8 Evaluation of the Long Term Plan

8.1 Preliminary Economic Evaluation

8.1.1 Methodology

(1) Purpose

The purpose of the preliminary economic analysis is to appraise the economic feasibility of the long term plan for the study port before a feasibility study on the 1st phase plan can proceed. The preliminary economic evaluation of a project should show whether the project is justifiable from the viewpoint of the national economy by assessing its contribution to the national economy.

(2) EIRR

A preliminary economic evaluation of the long term plan is performed to clarify the justification of the project by the Economic Internal Rate of Return (EIRR).

(3) "With" and "Without" analysis

The EIRR value is obtained from the annual economic benefit-cost value. The economic benefits are obtained from the difference between the "With the project" case (hereinafter referred to as the "With" case) and "Without the project" case (hereinafter referred to as the "Without" case).

(4) Measurement of Costs and Benefits

In estimating the costs and benefits of the project, "economic pricing" is applied. Economic pricing means that costs and benefits are appraised in terms of international prices(border prices).

The general procedure of the economic analysis is shown in Figure 8.1.1-1.

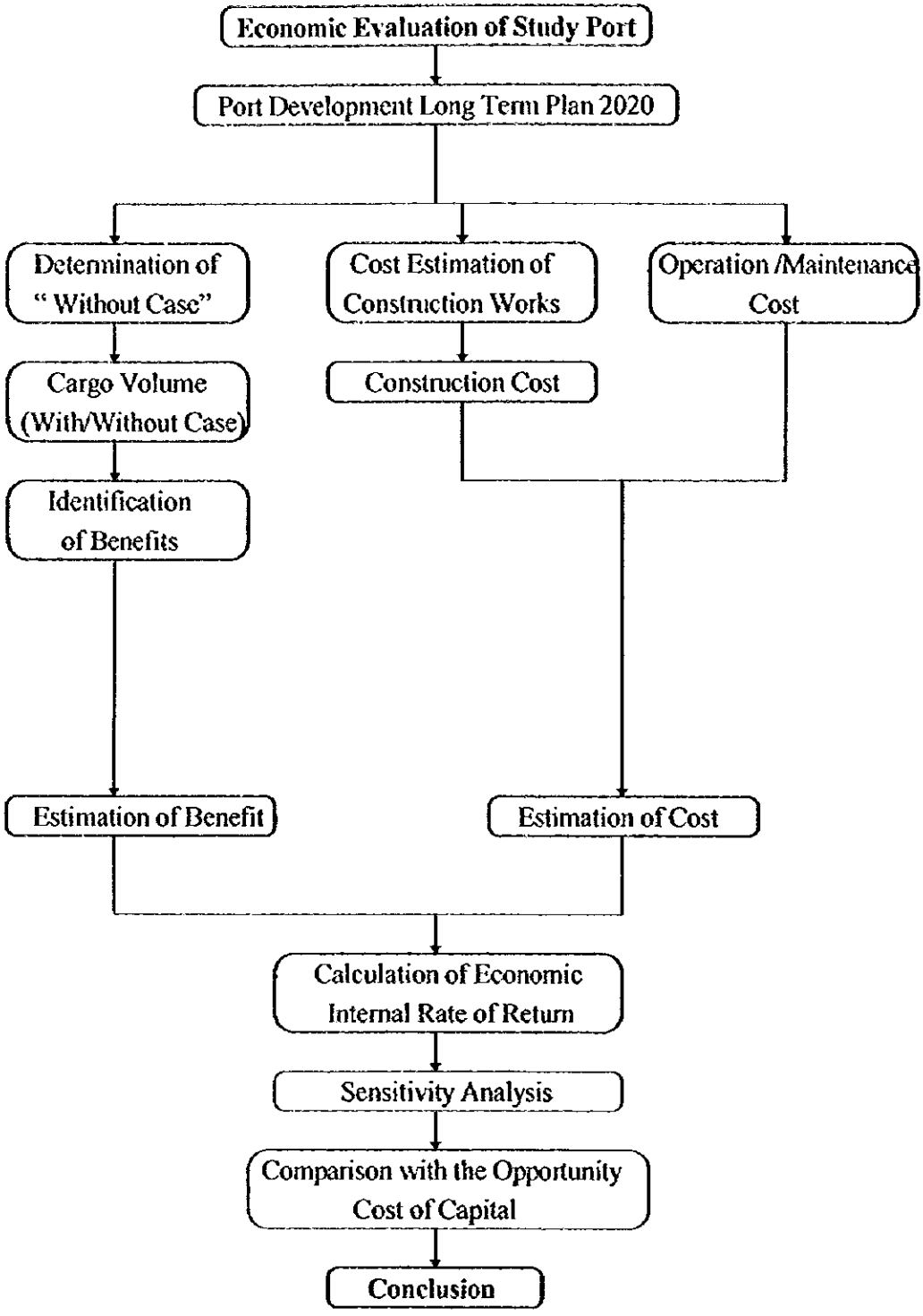

Figure 8.1.1-1 Flow Chart of Economic Evaluation

8.1.2 Prerequisites of Economic Analysis

(1) Base Year

The "base year" here means the standard year in the estimation of costs and benefits. Taking into consideration the base year in cost estimation of construction, 1998 is set as the "Base Year" for this study.

(2) Project Life

Taking into consideration the depreciation period of the main facilities of 30 years and the construction period of 3 years(when new facilities can begin to be utilized), the period of the calculation (project life) for the economic analysis is assumed to be thirty three years from the beginning of construction work.

(3) Foreign Exchange Rate

The exchange rate adopted for this analysis is US$ 1.00= 127.8 yen = 40.45 Peso (February,1998), the same rate as used in the cost estimation.

(4) "With" Case

In an economic analysis, benefits are mainly brought about by improvements and expansions in handling capacity. Therefore, the "With" case scenario includes all improvements in productivity and all expansion of port facilities in the Long Term Plan.

(5) "Without" Case

A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases. In this study, the following conditions are adopted as the "Without" case:

i) No investment is made for the port
ii) When handling volume reaches the maximum volume of handling capacity of the port, the cargoes imported which can not be handled in the port are assumed to be handled in adjacent ports and then transported to Subic Freeport Zone and its hinterland through adjacent ports by trucks. In the same way, the cargoes exported which can not be handled in the port are assumed to be handled at adjacent ports and then have to be transported to adjacent port by trucks.
iii) A lot of economic special zones which are already operating, being developed or planned are located in and near SBFZ. Therefore, the locators which are expecting a

main port for foreign trade may not come in to the aforesaid economic special zone due to the inconvenience of their operation. This could be detrimental to the economy.

8.1.3 Cost of Project

The items that should be considered as the costs of the projects are construction costs, maintenance costs and operation cost as shown in Table 8.1.3-1.

(1) Construction Costs

Construction costs are divided into such categories as civil costs and mechanical costs. In the cost-benefit analysis, various taxes such as VAT (value added total) will not be considered. . Main mechanical cost is purchasing of handling equipment.

(2) Maintenance Costs

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

(3) Operation Cost

The operation cost for SBF includes administration and personnel costs. Administration cost is 3.6 million pesos which is the annual budget of the seaport department in 1998. Personnel cost is 24 million pesos in 1997. After the project has been completed in 2003, personnel cost from 2004 to till 2020 is assumed to be half of the figure in 1997.

