SECTORAL REPORT III

URBAN DEVELOPMENT PLAN

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III. URBAN DEVELOPMENT PLAN

1. Master Plan

1.1 Policy for the Urban Development and Premises for the New Town

1) National Policy

The RTG's national policy for economic and social development intends to reduce the population flow into the Bangkok and decentralize growth away from the Bangkok Metropolis.

In this respect, the Eastern Seaboard region is expected to become the new center for the industrialization and new urban development.

A relatively high level of urbanization in the Laem Chabang Area is one of the Major targets of the Eastern Seaboard to relieve pressure on Bangkok for industry and urban growth. Urban growth at Laem Chabang is expected to offer an attractive basis for the new town development, at relatively low cost.

2) Policy for the Urban Development

Basic policies of the urban development are described below.

(1) The Urban Development should proceed to support the industrial and port activities in the adjacent areas. The new town will be developed in an optimum scale to accommodate the industrial workers and induced employees with the provision of full range of facilities aiming at creation of a balanced and successful town.

(2) New Town will be developed in a good balance with port and industrial development.

(3) The planning must be flexible enough to cope with possible changes in social, industrial and commercial requirements in a long-term perspective so that structure will function efficiently at all development phases.

(4) There should be a satisfaction of population in relation to age group, family structure and employment to provide a sound basis for the development of the new town at all phases of its growth.

(5) The new town development should be carefully related to the existing area and a part of established urban functions would be utilized by the new town residents.

(6) Infrastructures such as roads networks and sewerage systems will be provided linking to the urban and regional networks.

(7) The housing program will provide for low and middle (medium) and upper income workers with appropriate support facilities including educational and common facilities. It is important to provide housing to low and middle income families at an affordable prices.

(8) Development phasing of the new town should be able to keep pace with the industrial and port development program.

1.2 Present Condition

1) Settlements and Population

In the Eastern Seaboard, there are four major urban centers that are Chonburi, Siracha - Laem Chabang, Pattaya, Sattahip - Map Ta Phut - Rayong where urban development are expected.

Chonburi would remain as the main urban centre of the Eastern Seaboard, with its role as the sub-regional centre providing administrative services and transportation facilities marketing link to Bangkok.

The town of Siracha is the focus of this coastal area with relatively small population living within its municipal boundaries in 1982. The town is situated at a narrow apron of castal plain and its capacity for expansion is limited.

Laem Chabang development area covers a string of coastal towns and villages and inland of the Sukhumvit Highway, and scattered rural settlements. The existing urban population was 48,300 in 1981, is found in three main locations, from north to south, Bang Phra, Siracha and Bang Lamung. Population of Ao Udom Sanitary district is about 64,000 and most population is concentrated in the seaside village of Ban Ao Udom and in the Nearby settlements along the Sukhumvit Highway.

2) Topography and Physical Constraints

There are coastal hills in the south of Siracha with an average height of 200 m terminating at the coast of the headland of Laem Chabang. To the south of Laem Chabang stretches the broad sweep of flat interland drained by the Huai Yai river.

The urban development area is an elevated plain with good drainage conditions. The natural drainage starts to flow toward to the west of the Route 3 and from there the water flows into two directions to the north and south into the ocean.

3) Other Existing Conditions

Location of existing schools (1984), existing common facilities, assessed land value (1983-1984) and publicly owned land are presented in Fig. III.1.1 to III.1.4.

1.3 Previous Studies

As a previous study on the urban development at Siracha - Laem Chabang Area, the Eastern Seaboard Study for the National Economics & Social Development Board, September 1982, conducted by the Coopers & Lybrand Associates (ESS) shows various facts and estimates as follows,

1) Growth of Employment

In case of Eastern Seaboard Study, the growth of employment induced by the port development is not counted, consequently the growth of employment in this study is larger than that of ESS.

2) Population Projection

ESS proposed a new town, which accommodates all induced in-migrant population related to the industrial developments at Laem chabang area, with the population of some of 100,000. The proposal by the Study Team shows relatively larger number of population (around 120,000) in the New Town.

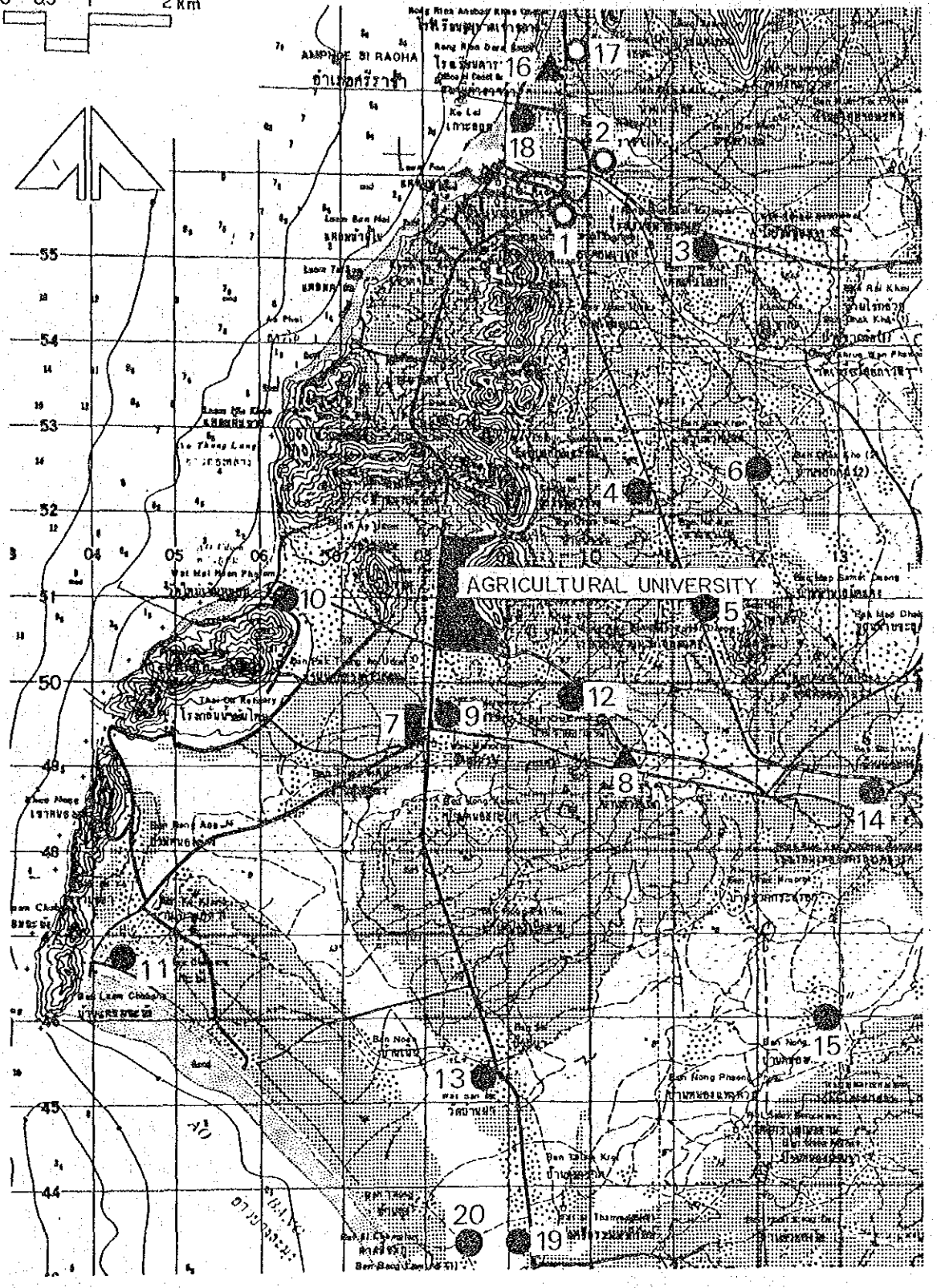
ESS also assumed that additional increase of population caused by increasing employments which would require residential developments beside the new town development. There are also taken into consideration in the present study.

