

Considering this, location of a new substation with 80 MVA capacity is proposed to be within northern side of the industrial estate which is the Laem Chabang-2 Substation planned in master plan.

Power supply system in the short-term is as shown in Fig. 4.6.5.

4.6.6 Telecommunication

1) Telephone

Telephone demand in the Laem Chabang Complex was estimated as 3,000 lines in 1991.

Number of telephone required in each area and total telephone lines to be installed are given as follows:

Telephone Demand Area	Number of Telephone
New Town	1,270
Industrial Estate	808
Port	541
Public Booths	52
Total	2,671
Number of Telephone Lines installed:	3,000 lines

According to the Development Project of TOT, number of telephone lines at exchanges in and around the Laem Chabang are required to be increased by 1977-1984 and 1984-1988 as follows:

Name of Exchange	Number of Telephone Lines		
	Existing	Lines to be added in	
		1977-1984 ^{/1}	1984-1988
Chanburi	5,600	2,048	5,120
Ban Bung	400	600	1,024
Bang Saen	1,400	-	2,560
Siracha	1,400	1,536	1,160
Laem Chabang	-	-	1,536
Pattaya	2,000	3,072	5,120

/1: In delay

As can be seen in the above table, present Development Project of TOT (1977-1984) is delayed for two years and installation of a new exchange at the Laem Chabang Complex is scheduled to provide 1,536 lines which is less than 3,000 lines proposed in this study.

A new local exchange will be installed by TOT in new telephone office. The exchange is connected with the Chonbri secondary center exchange to be incorporated into the existing long-distance telephone transmission system in Thailand.

Consequently, the exchange will be SPC digital type with the following capacity.

Initial Capacity (up to 1991) : 3,000 lines
Capacity (as of 2001) : 15,000 lines
Ultimate Capacity : 20,000 lines

2) Telex

Telex demand was estimated for short-term (1991) as below:

Telephone Demand Area	Number of Telex Terminal
Industrial Estate	
EPZ	10
GIE	6
Industrial Center	2
Port Area	
Distribution and Storage	9
Business and Commercial	5
Total	32

The fifth plan of CAT will provides twelve 16 line concentrators each year to be installed throughout Thailand. These will be distributed where necessary as there is no priority ranking for the allocation of the concentrators.

A double 16 line concentrator is installed by CAT in the new post office. And this concentrator connects the existing Pattaya zone exchange as well as the existing Chonbri, Siracha, Rayong and other concentrator.

4.6.7 Land Preparation Plan (For Port Hinterland)

Low land in port and industrial estate can be elevated up over E.L. 3 m by cutting and filling with the soil volume of 2,600,000 m³ for the short-term development. Materials for embankment can be supplied from the higher area in PAT land.

Earth work volume for the short-term development is as follows.

(Unit: m³)

Item	Industrial Estate	Port Area	Total
Cutting	370,000	2,230,000	2,600,000
Filling	740,000	1,860,000	2,600,000

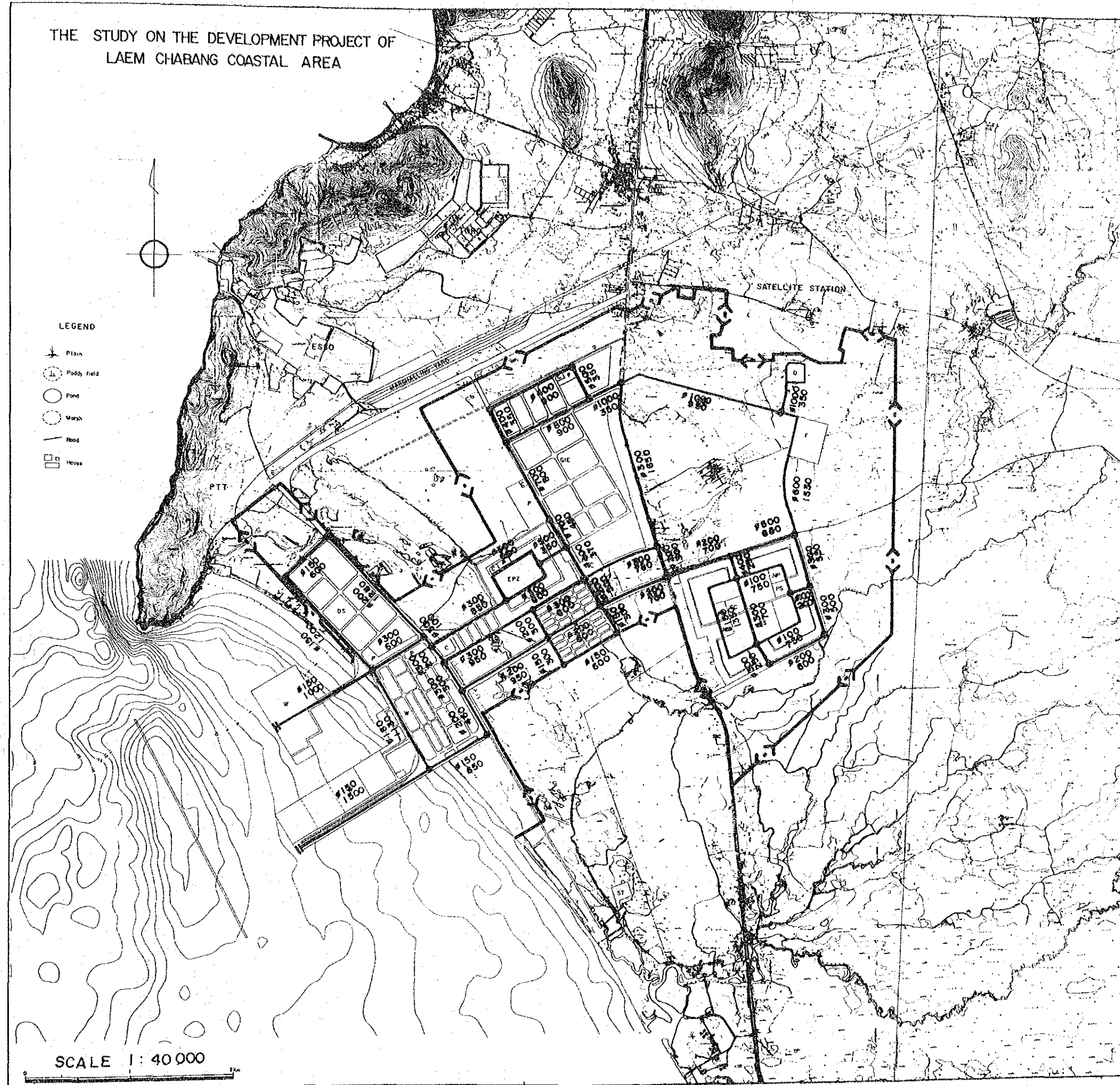
Table 4.6.1 OUTLINE OF FILTRATION PLANT FACILITIES

Items	Contents
Planning quantity	$42,100 \times 1.1 = 46000\text{m}^3$
1. Mixing Basin	W L H 3.6m x 3.6m x 3.0m x 8 system
2. Flocculation Basin	W L H 7.0m x 9.0m x 3.0m x 8 system
3. Chemical Sedimentation Basin	W L H 7.0m x 45.0m x 3.5m x 8 system overflow weir W L 3.5m x 7.0m x 8 system
4. Rapid Sand Filtration	W L 7.0m x 9.0m x 8 system
5. Crean Water Basin	Capacity = 1 hr. $3800 \times 1/24 + 400 = 2200 \text{ m}^3$ W L H 20.0m x 35.0m x 3.0m x 1 Basin
6. Pumping Station	1000 m ³
7. Lagoon and Waste Water Pond	1 set
8. Distribution Basin	Capacity = $14000 \text{ m}^3 + 400 \text{ m}^3$ $= 14500 \text{ m}^3$ W L H 35.0m x 70.0m x 3.0m x 2 Basin

Table 4.6.2 OUTLINE OF TREATMENT PLANT FACILITIES

Items	Contents		
Planning quantity	Max Daily	45,500 m ³ /d	
	Max Hourly	64,500 m ³ /d	
1. Degritting Tank	W	L	H
	3.8m x 10.0m x 0.7m x 1 Basin		
	Pump pit		
	W	L	H
	8.0m x 20.0m x 4m x 1 Basin		
2. Oxidation Ditch	W	L	H
	12.0m x 105.0m x 4m x 2 Basin x 4 stage		
3. Settling Tank	φ	H	
	30.0m x 2.5m x 4 Basin		
4. Chlorination Tank	W	L	H
	20.0m x 13.0m x 2.0m x 1 Basin		
5. Sludge Thickener	φ	H	
	7.0m x 5.0 x 1.0 Basin		

THE STUDY ON THE DEVELOPMENT PROJECT OF
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LEGEND

- Boundary of Project Area
- Boundary of Zone
- Ø 200 Diameter (mm)
- 1000 Length (m)
- D Distribution Basin

KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT
OF LAEM CHABANG COASTAL AREA

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Fig. 4.6.1
Proposed Layout Plan for Water Supply
System

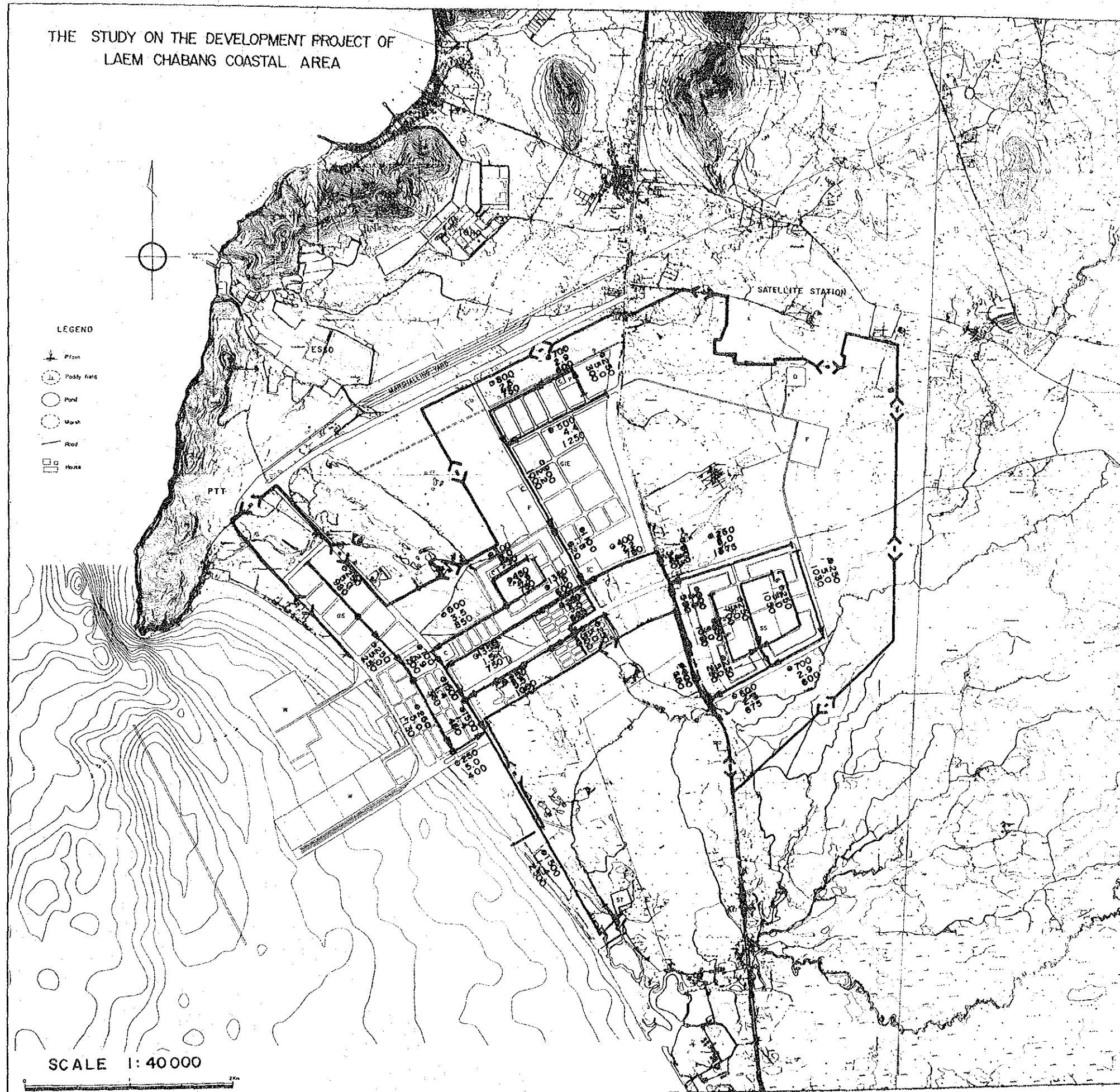
THE STUDY ON THE DEVELOPMENT PROJECT OF
LAEM CHABANG COASTAL AREA

LEGEND

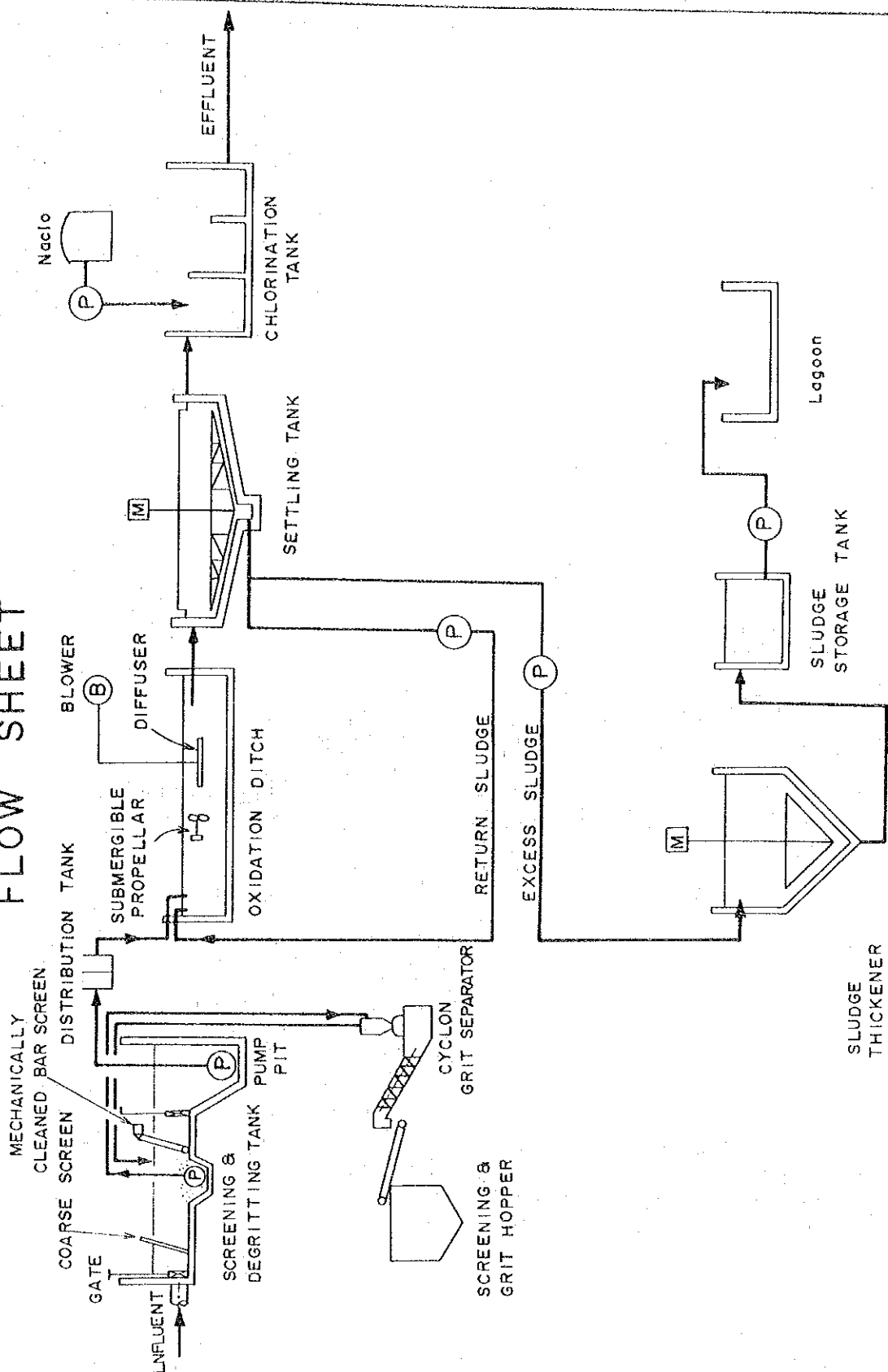
- Plain
- Paddy field
- Pond
- Marsh
- Road
- House