Table 8.1.3-1 Cost of the Projects in Subic Bay Freeport

Unit: Million US$

Cost / Plan	Construction Cost/project			Maintenance Cost/year			Operation Cost/year
	Civil Work	Equipment	Total	Structure	Equipment	Total	
Alternative 1	94.0	87.5	181.5	0.8	3.5	4.3	0.6
Alternative 2	144.7	96.0	240.7	1.4	3.8	5.2	0.6
Alternative 3	139.8	87.5	227.3	1.1	3.5	4.6	0.6

8.1.4 Benefit of Project

(1) Benefit Items

As the benefits brought by the Long Term Plan of the study port, the following items are identified.

i) Saving in land transportation costs
ii) Saving of costs in cargo handling
iii) Saving in interest of cargo costs
iv) Reduction of cargo damage and accidents at the port
v) Promotion of regional economic development
vi) Increase in employment opportunities and income

Above items are considered countable and in this study the monetary benefits of item i), ii) and v) are calculated.

(2) Calculation of Benefits

1) Saving in land transportation costs

a) Container cargo for industrial estate at SBFZ

In the "without" case , investment activities for industrial park located in SBFZ might be delayed or canceled. In this study, only the on-going projects of Industrial Park phase 1 & 2 and Technopark phase 1 will be developed. Other projects such as Industrial Park phase 3 and Technopark phase 2 will not be developed.

Based on above assumption, in the "Without" case, 70% of the export containerized cargo generated at factories located in SBFZ is transported to Manila and 20% of import containerized cargo needed at factories located in SBFZ is transported to SBFZ from Manila as at present (see Table 4.3.1-6). In the "With" case, 100% of container cargo will be loaded/unloaded at SBF. Therefore, the difference in the containerized cargo volume at SBF between "Without" and "With" case is 20% in the case of imports and 70% in the case of export containerized cargo generated at Industrial Park phase 1 & 2 and Technopark phase 1 located in SBFZ (see Table 8.1.3-2).

Table 8.1.3-2 Comparison of Transportation Mode

	Import Container	Export Container
"Without" case	20% from Manila to SBF	70% from SBF to Manila
	80% from SBF	30% from SBF
"With" case	0% from Manila to SBF	0% from SBF to Manila
	100% from SBF	100% from SBF

Savings in land transportation costs
= Difference in handling cargo volume between "With" and Without" cases
x In land transportation cost (unit cost)

b) Container cargo for industrial estate outside of SBFZ

In the "Without" case , containerized cargoes for industrial estates located in Region III will be transported to/from Metro Manila in the same manner as at present. However, in the "with" case, considering the transport distance and traffic congestion in Metro Manila, these cargoes will move through SBF instead of Manila port. Hereinafter, the distance and required transport time from each industrial estate to SBF/Manila port will be determined by considering the following factor. A truck is delayed at least one hour, which is equivalent to a distance of 40 km, when passing through Metro Manila due to the traffic congestion.

Based on the above, savings in land transportation costs can be considered as a benefit of the project. The benefit that will accrue to the Philippines from the projects can be calculated by the following formula.

Savings in land transportation costs

= Difference distance between "Industrial estate to SBF" and "Industrial estate to Manila port " x (80% of import container cargo volume and 100% of export container cargo volume at industrial estates

x In land transportation unit cost (US$/TEU/km)

The difference in land transportation distance between SBF to each industrial estate located in Region III and Manila to each industrial estate located in Region III in 2005 is shown in the following Table 8.1.3-3.

Table 8.1.3-3 Comparison of transport distance

2005 year

	Distance Km	Dis. x Volu. Km • TEU	Industrial Estate	Generated Cargo Volume (TEU)	Distance Km	Dis. x Volu. Km • TEU	
Subic	60	1300200	Bataan EPZ	21,670	160+40	4334000	Manila
Subic	70	7393470	C. S.E.Z	105,621	80+40	12674520	Manila
Subic	70	1706180	A. Indust. P.	24,374	80+40	2924880	Manila
Subic	90	3509820	Luisita I. P.	38,998	100+40	5459720	Manila
Subic	240	247440	B. C.E. Z.	1,031	250+40	298990	Manila
Subic	12	682476	Hermosa	56,873	96+40	7734728	Manila
		14839586		248,567		33426838	
Average	59.70				134.5		

Containerized cargo volume forecasted at industrial estates located in Region III in each year is shown in the following Table 8.1.3-4.

Table 8.1.3-4 Forecasted containerized cargo volume

Unit: TEU

Year / Industrial Estate	2005	2010	2015	2020
Bataan EPZ	21,670	37,148	55,723	61,914
C. S.E.Z.	105,621	158,431	211,241	211,241
A. Indust. P.	24,374	24,374	24,374	24,374
Luisita I. P.	38,998	63,372	87,746	97,496
B. C.E. Z.	1,031	1,213	1,213	1,213
Hermosa	56,873	113,745	181,992	227,491
Total	248,567	398,283	562,289	623,729

Based on above calculation method with demand forecast in each year, the difference in land transportation distance is shown in the following Table 8.1.3-5.

Table 8.1.3-5 Difference of transport distance

Distance / Year	Transport Distance (Km)		Difference
	Subic to Industrial Estate	Manila to Industrial Estate	Km
2005	60	135	75
2010	56	136	80
2015	54	137	83
2020	51	137	86

c) Non-containerized cargo through SBF

When the non-containerized cargo volume exceeds the handling capacity of the port, the excess cargoes which can not be handled in the port will be handled in adjacent ports and then be transported to SBFZ by trucks. In accordance with the implementation of the projects, all cargoes will be transported to destination in hinterland by trucks. The benefit that will accrue to the Philippines from the projects can be calculated by the following formula.

Savings in land transportation costs
= Difference in handling cargo volume between "With" and "Without" cases
x In land transportation cost (unit cost)

Herein, difference in handling cargo volume between "With" and "Without" cases will be determined. In the "Without" case, handling capacity will definitely decrease each year as facilities become timeworn. Also, the marine terminal will not be available after 2010, which means that non-containerized cargo will only be able to be handled at Boton wharf. Therefore, handling capacity of non-container cargo is assumed as 50% of the 2000 level. After 2010, cargo handling capacity will maintain the same level. Based on above assumption, the handling capacity of port in the "Without" case is set as in the following Table 8.1.3-6.

Table 8.1.3-6 Handling capacity of port in the "Without" case

Unit : 1000 Tons

Case / Year	1997	2000	2005	2010	2015	2020
"With" case	450	526	632	743	863	995
"Without" case	450	526	421	263	263	263
Difference	0	0	211	480	600	732
based on 2000			80%	50%	50%	50%

After that, the difference in land transportation distance between SBF to Region III and Manila to Region III is identified using the following Table 8.1.3-7.

Table 8.1.3-7 Comparison of transport distance

	Distance Km	Dis. x Ratio	Province Name	Population (1995) Ratio	Distance Km	Dis. x Ratio	
Subic	130	1716	Tarlac	13%	140	1848	Manila
Subic	75	1957	Panpanga	26%	85	2218	Manila
Subic	100	2490	Bulacan	25%	30	747	Manila
Subic	80	635	Zambales	8%	190	1509	Manila
Subic	40	274	Bataan	7%	110	754	Manila
Subic	130	2732	Nueva Ecija	21%	130	2732	Manila
		9804				9807	
Average	98.04				98.07		

As can be seen, the difference in transportation distance is negligible. However, a truck is delayed at least one hour, which is equivalent to a distance of 40 km, when passing through Metro Manila due to the traffic congestion. Therefore, this item can be considered as a benefit of the project.

2) Saving of costs in cargo handling

At present, an arbitrary charge of about US$ 200 per one TEU is levied on container handling at SBF.

In the "With" case, once port facilities have been developed sufficiently in 2005, this arbitrary charge will no longer be levied. In the "Without" case, this arbitrary charge for import/export container cargo will continue.