3) Land Requirements for the New Town

ESS assumed 20 persons per rai (125 persons/hectare) for the population density of the New Town, which resulted in the land requirement for the New Town to be around 4,700 rai (750 ha). The proposal by the Study Team shows relatively larger area requirement for the New Town.

4) Phasing of Development

According to ESS sinario, the early phases (up to 1991) of developments will take place around in the area of one fifth of the total development area. In comparison with ESS, relatively larger area is proposed to be developed at an early phase in the present study.



LEGEND (Refer to Appendix III - 7 for detail)

- Primary school (public)
- Secondary school (public)
- Private school (kindergarden, primary school, secondary school)
- Vocational school (private)

Note : Agricultural university is the training center.

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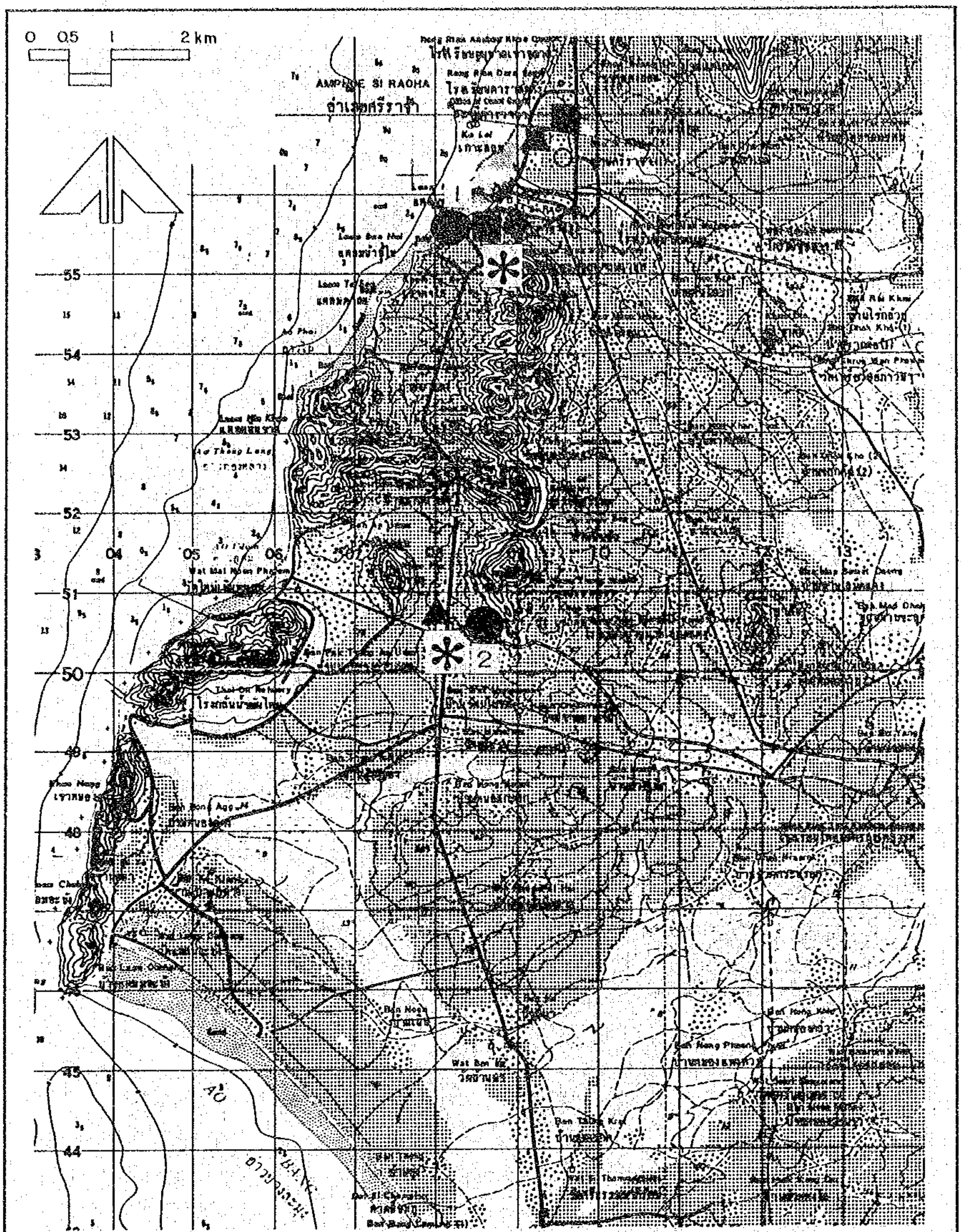
Fig. III.1.1
Location of Existing Schools (1984)



LEGEND

- Administrative Office
- Hospital (No.1), Health Center (No.2)
- Fire Station
- Police Station
- Post Office
- Market

