1,424,225	1,498,353	1,572,915	1,647,909	1,723,336
Total Liabilities & Capital	5,547	43,208	114,586	288,489	278,521	327,816	379,531	433,743	490,523	549,870	611,740	674,637	736,978	791,057	845,569	900,513	955,890	1,011,699	1,067,942	1,124,617	1,181,725	1,239,265	1,297,239	1,355,645	1,414,484	1,473,755	1,533,460	1,593,597	1,654,166	1,715,169
	0	0	0	0	-0	0	0	0	0	0	0	0	-0	0	0	0	0	0	0	0	-0	-0	0	0	0	0	0	0	0	0

Financial Indicators	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rate of Return on Net Fixed Assets (%)	0	0	0	0	20.28	22.38	24.73	27.42	30.51	34.05	38.29	43.30	40.14	34.65	37.14	40.02	43.37	47.35	52.12	43.23	38.75	41.89	45.59	50.00	55.35	61.99	70.44	81.56	96.85	119.19
Debt Service Coverage Ratio	0	0	0	0	8.12	8.41	8.69	8.97	9.27	9.57	9.59	8.23	6.46	4.07	4.16	4.24	4.33	4.42	4.51	4.61	4.71	4.82	4.93	5.05	5.17	5.30	5.44	5.59	5.74	5.90
Operating Ratio (%)					30.64	29.74	28.89	28.07	27.26	26.51	25.73	24.99	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28
Working Ratio (%)					12.15	11.79	11.46	11.13	10.81	10.51	10.20	9.91	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63

Table 4-4-6 Financial Statement [100%: foreign fund (8%)]

Income Statement

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operating Revenue	0	0	0	0	80,043	82,477	84,898	87,394	89,963	92,529	95,322	98,167	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008	101,008
Operating Expenditure	0	0	0	0	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528	24,528
Personnel					5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925	5,925
Maintenance					3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328	3,328
Administration					474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474	474
Depreciation	0	0	0	0	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801
Net Operating Income	0	0	0	0	55,515	57,949	60,370	62,866	65,435	68,001	70,794	73,639	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480
Non-operating Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others																														
Non-operating Expenditure	444	3,457	9,167	23,079	23,079	23,050	22,819	22,208	20,669	19,131	17,592	16,054	14,515	12,975	11,438	9,899	8,360	6,822	5,283	3,745	2,236	927	0	0	0	0	0	0	0	0
Interest on Long-term Loans	444	3,457	9,167	23,079	23,079	23,050	22,819	22,208	20,669	19,131	17,592	16,054	14,515	12,976	11,438	9,899	8,360	6,822	5,283	3,745	2,236	927	0	0	0	0	0	0	0	0
Others																														
Net Income	-444	-3,457	-9,167	-23,079	32,436	34,900	37,551	40,658	44,766	48,870	53,202	57,586	61,965	63,504	65,042	66,581	68,120	69,658	71,197	72,735	74,244	75,553	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480
Accumulated Earnings	-444	-3,900	-13,067	-36,146	-3,710	31,189	68,740	109,398	154,164	203,035	256,237	313,822	375,787	439,291	504,334	570,915	639,034	708,692	779,889	852,625	926,869	1,002,422	1,078,902	1,155,382	1,231,862	1,308,342	1,384,823	1,461,303	1,537,783	1,614,263

Cash Flow

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Cash Beginning	0	-444	-3,900	-13,067	-36,146	11,090	60,421	109,893	157,712	198,047	242,485	291,255	344,409	366,693	380,765	441,376	503,525	567,213	632,439	699,204	722,508	757,441	831,442	911,130	1,002,411	1,093,692	1,184,973	1,276,254	1,367,535	1,458,816
Cash Inflow	5,547	37,661	71,378	173,903	70,316	72,750	75,171	77,667	80,236	82,802	85,595	88,440	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281	91,281
Net Operating Income	0	0	0	0	55,515	57,949	60,370	62,866	65,435	68,001	70,794	73,639	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480	76,480
Depreciation	0	0	0	0	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801	14,801
Long-term Loans	5,547	37,661	71,378	173,903		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cash Outflow	5,991	41,118	80,545	196,982	23,079	23,419	25,700	29,847	39,902	38,363	36,825	35,286	68,998	77,209	80,670	29,132	27,593	26,054	24,516	67,977	56,348	17,280	11,594	0	0	0	0	0	0	0
Investment	5,547	37,661	71,378	173,903									35,250	45,000						45,000	35,250									
Payment for Long-term Loans	0	0	0	0	0	370	2,881	7,639	19,233	19,233	19,233	19,233	19,233	19,233	19,233	19,233	19,233	19,233	19,233	19,233	18,863	16,352	11,594	0	0	0	0	0	0	0
Interest on Long-term Loans	444	3,457	9,167	23,079	23,079	23,050	22,819	22,208	20,669	19,131	17,592	16,054	14,515	12,976	11,438	9,899	8,360	6,822	5,283	3,745	2,236	927	0	0	0	0	0	0	0	0
Other Non-operating Expenditure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Outflow	-444	-3,457	-9,167	-23,079	47,237	49,331	49,471	47,820	40,334	44,439	48,770	53,154	22,283	14,072	60,611	62,149	63,688	65,227	66,765	23,304	34,933	74,001	79,687	91,281	91,281	91,281	91,281	91,281	91,281	91,281
Cash Ending	-444	-3,900	-13,067	-36,146	11,090	60,421	109,893	157,712	198,047	242,485	291,255	344,409	366,693	380,765	441,376	503,525	567,213	632,439	699,204	722,508	757,441	831,442	911,130	1,002,411	1,093,692	1,184,973	1,276,254	1,367,535	1,458,816	1,550,097
Cash Excess	0	0	0	0	11,090	60,421	109,893	157,712	198,047	242,485	291,255	344,409	366,693	380,765	441,376	503,525	567,213	632,439	699,204	722,508	757,441	831,442	911,130	1,002,411	1,093,692	1,184,973	1,276,254	1,367,535	1,458,816	1,550,097
Cash Shortage	-444	-3,900	-13,067	-36,146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Balance Sheet