LEGEND

- Boundary of Project Area
- Pumping Station
- Treatment Plant
- Trunk Sewer
- Force Main
- 600 Diameter (mm)
- 3.5 Slope (‰)
- 400 Length (m)



FLOW SHEET



LEGEND

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Fig. 4.6.3
Flow Sheet for Oxidation Ditch Process

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LEGEND

- ✈ Plain
- ⬢ Paddy field
- Pond
- Marsh
- Road
- House

SCALE 1:40000

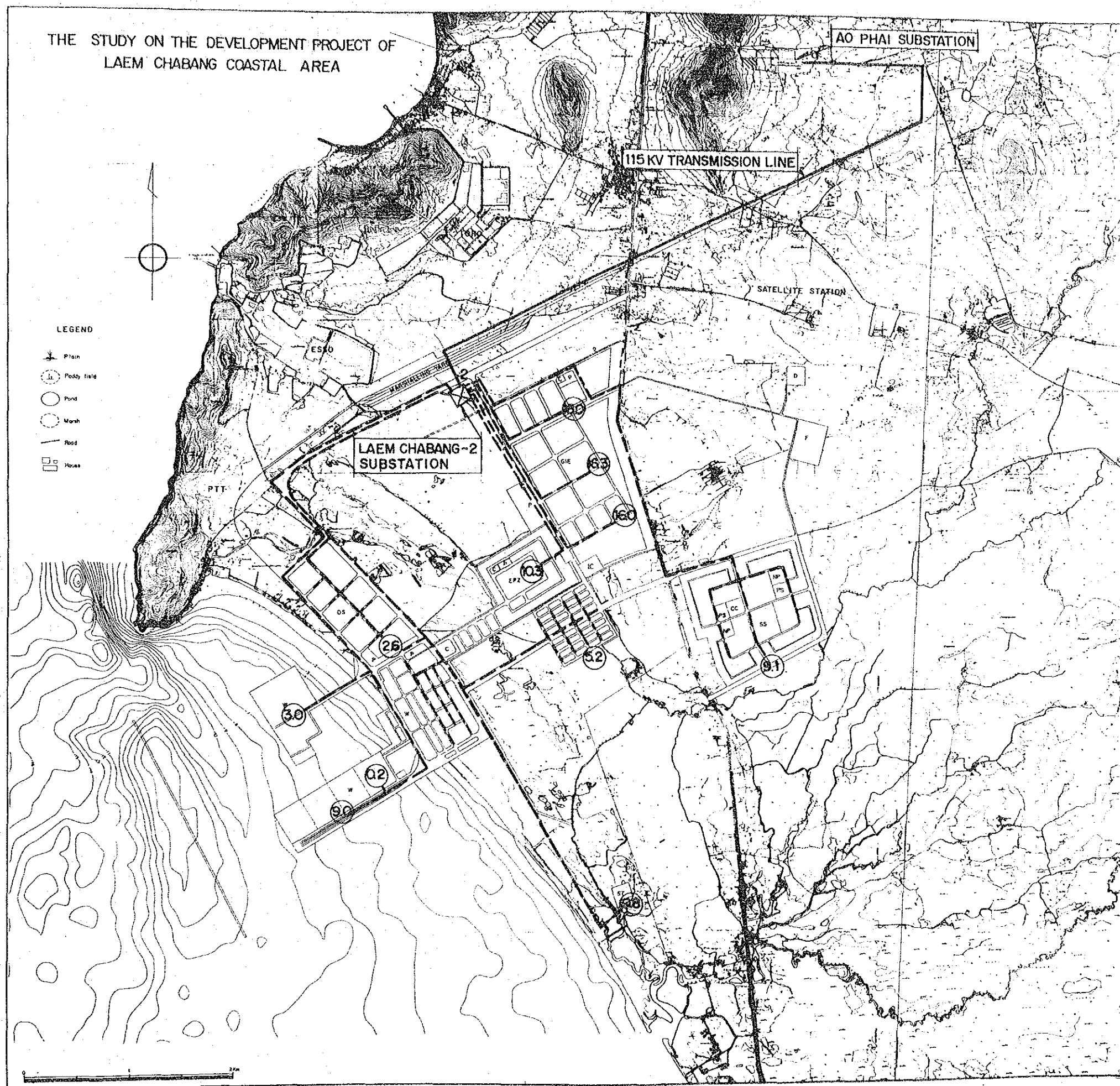
LEGEND

- >— Boundary of Project Area
- - - Boundary of Catchment
- Trunk Drain
- V14.0
10.0x2.0 Shape and Size (m)
- 0.5 Slope
- 500 Length
- Where
- Upper Width 14.0m
- Bottom Width 10.0m
- Depth 2.0m

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Fig. 4.6.4
General Plan of Proposed Drainage System



LEGEND

115 KV TRANSMISSION LINE

VOLTAGE : 115 KV
NO. OF CIRCUIT : 2
TYPE OF TOWER : 2-CCT STEEL
CONDUCTOR SIZE : 477 MCM
LINE CAPACITY : 100 MVA/CCT

22 KV DISTRIBUTION LINE

VOLTAGE : 22 KV
MAX. LINE CAPACITY : 300 A
KIND OF WIRE : INSULATED ACSE
WIRE SIZE : 120 SQMM
TYPE OF POLE : CONCRETE

LAEM CHABANG-2 SUBSTATION

SUBSTATION CAPACITY : 80 MVA
MAIN TRANSFORMER :
3 PHASE, 115/22 KV
40 MVA x 2 SETS
115 KV INCOMING LINE : 2
22 KV FEEDER : 8

Note :

Figures in circle indicate the power demand (MW) within each area.

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Fig. 4.6.5
Power Supply System in Short-Term Plan

4.7 Investment Costs

Investment costs of the short term development program is calculated based on the investment cost estimates of the master plan. The total investment cost is estimated to be $\text{¥}9,121 \times 10^6$ composed of foreign currency portion of $\text{¥}4,204 \times 10^6$ and local currency portion of $\text{¥}4,917 \times 10^6$ as shown in Table 4.7.1.

Detailed breakdown of the construction costs as well as their disbursement schedules for these are given in the Sectoral Report VI "Cost Estimation" except the cost of port wharf area. It is given in the Sectoral Report II "Port Development Plan".

Table 4.7.1 INVESTMENT COST FOR THE SHORT-TERM DEVELOPMENT
(Unit: 1984 Price)

Items	Amount ($\text{¥}10^6$)			Remarks
	Total	F/C	L/C	
1. Industrial Estate	1,114	478	636	
2. Port Area (Wharf)	5,948	2,985	2,963	Including cost of railroad spur
3. Port Area (Hinterland)	680	265	415	
4. New Town	1,010	297	713	
Sub-Total	8,752	4,025	4,727	
5. Power Supply	206	82	124	
6. Telecommunication	163	97	66	
Sub-Total	369	179	190	
Total	9,121	4,204	4,917	

F/C: Foreign Currency

L/C: Local Currency

4.8 Financial Evaluation

4.8.1 General

Financial viability of the project is evaluated in this section for the industrial estate and new town by employing financial internal rate of return (FIRR). Either for the industrial estate and the new town, FIRR to investment and to the responsible agency (IEAT for the industrial estate and NHA for the new town) are calculated. While all the costs are included to get FIRR to investment, some cost items which are considered to be under the responsibility of some other agencies are excluded from the costs in case of calculating FIRR to responsible agency.

Furthermore, income statement and cash flow are prepared for the industrial estate and new town respectively to foresee the financial balance of the project in future. They are prepared for the project as a whole assuming the provision of foreign loan in two cases.

4.8.2 Industrial Estate

1) Cost

All the cost items required for the construction of the industrial estate are included to calculate the FIRR to investment. Disbursement schedule of the investment cost with all the components is presented in the Table 4.8.1. More detailed estimation is given in the Sectoral Report VI "Cost Estimation". The total development cost is estimated at $\text{¥}1,328.3 \times 10^6$.

The cost of land for short-term development is estimated to be around $\text{¥}65 \times 10^6$. This amount is assumed to be paid by structural adjustment loan of the World Bank and repayment schedule is as included in the table 4.8.3. Assumed loan conditions are 11.6% interest and 15-years repayment period with 5-years grace period.

Operation and maintenance cost (O&M cost) of facilities are assumed to be the following percentage of the investment cost respectively.

- Water supply	: 5%
- Sewage treatment plant	: 5%
- Sewers	: 2%
- Road	: 2%
- Drainage	: 10%

Estate management charge and O&M cost for standard factory building are assumed to be $\text{฿}2,000$ per rai and $\text{฿}12$ per square meter per year respectively. Total O&M cost at the full operation stage is estimated to be $\text{฿}33.1 \times 10^6$ per annum.

2) Revenue

Revenue related with the industrial estate are composed of sale of the factory plots, land lease, lease of standated factory buildings, utility charge for water supply, sewerage, power and telecommunication and estate management charge.

(1) Land Sale

Land sale price of factory lots is proposed at the level to recover the investment cost and to be competitive with other industrial estates. Costs to be recovered by land sale are on-site facilities such as roads, water supply pipe and sewer within the industrial estate, land acquisition cost and corresponding engineering service fee. Land sale price is broadly assumed to be $\text{฿}560,000/\text{rai}$ and $\text{฿}480,000/\text{rai}$ for GIE and EPZ respectively. It is recommended that the final land sale price be determined by the Thai government based on the detailed cost to be estimated at the detailed design stage.

It is assumed in the present study that land is sold by cash and hirepurchase in 50% each. Hirepurchase conditions are assumed referring to previous examples in Thailand as follows:

Down payment	: 25% of total price
Interest	: 15% per year
Repayment period	: 3 years

(3) Lease and Rental

A half of EPZ including standard factory building (hereafter SFB) are assumed to be leased.

Rental charge is set so as to recover investment cost. It was determined by the following formula.

$$a = A \times \frac{r(1+r)^n - 1}{(1+r)^n - 1}$$

where, a: Rental charge (¥)
A: Basic price (¥)
r: Discount rate (¥)
n: Payment period (years)

Discount rate and payment period is assumed to be 13% and 20 years respectively.

For factory lots of EPZ, unit sale price of ¥480,000/Rai is amortized according to the above formula and lease price of ¥69,600 per rai per year is obtained. Annual rental charge of SFB is ¥1,225/m².

(4) Land Sale and Operation Plan

Factory lots are assumed to be sold and expand operation to the full capacity according to the schedule presented in Table 4.8.2. It is assumed that land will start to be sold in 1986 prior to the completion of development in consideration of high demand for industrial land.

As already explained in section 3.2 "Industrial Development Plan", operation of factories after purchase is planned on the basis of following assumptions.

- (i) Factories in GIE will be expanded in three stages and reaches full operation stage after 8 years from purchase of factory lot.

- (ii) Factories of EPZ becomes 100% operative after 5 years of land purchase through expansion in two stages.

Revenue from land sale and lease are estimated by applying the price and sale and operation schedule assumed in this manner.

(5) Estate Management Charge

In order to sustain the efficient operation of the industrial estate, estate management charge is induced on factories. It is equivalent to the annual O&M cost of such facilities as onsite roads, drainage, sewers, water supply pipe, and estate management charge. It is estimated to be around ₱1,250 per rai per annum. Revenue from this source amounts to around $₱13.2 \times 10^6$ at the full operation level.

(6) Utility and Estate Management Charge

Charges on water and sewerage are tentatively assumed in the present study at a level that will recover the invested development cost and annual O&M cost. Applying the annual discount rate of 13% and recovery period of 20 years and incorporating annual O&M costs, charges for these facilities are set as follows:

Water: ₱6.9/m³

Sewage: ₱7.1 / m³

Power charge is assumed to be ₱0.2/KWh which is the difference between retail power price of EGAT and consumer price of MEA.

For telecommunication, the amount equivalent to the investment cost is included in the revenue assuming that the investment cost be recovered by inducing an appropriate charge.

Revenue from these sources are estimated by multiplying annual demand and unit price. Revenue at the full operation stage is estimated to be $₱109.7 \times 10^6$ without telecommunication.

3) Financial Internal Rate of Return (FIRR)

Based on the costs and revenue thus estimated, FIRR to investment and to IEAT are calculated. For FIRR to investment, all the costs and revenue as mentioned are applied. In case of FIRR to IEAT, cost and revenue accrued from such facilities as water filtration plant, sewage treatment plant, power, telecommunication and water and sewage pipes, drain, and roads outside the estate are excluded from the calculation since responsibility of these are not likely to be of IEAT.

Future financial inflow and outflow are presented for the calculation of FIRR as shown in Table 4.8.3 and 4.8.4. For both cases, FIRR is calculated as follows:

(Unit: %)

Condition	FIRR to Investment	FIRR to IEAT
Standard	8.4	8.0
Cost 10% up	6.4	5.1
Revenue 10% down	6.2	4.8
1 year delay in sale	6.5	5.7

These figures indicate the sound financial viability of the industrial estate portion of the project, from the view points of both project as a whole and IEAT.

4) Income Statement and Cash Flow

Income statement and cash flow for the industrial estate are prepared including all the components as shown in Table 4.8.5 through 4.8.8 to foresee the future financial balance. Two cases are assumed for foreign loan. They are case 1 with 3.5% interest rate and 30 years repayment period with 10 years grace period and case 2 with 11% interest rate and 20 years repayment period with 5 years grace period. In either case it is revealed that the project is able to generate sufficient revenue to

carry out the sound and smooth operation of the industrial estate from financial point of view.

4.8.3 New Town

1) Costs

Disbursement schedule of the investment cost for the new town is presented in Table 4.8.9. The total investment cost for the new town is estimated to be $\text{P}1,090 \times 10^6$ including all the components. Detailed breakdown of the disbursement schedule is given in the Sectoral Report VI "Cost Estimation".

O&M cost of the new town is derived from operation and maintenance of such facilities as water supply, sewerage system, roads, and drainage. These O&M cost are estimated by applying the percentage to the investment costs with same rates as the industrial estate. The new town management cost is assumed to be 150 baht per housing units. Summing up all these, the annual O&M cost for the new town is estimated to be $\text{P}20.6 \times 10^6$ at the full development stage.

2) Revenue

(1) Sale of housing units

Sale price of housing units are proposed in the present study to recover the investment costs of the on-site infrastructures and to be within the affordable limit for purchasers. Costs to be recovered by sale of housing units are composed costs of raw land, developing on-site infrastructures, housing units, engineering service, and contingency. Raw land cost, on-site facilities costs, engineering service fee and physical contingency are based on the construction costs estimated in the present study. Interest during construction is assumed to be under the foreign loan with 3.5% interest for 5 years construction period. Construction cost of housing units is tentatively set at a level which makes the total price affordable for purchasers. In finding out appropriate price of housing units,

hirepurchase conditions are assumed to be 20 percent downpayment, 15 percent interest and 20-years payment period. Affordable limit for purchasers is taken at 20 percent of monthly income. Sale prices of housing units thus estimated are summarized as below and presented in Table 4.8.10.

(Unit: ฿)

Housing Type	Monthly Income Level	Housing Cost	Other Costs	Total Costs	Monthly Payment	Affordability (%)
A	-5,000	36,000	38,595	74,595	794	20
B	5,000-9,000	59,000	72,428	131,428	1,400	20
C	9,000-	143,000	128,601	271,601	2,892	19
D	Shop Houses (9,000-)	187,000	84,742	271,742	2,894	19

Average monthly incomes are assumed to be ฿4,000 baht and 7,000 baht for A and B type respectively and 15,000 baht for C and D type.

Housing units are planned to be sold in accordance with construction completion as follows.

1988 : 1,284 units
 1989 : 1,284 units
 1990 : 1,283 units
 1991 : 1,282 units
 Total : 5,133 units

Estimated revenue from sale of housing units is as given in Table 4.8.11.

(2) New Town Management Charge

The new town management charge is set to recover annual O&M cost of road and drainage system within the new town and other expense for

the management of the new town, which is assumed to be recovered by collecting 150 baht per month from a housing unit. Revenue from these sources sums up to $\text{P}13.7 \times 10^6$ per annum at the full development stage.