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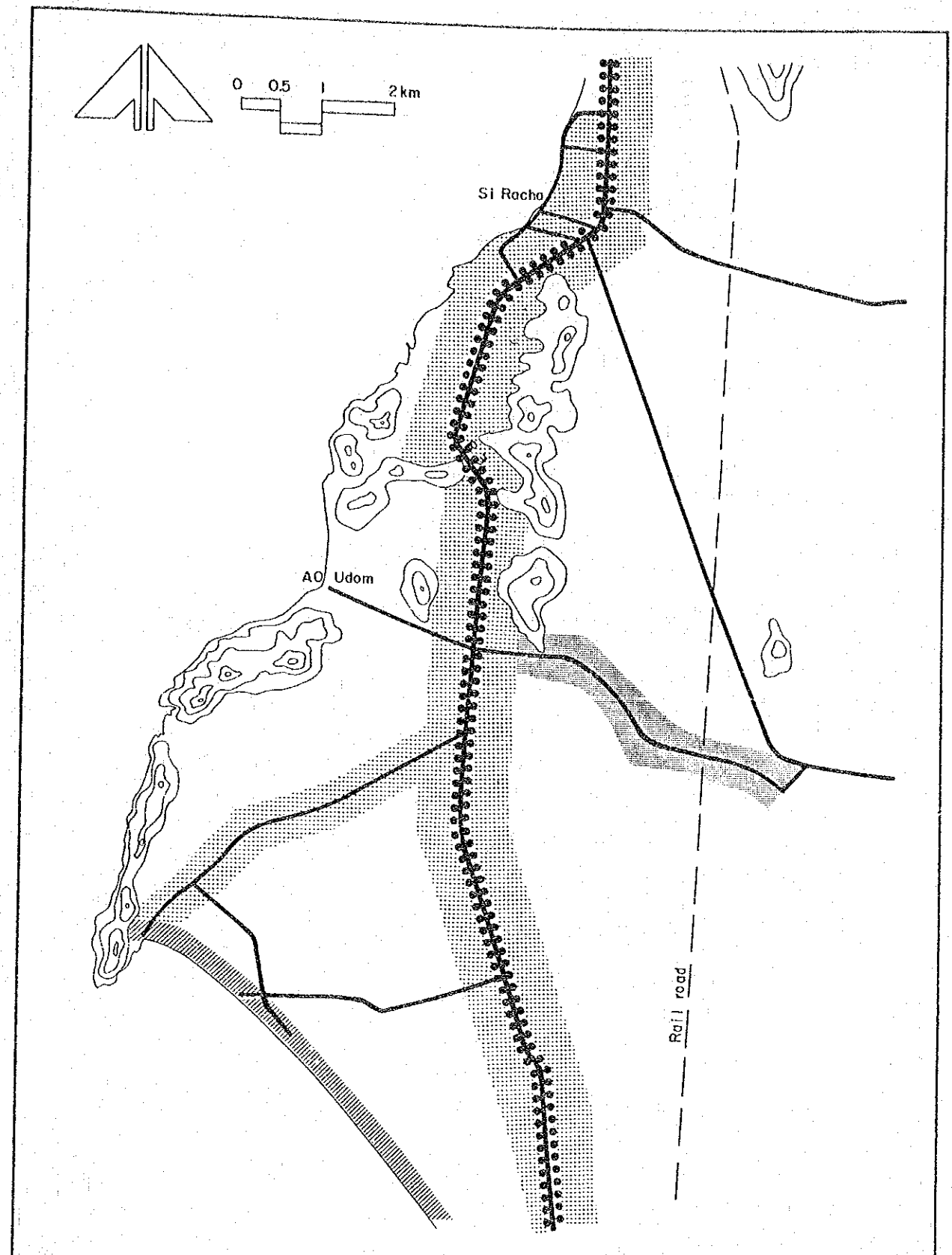
Fig. III.1.2
Existing Common Facilities



LEGEND

- 300,000฿/ Rai (with 40m from R.3)
- 500,000฿/ Rai (with 200m from Coast line)
- 200,000฿/Rai (range from 40m to 200m from R.3 and/or within 200m from the road)
- 60,000฿/Rai (within 200m from the road)
- and 50,000฿ Rai (within 100m from the road)
- 25,000฿ Rai (the area except above mentioned)

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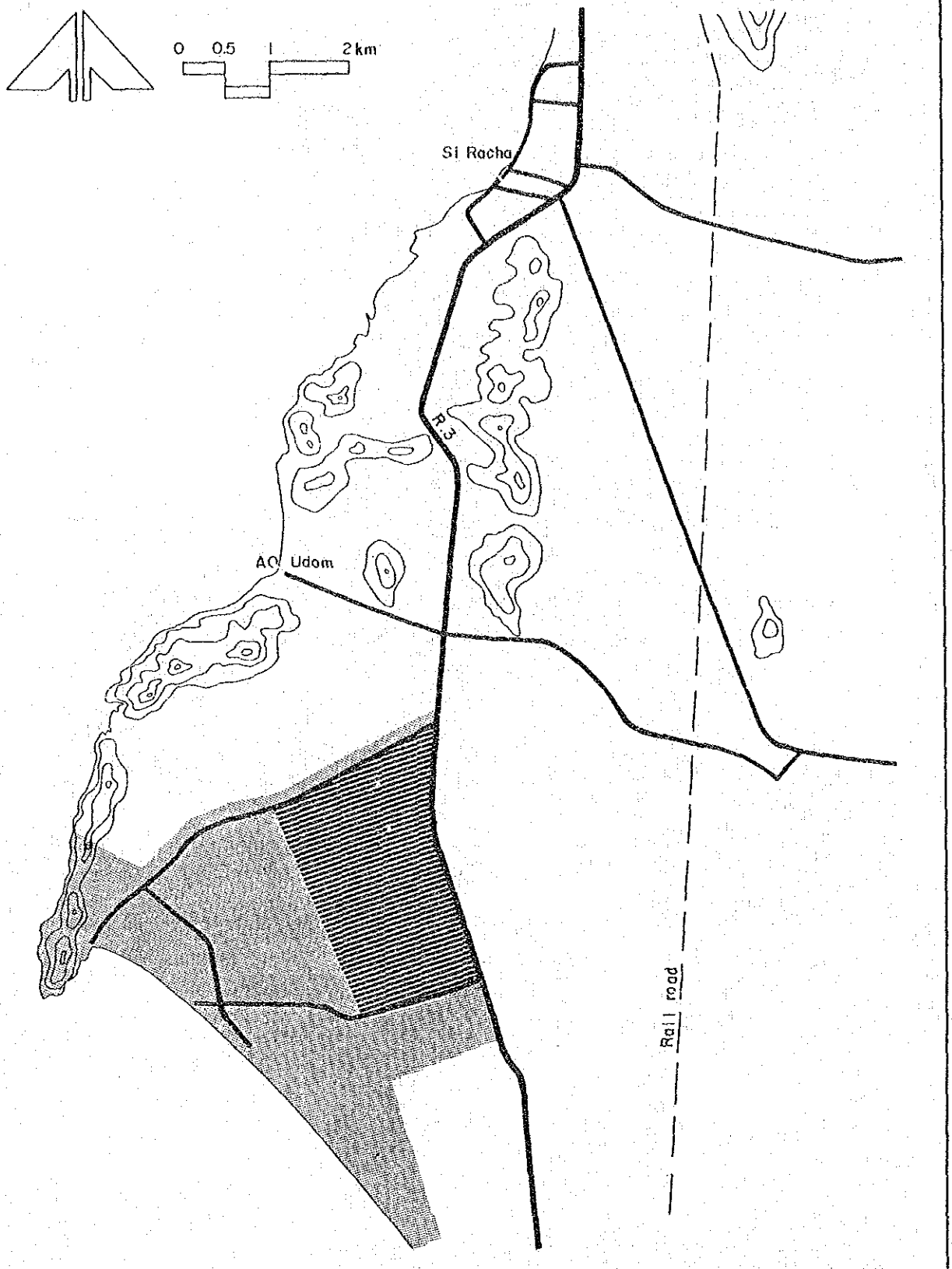
Fig. III.1.3
Assessed Land Value 1983–84