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Current Assets	0	0	0	0	11,090	60,421	109,893	157,712	198,047	242,485	291,255	344,409	366,693	380,765	441,376	503,525	567,213	632,439	699,204	722,508	757,441	831,442	911,130	1,002,411	1,093,692	1,184,973	1,276,254	1,367,535	1,458,816	1,550,097
Cash & Deposit	0	0	0	0	11,090	60,421	109,893	157,712	198,047	242,485	291,255	344,409	366,693	380,765	441,376	503,525	567,213	632,439	699,204	722,508	757,441	831,442	911,130	1,002,411	1,093,692	1,184,973	1,276,254	1,367,535	1,458,816	1,550,097
Other Current Assets																														
Fixed Assets	5,547	43,208	114,586	288,489	273,688	258,887	244,086	229,286	214,485	199,684	184,883	170,082	190,531	220,730	205,929	191,129	176,328	161,527	146,726	176,925	197,374	182,573	167,772	152,972	138,171	123,370	108,569	93,768	78,967	64,166
Depreciable Assets	5,547	43,208	114,586	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489	288,489
Accumulated Depreciation	0	0	0	0	14,801	29,602	44,403	59,203	74,004	88,805	103,606	118,407	97,958	67,759	82,560	97,360	112,161	126,962	141,763	111,564	91,115	105,916	120,717	135,517	150,318	165,119	179,920	194,721	209,522	224,323
Total Assets	5,547	43,208	114,586	288,489	284,779	319,308	353,979	386,998	412,531	442,169	476,138	514,491	557,224	601,495	647,305	694,653	743,540	793,966	845,930	899,433	954,815	1,014,015	1,078,902	1,155,382	1,231,862	1,308,342	1,384,823	1,461,303	1,537,783	1,614,263
Liabilities	5,991	47,108	127,653	324,635	288,489	288,119	285,239	277,600	258,367	239,134	219,902	200,669	181,437	162,204	142,971	123,739	104,506	85,274	66,041	46,808	27,946	11,594	0	0	0	0	0	0	0	0
Current Liabilities(Cross subsid)	444	3,900	13,067	36,146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fixed Liabilities(Long-term Loans)	5,547	43,208	114,586	288,489	288,489	288,119	285,239	277,600	258,367	239,134	219,902	200,669	181,437	162,204	142,971	123,739	104,506	85,274	66,041	46,808	27,946	11,594	0	0	0	0	0	0	0	0
Capital																														
Accumulated Earnings	-444	-3,900	-13,067	-36,146	-3,710	31,189	68,740	109,398	154,164	203,035	256,237	313,822	375,787	439,291	504,334	570,915	639,034	708,692	779,889	852,625	926,869	1,002,422	1,078,902	1,155,382	1,231,862	1,308,342	1,384,823	1,461,303	1,537,783	1,614,263
Total Liabilities & Capital	5,547	43,208	114,586	288,489	284,779	319,308	353,979	386,998	412,531	442,169	476,138	514,491	557,224	601,495	647,305	694,653	743,540	793,966	845,930	899,433	954,815	1,014,015	1,078,902	1,155,382	1,231,862	1,308,342	1,384,823	1,461,303	1,537,783	1,614,263
	0	0	0	0	-0	0	0	-0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Financial Indicators	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rate of Return on Net Fixed Assets (%)	0	0	0	0	20.28	22.38	24.73	27.42	30.51	34.05	38.29	43.30	40.14	34.65	37.14	40.02	43.37	47.35	52.12	43.23	38.75	41.89	45.59	50.00	55.35	61.99	70.44	81.56	96.85	119.19
Debt Service Coverage Ratio	0	0	0	0	3.05	3.11	2.92	2.60	2.01	2.16	2.32	2.51	2.70	2.83	2.98	3.13	3.31	3.50	3.72	3.97	4.33	5.28	7.87							
Operating Ratio (%)					30.64	29.74	28.89	28.07	27.26	26.51	25.73	24.99	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28	24.28
Working Ratio (%)					12.15	11.79	11.46	11.13	10.81	10.51	10.20	9.91	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63

Chapter 5 Environmental Impact Assessment

5.1 Qualitative Evaluation of selected Environmental Constituents (CEs)

181. There is very little environmental data available for the Study. As listed in PART IV, Present Conditons of the Port of Cortes, the only data available is on water quality. Therefore, qualitative evaluation can be applied for almost all environmetal constituents based on the Team's observations as well as various experiences in developed countries including Japan. Only impact of water quality is evaluated quantitatively.

5.1.1 General Characteristics of Each Environmental Constituents

182. As chosen in Initial Environmental Examination of PART III, environmental constituents to be further examined are as follows;

1) Construction	--->	a. water quality b. sea bottom material quality c. noise and vibration
2) Emergence of sites	--->	a. current around the new unit cargo terminal
3) Utilization	--->	a. noise and vibration b. water quality c. air quality

183. Here, unit cargo terminal, by-pass road and domestic terminal are chosen as a set of objective projects and environmental impact is assessed only for these projects. More consideration is required when other projects are planned and implemented. For example, dry bulk terminal requires another environmental impact assessment. The possible constituents to be checked for the dry bulk terminal are; dust and noise caused by operation, water quality caused by accidental spill and leakage and so on.

184. The items listed above are selected from the view point of the potentiality in terms of the deterioration to the surrounding environment. Among these items, water quality and water bottom material quality are the items which should carefully be checked because the construction work includes dredging as well as reclamation. Dredging and reclamation works will generate turbidity which is sometimes accompanied by deterioration of DO (Dissolved Oxygen) and COD (Chemical Oxygen Demand). Turbidity itself affects various sea activities such as fishing and sea recreation, however, the degree of impact is far smaller than the other factors affecting water quality.

185. Another effect, by the works, is a possibility of deterioration of the eco-system. Dredging work will sweep away and reclamation work bury all the benthos. If there is a large habitation of benthic organs, the dredging and reclamation works may bring a big impact.

186. Other items to be considered are noise and vibration. At the construction stage, noise and vibration are produced by heavy machines for construction work and vehicles for transportation of construction materials. At the operation stage, traffic volume is expected to increase to a considerable level which may bring a larger impact on environment.

187. Current around the new unit cargo terminal is another item to be examined. Emergence of new site may change the direction and the velocity of current which in turn may cause erosion or sedimentation on the shoreline around the site. The unit cargo terminal may as well affect the wave phenomenon which cause wave concentration and change of current pattern induced by wave.

188. Air quality is also a item to be examined. There are many constituents of air quality, however, typical indices for examining environmental impact by port project are dust, NOX (Nitrate-Oxygen compounds), SOX (Sulpher-Pxygen compounds) and CO2 (Carbon dioxide). Among these constituents, dust accompanies direct port operation, however, other items depend on port related activities such as industry as well as transportation.