The benefit that will accrue to the Philippines from the projects can be calculated by the following formula.

Savings of arbitrary charge costs
= (80% of Import container cargo volume in the "Without" case
+ 30% of export container cargo volume in the "Without" cases)
x US$200 per one TEU

3) Promotion of regional economic development

In the preceding section, it was noted that Industrial Park phase 3 and Technopark phase 2 would not be developed in future in the "Without" case.

In this study, amount of value added created from the factories located in Industrial Park phase 3 and Technopark phase 2 in future will be estimated. And then, benefits of the "With" case will be determined.

Amount of value added at each type of industry varies. Industry in the aforesaid industrial estates is classified into three types as mentioned in chapter 7.3.4.

Amount of value added per square meter is obtained from a Japanese report (Investigation of Unit Rate for Conditions of location of industry). In this study, located factories at SBFZ are mostly foreign and materials and products in these factories are imported/exported abroad. Therefore, unit rate of amount of value added in Japan can be used to exchange to local currency accordingly. However, amount of value added per square meter includes the cost of labor. Therefore, converting the labor cost to local currency is necessary.

The benefit that will accrue to the Philippines from the projects can be calculated by the following formula.

Benefit = Unit Rate of Amount of value added (US$/ m2)
x Factory area (m2) x Contribution rate to port (%)

Hereinafter, two methods will be applied to determine contribution rate to port.

i) Base on examples in port cities such as Yokohama, Kobe and Kitakyushu City, the port will accrue about 20% of direct effect value in the value added borne by the local economic zone. However, the electricity, water service, road and port in SBFZ is considered to be public property. Therefore, one quarter of public property is 5%. This is applied as the amount of value added borne by the project.

ii) In the "Without" case, the factories which were planning to locate in Industrial Park phase 3 and Techno Park phase 2 will look elsewhere. But if such factories go to other industrial estates located in Batangas, Cavite, Bataan etc., they would still be contributing to the national economy of the Philippines. However, among the factories which are planning to locate in Industrial Park phase 3 and Techno Park phase 2, some have been attracted by the close proximity of the airport.
Based on questionnaire survey of present locators, it can be assumed that about 20% of the factories are investing here principally because of the airport. In the preceding paragraph, the value added to port is one quarter of public property. Based on this theory, actual value added to port will be 5%.

Based on the above, the value added to port is 5% of the amount of value added borne by the project.

4) Removal of factories

In alternative 1, facilities for the handling of containerized cargo will be set up in the SBF(Ship Repair Facility) zone. Therefore, in the "With" case of alternative 1 only, located factories covering a total area of about 36,000 sq.m must be removed. Amount of value added at these factories will be considered as a negative benefit from the view point of the national economy.

(3) Summary of benefits

Table 8.1.3-8 shows the calculated benefits of the projects.

Table 8.1.3-8 Benefits of the Projects

(Unit: million US$)

Benefit / Plan	Factories Benefit	Land Transportation Benefits			Arbitrary Charge Benefits	Existing Factories Negative Benefits	Total
		Container at SBFZ	Container at Outside SBFZ	Non-container Cargo			
Alter. 1	563.2	106.4	890.3	70.9	540	-486.7	1,684.1
Alter. 2	645.9	115.8	939.9	70.9	575.3	0	2,347.7
Alter. 3	645.9	115.8	939.9	70.9	575.3	0	2,347.7

8.1.5 Evaluation of the Project

(1) Calculation of EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project.

The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. It is calculated by using the following formula.

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

where, n: Period of economic calculation (project life)
Bi: Benefits in i-th year
Ci: Cost in i-th year
r: Discount rate

The results of EIRR calculation are shown in Table 8.1.3-9.

Table 8.1.3-9 EIRR of Long Term Plan

Plan	EIRR
Alternative 1	0.225
Alternative 2	0.295
Alternative 3	0.322

For reference, Table 8.1.3-10, -11 and -12 show the calculation of EIRR for alternative 1, 2 and 3.

(2) Evaluation

The leading view is that a project is feasible if the EIRR exceeds the opportunity cost of capital. In general, the opportunity cost of capital is considered to range from 8% to 10% according to the degree of development in each country. It is generally considered that a project with an EIRR of more than 10% is economically feasible for infrastructure or social service projects.

As for this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR exceeds 10 % in all cases. In particular, alternative 3 is the most feasible from the viewpoint of the national economy.

Table 8.1.3-10 Calculation of EIRR

Alternative 1 (NSD Plan) - Long Term Development Plan

Unit: Tous.US$

	Year	Construction Cost	Equipment Cost	Maintenance Cost	Operation Cost	Cost Total	Factories Development Profit	Transportation Cost: Container SBFZ	Transportation Cost: Container Outside SBFZ	Transportation Cost: Non-container	Arbitrary Charge	Removal of Existing Factories	Benefit Total	Benefit - Cost	Net Present Value (NPV): Benefit	Net Present Value (NPV): Cost	Net Present Value (NPV): Benefit - Cost
	1998					0						(Negative Benefit)	0	0	0	0	0
	1999					0							0	0	0	0	0
	2000					0							0	0	0	0	0
1	2001	1,912			0	1,912	0	0	0	0	0	(1,248)	(1,248)	(3,160)	(1,248)	1,912	(3,160)
2	2002	1,912		19	0	1,931	0	0	0	0	0	(2,496)	(2,496)	(4,427)	(2,037)	1,576	(3,613)
3	2003	1,912	0	38	0	1,950	0	0	0	0	0	(3,744)	(3,744)	(5,694)	(2,494)	1,299	(3,793)
4	2004	9,174	0	57	579	9,810	0	0	0	669	0	(4,992)	(4,323)	(14,133)	(2,350)	5,333	(7,682)
5	2005	9,174	0	76	579	9,829	0	0	0	830	0	(6,240)	(5,410)	(15,239)	(2,400)	4,361	(6,761)
6	2006	9,174	29,159	96	579	39,008	0	0	0	1,065	0	(7,488)	(6,423)	(45,431)	(2,326)	14,123	(16,449)
7	2007	9,174	0	1,466	579	11,219	4,334	3,276	9,624	1,288	13,159	(8,736)	23,145	11,926	6,839	3,315	3,524
8	2008	9,174	0	1,547	579	11,299	5,292	3,318	9,657	1,500	13,766	(9,984)	23,748	12,449	5,727	2,725	3,002
9	2009	9,174	29,159	1,628	579	40,540	7,388	3,365	9,885	1,702	14,385	(11,232)	25,491	(15,049)	5,017	7,979	(2,962)
10	2010	1,912	0	2,875	579	5,365	9,479	3,417	18,389	1,895	15,017	(12,480)	35,718	30,352	5,737	862	4,875
11	2011	1,912	0	2,894	579	5,384	11,573	3,463	20,571	1,987	15,699	(13,728)	39,566	34,181	5,187	706	4,481
12	2012	1,912	0	2,913	579	5,404	13,666	3,515	22,795	2,081	16,396	(14,976)	43,477	38,073	4,651	578	4,073
13	2013	1,912	0	2,932	579	5,423	15,758	3,574	25,061	2,176	17,108	(16,224)	47,454	42,031	4,143	473	3,670
14	2014	1,912	0	2,951	579	5,442	16,832	3,640	27,370	2,273	17,835	(17,472)	50,479	45,037	3,597	388	3,209
15	2015	1,912	0	2,970	579	5,461	17,902	3,713	29,723	2,372	18,580	(18,720)	53,570	48,110	3,115	318	2,798
16	2016	0	0	2,990	579	3,568	18,970	3,801	32,092	2,472	19,334	(18,720)	57,949	54,381	2,750	169	2,581
17	2017	7,262	0	2,990	579	10,830	20,035	3,896	32,431	2,575	20,109	(18,720)	60,327	49,496	2,337	420	1,917
18	2018	7,262	0	3,051	579	10,892	21,099	4,000	32,578	2,679	20,906	(18,720)	62,543	51,651	1,977	344	1,633
19	2019	7,262	29,159	3,113	579	40,113	22,482	4,114	32,722	2,786	21,726	(18,720)	65,111	24,997	1,680	1,035	645
20	2020	0	0	4,341	579	4,920	23,817	4,237	41,925	2,895	22,571	(18,720)	76,725	71,805	1,616	104	1,512
21	2021	0	0	4,341	579	4,920	25,107	4,237	41,925	2,895	22,571	(18,720)	78,015	73,095	1,341	85	1,256
22	2022	0	0	4,341	579	4,920	26,354	4,237	41,925	2,895	22,571	(18,720)	79,262	74,342	1,112	69	1,043
23	2023	0	0	4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	921	56	865
24	2024	0	0	4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	752	46	706
25	2025	0	0	4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	613	38	576
26	2026	0	0	4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	501	31	470
27	2027	0		4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	409	25	384
28	2028	0		4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	333	20	313
29	2029	0		4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	272	17	256
30	2030	0		4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	222	14	209
31	2031	0		4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	181	11	170
32	2032			4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	148	9	139
33	2033			4,341	579	4,920	27,559	4,237	41,925	2,895	22,571	(18,720)	80,467	75,548	121	7	113
	Total	94,037	87,478	95,381	17,357	294,253	563,239	106,406	890,251	70,887	540,009	(486,720)	1,684,073	1,389,820	48,445	48,445	0