LEGEND

Land for Industrial Development

Land for Port Development

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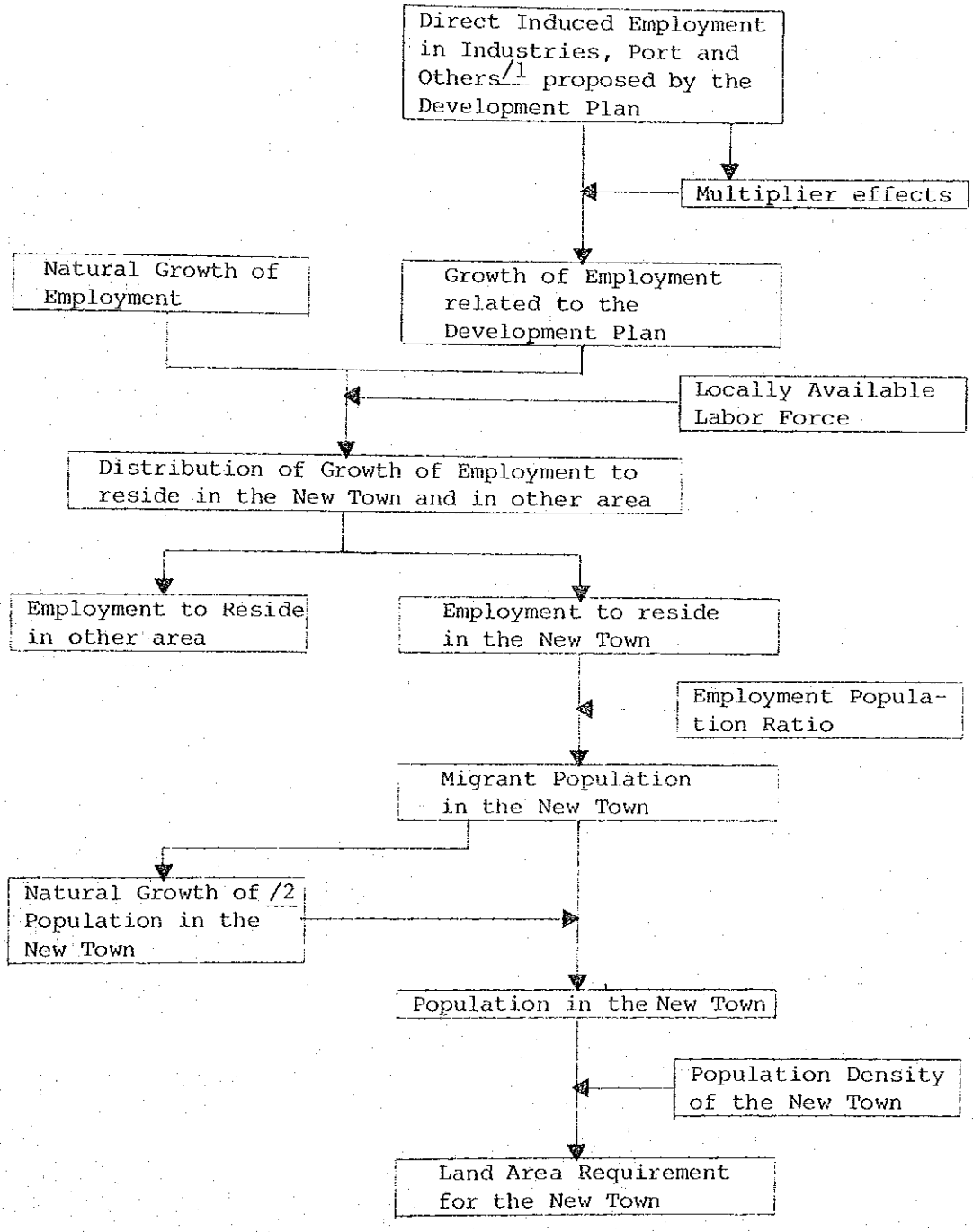
Fig. III.1.4
Publicly Owned Land for Laem Chabang Development

1.4 Population Projection

1.4.1 Methodology

The target population and the land area requirement for the New Town in the years of 1991 and 2001 are projected by the procedures as shown in the following chart.



/1: Higher Education and Research & Development, Offices, and Construction.
/2: For the population in the New Town, 1991, the natural growth of population are not counted.

1.4.2 Direct Induced Employment

For the direct induced employment by the development plan, following factors of the employment growth are counted.

1) Growth of employment induced by the port development
(Refer to the port development plan for detail.)

2) Growth of employment induced by the industrial development
(Refer to the industrial development plan for detail.)

3) Growth of employment induced by vocational and training schools and research & development institutions.

4) Employment growth induced by office relocation

Office relocation from Bangkok metropolitan area to this development area is proposed to decentralize office function and its engaged population.

5) Growth of employment induced by construction activities beside local building programme construction workers.

The figures for induced employment growth related to the development are shown Table III.1.1.

1.4.3 Multiplier Effects

In addition to the direct induced employment, there will be some indirect employment generation resulting from forward and backward linkages, and from the consumption requirements of the employment. These indirect employment effects are collectively defined as the employment multiplier.

For multiplier effects, the figures estimated and allocated to urban area by ESS are applied as follows:

Category	Ratio
Export-processing	1.4
Resource-based industry	1.8
Downstream industry	2.0
Light industry	2.3
Construction	1.8
Offices	1.3
Higher education	1.4
Port	1.6*

* Data from Map Ta Phut Study, and based on the datas of the Port of Kobe.

1.4.4 Natural Growth of Employment

According to ESS analysis, the natural growth of employment in the Siracha-Laemchabang development area, during years of 1981-2001 is estimated 23,700, which shows relatively high growth among other urban area in the Eastern Seaboard Corridor. Major portion of the growth is expected to be derived from the existing Siracha Industrial Park and oil refineries. For the employment to live in the new town a part of the growth of the employment of the Siracha Industrial Park and oil refineries are counted.