(3) Utility Charge

Rates applied for the industrial estate are also employed for the water supply, sewage, and power of the new town. Sum of these are $\text{P}29.6 \times 10^6$ annually at the full development stage. For telecommunication, investment cost amounting to $\text{P}42.9 \times 10^6$ is included in revenue on the assumption that the investment cost will be collected by inducing a certain appropriate charge for service.

3) Financial Internal Rate of Return

FIRR for the new town is calculated on the basis of costs and revenue as explained so far. For the calculation of FIRR for NHA, costs deriving from water filtration plant, sewage treatment plant, power and telecommunication facilities and main roads, water supply pipe, sewer and drainage outside the new town, and corresponding revenue are not included. Cost items which are considered to be borne by NHA are only counted. It is estimated to be $\text{P}504.4 \times 10^6$ including land acquisition cost. Flows of cost and revenue are presented in Table 4.8.11 and 4.8.12 for calculation of FIRR to investment and for NHA respectively. Results of the computation of FIRRs is as follows:

Condition	(Unit: %)	
	FIRR to Investment	FIRR for NHA
Standard	4.8	11.0
Cost 10% up	3.3	9.2
Revenue 10% down	3.2	9.0
1 year delay in sale	3.6	9.0

Relatively low FIRR to investment is due to the incorporation of such facilities as educational and community facilities, parks and main roads

which generate no revenue despite of the investment. These costs account for about 27% of the total investment cost. FIRR to investment without these components becomes 11.4% indicating the sound financial viability of the new town as a whole.

FIRR from the viewpoint of NHA also indicates the good financial feasibility of the project.

4) Income Statement and Cash Flow

Income statement and cash flow of the new town are prepared from the viewpoint of project as a whole including all the components as shown in Table 4.8.13 to 4.8.16. As done for the industrial estate, two cases of foreign loan are assumed; Case 1 with 3.5 percent interest and 30-years repayment period including 10-years grace period and the Case 2 with 11 percent interest rate and 20-years repayment period including 7-years grace period (equivalent to construction period). In either case, the new town portion of the project proves to generate sufficient revenue for the successful financial operation of the new town.

4.8.4 Cash Flow of the Project

Summary cash flows for the industrial estate and new town are prepared as shown in Table 4.8.17. Foreign loan with two cases of loan conditions are assumed.

Table 4.8.1 DISBURSEMENT SCHEDULE OF INVESTMENT COST
FOR THE INDUSTRIAL ESTATE

(Unit: ₦10 ³)			
Year	Foreign Currency	Local Currency	Total
1985	22,794	15,196	37,990
1986	51,031	50,110	101,141
1987	220,871	285,239	506,110
1988	145,015	193,386	338,401
1989	147,401	197,326	344,727
Total	587,112	741,257	1,328,369

Note: Including all the components of the industrial estate. (Engineering service fee, site preparation, road, water supply, sewerage, drainage, park & buffer zone, administrative facilities, standard factory building, solid waste tip, perimeter road, contingency and power and telecommunication facilities) For detail, please refer to the Sectoral Report VI "Cost Estimation."

Table 4.8.2 SALE AND OPERATION PLAN FOR GIE AND EPZ

(Unit: net rail)							
Year	GIE		EPZ		Total		
	Sale	Operation	Sales & Incremental Lease	Operation	Sales & Incremental Lease	Operation Area	(%)
1986	186	0	27	0	213	0	(0)
1987	138	62	41	0	179	62	(5.0)
1988	138	108	61	34	199	142	(11.5)
1989	138	154	61	65	199	219	(17.8)
1990	205	262	57	96	262	358	(29.1)
1991	138	376	41	159	179	535	(43.5)
1992	0	468	0	210	0	678	(55.1)
1993	0	576	0	240	0	816	(66.3)
1994	0	691	0	266	0	957	(77.7)
1995	0	783	0	288	0	1,071	(87.0)
1996	0	829	0	288	0	1,117	(90.7)
1997	0	897	0	288	0	1,185	(96.3)
1998-2007	0	943	0	288	0	1,231	(100.0)
Total	943	-	288	-	1,231	-	-

Note: (1) Proportion of sale and lease of EPZ land is 50% each.
(2) () in total indicates portion of operation to a full stage.

Table 4.8.3 FINANCIAL INTERNAL RATE OF RETURN FOR INDUSTRIAL ESTATE WITH ALL COMPONENTS

(Unit: ¥10⁶)

No.	Year	C o s t			R e v e n u e							Total	Surplus (Deficit)	
		Develop- ment Cost	Land Cost	O&M	Total	Sale	Lease	Estate Management	Water Charge/2	Sewage Charge/2	Telecom Charge/2			Power Charge/2
1	1985	3.0	24.2 ¹	0	62.2	0	0	0	0	0	0	0	0	(61.5)
2	1986	101.1	11.6	0	112.7	65.1	0	0	0	0	0	0	65.1	(47.3)
3	1987	506.1	11.6	1.6	519.3	68.6	3.4	0.7	2.4	2.2	23.1	0.8	101.2	(417.3)
4	1988	338.4	11.6	3.8	353.8	85.1	6.6	1.5	5.5	5.1	26.9	1.9	132.6	(220.7)
5	1989	344.7	11.6	6.0	362.3	99.4	7.7	2.4	8.6	8.0	26.9	3.0	156.0	(206.4)
6	1990	0	11.6	9.7	21.3	118.0	16.0	3.8	14.0	13.0	0	4.9	169.7	148.4
7	1991	0	11.6	14.8	26.4	100.0	21.2	5.9	21.5	20.0	0	7.5	176.1	148.0
8	1992	0	11.6	18.4	30.0	47.8	24.2	7.3	26.7	24.8	0	9.3	140.1	108.7
9	1993	0	11.6	22.1	33.7	33.5	27.0	8.8	32.1	29.8	0	11.2	142.4	107.3
10	1994	0	0	25.8	25.8	13.5	29.0	10.3	37.5	34.8	0	13.1	138.2	111.1
11	1995	0	0	28.9	28.9	0	29.0	11.5	42.0	39.0	0	14.7	136.2	106.2
12	1996	0	0	30.1	30.1	0	29.0	12.0	43.8	40.7	0	15.3	140.8	109.9
13	1997	0	0	31.9	31.9	0	29.0	12.7	46.4	43.1	0	16.2	147.4	115.3
14	1998	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
15	1999	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
16	2000	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
17	2001	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
18	2002	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
19	2003	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
20	2004	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
21	2005	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
22	2006	0	0	33.1	33.1	0	29.0	13.2	48.1	44.7	0	16.9	151.9	119.0
Total		1,328.3	117.0	491.0	1,936.3	631.0	483.1	195.7	713.4	662.8	76.9	250.0	3,012.9	1,072.7

FIRR: 8.4%

/1 : Including payment in 1984 by converting it to 1985 price with discount rate of 8.4%.

/2 : Water charge: $\text{P}6.9\text{m}^3$, sewage charge: $\text{P}7.1/\text{m}^3$, power charge: $\text{P}0.2/\text{kwh}$.

Table 4.8.4 FINANCIAL INTERNAL RATE OF RETURN FOR
INDUSTRIAL ESTATE UNDER IEAT

(Unit: $\text{P}10^6$)

No.	Year	Cost				Revenue				Surplus (Deficit)
		Invest- ment Cost	Land Cost	O&M	Total	Sale	Lease	Estate Manage- ment	Total	
1	1985	22.9	24.1	0	47.0	0	0	0	0	(47.0)
2	1986	53.8	11.6	0	65.4	65.1	0	0	65.1	(0.3)
3	1987	314.9	11.6	0.7	327.2	68.6	3.4	0.7	72.7	(254.5)
4	1988	136.5	11.6	1.6	149.7	85.1	6.6	1.6	93.3	(56.4)
5	1989	142.8	11.6	2.5	156.9	99.4	7.7	2.5	109.6	(47.3)
6	1990	0	11.6	4.0	15.6	118.0	16.0	4.0	138.0	122.4
7	1991	0	11.6	6.1	17.7	100.0	21.2	6.1	127.3	109.6
8	1992	0	11.6	7.6	19.2	47.8	24.2	7.6	79.6	60.4
9	1993	0	11.6	9.1	20.7	33.5	27.0	9.1	69.6	48.9
10	1994	0	0	10.7	10.7	13.5	29.0	10.7	53.2	42.5
11	1995	0	0	11.9	11.9	0	29.0	11.9	40.9	29.0
12	1996	0	0	12.5	12.5	0	29.0	12.5	41.5	29.0
13	1997	0	0	13.2	13.2	0	29.0	13.2	42.2	29.0
14	1998	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
15	1999	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
16	2000	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
17	2001	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
18	2002	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
19	2003	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
20	2004	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
21	2005	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
22	2006	0	0	13.7	13.7	0	29.0	13.7	42.7	29.0
Total		670.9	116.9	203.2	991.0	631.0	483.1	203.2	1,317.3	326.3

FIRR: 8.0%

Table 4.8.5 INCOME STATEMENT FOR INDUSTRIAL ESTATE (CASE 1)

(Unit: ¥10³)

Year	Revenue			Cost					Income Before Interest	Interest Payment /3	Net Income
	Land Sale	Land Lease	Estate Management	Water Charge	Waste Water Charge	(1) Total	(2) O & M Cost	(3) Tax /1	Depreciation /2		
1985	0	0	0	0	0	0	0	0	0	0	0
1986	65,100	0	0	0	0	65,100	0	2,506	0	62,594	798
1987	68,556	0	658	2,407	2,237	73,858	1,656	2,639	3,404	66,159	2,584
1988	85,075	3,424	1,514	5,537	5,143	100,693	3,809	3,210	21,274	72,400	9,175
1989	99,382	6,558	2,356	8,618	8,007	124,921	5,929	3,826	31,911	83,255	12,921
1990	118,033	9,663	3,830	14,011	13,016	158,553	9,639	4,544	42,548	101,822	16,750
1991	100,009	16,041	5,870	21,474	19,950	163,344	14,774	3,850	42,548	102,172	16,750
1992	47,771	21,155	7,292	26,674	24,780	127,672	18,351	1,839	42,548	64,934	16,750
1993	33,464	24,172	9,766	32,067	29,790	128,259	22,061	1,288	42,548	62,362	16,750
1994	13,519	27,016	10,253	37,507	34,845	123,140	25,804	520	42,548	54,268	16,750
1995	0	29,018	11,477	41,985	39,005	121,485	28,885	0	42,548	50,052	16,750
1996	0	29,018	11,964	43,767	40,660	125,409	30,111	0	42,548	52,750	16,158
1997	0	29,018	12,675	46,367	43,075	131,135	31,899	0	42,548	56,688	15,545
1998	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	14,911
1999	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	14,254
2000	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	13,574
2001	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	12,871
2002	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	12,143
2003	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	11,389
2004	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	10,609
2005	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	9,802
2006	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548	59,385	46,884
Total	630,909	456,245	195,113	713,746	663,078	2,659,091	491,043	24,222	779,905	1,363,921	304,118
											1,059,803

/1: 3.85% of land sale

/2: - Road: 2.5%

- Drainage: 2.5%

- Water Supply: 7%

- Sewerage: 7%

- Standard Factory: 5%

- Administrative facilities: 5%

Depreciation from 1987 to 1989 is in proportion to annual investment of these facilities.

/3: Under the assumed loan for foreign currency portion with 3.5% interest and 30 years repayment period with a 10 years grace period. Interest payment in 2006 includes sum of interest to be paid between 2007 and 2014.

Table 4.8.6 CASH FLOW FOR INDUSTRIAL ESTATE (CASE 1)

(Unit: \$10³)

Year	Income before Interest	Depreciation	Foreign Loan /1	Government Equity	Total Source	Capital Cost		Debt Service /2		Total Application	Surplus (Deficit)	Cumulative Surplus	Debt Service Coverage
						Foreign Currency	Local Currency	Interest	Principal				
1985	0	0	22,794	15,196	37,990	22,794	15,196	0	0	37,990	0	0	0
1986	62,594	0	51,031	50,110	163,735	51,031	50,110	798	0	101,939	61,796	61,796	78.4
1987	66,159	3,404	188,310	253,596	511,469	188,310	253,596	2,584	0	444,490	66,979	128,775	26.9
1988	72,400	21,274	107,027	156,470	357,171	107,029	156,470	9,175	0	272,674	84,497	213,272	10.2
1989	83,253	31,911	109,416	160,408	384,990	109,416	160,408	12,921	0	282,745	102,245	315,517	8.9
1990	101,822	42,548	0	0	144,370	0	0	16,750	0	16,750	127,620	443,137	8.6
1991	102,172	42,548	0	0	144,720	0	0	16,750	0	16,750	127,970	571,107	8.6
1992	64,934	42,548	0	0	107,482	0	0	16,750	0	16,750	90,732	661,839	6.4
1993	62,362	42,548	0	0	104,910	0	0	16,750	0	16,750	88,160	749,999	6.3
1994	54,268	42,548	0	0	96,816	0	0	16,750	0	16,750	80,066	830,065	5.8
1995	50,052	42,548	0	0	92,600	0	0	16,750	0	33,673	58,927	888,992	2.7
1996	52,750	42,548	0	0	95,298	0	0	16,158	16,923	33,673	61,625	950,617	2.8
1997	56,688	42,548	0	0	99,236	0	0	15,545	18,128	33,673	65,563	1,016,180	2.9
1998	59,385	42,548	0	0	101,933	0	0	14,911	18,762	33,673	68,260	1,084,440	3.0
1999	59,385	42,548	0	0	101,933	0	0	14,254	19,419	33,673	68,260	1,152,700	3.0
2000	59,385	42,548	0	0	101,933	0	0	13,574	20,099	33,673	68,260	1,220,960	3.0
2001	59,385	42,548	0	0	101,933	0	0	12,871	20,802	33,673	68,260	1,289,220	3.0
2002	59,385	42,548	0	0	101,933	0	0	12,143	21,530	33,673	68,260	1,357,480	3.0
2003	59,385	42,548	0	0	101,933	0	0	11,389	22,284	33,673	68,260	1,425,740	3.0
2004	59,385	42,548	0	0	101,933	0	0	10,609	23,064	33,673	68,260	1,494,000	3.0
2005	59,385	42,548	0	0	101,933	0	0	9,802	23,871	33,673	68,260	1,562,260	3.0
2006	59,385	42,548	0	0	101,933	0	0	46,884	256,177	303,061	(201,128)	1,361,132	0.3
Total	1,363,921	779,905	478,578	635,780	3,258,184	478,580	635,780	304,118	478,574	1,897,052	1,361,132	-	-

/1: 30 years with 10 years grace period and 3.5% interest.

/2: Payment in 2006 includes sum of payments to be made between 2007 and 2014.

Table 4.8.7 INCOME STATEMENT FOR INDUSTRIAL ESTATE (Case 2)

(Unit: £10³)

Year	Revenue			Cost			Income Before Interest	Interest Payment /3	Net Income
	Land Sale	Land Lease	Estate Management	Water Charge	Waste Water Charge	(1) Total	(2) O & M Cost	(3) Tax /1	Depreciation
1985	0	0	0	0	0	0	0	0	0
1986	65,100	0	0	0	0	65,100	0	2,506	0
1987	68,556	0	658	2,407	2,237	73,858	1,656	2,639	3,404
1988	85,075	3,424	1,514	5,537	5,143	100,693	3,809	3,210	21,274
1989	99,382	6,558	2,356	8,618	8,007	124,921	5,929	3,826	31,911
1990	118,033	9,663	3,830	14,011	13,016	158,553	9,639	4,544	42,548
1991	100,009	16,041	5,870	21,474	19,950	163,344	14,774	3,850	42,548
1992	47,771	21,155	7,292	26,674	24,780	127,672	18,351	1,839	42,548
1993	33,464	24,172	8,766	32,067	29,790	128,259	22,061	1,288	42,548
1994	13,519	27,016	10,253	37,507	34,845	123,140	25,804	520	42,548
1995	0	29,018	11,477	41,985	39,005	121,485	28,885	0	42,548
1996	0	29,018	11,964	43,767	40,660	125,409	30,111	0	42,548
1997	0	29,018	12,675	46,367	43,075	131,135	31,899	0	42,548
1998	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
1999	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2000	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2001	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2002	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2003	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2004	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2005	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
2006	0	29,018	13,162	48,148	44,730	135,058	33,125	0	42,548
Total	630,909	456,245	195,113	713,746	663,078	2,659,091	491,043	24,222	779,905
									1,363,921
									599,796
									764,125

/1: 3.85% of land sale

/2: - Road: 2.5%

- Drainage: 2.5%

- Water supply: 7%

- Sewerage: 7%

- Standard Factory: 5%

- Administrative facilities: 5%

Depreciation from 1987 to 1989 is in proportion to annual investment of these facilities.