5.1.2 Qualitative Evaluation

189. Environmental problems in Honduras are in their early stage. When the situation is rather good, problems are only identified when visible damage occurs. The environmental issue in Honduras is thought to be at this level. A typical example is a natural hazard triggered by environmental deterioration such as a flood caused by deforestoration (as issue which currently attracts keen attention in Honduras). The invisible environmental deterioration has garnered little possible debate so far. This is mainly because the environmental situation in Honduras is pretty good thanks to the lack of large scale industrial compounds which act as large pollution sources. Likewise, in the Bay of Cortes including the port, no serious environmental problem, so far, has been reported nor was observed during the study conducted by the Study Team.

190. Through the various field studies, however, it is noted that water quality sometimes shows anomalies. As for the source of these anomalies, it is commonly known among the local people that the pollution comes from river discharges as well as waste water from households. The port facilities as well as port activities have contributed to the pollution of the Bay only to a limited extent and the contribution of the port will remain at the current limited level.

[Bottom material]

191. Although no data on sea bottom material quality exists, there is no contamination expected. Deterioration of the bottom sediment is usually a long process. Contaminated waste water discharged into the bay over a long span of time carries various substances which settle and accumulate on the bottom and become potential sources of water quality deterioration like DO (dissolved Oxygen), COD(Chemical Oxygen Demand) and sometimes toxic materials. However, there are no or a very limited number of factories/mines which may generate toxic materials around the bay and along the basin of the rivers which discharge into the bay. Therefore, there is no accumulation of toxic substances expected in the bottom sediment of the Bay of Cortes. Even if the bottom sediment is stirred up, there is no fear of contamination or deterioration to the environment by the bottom sediment.

[Eco system]

192. As for the impact on benthos by the dredging as well as reclamation works, there is no serious problem foreseen. When ENP conducted large dredging and reclamation works in 1988 and 1989, there was no complaints concerning environmental deterioration. Every year, Texaco has been conducting dredging work (some 150 - 200 thousand cubic meters), however, no environmental problems have so far materialized. This is backed up by the fact that fishing in the bay, especially in the area near the port facilities including the reclaimed area, is very rare, according to interviews with local fishermen. Therefore, impact of dredging/reclamation works on benthic organs is expected to be minimal and no countermeasure is required.

[Current and waves]

193. The sea conditions in the Bay of Cortes are generally mild. There is no strong current reported in the bay and waves in the Bay are small thanks to the sheltering effects of the Punta de Caballos. So far, there has been no significant damage to the land area of the Bay of Cortes caused by sea phenomenon. The new land area is expanded southerly a few hundred meters with the unchanged direction of water front line and the reclaimed land is covered by rubble mound slope which dissipates wave energy and lower wave reflection. So, coastal phenomenon in the Bay will not change by the unit cargo terminal and no adverse effect, such as shore erosion and sedimentation is expected. As for the domestic terminal, the lay-out should be carefully planned so as not

to hinder the current from the Lagua de Alvarado. If the structure obstructs the smooth flow, the result may be disastrous, depending on the volume and velocity of the flow. Construction of a well planned training wall could avoid the risk and ensure safe operation at the terminal.

[Air quality]

194. At present, dust is the only item of air quality which is observed during the grain as well as fertilizer operation. Grain and fertilizer are the items which are planned to be transferrred to the exclusive dry bulk terminal. Thus, the environmetnal burden of the project will decrease comparing with the present condition. Port traffic may also have an put impact on air quality in terms of NOX and SOX. At the moment, no data for NOX nor SOX is available, however, by observation no pollution by NOX and SOX is noticed. In future, the volume of port traffic increases as well as the amount of cargo handling equipment which acts as additional burden on the environment. However, a considerable volume of dry bulk cargoes would be transferred to the dry bulk terminal and be transported by conveyer system which lessens the environmental burden. Thus, it appears that a air quality in the port will remain at its current level. The traffic volume out side the port increases as well, however, by-pass road will divide the traffic volume which results in the leveling of the air quality. In total, air quality is expected to continue at almost the same level in the future.

[Noise and Vibration]

195. The possible sources of noise and vibration produced during the construction period are as follows;

i. Heavy construction machines
ii. Trucks and trailers

196. Among heavy construction machines, the main possible sources of noise and vibration are driving piles. Many RC piles are planned to be used, however, ENP has experience in using the Water Jet Pile Driving Method which has no noise or vibration problem.

197. Construction site is remote from the residential area and thus noise produced by heavy construction machines as well as trucks and trailers in side the port causes no serious problem.

198. The volume of transportation is expected to dramatically increase and the total level of noise will increase. However, the project includes construction of the by-pass road which bears about half of the port traffic. Thus, the noise is dispersed to the level of less than present and no significant problem is foreseen.

199. In short, the environmental index to be further examined quantatively is water quality, especially turbidity.

5.2 Methodologies for EIA

200. There are no environmental standards which could be utilized as environmental targets, nor sufficient accumulation of environmental data in Honduras. Thus, the discussions below remain at the qualitative level. Our task is how to best evaluate the effects of the project on the environment.

201. The environmental indices for EIA have already chosen. The depth of the study for EIA should be appropriately examined and methodologies should be adopted accordingly. There are several methods, in terms of the depth of the study, to examine the environmental effects by a certain project or activity. "Environmental Assessment Handbook for Port Development Projects, March 1993" studied and compiled by OCDI (original in Japanese), proposes four (4) methodologies, as shown in the following table, for environmental impact assessment with their adoptability, according to the expected magnitude of the impact and the present condition of environment.

Table 5-2-1 Selection of a Suitable Assessment Method

Magnitude of impact*1		Significance of human concern*2		
		Major	Moderate	Small
Impact	Major	D	D	D
	Moderate	D	C or D	C
	Small	B or C	B	A

Method A: Impact grasping method
Method B: Impact assessment method
Method C: General assessment method
Method D: Comprehensive assessment method

*1 : The magnitude of impact does not have absolute range, but is judged based on the situation of the proposed area and existing environmental burdens.

*2 : The evaluation of the present environmental conditions is classified as significance of human concern which would be judged on the situation of pollution or on the situation of conservation of natural and social environment (higher ranks for more polluted condition or for the more conserved environment).

202. The four methodologies for EIA proposed in the Handbook are briefly explained as follows;

a. Method A; Impact Grasping Method

This method tries to determine the magnitude of impacts by the port development project on the present environment in and around the port, in comparison with impacts from other causes. If the impact from the port development project is determined to be small, then impacts of port development project would not be further examined, and no mitigatory countermeasures are needed.