EIRR= 0.22530

Table 8.1.3-11 Calculation of EIRR

Alternative 2 (NSD & Binictican Plan) - Long Term Plan

Unit: Tous.US$

	Year	Construction Cost	Equipment Cost	Maintenance Cost	Operation Cost	Cost Total	Factories Development Profit	Transportation Cost			Arbitrary Charge	Benefit Total	Benefit - Cost	Net Present Value (NPV)		
								Container SBFZ	Container Outside SBFZ	Non-container				Benefit	Cost	Benefit - Cost
	1998															
	1999															
	2000															
1	2001	17,332	0	0	0	17,332	0	0	0	0	0	0	(17,332)	0	17,332	(17,332)
2	2002	17,332	0	0	0	17,332	0	0	0	0	0	0	(17,332)	0	13,380	(13,380)
3	2003	17,332	25,226	0	0	42,558	0	0	0	0	0	0	(42,558)	0	25,362	(25,362)
4	2004	0	0	1,499	579	2,077	4,334	2,895	5,591	669	10,751	24,240	22,162	11,152	956	10,196
5	2005	7,262	0	1,499	579	9,339	5,292	3,208	8,054	830	11,979	29,363	20,023	10,428	3,317	7,111
6	2006	7,262	0	1,567	579	9,408	7,386	3,240	10,015	1,065	12,564	34,270	24,862	9,396	2,579	6,817
7	2007	14,524	23,589	1,636	579	40,328	9,479	3,276	12,029	1,288	13,159	39,231	(1,096)	8,304	8,536	(232)
8	2008	7,262	0	2,716	579	10,557	11,573	3,318	14,095	1,500	13,766	44,252	33,695	7,231	1,725	5,506
9	2009	7,262	23,589	2,784	579	34,214	13,666	3,365	16,215	1,702	14,385	49,332	15,118	6,223	4,316	1,907
10	2010	2,735	0	3,796	579	7,110	15,758	3,417	18,389	1,895	15,017	54,476	47,366	5,305	692	4,612
11	2011	2,735	0	3,824	579	7,138	16,832	3,463	20,571	1,987	15,699	58,553	51,415	4,402	537	3,865
12	2012	2,735	0	3,851	579	7,165	17,902	3,515	22,795	2,081	16,396	62,689	55,524	3,638	416	3,222
13	2013	2,735	0	3,879	579	7,193	18,970	3,574	25,061	2,176	17,108	66,889	59,696	2,997	322	2,674
14	2014	9,997	0	3,907	579	14,483	20,035	3,640	27,370	2,273	17,835	71,154	56,671	2,461	501	1,960
15	2015	9,997	0	4,003	579	14,579	21,099	3,713	29,723	2,372	18,580	75,487	60,908	2,015	389	1,626
16	2016	9,997	23,589	4,099	579	38,264	22,482	3,801	32,092	2,472	19,334	80,181	41,917	1,653	789	864
17	2017	2,735	0	5,138	579	8,452	23,617	3,896	34,505	2,575	20,109	84,902	76,450	1,351	134	1,216
18	2018	2,735	0	5,166	579	8,479	25,107	4,000	36,962	2,679	20,906	89,655	81,175	1,101	104	997
19	2019	2,735	0	5,193	579	8,507	26,354	4,114	39,465	2,786	21,726	94,445	85,938	896	81	815
20	2020	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	726	42	684
21	2021	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	560	33	526
22	2022	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	433	25	407
23	2023	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	334	20	314
24	2024	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	258	15	243
25	2025	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	199	12	187
26	2026	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	154	9	145
27	2027	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	119	7	112
28	2028	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	92	5	86
29	2029	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	71	4	67
30	2030	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	55	3	51
31	2031	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	42	2	40
32	2032	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	33	2	31
33	2033	0	0	5,221	579	5,799	27,559	4,237	41,925	2,895	22,571	99,187	93,388	25	1	24
	Total	144,708	95,993	127,649	17,357	385,707	645,918	115,750	939,683	70,887	575,303	2,347,741	1,962,034	81,649	81,649	0