/3: Under the assumed loan for foreign currency portion with 11.0% interest and 20 years repayment period with a 5 years grace period.

Table 4.8.8 CASH FLOW FOR INDUSTRIAL ESTATE (CASE 2)

(Unit: £10³)

Year	Income before Interest	Depreciation	Foreign Loan /1	Government Equity	Total Source	Capital Cost		Debt Service		Total Application	Surplus (Deficit)	Cumulative Surplus	Debt Service Coverage
						Foreign Currency	Local	Interest	Principal /2				
1985	0	0	22,794	15,196	37,990	22,794	15,196	0	0	37,990	37,990	0	-
1986	62,594	0	51,031	50,110	163,735	51,031	50,110	2,507	0	103,648	141,638	60,087	25.0
1987	66,159	3,404	188,310	253,596	511,469	188,310	253,596	8,121	0	450,027	591,665	61,442	7.8
1988	72,400	21,274	107,027	156,470	357,171	107,029	156,470	28,835	0	292,334	883,999	64,837	3.2
1989	83,255	31,911	109,416	160,408	384,990	109,416	160,408	40,608	0	310,432	1,194,431	74,558	2.8
1990	101,822	42,548	0	0	144,370	0	0	52,644	13,910	66,554	1,260,985	77,816	2.2
1991	102,172	42,548	0	0	144,720	0	0	51,113	15,441	66,554	1,327,539	78,166	2.2
1992	64,934	42,548	0	0	107,482	0	0	49,415	17,139	66,554	1,394,093	40,928	1.6
1993	62,362	42,548	0	0	104,910	0	0	47,530	19,024	66,554	1,460,647	38,356	1.6
1994	54,268	42,548	0	0	96,816	0	0	45,437	21,117	66,554	1,527,201	30,262	1.5
1995	50,052	42,548	0	0	92,600	0	0	43,115	23,439	66,554	1,593,755	26,046	1.4
1996	52,750	42,548	0	0	95,298	0	0	40,536	26,018	66,554	1,660,309	28,744	1.4
1997	56,688	42,548	0	0	99,236	0	0	37,674	28,880	66,554	1,726,863	32,682	1.5
1998	59,385	42,548	0	0	101,933	0	0	34,498	32,056	66,554	1,793,417	35,379	1.5
1999	59,385	42,548	0	0	101,933	0	0	30,971	35,583	66,554	1,859,971	35,379	1.5
2000	59,385	42,548	0	0	101,933	0	0	27,057	39,497	66,554	1,926,525	35,379	1.5
2001	59,385	42,548	0	0	101,933	0	0	22,713	43,841	66,554	1,993,079	35,379	1.5
2002	59,385	42,548	0	0	101,933	0	0	17,890	48,664	66,554	2,059,633	35,379	1.5
2003	59,385	42,548	0	0	101,933	0	0	12,537	54,017	66,554	2,126,187	35,379	1.5
2004	59,385	42,548	0	0	101,933	0	0	6,595	59,959	66,554	2,192,741	35,379	1.5
2005	59,385	42,548	0	0	101,933	0	0	0	0	0	2,192,741	101,933	-
2006	59,385	42,548	0	0	101,933	0	0	0	0	0	2,192,741	101,933	-
Total	1,363,921	779,905	478,578	635,780	3,258,184	478,580	635,780	599,796	478,585	2,192,741	-	1,065,443	-

/1: 20 years with 5 years grace period and 11.0% interest.

Table 4.8.9 DISBURSEMENT SCHEDULE OF INVESTMENT COST FOR NEW TOWN

			(Unit: $\text{¥}10^3$)
Year	Foreign Currency	Local Currency	Total
1985	1,259	88,257	89,516
1986	23,910	15,941	39,851
1987	47,268	72,815	120,083
1988	134,149	245,821	379,970
1989	84,299	189,751	274,050
1990	25,840	77,859	103,699
1991	16,598	65,826	82,424
Total	333,323	756,270	1,089,593

Note: Including all the costs for the new town (land acquisition, engineering service, site preparation, roads, water supply, sewerage, drainage, park, housing unit, educational facilities, community facilities, solid waste tip, bus terminal, power and telecommunication facilities).

Table 4.8.10 SALE PRICE OF HOUSING UNITS

Housing Type	Income Group	Plot Size (m ²)	(1) Raw Land Cost (P)	(2) Infra. Cost (P)	(3) Housing Cost (P)	(4) Engineering Service Fee (P)	(5) Physical Contin- gency /1 (P)	(6) Interest During Const- ruction /2 (P)	(7) Total Monthly Payment /4	(8) Portion in Income /5 (%)
A.	5,000	100	5,000	13,600	36,000	5,460	12,012	2,523	74,595	20
B.	5,001 - 9,000	200	10,000	27,200	59,000	9,620	21,164	4,444	131,428	20
C.	9,001 -	300	15,000	40,800	143,000	19,880	43,736	9,185	271,601	19
D.	Shop house	64	3,200	8,704	187,000	19,890	43,759	9,189	271,742	19

/1 : 10% of sum of (1) through (3).

/2 : 20% of sum of (1) through (4).

/3 : F.C. : Loan condition: 3.5% interest in 5 years payment

/4 : Hire-purchase conditions for all the types are:

Interest rate : 15%

Down payment : 20%

Repayment Period : 20 years

/5 : Average monthly incomes are assumed as follows:

A type : P 4,000/month

B type : P 7,000/month

C & D type: P15,000/month

Table 4.8.11 FINANCIAL INTERNAL RATE OF RETURN FOR NEW TOWN WITH ALL COMPONENTS

(Unit: #106)

No.	Year	C o s t		Total	Sale of Housing Unit	R e v e n u e					Telecom- munication	Total	Surplus (Deficit)
		Investment	O&M			Management Charge	Water Charge	Wastewater Charge	Power Charge				
1	1985	89.5	0	89.5	0	0	0	0	0	0	0	0	(89.5)
2	1986	39.9	0	39.9	0	0	0	0	0	0	0	0	(39.9)
3	1987	120.1	0	120.1	0	0	0	0	0	12.9	12.9	12.9	(107.2)
4	1988	380.0	5.1	385.1	24.2	3.4	3.0	2.8	1.6	15.0	15.0	50.0	(333.4)
5	1989	274.1	10.3	284.4	39.7	6.8	6.0	5.6	3.2	15.0	15.0	76.3	(204.6)
6	1990	103.6	15.4	119.0	55.2	10.2	9.1	8.4	4.8	0	0	87.7	(26.1)
7	1991	82.4	20.6	103.0	70.6	13.7	12.1	11.1	6.4	0	0	113.9	17.8
8	1992	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
9	1993	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
10	1994	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
11	1995	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
12	1996	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
13	1997	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
14	1998	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
15	1999	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
16	2000	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
17	2001	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
18	2002	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
19	2003	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
20	2004	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
21	2005	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
22	2006	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
23	2007	0	20.6	20.6	61.9	13.7	12.1	11.1	6.4	0	0	105.2	91.5
Total		1,089.6	381.0	1,470.6	1,180.1	381.0	223.8	205.5	118.4	42.9	2,024.0	768.5	

FIRR: 4.8%

Note: without park, education, community facilities and main roads, FIRR is 11.4%.

Table 4.8.12 FINANCIAL INTERNAL RATE OF RETURN OF NEW TOWN UNDER NHA

(Unit: $\text{¥}10^6$)

No.	Year	Cost				Revenue			Surplus (Deficit)
		Land	Invest- ment Cost	O&M	Sub Total	Sales of Housing Units	O&M	Sub Total	
1	1985	56.5	12.3	0	68.8	0	0	0	(68.8)
2	1986	0	18.9	0	18.9	0	0	0	(18.9)
3	1987	0	24.9	0	24.9	0	0	0	(24.9)
4	1988	0	127.4	3.4	130.8	24.2	3.4	27.6	(103.2)
5	1989	0	112.6	6.8	119.4	39.7	6.8	46.5	(72.9)
6	1990	0	75.9	10.2	86.1	55.2	10.2	65.4	(20.7)
7	1991	0	75.9	13.7	89.6	70.6	13.7	84.3	(5.3)
8	1992	0	0	13.7	13.7	61.9	13.7	75.6	61.9
9	1993	0	0	13.7	13.7	61.9	13.7	75.6	61.9
10	1994	0	0	13.7	13.7	61.9	13.7	75.6	61.9
11	1995	0	0	13.7	13.7	61.9	13.7	75.6	61.9
12	1996	0	0	13.7	13.7	61.9	13.7	75.6	61.9
13	1997	0	0	13.7	13.7	61.9	13.7	75.6	61.9
14	1998	0	0	13.7	13.7	61.9	13.7	75.6	61.9
15	1999	0	0	13.7	13.7	61.9	13.7	75.6	61.9
16	2000	0	0	13.7	13.7	61.9	13.7	75.6	61.9
17	2001	0	0	13.7	13.7	61.9	13.7	75.6	61.9
18	2002	0	0	13.7	13.7	61.9	13.7	75.6	61.9
19	2003	0	0	13.7	13.7	61.9	13.7	75.6	61.9
20	2004	0	0	13.7	13.7	61.9	13.7	75.6	61.9
21	2005	0	0	13.7	13.7	61.9	13.7	75.6	61.9
22	2006	0	0	13.7	13.7	61.9	13.7	75.6	61.9
23	2007	0	0	13.7	13.7	61.9	13.7	75.6	61.9
Total		56.5	447.9	253.3	757.7	1,180.1	253.3	1,433.4	675.7

FIRR: 11.0%

Table 4.8.13 INCOME STATEMENT FOR NEW TOWN (Case 1)

(Unit: ¥10³)

Year	Revenue				Operation & Maintenance Cost	Depreciation /2	Income before Interest	Interest Payment /3	Net Income
	Sale of Housing Unit /1	Management Fee	Water Charge	Wastewater Charge					
1985	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	44	(44)
1987	0	0	0	0	0	0	0	881	(881)
1988	24,212	3,424	3,022	2,786	5,146	4,463	23,835	2,535	21,300
1989	39,705	6,848	6,044	5,572	10,292	18,883	28,994	6,846	22,148
1990	55,171	10,272	9,066	8,358	15,438	28,153	39,276	9,348	29,928
1991	70,593	13,697	12,089	11,147	20,586	31,243	55,697	9,803	45,894
1992	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1993	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1994	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1995	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1996	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1997	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1998	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
1999	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2000	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2001	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2002	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2003	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2004	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2005	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2006	61,902	13,697	12,089	11,147	20,586	34,333	43,916	10,384	33,532
2007	216,569	13,697	12,089	11,147	20,586	34,333	198,583	23,507	175,076
Total	1,344,780	253,393	223,645	206,215	380,838	632,070	1,005,125	181,430	823,695

/1: Sale in 2007 includes hirepurchase between 2008 and 2011.

/2: Depreciation rates are as follows.

- Road and drainage: 2.5%

- Water supply and sewerage: 7%

- Housing unit, educational & community facilities: 5%

/3: Interest payment for assumed foreign loan with 30 years repayment period including 10 years grace period and 3.5% interest. Payment in 2007 includes sum of payments to be made between 2008 and 2015.

Table 4.8.14 CASH FLOW FOR NEW TOWN (Case 1)

(Unit: ¥10³)

Year	Income before Interest	Depreciation	Foreign Loan /2	Government Equity	Total Source	Capital Cost		Debt Service		Total Application	Surplus (Deficit)	Cumulative Surplus	Debt Service Coverage
						Foreign Currency	Local Currency	Interest	Principal				
1985	0	0	1,259	88,257	89,516	1,259	88,257	0	0	89,516	0	0	-
1986	0	0	23,910	15,941	39,851	23,910	15,941	44	0	39,855	(44)	(44)	-
1987	0	0	47,268	72,815	120,083	47,268	72,815	881	0	120,964	(881)	(925)	-
1988	23,835	4,463	123,161	233,023	384,482	123,161	233,023	2,535	0	358,719	25,763	24,838	11.2
1989	28,994	18,883	71,478	174,818	294,173	71,478	174,818	6,846	0	253,142	41,031	65,869	7.0
1990	39,276	28,153	13,019	62,927	143,375	13,019	62,927	9,348	0	85,294	58,081	123,950	7.2
1991	55,697	31,243	16,598	65,826	169,364	16,598	65,826	9,803	0	92,227	77,137	201,087	8.9
1992	43,916	34,333	0	0	78,249	0	0	10,384	0	10,384	67,865	268,952	7.5
1993	43,916	34,333	0	0	78,249	0	0	10,384	0	10,384	67,865	336,817	7.5
1994	43,916	34,333	0	0	78,249	0	0	10,384	0	10,384	67,865	404,682	7.5
1995	43,916	34,333	0	0	78,249	0	0	10,384	10,492	20,876	57,373	462,055	3.7
1996	43,916	34,333	0	0	78,249	0	0	10,017	10,859	20,876	57,373	519,428	3.7
1997	43,916	34,333	0	0	78,249	0	0	9,637	11,239	20,876	57,373	576,801	3.7
1998	43,916	34,333	0	0	78,249	0	0	9,244	11,632	20,876	57,373	634,174	3.7
1999	43,916	34,333	0	0	78,249	0	0	8,837	12,039	20,876	57,373	691,547	3.7
2000	43,916	34,333	0	0	78,249	0	0	8,415	12,461	20,876	57,373	748,920	3.7
2001	43,916	34,333	0	0	78,249	0	0	7,979	12,897	20,876	57,373	806,293	3.7
2002	43,916	34,333	0	0	78,249	0	0	7,528	13,348	20,876	57,373	863,666	3.7
2003	43,916	34,333	0	0	78,249	0	0	7,060	13,816	20,876	57,373	921,039	3.7
2004	43,916	34,333	0	0	78,249	0	0	6,577	14,299	20,876	57,373	978,412	3.7
2005	43,916	34,333	0	0	78,249	0	0	6,077	14,799	20,876	57,373	1,035,785	3.7
2006	43,916	34,333	0	0	78,249	0	0	5,559	15,317	20,876	57,373	1,093,158	3.7
2007	198,583	34,333	0	0	232,916	0	0	23,507	143,499	167,006	65,910	1,159,068	1.4
Total	1,005,125	632,070	296,693	713,607	2,647,495	269,693	713,607	181,430	296,697	1,488,427	1,159,068	-	-

/1: 30 years repayment including 10 years grace period and 3.5% interest

Table 4.8.15 INCOME STATEMENT FOR NEW TOWN (Case 2)

(Unit: ¥10²)

Year	Sale of Housing Unit / 1	Revenue					Operation & Maintenance Cost		Depreciation / 2	Income before Interest	Interest Payment / 3	Net Income
		Management Fee	Water Charge	Wastewater Charge	Total							
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	138	(138)
1987	0	0	0	0	0	0	0	0	0	0	2,769	(2,769)
1988	24,212	3,424	3,022	2,786	33,444	5,146	4,463	23,835	23,835	23,835	7,968	15,867
1989	39,705	6,848	6,044	5,572	58,169	10,292	18,883	28,994	28,994	28,994	21,516	7,478
1990	55,171	10,272	9,066	8,358	82,867	15,438	28,153	39,276	39,276	39,276	29,378	9,898
1991	70,593	13,697	12,089	11,147	107,526	20,586	31,243	55,697	55,697	55,697	30,811	24,886
1992	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	32,636	11,280
1993	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	31,391	12,525
1994	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	30,009	13,907
1995	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	28,475	15,441
1996	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	26,772	17,144
1997	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	24,882	19,034
1998	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	22,784	21,132
1999	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	20,455	23,461
2000	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	17,870	26,046
2001	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	15,001	28,915
2002	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	11,816	32,100
2003	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	8,280	35,636
2004	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	4,355	39,561
2005	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	0	43,916
2006	61,902	13,697	12,089	11,147	98,835	20,586	34,333	43,916	43,916	43,916	0	43,916
2007	216,569	13,697	12,089	11,147	253,502	20,586	34,333	198,583	34,333	198,583	0	198,583
Total	1,334,780	253,393	223,645	206,215	2,018,033	380,838	632,070	1,005,125	632,070	1,005,125	367,306	637,819

/1: Sale in 2007 includes hirepurchase between 2008 and 2011.