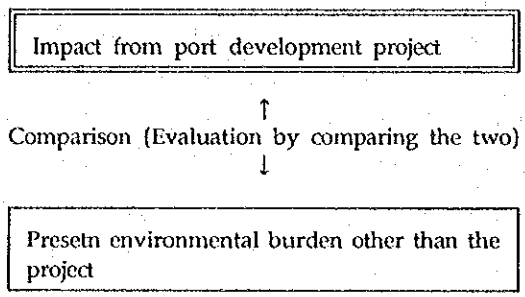

Fig. 5-2-1 Method A; Impact Grasping Method

b. Method B; Impact Assessment Method

The method first conducts prediction of magnitude of the impact generated in the future only by port development project, and compares it with the present environmental condition in the background area, then conducts assessment using the degree of differences or ratio between them.

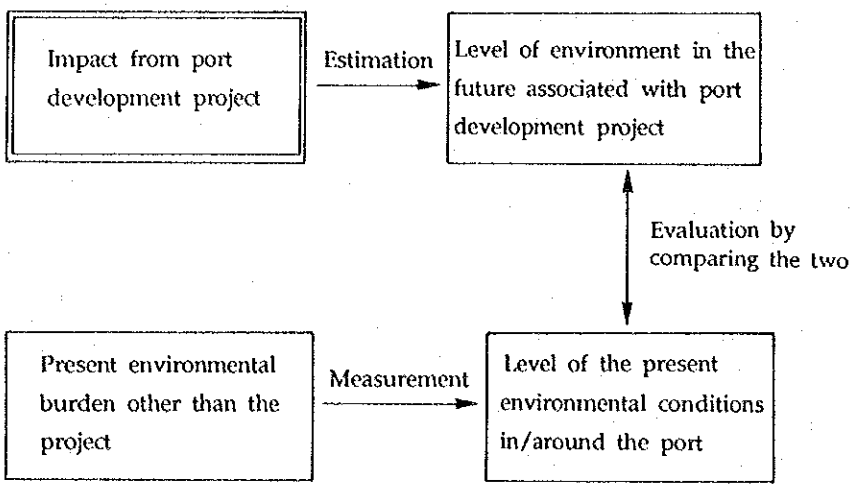

Fig. 5-2-2 Method B; Impact Assessment Method

As impact grasping method and impact assessment method can be done without an estimation of future burden and pollutant concentration in the background area, they can be conducted easily. However, it is necessary to consider the appropriate additional burden.

c. Method C; General Assessment Method

This method stands between impact assessment (Method B) and comprehensive method (Method D). It estimates the impact associated only with the port development project in future, then adds it to the present level of the background area, and obtains the future environmental level. The detailed result is evaluated by comparison with the environmental target. This method is applied where the site is presently in a favorable environmental condition, and environmental burden other than the project continues to be almost at the same level in the future.

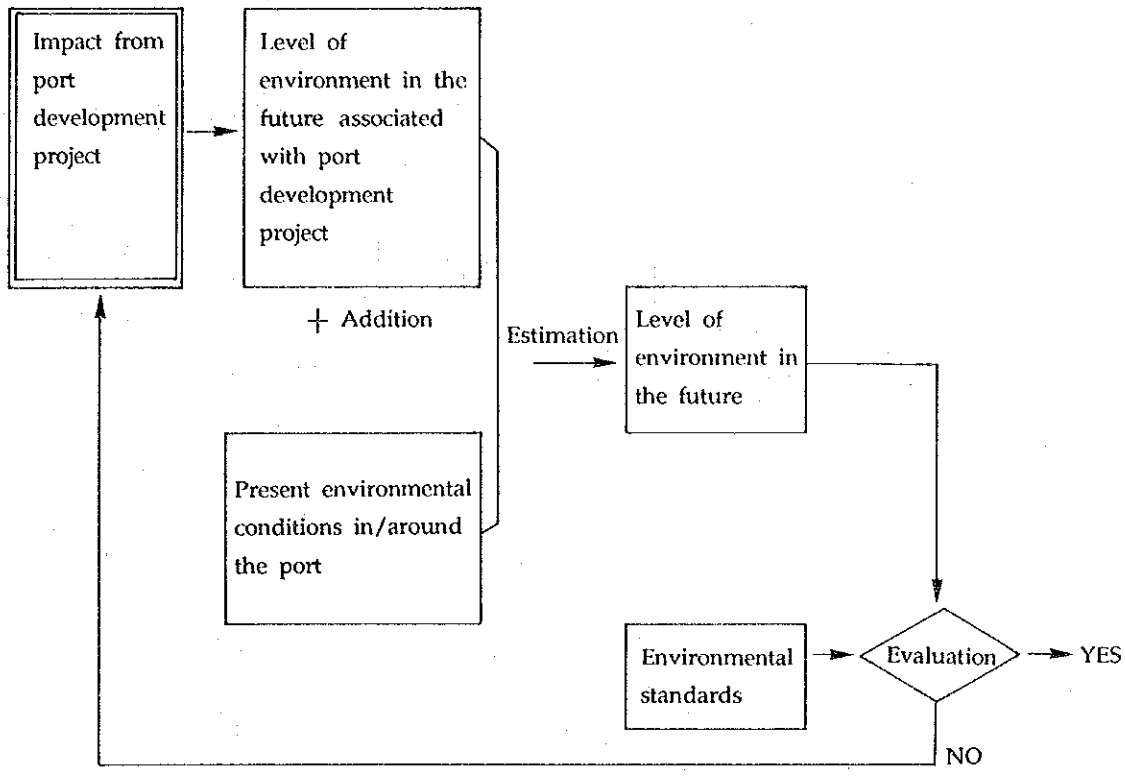

Fig. 5-2-3 Method C; General Assessment Method

d. Method D; Comprehensive Assessment Method

This method tries to obtain a comprehensive assessment of the future environmental level through separate assessment of impacts associated with port development and the impacts that can be generated in the future by other projects for the background area, this is the most accurate method.

203. To use this method, a full understanding of environmental situations in the vast background area and new sources of environmental burden and burden reduction plans, if any, is required. As this method requires information that is beyond the authority of port managers, especially in developing countries, close contacts and cooperation among many concerned authorities such as those related to infrastructure development are important.