EIRR= 0.29537

Table 8.1.3-12 Calculation of EIRR

Alternative 3 (Cubi Plan) - Long Term Plan

Unit: Toua.US$

	Year	Construction Cost	Equipment Cost	Maintenance Cost	Operation Cost	Cost Total	Factories Development Profit	Transportation Cost: Container SBFZ	Transportation Cost: Container Outside SBFZ	Transportation Cost: Non-container	Arbitrary Charge	Benefit Total	Benefit - Cost	Net Present Value (NPV): Benefit	Net Present Value (NPV): Cost	Net Present Value (NPV): Benefit - Cost
	1998															
	1999															
	2000															
1	2001	10,158	0	0	0	10,158	0	0	0	0	0	0	(10,158)	0	10,158	(10,158)
2	2002	10,158	0	0	0	10,158	0	0	0	0	0	0	(10,158)	0	7,684	(7,684)
3	2003	10,158	29,159	0	0	39,318	0	0	0	0	0	0	(39,318)	0	22,496	(22,496)
4	2004	10,158	0	1,369	579	12,106	4,334	2,895	5,591	669	10,751	24,240	12,134	10,490	5,239	5,251
5	2005	14,994	0	1,369	579	16,942	5,292	3,208	8,054	830	11,979	29,363	12,421	9,612	5,546	4,066
6	2006	14,994	29,159	1,417	579	46,149	7,366	3,240	10,015	1,065	12,564	34,270	(11,880)	8,486	11,427	(2,942)
7	2007	4,836	0	2,835	579	8,249	9,479	3,276	12,029	1,268	13,159	39,231	30,982	7,346	1,545	5,803
8	2008	4,836	0	2,883	579	8,297	11,573	3,318	14,095	1,500	13,766	44,252	35,954	6,269	1,176	5,094
9	2009	4,836	0	2,931	579	8,346	13,666	3,365	16,215	1,702	14,385	49,332	40,986	5,287	894	4,392
10	2010	4,836	0	2,980	579	8,394	15,758	3,417	18,389	1,895	15,017	54,476	46,082	4,416	680	3,735
11	2011	4,836	0	3,028	579	8,442	16,832	3,463	20,571	1,987	15,699	58,553	50,110	3,590	518	3,072
12	2012	4,836	0	3,076	579	8,491	17,902	3,515	22,795	2,081	16,396	62,689	54,198	2,907	394	2,514
13	2013	4,836	0	3,125	579	8,539	18,970	3,574	25,061	2,176	17,108	66,889	58,350	2,347	300	2,047
14	2014	14,994	0	3,173	579	18,746	20,035	3,640	27,370	2,273	17,835	71,154	52,408	1,888	497	1,391
15	2015	10,158	0	3,221	579	13,958	21,099	3,713	29,723	2,372	18,580	75,487	61,529	1,515	280	1,235
16	2016	10,158	29,159	3,221	579	43,118	22,462	3,801	32,092	2,472	19,334	80,161	37,063	1,217	655	563
17	2017	0	0	4,590	579	5,169	23,817	3,896	34,505	2,575	20,109	84,902	79,733	975	59	916
18	2018	0	0	4,590	579	5,169	25,107	4,000	36,962	2,679	20,906	89,655	84,486	779	45	734
19	2019	0	0	4,590	579	5,169	26,354	4,114	39,465	2,786	21,726	94,445	89,276	621	34	587
20	2020	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	493	26	467
21	2021	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	373	19	353
22	2022	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	282	15	267
23	2023	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	213	11	202
24	2024	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	161	8	153
25	2025	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	122	6	116
26	2026	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	92	5	88
27	2027	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	70	4	66
28	2028	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	53	3	50
29	2029	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	40	2	38
30	2030	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	30	2	29
31	2031	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	23	1	22
32	2032	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	17	1	16
33	2033	0	0	4,590	579	5,169	27,559	4,237	41,925	2,895	22,571	99,187	94,018	13	1	12
	Total	139,784	87,478	112,663	17,357	357,282	645,915	115,750	939,883	70,887	575,303	2,347,741	1,990,459	69,730	69,730	0

EIRR= 0.32204

8.2 Initial Environmental Examination

8.2.1 Outline of the project

The purpose of the project is to rehabilitate the existing wharves, or to construct a new wharf to ensure the economic development in SSEFZ and other Economic Zones in the hinterland. The three alternative long-term development plans are outlined in Table 8.2.1-1.

Table 8.2.1-1 Outline of the Alternatives for the Project

	Alternative-1	Alternative-2	Alternative-3
1. Project name	Subic Bay Port Master Plan		
2. Background	SBMA is developing SSEFZ and a large future cargo demand is forecast		
3. Purpose	To rehabilitate the existing port facilities or to construct a new port facilities for supporting the development of SSEFZ.		
4. Location	SBF secured area in SSEFZ		
	Central Business area NSD area Boton area	NSD area Binictican area Boton area	NSD area Boton area Cubi Point area
5. Executive organization	SBMA		
6. Plan (1) Type	Rehabilitation of existing wharves(CBA) Construction of a new wharf(NSD) Construction of storage facilities(Boton)	Construction of a new wharf(NSD,Binictican) Construction of storage facilities(Boton)	Construction of storage facilities(NSD,Boton) Construction of a new wharf(Cubi Pt.)
(2) New wharf	780m×-13m(NSD)	780m×-13m(NSD) 460m×-13m(Binict.)	780m×-13m(Cubi Pt.)
(3)Basin area	-13m	-13m	-13 m
(4) Dredging	Deepen to -10.5m in Rivera East wharf Dredging of basin in NSD wharf	Dredging of quay foundation (removal & replacement) and basin in NSD and Binictican areas	None in particular
(5) Reclamation	Reclamation for apron and terminal areas in NSD	Reclamation for apron and terminal areas in NSD and for apron area in Binictican	Reclamation for apron and terminal areas
(6) Other main works	None in particular	Diversion of an existing road and river	Construction of access road
7. Related development	SSEFZ (industrial park development, tourism development, commercial and business center development, airport development etc.)		

8.2.2 Existing Environmental Conditions

Site description of the project area is summarized in Table 8.2.2-1.
Since the project contains dredging or reclamation work in the construction stage and earthwork of marsh including mangrove area is planned in Alternative-2, IEE was conducted in the study.

Table 8.2.2-1 (1) Characteristics of Port Development Sites
(CBA, NSD, Binictican)

Site / Item	Central Business area	NSD area	Binictican area
	Alternative-1	Alternative-1,2,3	Alternative-2
1. Social environment (1) Residents	No inhabitants in SBF secured area except SBMA staff and investors staying on a temporary basis.		
(2)Proposed land use by World Bank	Business and commercial area, water front area	Transport area	Industrial area
(3)Economic / Recreational activities at present	Industrial, commercial, business and tourism activities in SBF secured area.		
	Factory, warehouse/ Port activity	Open storage yard, transit shed, warehouse/ Port activity	None in particular
2. Natural environment (1) Topography / geology	Many hills and few flat land areas in the SBF secured zone Silty sand, silty clay, high consolidated clay.		
	Flat land	Flat land	Flat land / Wetland Road and river are existing.
(2) Coast/sea area	Tidal difference is small. Waves are not high and current speed is slow. Slope of sea bottom drops steeply. Tendency of deposition caused by Lahar.		
(3) Precious fauna/ flora and their living area	None in particular.		
3. Pollution (1) Occurrence of complaints	None in particular.		
(2) Coping with complaints	None in particular.		
4. Others	None in particular.	Possibility of heavy metal concentrations in bottom sediments	Possibility of heavy metal concentrations in bottom sediments

Table 8.2.2-1 (2) Characteristics of Port Development Sites
(Boton, Cubi Point)

Site / Item	Boton area	Cubi point area
	Alternative-1,2,3	Alternative-3
1. Social environment (1) Residents	No inhabitants in SBF secured area except SBMA staff and investors staying on a temporary basis.	
(2)Proposed land use by World Bank	Industrial area	Transport area
(3)Economic / Recreational activities at present	Industrial, commercial, business and tourism activities in SBF secured area.	
	Factory, open storage yard/ Industrial and Port activities	None in particular Beach is situated in the vicinity.
2. Natural environment (1) Topography / geology	Many hills and few flat land areas in the SBF secured zone. Silty sand, silty clay, high consolidated clay.	
	Flat land	Flat land / shallows
(2) Coast/sea area	Tidal difference is small. Waves are not high and current speed is slow. Slope of sea bottom drops steeply. Tendency of deposition caused by Lahar.	
(3) Precious fauna/ flora and their living area	None in particular.	
3. Pollution (1) Occurrence of complaints	None in particular.	
(2) Coping with complaints	None in particular.	
4. Others	None in particular.	None in particular

8.2.3 Initial Environmental Examination

(1) General

Major sources of adverse effects of port development can be categorized into three types: ① location of port; ② construction; and ③ port operation, including ship traffic and discharges, cargo handling and storage, and land transport. Location of port connotes the existence of structures or landfills, and the position of the development site. Construction implies construction activities in the sea and on land, dredging, disposal of dredged materials, and transport of construction materials. Port operation includes ship-related factors such as vessel traffic, ship charges and emissions, spills and leakage from ships; and cargo-related factors such as cargo handling and storage, handling equipment, hazardous materials, waterfront industry discharges, and land transport to and from the port.

The Initial Environmental Examination (IEE) has been conducted using the check-list shown in Table 8.2.3-1. This check-list was prepared on the basis of JICA's guideline, and it covers the international standard type often used by international financial organizations.