/2: Depreciation rates are as follows.

- Road and drainage: 2.5%
- Water supply and sewerage: 7%
- Housing units and educational and community facilities: 5%

/3: Interest payment for assumed foreign loan with 20 years repayment period including 7 years grace period and 11.0% interest.

Table 4.8.16 CASH FLOW FOR NEW TOWN (Case 2)

(Unit: $\text{R}10^3$)

Year	Income before Interest	Depreciation	Foreign Loan /1	Government Equity	Total Source	Capital Cost		Debt Service		Total Application	Surplus (Deficit)	Cumulative Surplus	Debt Service Coverage
						Foreign Currency	Local Currency	Interest	Principal				
1985	0	0	1,259	88,257	89,516	1,259	88,257	0	0	89,516	0	0	-
1986	0	0	23,910	15,941	39,851	23,910	15,941	138	0	39,989	(138)	(138)	-
1987	0	0	47,268	72,815	120,083	47,268	72,815	2,789	0	122,852	(2,769)	(2,907)	-
1988	23,835	4,463	123,161	233,023	384,482	123,161	233,023	7,968	0	364,152	20,330	17,423	3.6
1989	28,994	18,883	71,478	174,818	294,173	71,478	174,818	21,516	0	267,812	26,361	43,784	2.2
1990	39,276	28,153	13,019	62,927	143,375	13,019	62,927	29,378	0	105,324	38,051	81,835	2.3
1991	55,697	31,243	16,598	65,826	169,364	16,598	65,826	30,811	0	113,235	56,129	137,964	2.8
1992	43,916	34,333	0	0	78,249	0	0	32,636	11,319	43,955	34,294	172,258	1.8
1993	43,916	34,333	0	0	78,249	0	0	31,391	12,564	43,955	34,294	206,552	1.8
1994	43,916	34,333	0	0	78,249	0	0	30,009	13,946	43,955	34,294	240,846	1.8
1995	43,916	34,333	0	0	78,249	0	0	28,475	15,480	43,955	34,294	275,140	1.8
1996	43,916	34,333	0	0	78,249	0	0	26,772	17,183	43,955	34,294	309,434	1.8
1997	43,916	34,333	0	0	78,249	0	0	24,882	19,073	43,955	34,294	343,728	1.8
1998	43,916	34,333	0	0	78,249	0	0	22,784	21,171	43,955	34,294	378,022	1.8
1999	43,916	34,333	0	0	78,249	0	0	20,455	23,500	43,955	34,294	412,316	1.8
2000	43,916	34,333	0	0	78,249	0	0	17,870	26,085	43,955	34,294	446,610	1.8
2001	43,916	34,333	0	0	78,249	0	0	15,001	28,954	43,955	34,294	480,904	1.8
2002	43,916	34,333	0	0	78,249	0	0	11,816	32,139	43,955	34,294	515,198	1.8
2003	43,916	34,333	0	0	78,249	0	0	8,280	35,675	43,955	34,294	549,492	1.8
2004	43,916	34,333	0	0	78,249	0	0	4,355	39,600	43,955	34,294	583,786	1.8
2005	43,916	34,333	0	0	78,249	0	0	0	0	0	78,249	662,035	-
2006	43,916	34,333	0	0	78,249	0	0	0	0	0	78,249	740,284	-
2007	198,583	34,333	0	0	232,916	0	0	0	0	0	232,916	973,200	-
Total	1,005,125	632,070	296,693	713,607	2,647,495	296,693	713,607	367,306	296,689	1,674,295	973,200	-	-

/1: 20 years repayment period including 7 years grace period and 11% interest.

Table 4.8.17 SUMMARY CASH FLOW FOR INDUSTRIAL ESTATE AND NEW TOWN (1/2)

(Unit: \$10⁶)

No.	Year	Source		Applicator			Surplus (Defecit)	Cumulative Surplus
		Industrial Estate	New Town	Total	Industrial Estate	New Town		
1	1985	38.0	89.5	127.5	38.0	89.5	0	0
2	1986	163.8	39.9	203.7	101.9	39.9	61.9	61.9
3	1987	511.5	120.2	631.7	444.5	121.0	66.2	128.1
4	1988	357.2	384.5	741.7	272.7	358.7	110.3	238.4
5	1989	385.0	294.2	679.2	282.7	253.1	143.4	381.8
6	1990	144.4	143.4	287.8	16.7	85.3	185.8	567.6
7	1991	144.8	169.4	314.2	16.7	92.2	205.3	772.9
8	1992	107.5	78.2	185.7	16.7	10.4	158.6	931.5
9	1993	104.9	78.2	183.1	16.7	10.4	156.0	1,087.5
10	1994	96.8	78.2	175.0	16.7	10.4	147.9	1,235.4
11	1995	92.6	78.2	170.8	33.7	20.9	116.2	1,351.6
12	1996	95.3	78.2	173.5	33.7	20.9	118.9	1,470.5
13	1997	99.2	78.2	177.4	33.7	20.9	122.8	1,593.3
14	1998	101.9	78.2	180.1	33.7	20.9	125.5	1,718.8
15	1999	101.9	78.2	180.1	33.7	20.9	125.5	1,844.3
16	2000	101.9	78.2	180.1	33.7	20.9	125.5	1,969.8
17	2001	101.9	78.2	180.1	33.7	20.9	125.5	2,095.3
18	2002	101.9	78.2	180.1	33.7	20.9	125.5	2,220.8
19	2003	101.9	78.2	180.1	33.7	20.9	125.5	2,346.3
20	2004	101.9	78.2	180.1	33.7	20.9	125.5	2,471.8
21	2005	101.9	78.2	180.1	33.7	20.9	125.5	2,597.3
22	2006	101.9	311.1 /1	413.0	303.1	187.9	(78.0)	2,519.3
Total		3,258.1	2,647.0	5,905.1	1,897.1	1,488.7	2,519.3	-

/1 : Including payment between 2007 and 2011.

Note: Foreign loan is assumed to be with 3.5% interest and 30 years repayment period including 10 years grace period.

Table 4.8.17 SUMMARY CASH FLOW FOR INDUSTRIAL ESTATE AND NEW TOWN (2/2)

(Unit: \$10⁶)

No.	Year	Source		Application			Surplus (Defecit)	Cumulative Surplus
		Industrial Estate	New Town	Total	Industrial Estate	New Town		
1	1985	38.0	89.5	127.5	38.0	89.5	0	0
2	1986	163.8	39.9	203.7	103.6	40.0	60.1	60.1
3	1987	511.5	120.2	631.7	450.0	122.9	58.8	118.9
4	1988	357.2	384.5	741.7	292.3	364.2	85.2	204.1
5	1989	385.0	294.2	679.2	310.4	267.8	101.0	305.1
6	1990	144.4	143.4	287.8	66.6	105.3	115.9	421.0
7	1991	144.8	169.4	314.2	66.6	113.2	134.4	555.4
8	1992	107.5	78.2	185.7	66.6	44.0	75.1	630.5
9	1993	104.9	78.2	183.1	66.6	44.0	72.5	703.0
10	1994	96.8	78.2	175.0	66.6	44.0	64.4	767.4
11	1995	92.6	78.2	170.8	66.6	44.0	60.2	827.6
12	1996	95.3	78.2	173.5	66.6	44.0	62.9	890.5
13	1997	99.2	78.2	177.4	66.6	44.0	66.8	957.3
14	1998	101.9	78.2	180.1	66.6	44.0	69.5	1,026.8
15	1999	101.9	78.2	180.1	66.6	44.0	69.5	1,096.3
16	2000	101.9	78.2	180.1	66.6	44.0	69.5	1,165.8
17	2001	101.9	78.2	180.1	66.6	44.0	69.5	1,235.3
18	2002	101.9	78.2	180.1	66.6	44.0	69.5	1,304.8
19	2003	101.9	78.2	180.1	66.6	44.0	69.5	1,374.3
20	2004	101.9	78.2	180.1	66.6	44.0	69.5	1,443.8
21	2005	101.9	78.2	180.1	0	0	180.1	1,623.9
22	2006	101.9	311.1 / 1	413.0	0	0	413.0	2,036.9
Total		3,258.1	2,647.0	5,905.1	2,193.3	1,674.9	2,036.9	-

/1 : Including payment between 2007 and 2011.

Note: Foreign loan is assumed to be with 11% interest and 20 years repayment period including grace periods of 5 years for industrial estate and 7 years for new town.

4.9 Economic Evaluation

4.9.1 General

Economic evaluation is conducted for the Laem Chanag Complex to assess its feasibility from national economic point of view. Economic evaluation is conducted focusing on the industrial estate and the new town in view of the current status of the port development that the detail design work is under way in parallel with the present study.

Economic internal rate of return (EIRR) is employed for the evaluation. The industrial estate and the new town are treated as combined one unit. The new town, mainly housing unit, is regarded as one of infrastructures to support activities of the industrial estate. Therefore, only a portion which is related with industrial activities is selected and included in the evaluation. This portion corresponds to the proportion of population related with industrial activities.

4.9.2 Cost

Since economic feasibility is evaluated in national economic terms regardless of division of responsibility among government agencies, all the costs related with the development of the estate and the new town are regarded as cost.

Normally, tax included in the estimated investment cost is eliminated regarding it as a transfer payment within a country. In the present study, import duties and other tax are not included in cost estimate, so the foreign currency portion is regarded to reflect real economic value and employed for economic evaluation.

Local currency portion of the investment cost is adjusted by applying standard conversion factor (SFC) so that the costs reflect real economic value. SFC is set at 0.92 according to the "Shadow Price for Economic Appraisal of Projects, An Application to Thailand" published by the World Bank in 1983.

Disbursement schedule of estimated economic investment cost is summarized below.

(Unit: $\text{¥}10^6$)			
Year	Industrial Estate	New Town	Total
1985	36.5	0.9	37.4
1986	96.1	16.3	112.4
1987	477.6	48.5	526.1
1988	319.0	152.8	471.8
1989	325.0	109.7	434.7
1990	0	41.2	41.2
1991	0	32.6	32.6
Total	1,254.2	402.0	1,656.2

Operation and maintenance cost is estimated to be $\text{¥}37.6 \times 10^6$ per year at full development stage, comprising $\text{¥}29.6 \times 10^6$ for the industrial estate and $\text{¥}8.0$ for the new town. Until the full stage, O&M cost is assumed to grow in accordance with operation expansion.

For land, agricultural production foregone is regarded as cost. Cassava is the main products in the Project area. Most of the new town area and about thirty percent of the industrial area is covered by cassava field. Net production value of cassava is estimated to be about $\text{¥}16,800$ per hectare by the previous study. As a whole, production amounting to around $\text{¥}3.3 \times 10^6$ is estimated to be foregone annually by the project and subtracted from benefit.

4.9.3 Benefit

Various benefits are expected to be generated by the development of the industrial estate. Since value added generated by the production in the industrial estate is reflected on the national income, it is regarded as benefit for the calculation of EIRR. Furthermore, value added will be divided into the portion created by investment on land development and the one on such facilities as building and machineries.

1) Value Added

Total value added is estimated based on a number of workers in the estate and average value added per worker for kinds of industries prospecting to be introduced into the estate. Estimate of total value added is summarized as below.

Item	GIE	EPZ
Value Added per workers ($\text{¥}10^3$)	250	159
Number of Worker	10,100	9,360
Total Value Added ($\text{¥}10^6$)	2,520	1,531

Total value added is estimated at $\text{¥}4,051 \times 10^6$ at full development stage.

2) Allocation of Value Added

One of the major objectives of the Project is to disperse over-concentrated economic activities in Bangkok to outside areas. In the present study, value added generated by factories relocating from Bangkok area is assumed to share 10% of the total value added in GIE. This portion is not included in benefit on the assumption that this would be generated even without the project. Therefore, only 90% of the benefit from GIE is counted as benefit newly generated by the project.

Value added is brought about not only by site and services but also by investment on on-site facilities such as factories and machineries. Estimated value added is roughly divided into these two portions to reflect benefit by the development of the industrial estate. Empirical data in Japan is referred to for this division and 15.5% and 16% for GIE and EPZ are taken as the portion of site and services. As a conclusion, benefit created by the development of the industrial estate is estimated as below.

- GIE: $82,520 \times 10^6 \times 0.9 \times 0.155 = 851.5 \times 10^6$
- EPZ: $81,531 \times 10^6 \times 0.16 = 8245.0 \times 10^6$

Total benefit is estimated to be 8596.5×10^6 per year at full operation of factories. Until the full stage, benefit will grow in accordance with the expansion plan of GIE and EPZ respectively.

4.9.4 Economic Internal Rate of Return (EIRR)

Cost-Benefit flow is prepared as shown in Table 4.9.1. EIRR is calculated with the project life of 20 years, counting from the 1st year of operation. The results are summarized as below.

(%)	
Condition	EIRR
Standard	19.2
Cost 10% up	17.5
Benefit 10% down	17.4
1 year delay in benefit generation	16.3

It is revealed from the above that the Project possesses high economic feasibility and expected to contribute much to the economic growth of Thailand.

Table 4.9.1 COST-BENEFIT STREAM FOR INDUSTRIAL ESTATE AND NEW TOWN

(Unit: £10⁶)

No.	Year	Cost					Benefit		
		Investment Cost		O&M Cost			Value Added		Surplus
		Industrial Estate	New Town	Industrial Estate	New Town	Sub Total	Production Foregone	Total	
1	1985	36.5	0.9	37.4	0	0	0	0	-37.4
2	1986	96.1	16.3	112.4	0	0	-0.2	-0.2	-112.6
3	1987	477.6	48.5	526.1	1.4	1.4	-0.8	27.4	-500.1
4	1988	319.0	152.8	471.8	3.4	5.4	-1.1	67.4	-409.8
5	1989	325.0	109.7	434.7	5.3	9.3	-1.9	104.9	-339.1
6	1990	0	41.2	41.2	8.6	14.6	-2.6	170.7	114.9
7	1991	0	32.6	32.6	13.2	21.2	-3.3	262.7	208.9
8	1992	0	0	0	16.4	24.4	-3.3	327.2	302.8
9	1993	0	0	0	19.7	27.7	-3.3	393.7	366.0
10	1994	0	0	0	23.0	31.0	-3.3	460.2	429.2
11	1995	0	0	0	25.8	33.8	-3.3	516.7	482.9
12	1996	0	0	0	26.9	34.9	-3.3	538.8	503.9
13	1997	0	0	0	28.5	36.5	-3.3	571.0	534.5
14	1998	0	0	0	29.6	37.6	-3.3	593.2	555.6
15	1999	0	0	0	29.6	37.6	-3.3	593.2	555.6
16	2000	0	0	0	29.6	37.6	-3.3	593.2	555.6
17	2001	0	0	0	29.6	37.6	-3.3	593.2	555.6
18	2002	0	0	0	29.6	37.6	-3.3	593.2	555.6
19	2003	0	0	0	29.6	37.6	-3.3	593.2	555.6
20	2004	0	0	0	29.6	37.6	-3.3	593.2	555.6
21	2005	0	0	0	29.6	37.6	-3.3	593.2	555.6
22	2006	0	0	0	29.6	37.6	-3.3	593.2	555.6
Total		1,254.2	402.0	1,656.2	438.6	140.0	578.6	2,234.8	8,779.3
									6,544.5

FIRR: 19.2%

4.10 Socio-Economic Impact

4.10.1 Socio-Economic Impact

Development of the Eastern Seaboard is anticipated to induce substantial impacts on the socio-economy of the region as well as the country as a whole. Major impacts to be incurred by the development of the Laem Chabang Complex are briefly summarized below.

1) Creation of Employment Opportunity

Employment opportunities will be newly created as a result of direct industrial promotion by the government and multiplier effect.

Unemployment is a critical social problem in Thailand. According to the labor force survey conducted in 1981, number of jobless people counted approximately 230,000 which is equivalent to 0.8 percent of the total labor force. The development of Laem Chabang is expected to contribute so much to the mitigation of this unemployment problem through the creation of about 25,000 job opportunities coupled with its linkage effect. Creation of job opportunities is also anticipated to attract the population in Bangkok Metropolitan area to Laem Chabang area. This will result in a promotion of dispersion of over-concentrated socio-economic activities away from Bangkok Metropolitan area, which is one of the major targets of the Fifth National Plan.