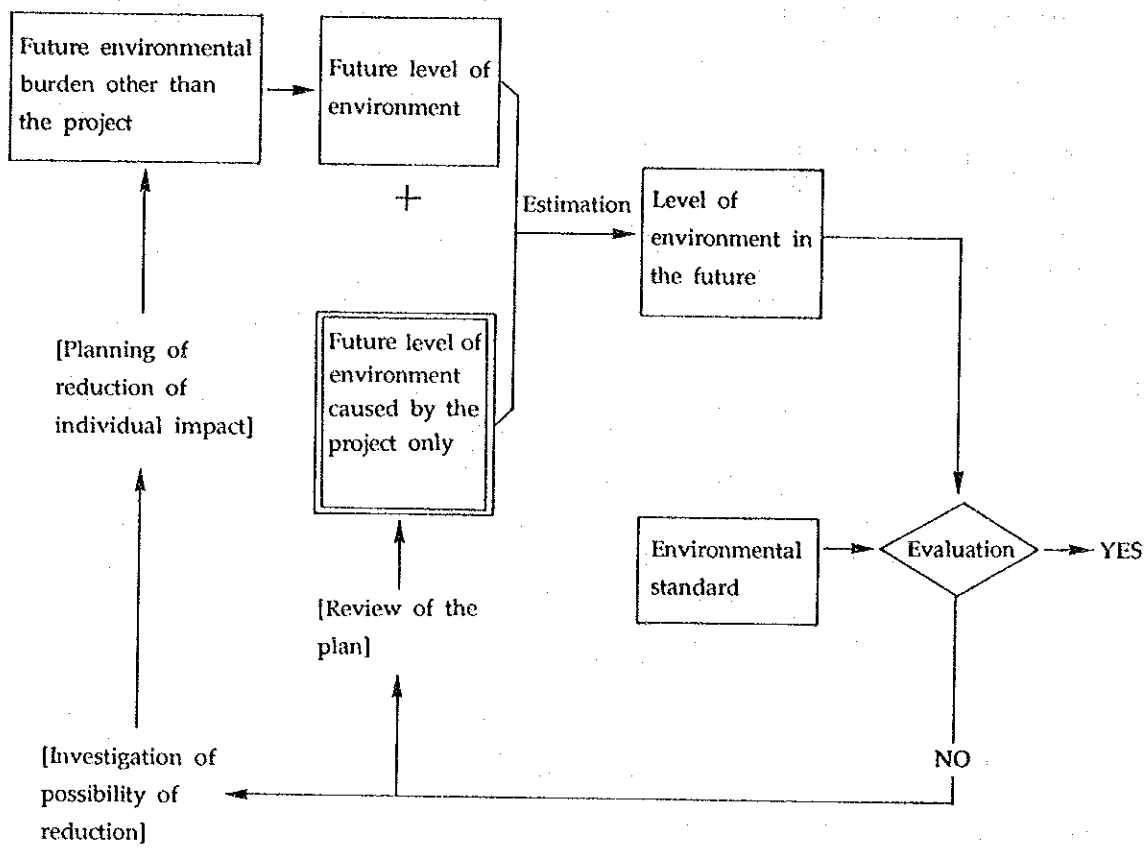

Fig. 5-2-4 Method D; Comprehensive Assessment Method

204. Upon conducting prediction and evaluation, it is necessary to determine the most suitable method after grasping the size of impact of each environmental component and present environmental conditions. In Japan, comprehensive assessment method (Method D) is applied by using computer simulation and/or model experiment. This requires quite a large amount of data as well as high techniques, which in turn necessitates a huge amount of money and time for measurement as well as simulation.

205. In Honduras, general diagnosis of the present environment is good and no conserved environmental item exists in the Bay of Cortes. Thus, the significance of human concern is thought to be small. Magnitude of impact by the project is later examined, however, it is foreseen to be rather small. One of the examples is that the dimensions of the project are small compared with a similar case in Japan. (Usually, reclamation of the site area of 50 ha or more requires the detailed environmental assessment in Japan, however, the projected reclamation area in this instance is only about 100 thousands sq.m.) Another factor to be borne in mind is that there is no environmental target to be referred and it is rather difficult to adopt methods C and D. Therefore, in general,Method A will be enough for the evaluation of environmental impact in Honduras. After these rather simple examinations are conducted, then gradually a more detailed and complicated method should be applied.

5.3 Environmental Impact on Water Quality

5.3.1 Water Quality in the Bay

206. Water quality is the item which should be thoroughly examined because the project includes dredging and reclamation work. During the work, water quality, especially turbidity worsens. The question is by how much and how widespread will the effect be. Then, if the environmental deterioration is very severe, what are the possible countermeasures.

207. The following table is extracted from Part IV; the present condition. As already mentioned, the test results are rather extreme examples after a large precipitation in the region and the salinity as well as COD figures indicate the phenomena well. Even under the extreme conditions as shown in the following table, DO figures fall into category 2 of the Japanese standards for water quality, which means the water quality is not bad and suitable for industrial use in terms of DO.

Location	Water Temp.	Trans -parency	Salinity (mg/l)	PH	DO (mg/l)	COD
A	26	1.7m	25	7.8	6.82	189
B	28	3.9m	28	7.7	5.86	377
C	28	3.6m	28	7.7	5.80	755
C'	32	3.6m	32	7.9	6.88	377
D	32	4.6m	32	7.9	6.76	
E	32	4.9m	32	7.8	6.37	
E'	32	4.9m	32	7.9	6.25	