SBMA has promulgated the following manuals and guidelines to secure sustainable development in SBFZ in respect of the environment:

① Environmental Procedure Manual
② Construction Management Guidelines
③ Solid Waste Guidelines
④ Solid Waste Management Fees
⑤ SBMA Seaport Instruction 94-007
⑥ Rules and Regulations for Hazardous Waste Generators and Transporters

All projects to be implemented in SBFZ must be approved by the Ecology Center in SBMA. Therefore, significant impacts are limited since the construction and operation of port will be controlled according to the above manuals and guidelines.

(2) Conclusions

Necessary EIA in First Phase Plan will be conducted once the project is decided after selection among the three Alternatives. Although the EIA contents will be decided after the First Phase Plan is finalized, the significant impacts in each long term plan are as follows:

1) Alternative-1

a)Possible collision between calling ships and fishing boat traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishing boat traffic survey is necessary to make a navigation aids plan.

2) Alternative-2

a) Dredged material disposal

The necessary dredging volume for channel and basin is about 1.6 million m^3 and there is a

possibility that dredged material disposal would have a significant effect on the marine environment.

b) Wetland damage and filling

There are wetlands with mangrove along Binictican River in the proposed site. Ecological value of wetland (use by domestic animals, use by other fauna, unique vegetation, irrigation water source, damage to flora) will be assessed.

c) Possible collision between calling ships and fishing boat traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishing boat traffic survey is necessary to make a navigation aids plan.

3) Alternative-3

a) Impact to recreational beach at Cubi Point

Cubi Point beach is located close to the project site. EIA will be conducted to determine the extent of impact.

b) Change in coastal currents

Reclamation of Cubi Point will cause a change in coastal currents. These changes will be simulated.

c) Dispersal of suspended sediments

Dispersal of suspended sediments from landfills during construction stage will be simulated.

d) Possible collision between calling ships and fishing boat traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishing boat traffic survey is necessary to make a navigation aids plan.

Table 8.2.3-1 Checklist of Environmental Parameters for Ports and Harbors Projects

For Subic Bay Port Master Plan

	Actions Affecting Environmental Resources and Values	Damage to Environment	Recommended Feasible Protection Measures	IEE				REMARKS
				No Significant Effect	Significant effect			
					Small	Moderate	Major	
	(A)	(B)	(C)	(D1)	(D2)	(D3)	(D4)	
A.	Actions Affecting Coastal Marine Ecology							
1.	Location on harbor in fisheries reproduction zone	Loss of fisheries reproduction	Consider relocation of harbor site	*				
2.	Location of harbor in fisheries capture zone	Displacement of fishermen families	Relocation of fishing zones	*				
3.	Disposal of dredging spoils into fisheries reproduction zone	Loss of fisheries reproduction	Proper spoils disposal	*				
4.	Disposal of dredging spoils into coral beds	Loss of fragile/precious marine ecology	Proper spoils disposal	*				
5.	Oil spills leakage within harbor which escape harbor area	Damage to marine ecology (fisheries/corals)	Improved routine and emergency control of oil leakage/spills	*				
6.	Oil spills from tankers on way to and from harbor	Damage to marine ecology (fisheries/corals)	Improved routine and emergency control of oil leakage/spills	*				
B.	Actions Affecting Recreational Resort Beach Areas along Coastal Zone.	Depreciation of Recreation Areas by:						
1.	Location of harbor too close to recreational areas	Visible turbidity of discoloring of beach waters	Consider relocation of port or of resort		*			Alt-3 (Cubi Point Beaches)
2.	Escape of liquid and solid wastes from harbor area, especially floatables	Silt depositions along shoreline	Extraordinary attention to liquid/ solid waste management	*				
3.	Air pollutant emissions from harbor ships facilities	Visible floatable wastes	Extraordinary attention to air pollution control	*				
4.	Disposal of dredging spoils which reach along shoreline.	Waste deposition along shoreline	Proper spoils disposal			*		Alt-2 Construction Stage
5.	Oil spills leakage within harbor which escapes harbor area	Oil firms on beach waters and shoreline	Improved spill leakage control and improved emergency oil spill cleanup	*				
6.	Oil spills from tankers on way to and from harbor	Contamination of beach waters	Improved emergency oil spill cleanup	*				
C.	Actions Causing Unacceptable Sanitation Conditions in Harbor Area	Unsanitary Harbor Environment, including:						
1.	Inadequate provision of water supply to port facilities and ships	unacceptable environmental activities	Extraordinary attention to water supply	*				
2.	Inadequate management of waste emissions from port facilities	health hazards to port and ship workers	Extraordinary attention to waste management of shore facilities	*				
(a)	liquid sanitary and industrial wastes	destruction of harbor fishery / ecology		*				
(b)	solid sanitary and industrial wastes	hazards for pollution of coastal areas by escape of wastes from harbor		*				
(c)	gaseous emissions from shore industries			*				
3.	Inadequate management of wastes from ships	Similar to A 1,2,3,4, above	Extraordinary attention to management of ships					
(a)	liquid wastes, especially floatables, including bilge waters			*				
(b)	solid wastes, especially floatables, including garbage			*				
4.	Escape of oils within harbor	Similar to A 1,3,4, above	Improved routine and emergency controls of oil leakage and spills					
D.	Handling of Hazardous Cargoes within Harbor especially :	Similar to A 1,2,3,4	Extra Careful Attention in Design/ Operations					
1.	Dust Emissions (for example, handling of coal and cassava dusts)	Air pollution and explosion hazards	Proper air pollution control	*				
2.	Hazardous material (inflammables, explosives, toxic substances)	Health and safety of workers and nearby residents	Proper control of hazardous materials	*				

	Actions Affecting Environmental Resources and Values	Damage to Environment	Recommended Feasible Protection Measures	IEE				REMARKS
				No Significant Effect	Significant effect			
					Small	Moderate	Major	
	(A)	(B)	(C)	(D1)	(D2)	(D3)	(D4)	
E.	Handling of Materials to and from Harbor							
1.	Traffic congestion	Airpolution and explosion hazards	Proper air pollution control	*				
2.	Hazardous materials (inflammable, explosives, toxics)	Health and safety of workers and nearby residents	Proper control of hazardous materials	*				
F.	Actions Affecting Local Socioeconomics							
1.	Inadequate housing for new population	Hazards for creating slums	Planning to prevent slum problems	*				
2.	Inadequate health precautions during construction (especially malaria)	Communicable disease hazards	Proper planning of construction worker facilities	*				
(a)	communicable disease hazards from imported workers'carriers)	Proper precautions during construction	spraying of workers' camp for anopheline mosquito control	*				
(b)	inadequate water supply and sanitation for workers	provision for adequate facilities	provision for adequate facilities	*				
3.	Changes in land use patterns:							
(a)	displacement of agriculture	loss of agricultural values	appropriate resettlement	*				
(b)	displacement of villages	displacement of villages	appropriate resettlement	*				
4.	Excessive noise from harbor operations	Health of harbor workers and nearby residents	Adequate noise control	*				
G.	Actions Affecting Terrestrial Ecology							
1.	Adverse impact on local forest / wetland	Similar to A 1 to A 6 above	Similar to A1 to A6 above		*			Alt.-2 (Loss of wetland and mangroves)
2.	Adverse effects on wildlife from loss in forest / wetland habit	(ditto)	(ditto)		*			Alt.-2 (Loss of wetland and mangroves)
3.	Adverse effects on estuarine lagoons (fisheries, wildlife)	(ditto)	(ditto)		*			Alt.-2 (Loss of wetland and mangroves)
H.	Actions Caused by Changes in Coastal Hydrology	Physical Damage to Coastal Facilities/ Ecology	Careful Project Design with Respect to Hydrology, plus Protection Facilities.					
1.	Change in coastal currents	Stagnation or promotion of water flow	Proper engineering to avoid problems		*			Alt.-3 (reclamation of Cubi Point)
2.	Deposition along nearby coastal areas	Damage to shoreline properties	(ditto)	*				
3.	Erosion along nearby coastal areas	(ditto)	(ditto)	*				
4.	Adverse effect on marine water quality	Damage to living conditions	(ditto)		*			Alt.-3 :Construction Stage
I.	Actions Affecting Precious Historical Culture Religious Monuments Sites	Loss or Damage to Resources	Relocation or Protection Measures					
1.	By displacement on submergence			*				
2.	By alternations in coastal zone hydrology'shoreline			*				
J.	Hazards from Access Roads' Traffic Living Harbor	Collision Spill Hazards to Ships	Proper Design for Harbor Access	*				
K.	Navigation Hazards from Ship Entering or Leaving Harbor				*			All