2) Foreign Exchange Earning

Since the late 1970's, the Government of Thailand has been endeavoring to transform the industrialization pattern from the import substitution to the export promotion of consumer goods and taking various policy and legal measures. Along this development direction, EPZ and export-oriented light industries are planned to be introduced into the Laem Chabang Complex. Total export of EPZ (at full development stage) is roughly estimated at $\text{US\$}700 \times 10^6$ in 1981 price, which is substantially large amount considering that it corresponds to around 9% of the total export value of Thailand amounting to $\text{US\$}7,500 \times 10^6$ in 1981. Assuming

the value added ratio of 30%, net foreign exchange earning reaches around US\$200 x 10⁶ in 1981 price.

In addition to the actual contribution in monetary terms, it is highly expected that the development of Laem Chabang spearhead the export-oriented industrialization of Thailand.

In addition to these two major aspects, there are other various impacts to be incurred on the regional and national socio-economy as below.

- (1) Improvement of transportation system
- (2) Development of coastal shipping and port related industry
- (3) Impact on activation of regional economy
- (4) Utilization of local resources
- (5) Accumulation of production technologies, managerial technology and know-how.

4.10.2 Devaluation Impact

On November 5, 1984, Thai baht was devalued from previous 1 US\$ = 23 baht to 1 US\$ = 27 Baht. Until then baht was rather overvalued in connection with US dollar (around 15% according to some source) and this had been partly a cause of low export competitiveness of Thai products. In association with other various measures, devaluation this time is expected to contribute to the improvement of trade balance situation of Thailand through promotion of export promotion and restrain of import. Trade deficit of Thailand reached about 66,700 x 10⁶ in 1982. To maintain balanced improvement of trade structure, it will also be necessary to minimize the inflation due to devaluation, for example, by applying such measures as abolition of import surcharge and reduction of import tax.

The project cost of the Laem Chabang Complex is expressed in devalued baht as follows.

Area	Amount (฿ x 10 ⁶)		
	Total	F/C	L/C
1. Industrial Estate	1,197	561	636
2. Port Area (Wharf)	6,467	3,504	2,963
3. Port Area (Hinterland)	726	311	415
4. New Town	1,062	349	713
Sub-total	9,452	4,725	4,727
5. Power Supply	220	96	124
6. Telecommunication	180	114	66
Sub-total	400	210	190
Total	9,852 (100%)	4,935 (50.1%)	4,917 (49.9%)

Foreign currency portion was increased from the original by 17.4 percent, while local currency remains the same. However, Thai government prospects that domestic price will rise in future by around 9.5 percent as a result of devaluation impact.

Devaluation impact on FIRR is considered to be null both for the industrial estate and the new town in principle. This is because sale prices of industrial plots and housing units are set to recover the investment costs. If this principle is maintained, relationship between cost and revenue will be unchanged and there will be no impact on FIRR. The same logic can be applied for O&M cost and estate management charge. On the contrary, if certain measures are taken, incentive to investors for example, to keep the low sale price or O&M cost, FIRR will be, needless to say, affected adversely.

It depends on a case whether devaluation impact on EIRR becomes positive or negative. That depends on the relationship between portion of foreign currency to the total investment cost and the portion of value added earned by export in the total value added generated in the industrial estate. If the former is more than the latter, the effect will be negative and vice versa. In case of the present project, impact is

considered to be neutral or positive, though quantitative verification is hardly possible. For the industrial estate and the new town, foreign currency portion shares around 36 percent of the total investment cost. On the other hand, the value added for the export products of EPZ accounts for about 38 percent of the total value added. Adding certain portion of value added for import substitution, the foreign currency portion of the value added is considered to surpass the one of the investment cost. In consideration of these, devaluation impact on EIRR is considered to be positive rather than adverse.

4.11 Environmental Aspect

4.11.1 Environmental Impact

Laem Chabang Complex includes industrial port, new town development and related infrastructure adjustment in coastal zone of the gulf of Thailand. Such a large-scale and widespread development will threaten to result the various degradation of the natural environmental resources of the area in the vicinity.

The major concerns are the following:

1) Environmental Impact by Industrial Development

- (1) Impact by the sewage, air and solid produced by industrial processing to the environmental resources.
- (2) Flooding hazards due to alternations of hydrology caused by cutting of vegetation.
- (3) Shortage of water resources caused by high industrial water consumption.
- (4) Excessive noise, air pollution and increased accidents from increased use of automobile and other transportation vehicles.

2) Environmental Impact by Port Development

- (1) The impact on the fishery and other sensitive marine ecological values in the affected area. The impact can be caused by 1) filling or dredging for creating the harbour facilities, 2) pollution effects resulting from operation of port of facilities, including pollutive discharge (oils, refuse) from both ships and shore installations.
- (2) Beaches and other recreational assets in the coastal zone could be affected by filling or dredging.

- (3) Oil pollution from shipping operations, not only emergency oil spilled from oil tankers but bilge oil released from commercial ships.
 - (4) Air pollution by exhaust gas from ship's engine or the dust caused by shipping of tapioca.
- 3) Environmental Impact by New Town Development
- (1) Flooding hazards due to the clearance of wide-spread vegetation in the area proposed for new town.
 - (2) A lot of waste of water and solid from numerous new residents in new town might be generated.
 - (3) There might be so much traffic increase that 1) the hazard of traffic accident, 2) air pollution due to exhaust gas from cars would be caused.

4.11.2 Environmental Protection Planning

The basic control measures against the environmental pollution are 1) the introduction of the anti-pollution facility and 2) the establishment of the system of pollution control management.

The anti-pollution facility comprise not only sewage treatment plant and solid waste disposal tip but individual pollution control facility in each factory.

Management system means the agreement of pollution prevention, the establishment of manager in charge of pollution control and monitoring system.

In this study, the following environmental pollution control measures are proposed to be implemented against the above mentioned environmental impact in Laem Chabang Complex planning.

1) Protection against the Impact of Industrial Estate Development

- (1) Industrial sewage can be well treated in the sewage treatment plant with oxidation ditch that is further advanced treatment system. (The sewage treatment plant would have acceptable sewage quality standard and each factory must treat the waste water to fit the standard by own treatment facility)

The reason of proposition of such high quality sewage treatment plant is that Pattaya international resort is in the vicinity of Laem Chabang Complex and sea water pollution is a one of crucial damage for the Pattaya resort.

- (2) Solid waste will be treated by land filling in the ample reserved area in Laem Chabang Complex. (Toxic waste for human life from industry must be treated on each factory's own responsibility)
- (3) Air pollution due to the industrial estate will be slight because only light industry which has no large-scale gas generator or incinerator will be introduced into Laem Chabang Industrial Estate, and better still, feasible and well-established control technology is available for each factory to minimize the air pollution.
- (4) Flooding can be controlled by the construction of the canal and the improvement of existing streams.
- (5) The water supply planning has been done in accordance with the basic plan of water resources distribution in the Eastern Seaboard that is shown in "The Eastcost Water Resources Development Project (Phase II), August 1983, JICA" and adequate water can be supplied to Laem Chabang Complex. The quantity of water resources in the Eastern Seaboard had some limitation so that it is recommended that less consumption type of industry be introduced preferentially into Laem Chabang Complex.
- (6) Regarding to traffic noise and exhaust gas, the buffer zone with green belt that is located between main road and residential area

or industrial site with 20 -100m width can be efficient protection.

2) Protection against the Impact of Port Development

(1) Dumping of dredged soil into seawater must be basically avoided. Nevertheless, in case of dumping, a certain limited area must be appointed as a dumping point. The other trawls prohibited area are shown in Fig. 4.11.1 that contains lots of islands with coral bed must be avoided at least.

(2) Water release from ships must be restricted as following (proposition):

- Ballast water and washing water of tanker

It can be permitted to release the ballast water in the port when the oil membrane is not observed, or outside the 50 sea miles from the territorial waters the constant release of ballast water and washing water can be done on sailing.

- Bilge Water

Constant release of bilge water can be permitted at sea as far as possible from seashore.

- Other water release is prohibited.

(3) Seashore of 2 km in Laem Chabang coastal area might be reserved for the usage of natural sea park. Reserved seashore might be unique centre of Laem Chabang Complex for workers and residents that will reserve the sound scenery of seashore, vegetation, fishery ecological value.

(4) PAT or PTT must organize the oil spill program for the emergency oil spill control.

(5) SO_x and NO_x would be generated by the ship engine at ship departure and entry. Nevertheless, residential districts (New Town, Ban Ao Udom) is located far from port enough to be not affected by engine gas.

(6) Dust of Tapioca at the loading berth must be enclosed in order to reduce the amount of the dust to the adjacent ship repairing yard and other berths.

3) Protection against the Impact of New Town Development

(1) Flooding can be controlled by the new construction of the canals and/or improvement of existing streams.

(2) Sewage may be treated in the common treatment plant with the waste from industrial estate and port. Common sewerage system which can receive, treat and dispose of all sanitary and industrial waste is recommended because of the economization of the total cost by "Manual of NEB, Guideline for Preparation of Environmental Impact Evaluation, Apr. 1979".

(3) Traffic accident might be minimized by the road network planning such as segregation of automobile and pedestrian that is the basic idea in this study.

(4) As noted in Eastern Seaboard Study, ESSO refinery at Siracha utilized an excellent air pollution control system and proposed EGAT power generating plant at Ao Phai will pose no significant air pollution problem if it will burn natural gas. New Town is located in east over 2 km from oil refinery or proposed generating plant that cause a slight air pollution and might not be affected by any air pollution. The prevailing winds are from southwest except west wind during February to May.

Note: Wind Condition according to "Environmental Guideline for Coastal Zone Management in Thailand, Zone of Pattaya, NEB, Nov. 1975"

Records, which cover a period of 20 years, show the mean wind velocity to be approximately 10 knots (1 knot = 6,080 ft/hr = 1.85 km/hr). Prevailing winds at Ko Sichang are from the west and the southwest and from the south and the southwest at Sattaship in the months of February to May.

During June to September the influence of the southwest monsoon is predominant and winds are from southwest with the percentage frequency exceeding 30 percent corresponding to frequent velocity ranging from 4 to 16 knots. The northeast monsoon from October to January brings the winds predominantly from the north and the northeast, with the percentage frequency ranging from 10 to 40 percent, and with 80 percent of the velocity between 4 to 16 knots.

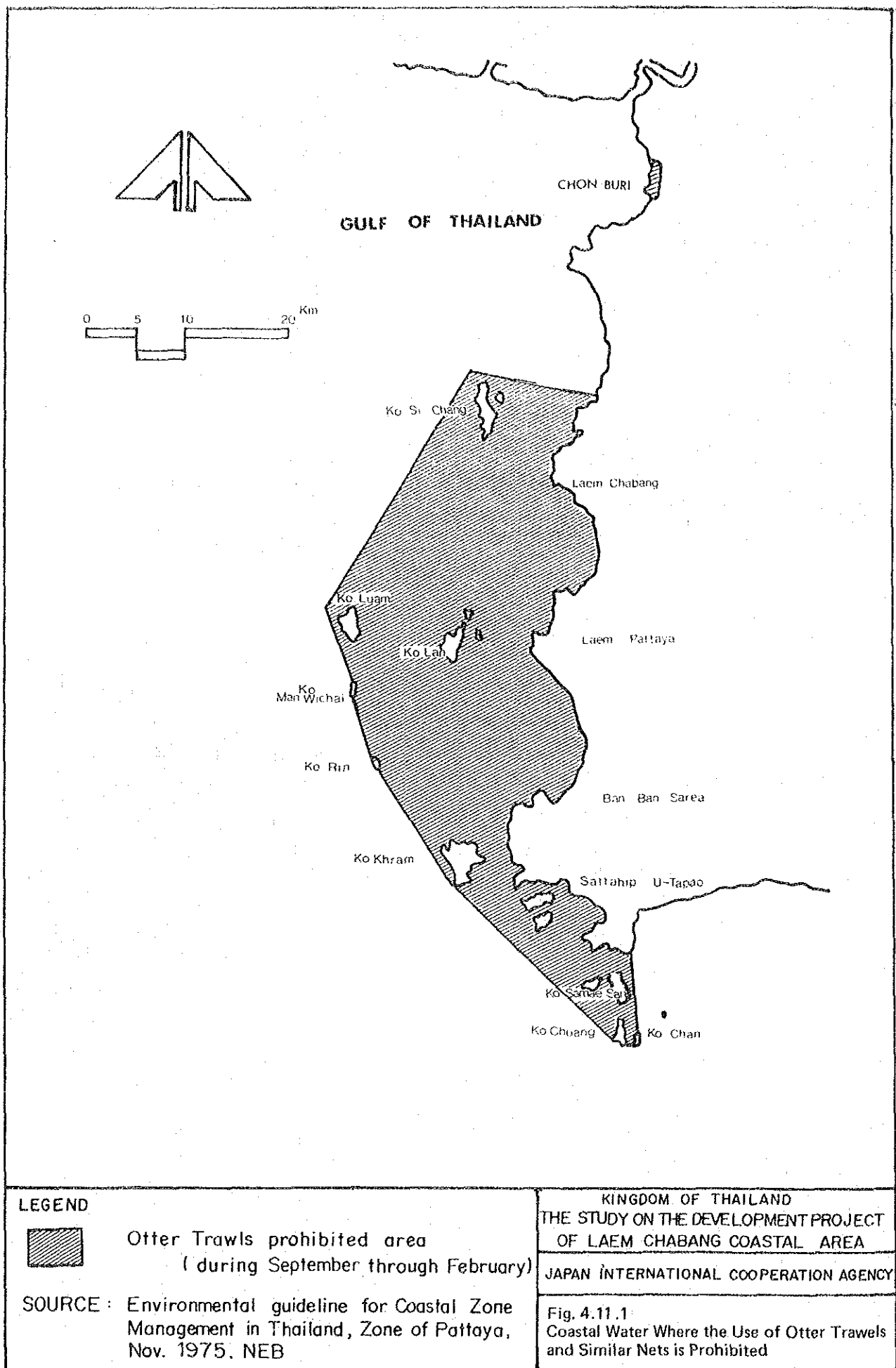
The maximum wind velocity from the twenty-year records for Sattahip is 73 knots from the north-northeast in November and 40 knots from the west in June at Ko Sichang. Winds over 27 knots may result from cyclonic storms. Typhoons, from their place of origin in the south China Sea, may cross the main body of the Gulf of Thailand during the months of May to June and September to December. Typhoon and tropical depressions are infrequent but as many as three have influenced the area in one year. It may be concluded that the maximum wind speeds can be expected from the southwest because of the uninterrupted distance over the sea.

4) Regulation on Pollution Control

Regulatory programs will be needed for the pollution control and regulatory programs will succeed only when the monitoring is incorporated into the program.

- (1) Monitoring of quality of industrial sewage and solid waste is specially needed. Sewage quality must be monitored not only at sewer outlet of each factory but inlet of sewage treatment plant. Illegal dumping of solid waste must be prevented by continuous inspection.

- (2) The authority and responsibility for establishment, conducting of monitoring and regulatory programs will probably fall in the IEAT because of the comprehensive management of industrial estate in cooperation with PAT.



4.12 Institutional Aspects

4.12.1 Organization for Eastern Seaboard Development

1) Overview

The Eastern Seaboard Development Program is a large and complicated process involving many agencies and substantial government investment. At the present time several major projects are underway, in particular the Laem Chabang industrial estate and port project and the Map Ta Phut industrial estate and port project. The various aspects of these projects must be carried out in a coordinated way, both to insure timely completion and to insure economy in the use of funds.

The organizational mechanism for achieving these objective could take a variety of forms and could involve either loose or tight coordination. Which type of mechanism and degree of coordination is appropriate depends in part on the rate at which the government wishes to implement the various components and the degree of interdependency among them. It also depends on the existing administrative structure, the configuration of agencies and relevant legislation. It should be kept in mind that the more elaborate the proposed mechanism and the more extensive its scope of authority, the more difficult and time consuming will be its establishment.