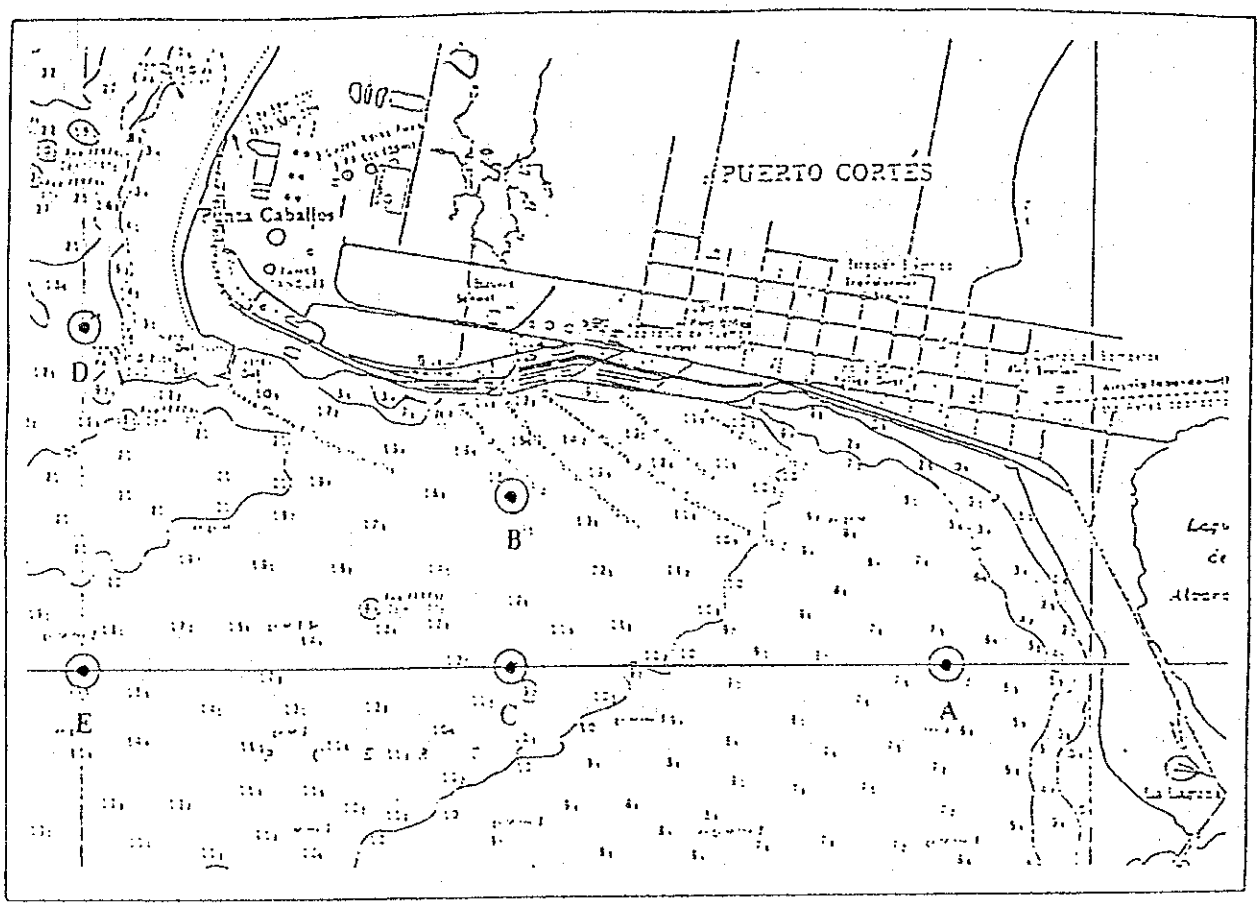

Fig. 5-3-1 Water Sampling Points

208. From the water quality test result by a handy test device, it is noted that COD is nil all over the bay area including the adjacent area of the port. This means that the water quality is very good in terms of COD and is suitable even for bathing.

209. It can be said that the water quality in the Bay of Cortes is, in general, good. However, low transparency is often observed in shallow water areas. From the table above, the transparency in shallow water, point A, is less than 2m while the deeper water shows better figures. Even under calm weather, the color of the water remains turbid along the coast line and a brown belt zone of some hundred meters wide is formulated. There is no comprehensive data of measurement on transparency in the bay, however, observation from on board indicates that in the said brown belt zone the transparency is no better than 2.5m which is adopted in Japan as one of the water quality standards for fishing environment. The project includes dredging as well as reclamation works which add new environmental burdens on the water quality. Therefore, turbidity should be further examined.

5.3.2 Turbidity

210. There are two major causes of turbidity in the Bay, excluding dredging and reclamation; inflow of external turbid water and stirring-up of bottom sediment. There are several sources of turbid water inflow into the Bay of Cortes. The main inflow comes from the Laguna de Alvarado. There are some other inflows; Rio Mar and the creek at the Wharf N0.2. In particular, the situation of Lagua de Alvarado is the worse in terms of water quality and turbidity.

211. As for the stirring-up of bottom sediment, the following figure (extracted from "Lists of Hydraulics Equations; JSCE", original Japanese) gives the relation between settling velocity and diameter of sand particle. From the figure it is noted that the smaller the particle, the slower the settling velocity.

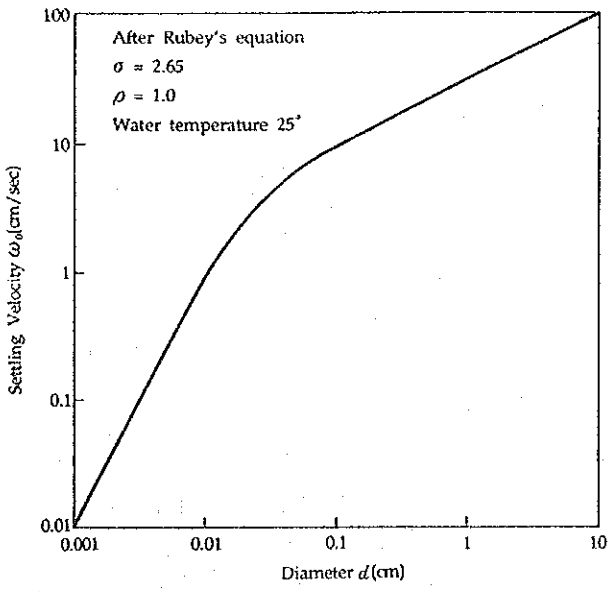

Fig. 5-3-2 Settling Velocity - Diameter of Sand Pontile

212. The table below lists the examples of settling velocity as well as critical stirring velocity of fine sediment particles (the velocity is obtained by applying Stokes' equation). This indicates that small particles are easily stirred up and very difficult to settle down. Therefore, the bottom sediment constituted of small particles would increase the likelihood of turbidity.

Table 5-3-1

d(1/1,000mm)	Vs(cm/sec)	Vc(cm/sec)
1	0.00008	0.001
5	0.00193	0.029
74	0.42338	6.314

d : diameter of sediment particle
Vs: settling velocity
Vc: critical velocity for stirring

213. The results of soil sampling test show that the bottom sediment in the bay of Cortes is almost exclusively constituted of sand and the proportion of fine particles (smaller than 75 micro meters) is, at largest, 20% (except the sampling result A-4 of B-3 where the proportion of fine particles exceeds 80%). Fine particles, especially in the muddy portion (diameter less than 5 micro meter), are easily stirred up by wave action and hard to settle down to the bottom. This is the cause of the perpetual brown belt zone observed along the coast line in the bay. The muddy portion will be ionized and several particles stick together formulating flocks which eventually promote settlement.

i. Turbidity by dredging work

214. Among the construction works of new unit cargo terminal, dredging and reclamation are the most critical. The dredging method to be taken is cutter suction type pumping dredger and this method may cause additional turbidity, especially around the cutter, when cutting the earth. However, additional turbidity caused by cutter tends to settle down much sooner than the turbidity made by wave action and/or brought from Laguna de Alvarado because the turbidity is made of rather large particles comparing with the turbid caused by the latter.