CONCLUSIONS: No significant adverse environmental effect to be caused by project (D1). No EIA needed.
Significant environmental impact as shown in columns D2, D3 and D4. Follow-up EIA needed.

8.3 Overall Evaluation of the Master Plan

8.3.1 Overview of the Master Plan

Three alternatives for the long term development plan (target year: 2020) were formulated; merits and demerits of each alternative are shown in Table 8.3.1-1.

Points in common among the three alternatives in the Port Master Plan are as follows (see Table 7.4.3-1):

(1) Usage of existing wharves excluded from the long term development plan as SBMA Port Project

The necessary investment for the function mentioned below is excluded from the SBMA port project (long term plan).

①Alava Wharf will accommodate passenger ships in 2020.

② POL Pier will be used for oil terminal by private company the same as at present.

③ RO-RO Ramp at Lower Mau will be utilized for LCT the same as at present.

④ Nabasan Wharf will be used for non-container cargo (cargo operation of small impact to environment) by private company.

⑤ Camayan Wharf will be utilized for eco-tourism purposes (berthing of bay cruise boat, tourism resources etc.)

(2) Usage of existing wharves included in the long term development plan as SBMA Port Project

①Bravo Wharf will be used for berthing of port service boats(tug boats, pilot boats).

②Boton Wharf will be utilized as a non-container cargo wharf.

③Alava and Rivera Wharves will be used for handling of non-container cargo (Alternative-1).

④NSD Wharf will be used for handling of non-container cargo instead of container terminal development (Alternative-3).

Table 8.3.1-1 Merits and Demerits of the Alternatives of Long Term Plan

	Merits	Demerits
Alternative-1	1. It is possible to make maximum use of the existing port facilities. 2. Project cost is lowest among the three alternatives. 3. It is possible to handle all non-container cargo demand without private company's new investment. 4.The location of the container terminal is the best place for transportation of cargo from/to the Techno-park and the Industrial Park. 5.Phasing of the project can be flexibly accomplished.	1.The location of the container terminal is not suitable as it is too close to the marina. 2. Since the concession for the container terminal is in the courts and will not be cleared up for some time, the setting up a factory in SBFZ and the realization of SBMA's vision will be delayed. 3.Since a private company(concessionaire of NSD container terminal) would not be willing to make the prior investment, it would be difficult to attract port users and customers, and it would influence factories setting up schedule in the industrial estates. 4. It is necessary to revise the urban redevelopment plan (Kenzo Tange's Master Plan of the Central Business Area). 5. The lease fee from the backyard of Rivera Wharf must be lost. 6. The actual deadweight capacity of ship is limited to 15,000 metric tons due to the weak structure in Alava and Rivera wharves. 7. Complete coordination between airport and seaport operation would be needed to ensure safety and ship schedule would be influenced greatly by flights in Boton Wharf. 8. The economic benefit is low because of the reasons mentioned in 2 and 3 above.
Alternative-2	1. It is possible to handle container cargo in the First Phase Plan at Binictican area and it will result in efficient container shipping. 2. SBMA's aim to become a logistics base combining the seaport and airport will be realized. 3. The location is the best place for transportation of cargo from/to the Techno- park and the Industrial Park. 4. Phasing of the project can be flexibly accomplished.	1.The location of the container terminal is not suitable as it is too close to the marina. 2. Bulk cargo of soya and cement must be left to a private company. 3. Since it is necessary to landfill the wetland and to cut the mangrove, prudent environmental consideration and mitigation will be required. 4. The project area (Binictican) is located in a portion of the Industrial Park Phase III planning area. 5. Dredging of 1.6 million m^3 spoils which may contain heavy metals is required. 6. Construction cost is the highest of the three alternatives.
Alternative-3	1.Since the location of the container terminal is in the mouth of the port, it is a suitable site from the navigational safety aspect. 2. It is possible to handle container cargo at fully equipped berth in Cubi Point area and it will result in efficient container shipping. 3. SBMA's aim to become a logistics base combining the seaport and airport will be realized. 4. There is room for future port expansion.	1. It is necessary to construct a new access road and the distance from the Industrial Park to the container terminal is longer than other Alternatives. 2. Flexibility for phasing development plan is more difficult than other Alternatives. 3. Reclamation of about 3.0 million m^3 is required.

8.3.2 Evaluation of the Long Term Plan

Evaluation of the alternatives for the long term plan is shown in Table 8.3.2-1.

Commonly, the evaluation of a plan is influenced by the governor's sense of values. For example, if project cost were the most important consideration, Alternative-1 would be selected or if the public bidding of the container terminal concession could be returned to the starting line (allowing the site and construction plan to be altered), Alternative-3 would become the best plan. At this time, however, the evaluation of the alternatives is not influenced by preconceptions as each evaluation item is given the same weight.

Alternative-2 and -3 are both viable according to Table 8.3.2-1. The differences between these alternatives are as follows:

①Consultation issue with the concessionaire

The sites of container terminal are NSD area in Alternative-2 and Cubi Point in Alternative-3. If Alternative-3 is adopted, consultation with the concessionaire is necessary, to change the site from NSD to Cubi Point or to open new bidding for the container terminal in Cubi Point with cancellation of the bidding of NSD container terminal.

②Safety navigation

The new container terminal in NSD area is located in the inner port area and too close to marina. Therefore the terminal in Cubi Point is better than NSD area from the navigational safety aspect.

③Access road issue

The construction of a new access road increases the cost of Alternative-3. In addition, the distance from the industrial estates is greater than in Alternative-2.

Flexibility for phasing development plan in Alternative-3 is also influenced by this issue.

④Utilization of existing port facilities

The existing facilities located in NSD area will be replaced by a container terminal in Alternative-2, while all of the existing facilities will be used effectively in Alternative-3.

⑤Environmental issues

Dredging and dumping of spoils which may contain heavy metals, and cutting of mangrove is necessary in Alternative-2. Current changes and dispersal of filling-up materials occur in Alternative-3.

⑥Construction cost

The construction cost of Alternative-2 is higher than Alternative-3. Therefore, Alternative-3 is more beneficial than Alternative-2.

Consequently, Alternative-3 is the most suitable for the long term development plan according to the total evaluation. Therefore, Alternative-3 was decided as the long term plan.