Whatever the organizational mechanism may be, two aspects of its function should be differentiated; the promotion and the control of the project. The former is primarily concerned with the timely completion and the latter with the economy of the use of funds although they are deeply interrelated. It is generally advisable to assign these two different tasks to separate agencies so that the two agencies can be placed under a condition of check and balance for each other. In this way inefficiencies such as those arising from collusion can be avoided.

Many countries have undertaken regional development programs with a focus on encouraging the establishment of new industries or the relocation of existing ones. Among the most successful of these in the Asian region are Singapore, Korea and Japan. In addition to the development of

new industry these countries are also concerned with relocating existing industries to reduce pollution. Since the conditions confronted by these countries differ markedly from those in Thailand, it is not likely that the agencies established to carry out their industrial and regional development programs could be simply transferred to Thailand. Nevertheless, they may serve as models from which to formulate a solution to Thai industrial development requirements. It is generally felt that few industries will relocate from the Greater Bangkok area to the eastern seaboard. Rather, most of the factories to be established in the region will be new enterprises or expansions of existing ones.

Creating a completely new mechanism can be very time consuming and may generate friction among various elements of the existing administrative and governmental structure or it may disrupt the activities of other agencies. Generating such adverse conditions may work against the purpose for which the new mechanism was intended. Furthermore, if the objective of the government is to obtain results in the short term, attempting to create a new mechanism may divert the attention and resources of the government from the development projects themselves to the complicated and arduous task of administrative reform. Therefore, it is advisable to first attempt to modify existing mechanisms to permit them to carry out the tasks desired.

Thailand has a unitary administrative system, similar in many respects to that of France. Almost all powers exercised by authorities in the field is delegated by the central authorities. Furthermore, resources available to officials in the field are derived for the most part from the central administration and these officials have little discretion over the use of such resources. It is well recognized that a greater delegation of authority to local officials would permit greater flexibility of operations and reduce response time to urgent problems. In practice such delegation of authority is rarely forthcoming, because responsibility for consequences continues to remain with the central authorities. Operation coordination may be undertaken by local officials, but when such coordination requires the reallocation of resources the matter invariably must be referred to the parent agencies of the officials involved. This often leads to delays in project implementation.

For functional reasons, major agencies must be independent of one another, even though their activities may have an impact on other agencies. It is difficult to establish a superior agency that is capable of coordinating the activities of these agencies without at the same time impairing the independence which they require for their own operations.

Agencies have their own priorities and cannot voluntarily change these priorities to suit the convenience of another agency. Such a change in priorities must derive from the priorities established by a superior agency. However, requiring shifts in priorities ought not to be a common occurrence and should not result in impeding the work of the subordinate agency. An agency which fears or experiences interference in its operations or priorities on a frequent basis is likely to resist further intrusion.

The above discussion is to indicate that in administration a sense of fairness should be taken into account as an important factor as well as the direct operational efficiency. The sense of fairness should be kept in mind not only toward people affected by the project but toward concerned government agencies. This would ensure a smooth project implementation, and thus eliminating cost overruns.

2) Existing Coordinating Mechanisms for the Eastern Seaboard
and Associated Problems

The Eastern Seaboard Development Committee is the principal coordinating body for the region. It has been given substantial authority by the Prime Minister to make decisions in place of the Cabinet. The committee consists of twenty-two ministers, deputy ministers and senior officials and is chaired by the Prime Minister. The committee has formed three subcommittees to deal with major program components: Petrochemical Industries, Deep Water Ports, and Education and Social Development. In its work the committee is assisted by its secretariat - the Center for Integrated Plans of Operations (CIPO) which is a division of the NESDB. CIPO has a major role in coordinating the provision of infrastructure and services needed to support industrial development in the region.

The Industrial Estate Authority of Thailand is responsible for coordinating a number of activities concerned with the Map Ta Phut industrial estate and the urban areas near it. It is also responsible for development of the Laem Chabang industrial estate and so must coordinate closely with other agencies responsible for associated urban, port and transportation facilities.

A number of ad hoc committees have been established to manage the development of major industrial projects in the region, in particular the Fertilizer Complex and the Petrochemical Complex. More ad hoc committees may be appointed in the future to oversee especially important industrial projects in which the government intends to invest.

Much of the small to medium scale industry anticipated for the Eastern Seaboard will not occur within existing or planned industrial estates. Where this industry will be located and the demands it will place on local and national agencies can be anticipated to some degree, but there is no particular agency presently designated or capable of adequately supervising the development of such industries. To some extent the Board of Investment, the Department of Industrial Works, the National Environment Board, the Department of Local Administration and several other agencies will deal with various aspects of this development.

There is general agreement that the region should be the location for much of the future industrial development of the country. However, there is no complete agreement over the extent or the pace of this development. A serious reassessment of the industrial development potential and requirements for Thailand is now underway and will be reflected in the forthcoming Sixth Five-Year Development Plan (1987-1991).

Various aspects of infrastructure development have been delayed and substantial amounts of foreign loans and counterpart funds will be required to maintain the schedules originally anticipated for the Eastern Seaboard program. Several of the major industrial projects are behind schedule or are being revised to accommodate economic and technical developments. Whether this will mean further delays is not yet clear.

Land acquisition for industrial estate development has long been hampered by the lack of an adequate land acquisition act. An act is now in the parliament, but not yet been promulgated. In the next chapter is presented a list of immediate actions required to solve various problems and to expedite the implementation of the Eastern Seaboard Development Program.

3) Experience in Other Countries

A program as large and complicated as that of the Eastern Seaboard cannot be pursued in an ad hoc fashion. Because large amounts of resources are required over an extended period of time, such a program must proceed according to plan.

In practice the implementation of a plan will not be as orderly and will not proceed as smoothly as might be suggested in the plan. Many things might occur to interfere with the implementation of components of the plan. On the other hand, circumstances might arise that offer the opportunity to accelerate aspects of the plan. The government should be able to adapt to both positive and negative contingencies in a timely fashion to insure that the program can proceed on schedule. At the present time it appears that the ability of the government to coordinate the Eastern Seaboard Program effectively and to react to new conditions is less adequate than would be desired.

In approaching a solution to this problem is worthwhile to look at the experience of other countries with regional development programs and the types of organizational, administrative and procedural mechanisms they have adopted. Two of the more prominent examples are Singapore and Japan.

Singapore established the Jurong Town Corporation in 1978 to develop and manage industrial estates in keeping with the overall economic, environmental and urban development needs of the country. At the present time the corporation operates 19 estates and has an additional 15 estates in various stage of preparation. The corporation has a wide range of powers and functions beyond site preparation for estates. This includes providing technical and managerial support to enterprises in its estates,

constructing, leasing and maintaining housing facilities for workers, and the management of a deep water port. The Singapore conditions differ from those on the Eastern Seaboard in that its area is rather small and it is not faced with the likelihood of major population movements in conjunction with the development of its industrial estates. Thus the Jurong Town Corporation is more appropriate as a model for a possible reorganization of the Industrial Estate Authority of Thailand than it is for the coordination of the Eastern Seaboard program.

A closer parallel to the conditions on the Eastern Seaboard is found in Japan. Japan, like Thailand, is faced with an excessive concentration of industry in and around its capital city. The disadvantages of this concentration in terms of pollution, strain on infrastructure and a deterioration in the quality of life are now coming to outweigh the advantages of convenient transportation and communication. As a result the Japanese Government has enacted legislation to restrict the location of industries in congested areas and, by means of the Industry Relocation Promotion Law (1972), to encourage the movement of factories to less developed areas of the country.

Carrying out this policy has been assigned to the Japan Regional Development Corporation (JRDC), established in 1974. The JRDC is a government affiliated organization which constructs large scale industrial estates and new towns in what are termed "Industry Relocation-Encouraged Areas". In addition, the JRDC provides subsidies and preferential tax treatment to industries which relocate or initiate operations in the designated areas. In cases where local governments grant tax concessions to such industries, the loss of local tax revenue is reimbursed by the national government. The JRDC also provides subsidies to local governments to help them supply proper amenities, such as parks and other recreational facilities, for relocating workers and their families, and to carry out various environmental preservation measures necessitated by the new industries.

Much of the initiative for JRDC's activities comes from the local governments which wish to develop the economies of their regions. At the request of prefectural and municipal governments the JRDC will design and

construct industrial parks suitable for local conditions. As an added inducement the national government will subsidize part of the interest on loans incurred by local governments for the construction of industrial parks.

The JRDC consists of three departments: the Regional City Development Department, the Industrial Location Department and the Coal Mining Area Development Department. The first is responsible for the design and construction of new towns to meet the needs of and to encourage relocating industries. The latter two departments build and sell factory sites in industrial parks. The JRDC provides low-interest loans to firms for plant and equipment, as well as collateral loans for factory sites being vacated. Low interest installment payments for the purchase of factory sites are also offered. The Coal Mining Area Development Department was established in 1962 as the Coal Mining Area Development Corporation and later was incorporated in the JRDC in 1974. From its inception through 1980 this department constructed 110 industrial parks. The newer Industrial Relocation Department has completed or is presently constructing 12 industrial parks.

It should be noted that the JRDC is placed under the Ministry of International Trade and Industry despite its far reaching scope of work. The Ministry keeps the final control of activities of the JRDC to maintain the proper level of check and balance.

4) Applicability of the JRDC Model to Thailand

The administrative system of Thailand differs markedly from that of Japan. Consequently, it is not possible to make a direct application of the JRDC model, either to Thailand as a whole or to the Eastern Seaboard alone. While the JRDC reflects a policy of the national government to decentralize industry, the JRDC is heavily dependent on the initiative of local governments. These local governments are largely autonomous of the national government, have their own civil services and are able to generate substantial amounts of revenue. They can incur debts to finance development activities and set policies on the type and pace of development they prefer.

Thailand employs a unitary administrative system, more similar to that of France than of Japan. Provinces in Thailand are staffed by central government officials who are periodically reassigned to other provinces. While these officials may be attentive to local conditions and needs, their principal orientation is inevitably toward their parent agencies in the central administration. Furthermore, though senior provincial officials, particularly the governor, have certain discretionary authority, their decisions can be countermanded by their superiors. The province may adapt somewhat the application of national policies to suit local conditions, but it may not reject such policies or adopt contrary ones.

Thailand has several forms of local government. The major ones are the municipality and the provincial administrative organization (PAO). However, both of these types are heavily dependent on the central government for resources and are closely supervised by the Department of Local Administration, Ministry of Interior. Both types of local government have their own civil service systems established by national law and patterned on the national civil service system. In the case of the PAO, provincial civil servants are restricted to relatively low ranks. Executive positions in the PAO are held by central administration officials assigned to the same province. For example, the provincial governor simultaneously serves as the chief executive officer of the PAO.

These local governments have very modest revenue generating capacity, and are not permitted to incur debt through borrowing, since this would actually be an incumbrance on the central government. While local governments may propose that certain activities be undertaken within their jurisdictions, on their own they are not able to make agreements with outside agencies. Agencies such as the IEAT might be receptive to suggestions from local governments, but their decisions would be based on their own assessment of need and their capacity for carrying out projects.

The legislation governing the IEAT makes no reference to local governments, but rather assigns full responsibility for the location, construction, and management of industrial estates to the IEAT itself. The primary objective of the IEAT is to facilitate the establishment of

new industries, and only secondarily the relocation of existing industry. The IEAT at the present time does not provide subsidies of the kind employed by JRDC either to industrial enterprises or to local governmental or administrative organizations.

Responsibility for new town planning and development in Thailand is shared by a number of agencies, including the Department of Town and Country Planning, the Department of Local Administration, the National Housing Authority, the Public Works Department, the Provincial Electrical Authority, and the Provincial Water Works Authority.

There is no agency or authority with direct responsibility for supervising and coordinating these agencies, except for the Eastern Seaboard Development Committee, the authority of which extends only to this region. In contrast, the JRDC oversees the entire process of new town and industrial estate development throughout Japan and insures that new towns are properly balanced with respect to residential and commercial areas, industrial parks, as well as cultural, recreational and educational facilities. Local governments themselves are responsible for insuring that necessary infrastructure is provided. Even when the funds are provided by the central government in the form of grants, the burden of coordinating the provision of this infrastructure falls on the local governments and not on the JRDC.

For an organization like JRDC to function in Thailand several preconditions would have to be met. First, local governments or administrative jurisdictions such as the province would have to be strengthened to be able to initiate and carry out substantial activities. They would require a much larger degree of autonomy and greater ability to generate resources locally from taxes, rents and fees. The qualifications of local officials would have to be raised in order to exercise such autonomy effectively, and this would require amending the civil service regulations applying to the PAOs and municipalities to permit local officials to rise to senior decision-making levels.

The Thai counterpart to the JRDC, whether it were a reconfigured IEAT or a new organization, would also require greater levels of funding or revenue in order to be able to grant adequate subsidies or other

assistance to local governments and industrial enterprises. Meeting these preconditions would be very difficult, expensive and time consuming. Moreover, it remains to be seen whether the cost of introducing these changes would offset the industrial development they would encourage on the Eastern Seaboard.

5) Some Ideas on Organizational Improvements

The encouragement of industrial development on the Eastern Seaboard is already being carried out by a number of government and government affiliated agencies and state enterprises, in particular the BOI, the IEAT and the IFCT. The last is now in the process of increasing its capitalization so that it can play a bigger role in supporting the growth of major industries.

It appears unnecessary to create a new organization at the present time to deal with the industrial development in the Eastern Seaboard. It is better instead to enhance the role of the IEAT in facilitating the implementation of industrial projects in the region. IEAT is already heavily involved in the Laem Chabang and Map Ta Phut projects. However, to insure that the development of other industry in the region progresses in an orderly fashion and does not duplicate the chaotic conditions in Bangkok area, consideration should be given to having the IEAT undertake other estates or export processing zones for various types of industry. The IEAT might even be assigned to approve the location of industrial areas. Factory locations outside of these areas would not be permitted. In assuming this new role the IEAT would have to work closely with other agencies, especially the NESDB, the Department of Town and Country Planning and the National Environment Board, as well as the Industrial Economics and Planning Division of the Office of the Permanent Secretary, Ministry of Industry.

The IEAT will have to play a central role in implementing and operating the Laem Chabang Coastal Development Area. The vital function of coordination with other concerned agencies could be achieved by means of giving the IEAT the responsibility of co-administrator of individual functions currently under other agencies.

Administration of the port of Laem Chabang will require a particularly high level of coordination. A co-administration mechanism between the PAT and the IEAT may be established. The business area currently proposed within the property of the PAT will require administrative controls even closer to the IEAT activities. It is advisable to transfer the whole responsibility for this area to the IEAT.

There is a need for better programming of public sector infrastructure projects. This will insure that such projects are in place to meet the anticipated demand of industrial investors and residents of new and expanding urban centers. Sound programming, including accurate forecasting or revenue needed to carry out infrastructure projects will facilitate the preparation of government budgets, and lessen delays caused by unexpected shortfalls in budgetary allocations. Nevertheless, it is anticipated that there will be short-term problems or the need to accelerate certain projects to take advantage of newly opened opportunities. The major implementing agencies are constrained by their budgetary allocations and sectoral plans to carry out their activities according to a schedule. While the Program Planning and Budgeting System (PPBS) employed by government agencies permits them some flexibility in reallocating funds to deal with revised priorities or unexpected events which affect their operations, it does not necessarily extend to regional program contingencies which do not directly impact their operations. When the contingency applies to an overall program such as the Eastern Seaboard program, the need for a reallocation of resources may not be perceived by a particular agency, or it may not be possible for the agency to reallocate funds in a timely fashion - perhaps due to contractual commitments. In such a case it would be desirable to have some mechanism available to assist in meeting the objectives of the program without adversely affecting the operations of individual agencies.

This objective might be accomplished by the establishment of a central fund to be used in meeting program contingencies. In the case of the Eastern Seaboard such a fund might be associated with the Eastern Seaboard Committee. The committee might then make supplementary allocations to implementing agencies, either to permit them to continue their pace of implementation in the face of budgetary shortfalls, increased costs, or perhaps to accelerate or expand their activities to respond to

new opportunities. It is important to stress that such a fund should be to supplement the activities of executing agencies within the objectives of a defined program. It is equally important that all of the participating agencies, particularly the body responsible for the fund, to have a commonality of viewpoints and be committed to the objectives of the program. In this way the implementing agencies will not view the fund as a competitor, but as a resource that will assist them in achieving their own objectives.