1.4.5 Locally Available Labor Force

To some portions of the induced employment, non-migrant labor forces would be attracted. As such a locally available labor force, following sources of labor force could be counted.

- the natural growth of labor force
- unemployed labor force
- transfered labor force from presently engaged occupations

The changes in the labor force (economically active persons) in the Chon Buri - Bang Lamung - Bunb Bung - Siracha - City of Pattaya area, where the locally available labor forces are counted to place the induced employment, are shown Table III.1.2 which are figured out based on the changes of the sex and age structure of 1980 census population (Table III.1.3 and III.1.4) and the changes of the economic activity rated (Table) III.1.5).

11,000 persons, which is around 7.5% of 1990 economically active persons or around 70% of the growth of economically active persons from 1985 to 1990 are counted for the locally available labor force for the short term development. But after the short term development, most of the induced employment are assumed to be filled by migrant workers, because the natural growth of the labor force are not much expected and the demand for the labor force in the area is projected high.

1.4.6 Distribution of Growth of Employment to reside in the New Town and in Other Area

Assumptions of the distributions of the growth of employment are set as follows:

1) 90 per cent of the growth of employment directly induced by this development programme will go to the new town, and residual 10 per cent will go to or come from other urban area.

2) 60 per cent of the growth of employment by multiplier effects of induced employment will go to the new town, and residual 40 per cent will go to or come from other urban area.

3) Out of the natural growth of employment, some 8,000 employment are assumed for Siracha Industrial Park and oil refineries. 25 per cent of these will go to the new town and the rest will go to or come from other area.

1.4.7 Population/Employment Ratio

The employment to population conversion ratio is figured out from the labor force participation ratio and the labor force population ratio. According to ESS analysis, employment/population ratios of in-migrant varies from 0.53 (1986-1991) to 0.52 (1996-2001).

The population/Employment Ratio is set 1.92 and the ratio is confirmed by the sex and age structure of the population and the economically active rated in the minicipal area of Chongwat Chon Buri, 1980. (Table III.1.6.)

1.4.8 Natural Growth of Population

The changes in the population in the new town are figured out by using the cohort analysis.

1) Projection of the Fertility Rates

(1) Total Fertility Rates

The datas of the total fertility rates from the years of 1970 to 1979 in Thailand are analized and the rates are set as follows.

2.37 (1991), 2.02 (1996), 1.73 (2001)

For the detailed information on the total fertility rates is shown Table III.1.7.

(2) Fertility Rates by Age Group

The changes in the fertility rates by age groups are shown Table III.1.8. The 1979 pattern of the fertility rates by age group are applied to the total fertility rates for the projection of that in the years of 1991, 1996 and 2001.

The sex distribution for the births is set, Male 106: Female 100, analizing 1970-1979 datas.

2) Mortality Rates

The changes in the mortality rates by sex and age group are shown Table III.1.9, analizing the datas of the mortality rates from the years of 1972 to 1981 in Thailand, shown Table III.1.10.

3) Sex and Age Distribution of the Migrant Population

The projection of the sex age structure is shown Table III.1.11, based on the sex and age distribution of migrant population to the new town of which the method of the projection is described in the Short Term Development Plan.

4) Natural Growth of Population in the New Town

The result of calculation of the natural growth of the population is as follows.

1991 - 1996	2,770
1996 - 2001	6,930
Total	9,700

The changes in sex and age structures of the migrant groups are shown Table III.1.12, III.1.13 and III.1.14.

The number of births in the new town is shown Table III.1.15 and the number of the mortality is shown Table III.1.16, III.1.17 and III.1.18.

1.4.9 Population in the New Town

As a result, the new town population, in 2001 would be around 120,000 (117,680) and the land area required for the new town would be 960 ha (6,000 Rai)/1. The population density for the new town is set to be 125 persons per hectare (20 persons per Rail). The detailed information on the population is given in Table III.1.1.

/1: In case of the NHA's housing area for the new town, the density would be higher than 125 persons per hectre and the land area requirement for the new town would be smaller than this figure.

Table III.1.1 PROJECTION OF EMPLOYMENT AND POPULATION IN NEW TOWN

	1991				1996 /A			2001 /A		
	EMPLOYMENT	LOCALLY AVAILABLE LABOR FORCE	NEW TOWN	OTHER AREA	EMPLOYM'T	N.T.	OTHER AREA	EMPLOYM'T	N.T.	OTHER AREA
EPZ	5,430	9,470 3,450	5,420	600	7,210	6,490 (90%)	720 (10%)	4,660	4,190 (90%)	470 (10%)
GIE	4,040				6,230	5,610	620	3,780	3,400	380
PORT	7,200	2,620	4,120	460	3,400	3,060 (90%)	340 (10%)	3,400	3,060 (90%)	340 (10%)
HIGHER ED., RESEARCH & D.	-	-	-	-	500	450 (90%)	50 (10%)	500	450 (90%)	50 (10%)
CONSTRUCTION	-	-	-	-	900	810 (90%)	90 (10%)	500	450 (90%)	50 (10%)
OFFICES	-	-	-	-	1,000	900 (90%)	100 (10%)	1,000	900 (90%)	100 (10%)
MULTIPLIER EFFECT	8,130	3,840 *	2,580	1,710	2,400 /1	1,440 (60%)	960 (40%)	3,090 /3	1,850 (60%)	1,240 (40%)
					9,280 /2	5,570	3,710	6,440 /4	3,860	2,580
TORC, ESSO SRI	3,000	1,090	480	1,430	3,000	750 (25%)	2,250 (75%)	2,000	500 (25%)	1,500 (75%)
TOTAL	27,800	11,000	12,600	4,200	33,920	25,080	8,840	25,370	18,660	6,710
POPULATION			24,000(1)	8,100		48,150(2)	16,970		35,830(3)	12,880

NEW TOWN POPULATION (2001)

(1)+(2)+(3)	107,980
NATURAL GROWTH	9,700
TOTAL	117,680

≒ around 120,000

/1 REDISUAL MULTIPLIER EFFECT GENERATED BY 1991 INDUCED EMPLOYMENT
/2 75% OF MULTIPLIER EFFECT GENERATED BY 1996 INDUCED EMPLOYMENT
/3 25% - DO -
/4 75% OF MULTIPLIER EFFECT GENERATED BY 2001 INDUCED EMPLOYMENT
/A MOST OF THE NATURAL GROWTH OF LABOR FORCE WILL BE ABSORBED BY THE NATURAL GROWTH OF EMPLOYMENT, IN CHONBURI-SIRACHA-PATAYA AREA, THE INDUCED EMPLOYMENT IN 1996 AND 2001 WILL BE FILLED BY MIGRANT.