Table 8.3.2-1 Evaluation of Alternatives of Long Term Plan

Item	Alternative-1	Alternative-2	Alternative-3
Consistency with SBMA's Strategy	△	◎	◎
Incentive to Container Shipping	△	◎	◎
Conformity with Land Use Plan	△	○	◎
Consultation with the Concessionaire	◎	○	△
Navigational Safety aspect for container ships (possibility of collision with yachts)	△	△	◎
Ship's Maneuverability	○	○	○
Efficiency of Cargo Handling for Non-container Cargo	△	◎	○
Port Management and Operation Perspective	○	◎	○
Accessibility to the Container Terminal	◎	◎	○
Utilization of Existing Facilities	○	△	◎
Constraints of Airport	△	○	○
Future Expansion	△	△	◎
Flexibility of Phasing Development Plan	◎	○	△
Environmental Impact	◎ None in particular (Dredging)	△ Moderate (Dredging, Loss of wetland)	○ Small (Reclamation)
Construction Cost	◎	△	○
Benefit	○	○	○
Total Evaluation	△	○	◎

Note) ◎: Optimum ○: Fair to Good △: Poor

9 Conclusions and Recommendations

9.1 Conclusions

(1) General

At present, SBF has a total berth length of 2,710m, but there is no adequate and efficient container berth.

Owing to the urban redevelopment plan (Kenzo Tange's Master Plan of the Central Business Area) and container terminal development plan in NSD area, the present berth length (2,710 m) will be reduced to only 410 m (Boton Wharf).

Also, the construction of a new container terminal by BOT scheme in NSD area has been suspended and it is impossible to clarify when it will be operational.

SBMA has a strategy to introduce target industries in SSEFZ. According to the SBMA's vision, SBF is an important infra-structure to realize the future development in SSEFZ.

Therefore, it is essential to provide economical and efficient port service in SBF to consignors and consignees, because the advantage of SSEFZ is the accessibility to the seaport as well as airport. The development of SSEFZ actually began in 1994 and the rate of investment in SSEFZ will be accelerated toward the early 21st century, which will subsequently cause a rapid and considerable cargo traffic increase. Port development to cope with the future cargo traffic is thus essential to ensure that economic activities in SSEFZ are not impeded by the capacity of the port.

Given the various types of new factories and business activities, both container cargo and non-container cargo generated in SSEFZ must be handled efficiently in SBF.

(2) Port development concept

The development concept of SBF can be defined as a specialized port for business development in SSEFZ, adjacent SEZ and EPZ, and for the tourism development in SSEFZ.

(3) Conceptual zoning plan

SBMA must have a conceptual zoning plan and the coastal development in SSEFZ should comply with the zoning plan. Taking road network condition and present land use into consideration, the port development should be conducted initially in SBF Secured Area and then in Redondo Peninsula.

(4) Demand forecast for SBF (middle case)

In 2020, container cargo will increase to 720 thousand TEU, which means an increase of 30.7 times over 1997 (23 thousand TEU), and non-container cargo will increase to 840 thousand tons for foreign trade and 155 thousand tons for domestic trade, increases of 2.0 times and 4.2 times over 1997 (foreign:420 thousand tons, domestic:37 thousand tons) respectively.

(5) Required number of berth for future cargo demand (2020)

Based on the calculation of required number of berth, three (3) berths for container cargo, four (4) berths for foreign trade, one (1) berth for domestic trade (eight in total) are necessary in 2020.

If the bulk cargoes generated in the hinterland other than SSEFZ or EPZ nearby shall be handled by special facilities operated by private bulk terminal, three (3) berths for container cargo, two (2) berths for the foreign trade and one (1) berth for the domestic trade is enough excluding re-export of cigarette and domestic trade of heavy equipment.

(6) Countermeasure for accommodating the future cargo traffic in long term plan

There are three countermeasures for accommodating future cargo traffic in 2020. The first is to make maximum use of the existing port facilities (Alava, Rivera and Boton wharves) and construct a new container terminal in NSD area. The second is to construct new wharves for container cargo in NSD area and for foreign trade in Binictican area. The third is to construct a new wharf for container cargo in Cubi Point and utilize the existing port facilities in NSD wharf for foreign trade. After careful examination and evaluation, it was decided that construction of a new container terminal in Cubi Point is desirable for SSEFZ if the present concession bidding and the contract can be canceled or a new contract for container terminal operation can be introduced.

In addition to the conclusions mentioned above, an efficient container berth for gearless container ship must be provided as soon as possible. Therefore the new wharf should serve as a fully equipped container terminal from the first stage.

(7) Long term plan of the new wharf in Cubi Point with domestic berths at Boton Wharf

1) Handling cargo volume in 2020 (middle case) : 720,000 TEUs of container (Cubi Point),
840,000 tons of foreign cargo, 155,000 tons of domestic cargo
2) Required new berth length: 780 m (New container berth in Cubi Point)
3) Required new berth depth: -13m (New container berth in Cubi Point)
4) Necessary land scale: 35 ha (Container terminal in Cubi Point)
36 ha (Non-container cargo storage area in NSD)
17 ha (Non-container cargo storage area in Boton)
5) Construction cost: Philippine P 9.4 billion (US$ 232 million, including VAT)

(8) The result of IEE

The necessary items for EIA (Alternative-3) are as follows:

①Impact to recreational beach at Cubi Point
②Change in coastal currents
③Dispersal of reclamation material
④Possible collision between calling ships and fishing boat traffic

9.2 Recommendations

With a view to securing successful realization of SBMA's vision, timely actions on the part of the Government of Philippines and SBMA are recommended as follows:

(1) Preparation of port statistics

During our study, we encountered problems in port planning. Specifically, it was very difficult to gather accurate statistics on cargo handled and calling ships at ports as well as data concerning existing port facilities including accurate and updated maps. A port continuously grows and develops in line with the national or regional economy. Therefore, it is very important to develop a port based on a long term development plan that contains the most accurate forecast of future events as possible. The above mentioned information is fundamental in making a port development plan. It is strongly recommended to consolidate the legal and institutional frame for obtaining and maintaining these statistics. Information and Statistics Section is included in the Proposed Organization Chart (Figure 4.1.1-2)

(2) Immediate construction of container terminal

It can be said that contemporary business logistics is mainly composed of container transportation. It is essential to provide efficient container handling service in SBF for realization of SBMA's vision through introduction of modern industries and factories such as regional hub services, printing / publishing and transport related services.

Therefore, it is strongly recommended that construction of container terminal must be started immediately to promote the development in SSEFZ. And the best approach is for the SBMA to construct a fully equipped container terminal in the short term plan, because it will take a great deal of time to construct and efficiently operate a fully equipped container terminal under a BOT scheme.

For the construction of a new container terminal in the first phase, the best approach is to utilize idle land in order to minimize the construction cost and to maximize the benefit. To give an actual example, the car racing field located in the north side of the Subic International Airport should be used for a container storage yard until the airport intends to develop this area.

(3) Modernization of shift system on cargo handling

To secure efficient cargo handling, the present two shift system must be changed to a three shift system.

(4) Cooperation among government organizations

Since it is also important for development in SBF to conduct the urgent restoration works of roads destroyed by Lahar, to implement road construction projects (Manila North Tollways, Rainbow Highway, Manila-Subic Expressway) and to obtain a soft loan from international banks, SBMA needs the cooperation of other Philippine government organizations.

(5) Prudent examination of Kenzo Tange's Master Plan from the port engineering aspect

According to Kenzo Tange's Master Plan, a part of Alava Wharf shall be removed to construct a basin for small ships, but this new basin faces entering waves and thus it is necessary to examine the location and length of revetment of the basin for tranquility before finalizing the plan.

(6) Port administration organization

It is proposed to convert the basic attitude of doing business from an "in-house" business perspective to a "customer oriented business" perspective.

SBMA should define its function as Port Administrator only and leave loading / unloading operation etc. to the private sector, abolishing the pre-arrival meeting.