215. The following equation, known as Fick-Iwai equation, gives the concentration of SS (Suspended Substances; mg/l) at a given point as a function of distance from the source. Through this equation, turbidity is roughly obtained and the impact of the dredging as well as reclamation work could be predicted.

$$S(X) = q / 2 / H / \sqrt{3.14 \times k \times U \times X}$$

S(X) : SS concentration at distance X (mg/l)
q : SS production volume (g/sec.)
H : Mixing depth (cm)
k : Dispersion coefficient (sq.cm/sec)
U : Average velocity (cm/sec)
X : Distance from the center (cm)

216. The current in the Bay of Cortes is thought to be small because the main cause of the current, tidal range, is rather small, say 10-30cm. When compared to the oceanographic phenomenon happening along the coast line of Japan, the tidal range is only comparable to the coast of the Japan Sea where the maximum tidal range records around 40cm. This indicates that the dispersion coefficient is rather small, say in the order of 10,000 sq.cm/sec. The average velocity will be less than 10cm and mixing depth is around 10m. q is calculated by the following relation.

q = dredging volume per hour(cu.m/h) x specific productivity(ton/cu.m)

217. From the various studies in Japan, specific productivity for sandy bottom sediment by cutter suction dredging is given as around 2.8kg/cu.m. The dredging volume per hour is assumed as 200 cu.m, then 0.16 kg/sec or 160 g/sec is obtained for q. Putting these numbers into the equation, 140 mg/l(ppm) is obtained at the source center (at the cutter), 14 mg/l (ppm) at a point 10 m and 4.4 mg/l(ppm) at a point 100m and 1.4 mg/l (ppm) from the source.

218. This result indicates that although SS burden by dredging work would be considerably high around the cutter, the burden decreases according to the distance from the center. At the distance of 100m from the center, thereis a little burden and at 1000m, practically no burden to the environment, compared with the back-ground turbidity.

ii. Turbidity by reclamation work

219. Reclamation is another major cause of turbidity. Dredged sand is directly sent through a pipe-line system and discharged into the reclamation site. This type of work produces one of the highest concentrations of turbidity because the earth is loosened to mud and discharged into the water.

220. After the discharge of dredged earth, the mud layer of high turbid concentration disperse along the bottom. At the surface and middle layer, settling effect appears and the turbidity diminishes very early. Turbidity disperses with tidal current flow. An experiment in Japan indicates that at a few hundred meters from the discharging point, the turbidity remains at around 10ppm even at the bottom.

221. From Table 5-3-1, time required for a particle to settle down to the bottom (-5m) is calculated as follows;

d(1/1,000mm)	Vs(cm/sec)	Tc(hour)
1	0.00008	1,736
5	0.00193	72
74	0.42338	0.33

222. All silt portion would settle down to the sea bed in three days, however, muddy portion remains suspended for a very long period of time. From the soil test result, it is known that the bottom material in the Bay is constituted of a sandy portion and thus the turbidity caused by muddy portion is limited. Another thing to be mentioned is that there is no large scale permanent flow in the Bay and the turbidity caused by the reclamation work would remain in the narrow strip along the coast line where the back-ground water is already low in transparency. The turbidity will be limited compared with the back ground turbidity which is observed without the construction work. Furthermore, during the day time, wind prevails landwardly and thus contributes to prevent further dispersion of turbidity. Therefore, the environmental impact by reclamation work would be minimal.

iii. Possible mitigatory measures

223. A useful countermeasure to minimize the turbidity is to study and arrange the method and the order of civil works. One of the measures is to slow down the speed of dredging which is useful both for dredging and reclamation.

224. The enclosing structure of the reclaimed area would be another effective measure in order to confine the turbidity generated by discharging. A sluice should be made on the landward side and excess water overflow the sluice. Thus, less turbid water at the upper layer should flow out to the open sea. Through this measure, the SS burden on the surrounding water could be further lessened. The following is an example of reclamation work which adopts enclosed dumping pond with sluice for discharging excess water. The material dredged was silty clay and the power of the dredger was 4,000 PS, which indicates that the turbidity should be much higher than the Port of Cortes project. Therefore, SS concentration of the excess water should be much smaller than 12 ppm and the environmental impact would be minimal.

Dredger	Silt or less	Muddy	Turbidity
4,000 PS, Pump	63.6%	20.5%	Volume of excess water:5,720cu.m/h SS at 600m from sluice: 11.8ppm at low tide 11.3ppm at high tide

5.4 Other Related Matters

225. The port project creates job opportunities. The construction stage continues for about four years and brings various job opportunities in both a direct and indirect fashions. Direct effects include jobs in the Port of Cortes or vicinity; workers for the construction work itself, transportation of construction materials and other related workers. Besides the Port of Cortes, for example, administration of these activities will be activated. Basic concept is that more people will be drawn to this area and demand will subsequently increase. The community needs accommodation as well as foods for these extra population. In this way, favorable cycle starts spinning.

226. After the completion of the project, the new terminals start operation. Much larger volume of cargoes goes in and out the port. The samecan be said of people. The implication is that both the number of ENP personnel and the number of workers of port related industries will increase. The development of port helps industrial as well as commercial activities grow. This also translates into an increase in job opportunities. To this point, the port has been the transit point of cargoes from the water transport to land transport or vice versa (First Generation Port). With the increase of cargo, the port may acquire other functions such as storage of cargoes, consolidation/deconsolidation of cargoes, which as a result strengthen the commercial function of the port (Second Generation Port).

227. Through this process, the population of Cortes will increase and so will generated income of this area. The Port of Cortes is expected to grow as a new core city. From a national view point, this will contribute to the balanced-development of Honduras.

228. Adverse effects of the project on other items are expected to be minimal. The unit cargo terminal is constructed on the reclaimed land and by-pass road is planned in the fringe area of the free trade zone where no particular activity takes place. Therefore, no relocation of local inhabitants is needed and separation of local community will not occur.

229. There are neither historical and prehistoric spots nor cultural assets in/around the port and, thus, no impact is foreseen. As mentioned in 5.1, commercial fishing in the Bay is practically nil and there is no impact by the project.

230. In short, the project will bring considerable benefit to the local area as well as the country while almost no adverse effects are anticipated.

Chapter 6 Evaluation of Port of Cortes Short Term Plan

231. This Chapter is to recapitulate the preceding Chapters in relation to the year 2000 short term development plan of the Port of Cortes, and in particular to assess the projects' viability which is evaluated from three angles, ie. feasibility in terms of the national economy, financial viability for the possible undertaking organ and the projects' impact on the environment. This Chapter will also indicate measures to be considered while the project is being implemented, and finally study what should be done to ensuring prosperous and efficient operation.