The use of such a fund would produce beneficial side effects. It would induce each participating agency to view the situation relative to other agencies' situation, resulting in better coordination. And more obviously, the body which maintains direct control over the fund can command better position in aligning activities of participating agencies in accordance with higher priorities.

Japan has utilized a similar mechanism. The Planning and Coordination Bureau of the National Land Agency is allocated an Adjustment Fund which is used in a fashion described above.

The potential value of such a fund can be appreciated in the abstract. However, the feasibility of its operation is another issue. Determining the size of the fund is especially difficult since by definition it is intended to be a program contingency fund, not the source of basic program funding. A balance must be struck between a fund which is capable of handling major contingencies and one which can deal only with small problems. For the Eastern Seaboard program a replenishable fund of at least several hundred million baht would probably be required. Since the incidence of major problems cannot be predicted accurately, it is not clear at what rate the resources of the fund would be depleted. For this fund to operate properly a sound estimation of the probable demand should be made, and there must be official assurance that the fund would be replenished as needed.

The fund itself could be located in the Office of the Prime Minister, similar to the Central Budget, and disbursed on the recommendation of the Eastern Seaboard Development Committee. The government has expressed concern over the proliferation of special funds operated by various

government agencies because these funds are largely outside of the control of the Budget Bureau and involve enormous sums of money. However, if the fund discussed above were part of the annual budgetary allocation to the Office of the Prime Minister, this problem would not arise. As a regular budget item there is no certainly the fund that would be continued from year to year. However, as long as the government felt that it served an important purpose, it is likely that it would be renewed. This is more suitable than an independent fund, since once it had achieved its purpose, it could be easily eliminated.

The creation of such a fund would greatly enhance the effectiveness of CIPO as the secretariat of the Eastern Seaboard Development Committee in its role of coordinating concerned agencies. With the access to such a fund CIPO could claim they could provide real assistance where needed to implementing agencies rather than relying on the command from higher authorities. Time required for coordination would be shortened and reaching at the common ground easier. The process of critically reviewing the progress and estimating the amount of additional fund would also provide CIPO and implementing agencies opportunities for tighter control of individual projects.

6) Functions of Program Implementation and Operation

Table 4.12.1 lists administrative functions required for the implementation and operation of the Laem Chabang Coastal Area Development Program except for the Port, for which a separate section is included following this section. Table 4.12.2 lists facilities and work items to be included in the program. Listed functions in coordinated way are required to realize those facilities and work items. These listed functions and items are by no means exhaustive. Many other functions would probably be required as the Program proceeds. The responsibility for these functions would likely be shared by many agencies. It is desirable, however, to define to the extent possible agencies which are assigned of primary responsibility for each function.

Some ideas on institutional issues are presented in the preceding subsection. The Study is called for at this stage of the Program to

determine the optimum institutional mechanism for the successful implementation of the Program.

4.12.2 Port Operation

1) General Port Administration and Operation in Thailand

The overall port administration and operation of Bangkok Port (Klong Toei Port) and the Sattahip Commercial Port is under the control of the Port Authority of Thailand (P.A.T.), a port management body which is a public utility state enterprise, established in 1951 as an autonomous body. Most of the port services are provided by the P.A.T. Only pilotage is under the supervision of the Harbor Department, a separate Department of the Government.

The Board of Commissioners of the P.A.T. has the power and duty to lay down policies, to control, and to supervise generally the activities of the Port Authority of Thailand. (Refer to the Sectoral Report II)

Cargo handling within the customs fence is one of the main businesses of the P.A.T. This is mainly due to the fact that the P.A.T. governs and controls all the premises such as transit sheds, warehouses and open storage yards and all the cargo handling except stevedoring is managed by the direct labor force and equipment (forklifts and truck cranes) of the P.A.T. The P.A.T. is, in principle, engaged in all the cargo transportation into and out of the customs fence in addition to general cargo handling.

This section describes the present conditions of port operations inside and outside the customs fence. The operations seem not to be fully developed or efficient and therefore the Study Team tries to suggest a desirable port operation system at the new deep-sea port of Laem Chabang, which is supposed to start operation in 1987.

2) Present Port Operation Systems Mainly Related to Cargo
Handling Activities at Klong Toei Port

(1) Cargo Handling Procedures

When any consignee or a shipping agent in Thailand wants to receive his imported cargo from aboard a ship at Kong Toei Port, he cannot take it by himself. A stevedore company (private enterprise) removes the consignee's cargo from the ship by asking the P.A.T. to mobilize its direct equipment and operators and then the cargo is cleared through customs.

But because cargo removal from the customs fence is handled solely either by trucks of the Express Transport Organization (ETO), ETO's contractors or by freight trains of the state Railway of Thailand (SRT), the consignee cannot claim the freight directly. The ETO is a government sponsored body and the SRT is one of the state-run corporations. Some of the imported cargoes are transported by barges as well.

The ETO's truckage which is considered expensive, is not necessarily high in the case of short distance haulings when comparing its tariff with private companies. However, the ETO does not own enough vehicles for inland transportation, so in reality users have to hire the more expensive lorries of private companies. In this case, inland transportation by truck is centrally and solely operated by ETO, so users have no choice in cargo removal. Since the principle of free competition does not exist in the field of land transportation into and out of the customs fence, users are encountering serious difficulties.

It is well known that transportation by container has the advantage of door-to-door service, but this mode of cargo haulage has not become popular in Thailand. This is why the ETO has been applying the double tariff system (measurement basis and weight basis) in which bulk transportation (LCL cargo) by truck costs considerably less than containerized transportation (CL cargo) by train.

Charges calculated by weight basis cost only one third of those calculated by measurement basis. It follows that the ETO is using

different charging systems between container cargo (CL) and bulk cargo (LCL). Shipping companies do, therefore, unstuffing of containers within the customs fence and transshipping the contents on ETO's trucks.

(2) Efficient Use of Container Terminal

Empty containers are being disorderly stocked almost everywhere in the marshalling yard which is available free of charge and the marshalling yard is used only by the first occupant. Those who are using the yard for container storage are, of course, asked to pay some amount of money.

(3) Customs Formalities

There are not enough bounded warehouses in Klong Toei Port and bonded facilities are not fully utilized. Shipping agents do not necessarily make the best use of bonded area. This is because they have to pay expensive charges plus extra money for bonding their cargoes.

Customs examination is being executed on each container, but in most of the developed countries customs inspection is, in almost all cases, just finished by examining shipping documents, export/import declaration for customs clearance and other related papers. All the documents and customs formalities necessary for shipping and unshipping at Si Racha have to be prepared back in Bangkok.

(4) Cargo Handling Facilities

The P.A.T. is handling container cargoes with its truck cranes and other equipment at Klong Toei Port, but it has no gantry cranes of its own, which are very efficient for loading/unloading of containers. The P.A.T. sometimes hires cargo handling equipment from private companies.

When it began operating the Klong Toei Port, the P.A.T. did not equip container freight stations (CFS). But it has two CRSs now.

Poor surface conditions of the wharf at Klong Toei Port also make handling work difficult. There is differential settlement and unpaved areas in the cargo handling yard.

(5) Other Problems

Shipping companies/agents have their own field offices in the P.A.T.'s premises, but they have the following serious troubles.

- Telex and telephone networks are still poor and some shipping companies are making their employees go to their head offices in Bangkok to send and receive telexes.
- Shipping companies also use the P.A.T.'s extension line to make telephone calls to their head offices, but the telephone network does not work well. This is because the line is nearly always busy.
- As for container handling, communication by transceiver is very efficient between container vessels and the stuffing yard but the police are reluctant to give permission to use the instrument.

3) Favorable Port Operation System at Laem Chabang Port

Laem Chabang Port is being planned and designed as the natural extension of Bangkok Port to overcome the latter's natural constraints. Therefore, it will function as a complementary addition to Bangkok Port in the early stage of development, but later will become the main gateway to the country. Bangkok Port will thus become the complement of Laem Chabang Port by the first half of the 21st century.

In this sense, the port should be fully equipped with modern cargo handling equipment and backed up with an efficient port operation and management system from its opening.

The Study Team is of the view that the terminal operations at Laem Chabang Port shall be carried out by private operators and this is in

accordance with the RTG's approach. Tentatively proposed terminal operators for the different types of wharves are as follows:

- (1) Container Terminal: a shipping company or a group of shipping companies for each berth
- (2) Sugar & Molasses: a private company or association of exporters
- (3) Agribulk: an exporter or association of exporters

For the container terminal, it is considered natural that the construction of civil works and installation of cargo handling equipment, such as container cranes, will be made by the P.A.T. But, berths for sugar and molasses and agribulk, including necessary facilities and equipment, could be constructed and prepared by the operators themselves. Detailed engineering design for the above terminals must be made by the public sector in advance, though some modification may be required in later stage.

It is needless to mention that the P.A.T. will administer and manage general port business in addition to daily port-related routine work such as preparation of entrance/clearance papers, quarantine, pilotage, etc.

Many employees of the P.A.T. and private companies will start working at various sections and departments in Laem Chabang Port. It is necessary to prepare sufficient and comfortable working conditions from the beginning so as to achieve efficient port management and operation.

Cargo transportation between Klong Toei Port and its hinterland is, at present, solely being handled by the ETOs trucks and ETO's licensed subcontractor's lorries under the present expensive tariff system. In this way of truckage, users cannot make use of free competition between private trucking companies. Therefore the present way of truckage should not be applied in Laem Chabang Port after the commencement of port operation, and free competition by private trucking operators has to be introduced. In introducing this new inland transportation system, it should be noted that a new (truckage) tariff should be so arranged that transportation by rail will be competitive with that of truck.

Smooth and prompt introduction of the various necessary commercial functions to the new port will be essential to the successful operation of Laem Chabang Port.

After shifting most of their main activities from Klong Toei to Laem Chabang, shipping companies will still have to manage the same kinds of competitive port business, for example, container export and import for a considerably long period at the same time at the both ports.

Therefore, some policies on maritime transportation should be adopted so that both businesses can be competitive with each other. It goes without saying the new port activities at Laem Chabang will produce substantial economic benefits to the nation itself and these benefits should be allocated to shipping companies and agents by an appropriate institutional setup. For this reason, the Study Team suggests that the RTG should prepare an adequate tariff system and a wide variety of commercial incentives to those starting new businesses in the new port.

In addition to the above-mentioned new port operation system, the following items would also be very effective measures which will help Laem Chabang Port develop successfully.

- Dispatch of port operation specialists to the P.A.T.
- Field training of the P.A.T.'s port operation staff in third countries (Hong Kong, Singapore, Japan etc.)
- Improvement, simplification and rationalization of the P.A.T.'s office work
- Establishment of a port security system against burglary, pilferage and smuggling.

Further, detailed studies on the operation and management of Laem Chabang Port will be required hereafter in another study. So that the port will fulfill its functions thoroughly.

Table 4.12.1 ADMINISTRATIVE FUNCTIONS FOR THE PROGRAM

1. General Affairs
 - . Coordination of concerned agencies and departments
 - . Basic policy planning concerning organization and operation
 - . Overall control of budgeting and cash flow planning
 - . Policy concerning sales and codes
 - . Legal affaires
 - . Contact of official documents
2. Accounting
 - . Accounting of projects
 - . Accounting of administration
3. Public Relations
 - . Public relations activities
4. Promotion of Inducement of Firms
 - . Planning and coordination of firm inducement activities
 - . Marketing
5. Technical Standards
 - . Establishment of technical standards and cordination of concerned agencies on matters including design, construction, environmental protection and safety.
6. Personnel
 - . General personnel matters including appointments, salaries and wages, fringe benefits, evaluation, trade union, employee's welfare, social insurance.
7. Budgeting, Auditing and Contracting
 - . Budgeting
 - . Auditing
 - . Fund planning
 - . Contract tender management

8. Program Planning
 - . Short-term program planning
 - . Long-term program planning
 - . Basic research concerning the above
9. Urban Facilities Planning
 - . Preparation of project plans and fund planning
 - . Selection of sites
 - . Acceptance or evaluation of requests by local communities
 - . Policies concerning user charges and sales prices
 - . Public sector investment planning
 - . Surveys and researches concerning urban facilities
 - . Land acquisition planning
 - . Compensation planning
 - . Management of acquired land titles
 - . Legal matters concerning land use purpose changes and acquisition
10. Urban Facilities Implementation
 - . Preparation of implementation plans
 - . Management of contracted works
 - . Detailed designs
 - . Construction management
 - . Construction supervision & inspection
 - . Construction cost control
 - . Construction technology management
11. Urban Facilities Operations
 - . Preparation of operation plans
 - . Determination and updating of operation and maintenance organizations
 - . Personnel and equipment management
 - . Planning and implementation of supply procurement
 - . Operation supervision and inspection

12. Industrial Estate Planning
 - . Preparation of project plans and fund planning
 - . Selection of sites
 - . Receptance or evaluation of requests by local communities
 - . Policies concerning user charges and sales prices
 - . Public sector investment planning
 - . Surveys and researches concerning industrial estates
 - . Land acquisition planning
 - . Compensation planning
 - . Management of acquired land titles
 - . Legal matters concerning land use changes and acquisition
13. Industrial Estate Implementation
 - . Preparation of implementation plans
 - . Sales promotion
 - . Processing of applications and evaluation
 - . Sales contracts
 - . Detailed design
 - . Construction management
 - . Construction supervision and inspection
 - . Construction cost control
 - . Construction technology management
 - . Loan arrangements for sales
14. Industrial Estate Operation
 - . Preparation of operation plans
 - . Determination and updating of operation and maintenance organizations
 - . personnel and equipment arrangement
 - . Planning and implementation of supply procurement
 - . Operation supervision and inspection

Table 4.12.2 TYPES OF FACILITIES AND WORK ITEMS FOR THE COMPLEX

1. Land
 - a. Industrial estate land preparation and sales
 - b. New Town land acquisition, preparation and sales
 - c. Other necessary land acquisition, preparation and sales
2. Construction material depot
 - a. Construction materials transport
 - b. Construction materials depot
 - c. Manufacture of construction materials
(raw concrete, sand, gravel, crushed stone)
3. Construction worker camp
 - a. Construction, maintenance and operation of dwellings for
construction workers (may be converted later to general use)
4. Construction equipment
 - a. Construction equipment depots
 - b. Construction equipment repair and maintenance
 - c. Sales and leasing of construction equipment
 - d. Other equipment repair and maintenance
5. Port
 - a. Port construction
 - b. Port cargo handling, transport, and storage
 - c. Ship guidance services (Tugboats, pilotage mooring)
 - d. Shipping agents
 - e. Firefighting and oil spill prevention services
 - f. Ship supply and repair
 - g. Bilge oil processing, ship interior cleaning, etc.
 - h. Environmental protection and safety precaution
(Pollution control center, accident prevention center)
 - i. Social welfare facilities for port workers
 - j. Social welfare facilities for sailors

6. General Services
 - a. Communication facilities construction and operation
(cable, telephone, telex, post office)
 - b. Health services
(hospital, clinic, dispensary)
 - c. General service offices
(local government, bank, insurance company, travel agents,
etc.)
 - d. Whole salers
 - e. Cultural facilities
(assembly hall, library, auditorium)
 - f. Vocational training facilities
 - g. Offices
7. Distribution
 - a. Truck terminals
 - b. Warehouses
 - c. Distribution information services
 - d. Exhibition spaces
8. Transport sytem
 - a. Bus system (intra-area and inter-city)
 - b. Barge system
9. Parking
 - a. Construction, maintenance and operation of parking facilities
10. Railway
 - a. Railway construction, maintenance and operation
 - b. Marshalling yard construction, maintenance and operation
 - c. Cargo handling from or onto railway cars
11. Utilities
 - a. Industrial energy supply
(electricity, heat, steam, oxigen)
 - b. Residential energy supply
(electricity)

- c. Watersupply (industrial & residential)
 - d. Common waste water treatment plant
 - e. Common industrial waste processing facility
12. Residential estates
- a. Dwelling units construction, sales and leasing
13. Parks and green zones
- a. Park and green zone preparation and maintenance
 - b. Supply of trees for green zones
14. Security
- a. Security facilities
 - b. Firefighting facilities
15. Sports and recreation
- a. Gymnasiums
 - b. Sport grounds
 - c. Other recreational facilities
(cycling courses, pedestrian paths, marinas)
16. Commercial facilities
- a. Shopping centers
 - b. Restaurants, coffee houses and bars
 - c. Amusement facilities
 - d. Hotels

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