OTHER NATURAL GROWTH OF EMPLOYMENT IN SIRACHA LAEMCHABANG D.P.A. (SOURCE: ESS)

	1991	1996	2001	TOTAL
NATURAL GROWTH OF EMPLOYMENT	9,800	2,100	3,800	15,700

Table III.1.2 CHANGES IN ECONOMICALLY ACTIVE PERSONS OF 1980 POPULATION
(WITHOUT IN-MIGRATION AND EMIGRATION AFTER THE CENSUS)

AGE GROUP	MALE			FEMALE			TOTAL (MALE + FEMALE) (CHON BURI, BANG LAMUNG, BAN BUNG, CITY OF PATTAYA) 1/2 + SIRACHA			GROWTH OF ECONOMICALLY ACTIVE PERSONS	
	1985	1990	2000	1985	1990	2000	1985	1990	2000	1985-1990	1990-2000
11 - 14	2,630	1,900	1,409	2,694	2,042	1,489	5,324	3,942	2,898	-1,382	-1,044
15 - 19	9,804	8,838	6,967	8,906	7,717	6,226	18,710	16,555	13,193	-2,155	-3,362
20 - 24	14,583	14,047	11,663	10,866	10,727	8,872	25,449	24,774	20,535	-675	-4,239
25 - 29	13,149	15,650	14,664	9,788	11,086	10,103	22,937	26,736	24,767	3,799	-1,969
30 - 34	9,994	13,233	15,509	7,877	10,052	11,249	17,871	23,285	26,758	5,414	3,473
35 - 39	7,584	9,833	15,615	5,980	8,277	11,912	13,564	18,110	27,527	4,546	9,417
40 - 44	6,590	7,405	12,775	5,250	5,869	10,252	11,840	13,274	23,027	1,434	9,753
45 - 49	5,901	6,212	9,090	4,471	5,027	7,699	10,372	11,239	16,789	867	5,550
50 - 54	4,351	5,385	6,362	3,361	4,055	5,029	7,712	9,440	11,391	1,728	1,951
55 - 59	3,105	3,621	4,693	2,249	2,785	3,735	5,354	6,406	8,428	1,052	2,022
60 - 64	1,812	2,240	3,240	1,197	1,535	2,321	3,009	3,775	5,561	766	1,786
SUB-TOTAL	79,503	88,364	101,987	62,639	69,172	78,887	142,142	157,536	180,874	15,394	23,338
65 OVER	1,674	1,895	2,782	1,113	1,277	1,994	2,787	3,172	4,776	385	1,604
TOTAL	81,177	90,259	104,769	63,752	70,449	80,881	144,929	160,708	185,650	15,779	24,942

Table III.1.3 CHANGES IN POPULATION BY AGE GROUPS, BASED ON MALE, 1980 POUPLATION, CHONBURI - SIRACHA - PATHAYA AREA

	CHONBURI 1/2	BANG LAMUNG 1/2	BAN BUNG 1/2	SIRACHA 1	CITY OF PATHAYA 1/2	TOTAL 1980	%	1985	1990	1995	2000
0 - 4	4,247	1,188	2,380	5,802	1,034	14,651	11.28	14,000	13,500		
5 - 9	4,844	1,442	2,444	6,545	999	16,274	12.53	14,307	13,687	13,214	
10 - 14	4,708	1,651	2,629	6,906	977	16,871	12.99	16,176	14,225	13,613	13,146
15 - 19	5,248	2,218	2,397	6,248	1,039	17,150	13.20	16,787	16,099	14,161	13,555
20 - 24	5,724	983	1,671	4,717	1,136	14,231	10.96	16,996	16,643	15,969	14,052
25 - 29	3,442	824	1,330	3,933	1,034	10,563	8.13	14,003	16,738	16,403	15,751
30 - 34	2,611	609	1,091	2,876	824	8,011	6.17	10,389	13,784	16,489	16,172
35 - 39	2,163	553	926	2,763	597	7,002	5.39	7,875	10,221	13,573	16,249
40 - 44	2,002	528	892	2,661	466	6,549	5.04	6,858	7,722	10,032	13,335
45 - 49	1,542	487	750	2,029	283	5,091	3.92	6,320	6,630	7,479	9,732
50 - 54	1,245	383	616	1,618	224	4,086	3.15	4,834	6,017	6,329	7,156
55 - 59	947	240	467	1,192	170	3,016	2.32	3,833	4,549	5,681	5,993
60 - 64	759	224	368	886	165	2,402	1.85	2,787	3,556	4,238	5,312
65 - 69	483	171	256	640	75	1,625	1.25	2,134	2,476	3,199	3,834
70 - 74	368	127	187	439	50	1,171	0.90	1,354	1,795	2,104	2,742
75 OVER	373	131	197	438	65	1,204	0.93	1,406	1,688	2,180	2,887
						129,897	100.01				

Table III.1.4 CHANGES IN POPULATION BY AGE GROUPS, BASED ON FEMALE, 1980 POPULATION CHONBURI - SIRACHA - PATHAYA AREA

	CHONBURI 1/2	BANG LAMUNG 1/2	BAN BUNG 1/2	SIRACHA	CITY OF PATHAYA	TOTAL 1980	%	1985	1990	1995	2000
0 - 4	4,025	1,110	2,169	5,466	991	13,761	10.65	13,000	12,500		
5 - 9	4,154	1,390	2,383	6,094	952	14,973	11.59	13,500	12,765	12,286	
10 - 14	4,613	1,530	2,495	6,732	918	16,288	12.60	14,898	13,436	12,708	12,086
15 - 19	5,006	1,361	2,470	6,401	1,201	16,439	12.72	16,223	14,841	13,388	12,654
20 - 24	4,823	1,048	1,960	5,427	1,280	14,538	11.25	16,340	16,131	14,761	13,342
25 - 29	3,648	814	1,490	4,349	1,096	11,397	8.82	14,436	16,231	16,029	14,685
30 - 34	2,715	630	1,153	3,056	692	8,246	6.38	11,317	14,340	16,129	15,933
35 - 39	2,232	572	1,047	2,906	566	7,323	5.67	8,180	11,231	14,237	16,032
40 - 44	2,040	556	855	2,579	372	6,402	4.95	7,242	8,095	11,120	14,140
45 - 49	1,666	479	821	2,010	281	5,257	4.07	6,280	7,111	7,957	11,015
50 - 54	1,353	264	656	1,548	231	4,052	3.14	5,115	6,248	6,938	7,845
55 - 59	1,010	244	434	1,113	156	2,957	2.29	3,912	4,947	6,054	6,778
60 - 64	869	235	412	973	120	2,609	2.02	2,830	3,752	4,756	5,875
65 - 69	601	187	275	678	72	1,813	1.40	2,441	2,657	3,534	4,581
70 - 74	501	120	213	505	70	1,409	1.09	1,634	2,213	2,421	3,339
75 OVER	636	187	252	599	92	1,766	1.37	2,142	2,598	3,423	4,313
						129,230	100.01				