Feasibility in terms of the national economy

232. According to the team's plan, two unit cargo terminals with total length of 370m, a set of domestic cargo terminals and by-pass road of 1380m length will be constructed by the year 2000. Besides the above installations, ENP already has a plan to build one dry bulk terminal and one refrigerating warehouse. Feasibility studies are not conducted for the construction of the dry bulk terminal and the refrigerating warehouse based on the fact that these facilities will be constructed and operated with more private participation, while the other three assets are expected to be installed by ENP by the year 2000.

233. To measure economic feasibility, the Report employs internal rete of return (EIRR) which is a discount rate where the cost of the project and the benefit attributable to the Honduran economy become equal. For the economic benefit in the analysis, only such quantifiable costs saved by the project as ships' staying, interest of cargo handling labor and land transportation are used.

234. The resultant figure in terms of EIRR is 22.73%, and according to sensitivity analyses which are conducted for determining whether the project is feasible with certain changes in the assumptions used in the calculations, even the worst case (10% less in benefits and 10% plus in costs) shows an EIRR of 19.08%. Normally the project in judged as feasible if the IRR is above the ordinary level of the country's opportunity cost of capital (OCC). Although OCC in Honduras is not clear, taking into account that World Bank and Asian Development Bank estimate OCCs in developing countries to be a little more than 10%, this project can be regarded as feasible.

Financial feasibility for possible implementing body(s)

235. While in the economic analysis the project's feasibility is appraised in terms of the national economy, the financial analysis focuses its attention on the project's financial aspects. These analyses are conducted to measure the viability of the project itself and the financial soundness of the possible undertaking organ in the project life. Major part

of the facilities under this project will be operated by a private sector while domestic port and road are managed by ENP which will build all the facilities. Accordingly, implementing body is diverted in some way. In this study, it is assumed that an implementing body undertakes all the work to avoid unnecessary complication. The resultant figure will not much differs.

236. The viability of the project is appraised by the financial internal rate of return (FIRR) which is a discount rate where the costs and revenues during project life become equal. Cost and revenue include all the cash items required for completion and management of the assets except income from fund management and costs for depreciation, interest and repayment of principal loans. Financial soundness of the possible under taking body(s) is appraised based on its estimated financial statements and using financial indicators such as rate of return on net fixed assets, debt service coverage ratio, operating ratio and working ratio.

237. The resultant FIRR is 23.09% and the worst case of the sensitivity analyses (10% plus of investment cost and 10% less of revenue) shows an FIRR of 18.83%. If these figures are over the estimated average of interest rate, this project is viable for the undertaking body(s). Here, in this project, the weighted average of the interest rate will not be well over 10%, assuming that a large part of the cost is funded by assistance from an international institution or donor country.

The profitability measured by the rate of return on net fixed assets is always exceeding the estimated average interest rate, and other calculated financial indicators show that the project is financially sound.

Environmental Impact Assessment

238. It is thought that each stage of the port project might give impact to relevant environmental constituent, however due to lack of available data most of the work was done qualitatively except water quality assessment.

239. The team carefully examined through field surveys, documentary check and interviews the various aspects which might cause environmental problems, such as sea bottom material, impact on ecosystem, change in current and wave, air pollution and noise and vibration produced during the construction and operation there after. It is asserted with fairly high probability that in each stages namely construction, emergence of the site and utilization of the project serious damage to the environment will not be generated.

240. Impact to water quality, especially turbidity in the area is examined utilizing the team's survey and soil test result, and relevant equations. Thanks to the bottom material, present background water condition and wind direction in daytime, environmen-

tal impact during the construction will be minimal.

Conclusion of the feasibility study

241. Port development which is consistent with trade and economic growth may bring leverage for the prosperity of the region and the country. The benefits used in the economic analysis are only the quantifiable parts, and through activity of port construction and operation employment opportunities will be created, thereby attracting population and industry in the region.

242. The above consideration proves in high probability that the port sector improvement will bring about large benefits to the nation.

Efforts to attain the target

243. While the plan will be implemented mainly by foreign funds, some portion shall be locally funded, because no donor will supply 100% of the required resources. ENP should make efforts to raise the resources utilizing reserves or borrowing from outside. The Honduran government should also make efforts to secure domestic funds by appropriate means.

244. The financial analysis is calculated on the assumption of interest rate by 3% per annum which is an OECF loan model. Normally, the treasury of an aid-receiving country tends to refinance the foreign assistance with added interest. This is inevitable in developing countries because treasuries defend against inflation and decrease of currency rate. Although the financial analysis shows the estimated future account can accommodate an interest higher than that assumed, with the view to ensuring the implementing body's cash-flow, the treasury should make efforts to provide the refinancing with as low interest as possible.

245. Bearing in mind that ENP will undertake the task of the planned port development and some of the resources are expected to be borne by ENP's own reserve, it is required to foster ENP's financial position. In this sense ENP's unprescribed financial contribution to the central government should be abolished in favor of a more transparent levying measure such as fixed amount or fixed rate prescribed in a law.

246. Fostering of ENP's financial position will also be achieved by tariff restructuring. ENP has hired a consultant to study this matter. In this context, it is the team's view that under the circumstances where ENP's tariff is said to be high among Caribbean ports, general increase of tariff may be unrealistic; adjustment between commodities including narrowing spreads between discount rate and ordinary rate may be the only applicable means.

247. Although the environmental impact of the project is minimal, it is advisable to further mitigate the impact by reducing the speed of dredging and enclosing the reclaimed area with a sluice on the landward.

Steps to be taken for better operation

248. As pointed out in paragraph 356 of PART II, operation by the private sector of container terminal is the prevailing practice within the world's maritime circle. The team also suggested that lease or concession is adequate scheme for the private participation. It is envisaged that preparation for the scheme takes time, and it is therefore recommended that preparation work should be commenced at an early stage of construction by hiring a reliable consultant or other means.

249. With two container berths being operated by the private sector, it is important for ENP to keep and create unified manner of overall port management. For that, ENP should study and realize the adequate scheme for the following items by persuasion, ruling, contract clause and agreement;

- Training of employees within and out of ENP utilizing the TRAINMAR assets,
- developing computer network connecting agencies pertaining to port management and operation keeping pace with port activity and world's progress in this respect,
- providing a rule under the friendly relation with terminal operater that ENP may order private operators to use installations under their operation for RO/RO vessels and in case of emergency such as abnormal port congestion,
- forming a machinery with relevant private sector to keep up with users' requests and work for active port sales.

250. Since it has been determined that Honduras will become a contracting party to 1973 IMO Marine Pollution Convention and some of the Protocols, the country is obliged to furnish an oil reception facility in ports. This may well be the task of ENP, and for that a plan to build and operate including the fare level be studied at an early stage.

JICA