Table III.1.5 CHANGES IN ECONOMIC ACTIVITY RATED/1

AGE GROUP	MALE					FEMALE				
	1970/2	1980/3	1985/4	1990/4	2000/4	1970/2	1980/3	1985/4	1990/4	2000/4
11 - 14	36.8	23.4	20.1	16.7	13.4	40.7	26.2	22.6	19.0	15.4
15 - 19	75.7	61.8	58.4	54.9	51.4	69.2	57.7	54.9	52.0	49.2
20 - 24	92.8	87.2	85,8	84.4	83.0	66.6	66.5	66.5	66.5	66.5
25 - 29	95.9	94.3	93.9	93.5	93.1	65.4	67.3	67.8	68.3	68.8
30 - 34	96.9	96.3	96.2	96.0	95.9	67.2	69.1	69.6	70.1	70.6
35 - 39	96.6	96.3	96.3	96.2	96.1	69.8	72.4	73.1	73.7	74.3
40 - 44	96.5	96.1	96.0	95.9	95.8	72.6	72.4	72.5	72.5	72.5
45 - 49	95.5	94.3	94.0	93.7	93.4	73.5	71.6	71.2	70.7	69.9
50 - 54	92.6	90.5	90.0	89.5	88.9	69.5	66.4	65.7	64.9	64.1
55 - 59	87.7	82.3	81.0	79.6	78.3	63.6	58.7	57.5	56.3	55.1
60 - 64	75.0	67.0	65.0	63.0	61.0	49.1	43.6	42.3	40.9	39.5
65 OVER	46.0	36.5	34.2	31.8	29.4	21.7	18.6	17.9	17.1	16.3

/1: Economically active person / Population over 11 years old x 100(%)

/2: 1970 Population & Housing Census, Changwat Chon Buri

/3: 1980 Population & Housing Census, Changwat Chon Buri

/4: Projected by the Study Team.

$$R_n = R_{n-10} + \frac{R_{n-10} - R_{n-20}}{2}$$

R_n = Economic Activity Rated at the year of n.

Table III.1.6 1991 (NEW TOWN) POPULATION - NUMBER OF EMPLOYMENTS BASED ON ECONOMIC ACTIVITY RATED, 1980 MUNICIPAL AREA

AGE GROUP	MALE			FEMALE			TOTAL
	POPULATION	ECONOMIC ACTIVITY RATED	EMPLOYMENT	POPULATION	ECONOMIC ACTIVITY RATED	EMPLOYMENT	
11 - 14	770	15.3	118	740	15.9	118	236
15 - 19	1,770	47.4	839	1,770	44.0	779	1,618
20 - 24	4,060	73.6	2,988	2,720	62.8	1,708	4,696
25 - 29	1,530	89.0	1,362	1,420	70.4	1,000	2,362
30 - 34	780	93.8	732	660	69.4	458	1,190
35 - 39	690	93.7	647	570	72.9	416	1,063
40 - 44	400	93.4	374	310	68.8	213	587
45 - 49	320	91.4	292	260	68.9	179	471
50 - 54	200	84.9	170	160	59.0	94	264
55 - 59	150	75.8	114	110	47.4	52	166
60 - 64	80	52.8	42	90	34.5	31	73
65 OVER	130	29.0	38	170	14.5	25	63
TOTAL	10,880	70.9	7,716	8,980	56.5	5,073	12,789

Table III.1.7 CHANGES IN TOTAL FERTILITY RATES (TFR)* IN THAILAND

YEAR	1960	1970	1972	1973	1975	1976	1977	1979	1991/1	1996/1	2001/1
TFR	5.91	5.02	4.58	4.36	3.87	3.87	3.68	3.14	2.37	2.02	1.73

/1 Projected by the study team
$y=42.60.e^{-0.0317x}$
r=-0.949 coefficient of correlation

Source: Demographic Year Books, 1975, 1976, 1977, 1978, 1979, 1982, United Nations.

* TFR: average total number of live birth by a female of the age between 15 to 49.

Table III.1.8 CHANGES IN LIVE BIRTH RATES SPECIFIC FOR AGE OF MOTHER, FERTILITY RATES BY EACH FEMALE 5 YEARS AGE GROUP, IN ONE YEAR IN THAILAND

	1970	1975	1977	1979	1991/1	1996/1	2001/1
15 - 19	0.0524	0.0526	0.0524	0.0488	0.0368	0.0314	0.0269
20 - 24	0.2271	0.1912	0.1862	0.1719	0.1297	0.1105	0.0946
25 - 29	0.2416	0.1726	0.1721	0.1509	0.1138	0.0970	0.0831
30 - 34	0.2051	0.1382	0.1211	0.1003	0.0757	0.0645	0.0552
35 - 39	0.1666	0.1274	0.1079	0.0784	0.0591	0.0504	0.0432
40 - 44	0.0853	0.0665	0.0647	0.0518	0.0391	0.0333	0.0285
45 - 49	0.0257	0.0257	0.0311	0.0263	0.0198	0.0169	0.0145

Source: Demograpic Year Books, 1975, 1976, 1977, 1978, 1979, 1982, United Nations

Table III.1.9 CHANGES IN MORTALITY RATES BY SEX AND 5 YEARS AGE GROUP IN 5 YEARS IN THAILAND

YEAR, SEX	1991 - 1996		1996 - 2001	
AGE	MALE	FEMALE	MALE	FEMALE
0 - 0	0.02115	0.0171	0.0201	0.01625
0 - 4	0.0054	0.0045	0.0051	0.0043
5 - 9	0.0045	0.0036	0.0043	0.0034
10 - 14	0.0081	0.0054	0.0077	0.0051
15 - 19	0.0144	0.0063	0.0137	0.0060
20 - 24	0.01485	0.0063	0.0141	0.0060
25 - 29	0.0153	0.0072	0.0145	0.0068
30 - 34	0.01845	0.0099	0.0175	0.0094
35 - 39	0.0315	0.0171	0.0299	0.01625
40 - 44	0.04545	0.0243	0.0432	0.0231
45 - 49	0.0558	0.03105	0.0530	0.0300
50 - 54	0.0684	0.0387	0.0650	0.0368
55 - 59	0.10035	0.05805	0.0953	0.0551
60 - 64	0.1503	0.08865	0.1428	0.0842
65 - 69	0.2259	0.14805	0.2146	0.1406
70 OVER	0.5049	0.40815	0.4797	0.3877

Projected by the Study Team based on Datas of the Demographic Year Books, 1975, 1976, 1977, 1978, 1979, 1982, United Nations.

Table III.1.10 CHANGES IN MORTALITY RATES IN THAILAND
(SINGLE YEAR, PER 1000 POPULATION)

YEAR, SEX / AGE	1972		1973		1975		1976		1977		1979		1981	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
0 - 4	9.1	7.7	7.7	6.5	8.4	6,5	8.3	6.2	8.0	6.1	5.2	4.2	4.7	3.8
5 - 9	2.1	1.9	2.0	1.8	1.6	1.6	1.7	1.4	1.6	1.5	1.5	1.2	1.2	1.0
10 - 14	1.4	1.2	1.5	1.2	1.2	1.0	1.3	1.0	1.3	1.0	1.2	0.9	1.0	0.8
15 - 19	2.1	1.6	2.3	1.6	2.2	1.5	2.1	1.4	2.1	1.4	2.2	1.4	1.8	1.2
20 - 24	2.3	1.8	2.7	1.8	2.8	1.7	2.9	1.6	2.9	1.7	3.5	1.7	3.2	1.4
25 - 29	2.6	1.9	2.7	1.9	2.6	1.6	2.7	1.6	2.8	1.6	3.3	1.6	3.3	1.4
30 - 34	3.7	2.8	3.9	2.6	3.8	2.2	3.3	2.1	3.0	1.9	3.4	1.9	3.4	1.6
35 - 39	5.1	3.7	5.4	3.8	6.0	3.4	5.3	3.3	4.9	3.0	4.9	2.7	4.1	2.2
40 - 44	6.3	4.7	6.8	4.6	7.5	4.3	7.1	4.5	6.9	4.3	7.8	4.5	7.0	3.8
45 - 49	8.2	5.2	8.9	5.5	9.5	5.3	8.8	5.2	8.5	5.4	9.8	5.5	10.1	5.4
50 - 54	10.8	7.3	14.1	7.3	11.7	6.9	10.8	6.7	10.8	6.6	12.7	7.2	12.4	6.9
55 - 59	16.8	9.8	17.0	10.3	16.6	10.3	14.5	8.9	14.2	8.8	15.6	9.1	15.2	8.6
60 - 64	22.4	14.2	23.3	14.2	24.9	15.1	24.1	14.7	23.7	15.3	25.1	14.8	22.3	12.9
65 - 69	28.0	19.2	29.3	19.1	33.4	22.5	32.8	21.3	32.6	20.7	34.2	20.7	33.4	19.7
70 - 74	60.9	55.5	47.8	55.0	71.7	58.3	72.2	56.3	69.5	54.0	73.0	56.8	50.2	32.9
75 OVER													112.2	90.7

Source: Demographic Year Books, 1975, 1976, 1977, 1978, 1979, 1982, United Nations

Table III.1.11 PROJECTION OF POPULATION IN NEW TOWN, SEX AND AGE DISTRIBUTION, 1991, 1996, 2001

	1991			1996			2001				
AGE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	%	FEMALE	%
0- 4	1,830	920	910	6,880	3,490	3,390	11,010	5,630	8.93	5,380	9.85
5- 9	1,930	970	960	5,710	2,870	2,840	9,730	4,930	7.81	4,800	8.79
10-14	1,890	960	930	5,700	2,880	2,820	8,490	4,280	6.79	4,210	7.70
15-19	3,540	1,770	1,770	9,000	4,510	4,490	10,960	5,510	8.74	5,450	9.98
20-24	6,780	4,060	2,720	17,090	9,880	7,210	19,030	10,510	16.67	8,520	15.59
25-29	2,950	1,530	1,420	12,630	7,070	5,560	21,320	12,020	19.07	9,300	17.02
30-34	1,440	780	660	5,810	3,070	2,740	14,640	8,130	12.89	6,510	11.92
35-39	1,260	690	570	3,930	2,150	1,780	7,590	4,040	6.41	3,550	6.51
40-44	710	400	310	2,660	1,480	1,180	4,890	2,680	4.25	2,210	4.05
45-49	580	320	260	1,860	1,030	830	3,450	1,900	3.00	1,550	2.84
50-54	360	200	160	1,250	690	560	2,310	1,270	2.01	1,040	1.90
55-59	260	150	110	870	500	370	1,590	880	1.39	710	1.30
60-64	170	80	90	580	300	280	1,050	570	0.90	480	0.88
65-70	110	50	60	370	170	200	680	330	0.53	350	0.64
70 OVER	190	80	110	580	230	350	940	380	0.60	560	1.02
TOTAL	24,000	12,960	11,040	74,920	40,320	34,600	117,680*	63,060	100	54,620	100

NATURAL GROWTH OF POPULATION IN THE NEW TOWN

	1991-1996	1996-2001	TOTAL
NATURAL GROWTH OF POPULATION IN THE NEW TOWN	2,770	6,930	9,700

* The total population in the new town, 2001 will be around 120,000.

Table III.1.12 CHANGES OF 1991 MIGRANT GROUP, SEX AND AGE STRUCTURES

Age Group	1991		1996		2001	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
0 - 0/1	-	-	1,690	1,594	1,448	1,366
0 - 4	920	910	1,654	1,567	1,419	1,344
5 - 9	970	960	915	906	1,646	1,560
10 - 14	960	930	966	957	911	903
15 - 19	1,770	1,770	952	925	958	952
20 - 24	4,060	2,720	1,745	1,759	939	919
25 - 29	1,530	1,420	4,000	2,703	1,720	1,748
30 - 34	780	660	1,507	1,410	3,942	2,684
35 - 39	690	570	766	653	1,480	1,397
40 - 44	400	310	668	560	743	643
45 - 49	320	260	382	3-2	639	547
50 - 54	200	160	302	252	362	294
55 - 59	150	110	186	154	283	243
60 - 64	80	90	135	104	169	145
65 - 69	50	60	68	82	116	95
70 OVER	80	110	78	116	94	142
TOTAL	12,960	11,040	14,323	12,499	15,419	13,615

/1: Number of birth, previous 5-year period and not included in total.

Table III.1.13 CHANGES OF 1996 MIGRANT GROUP, SEX AND AGE STRUCTURES

Age Group	1996		2001	
	MALE	FEMALE	MALE	FEMALE
0 - 0 /1	-	-	2,898	2,734
0 - 4	1,840	1,820	2,840	2,690
5 - 9	1,950	1,930	1,831	1,812
10 - 14	1,920	1,860	1,942	1,923
15 - 19	3,560	3,560	1,905	1,850
20 - 24	8,140	5,450	3,511	3,539
25 - 29	3,070	2,860	8,025	5,417
30 - 34	1,560	1,330	3,025	2,840
35 - 39	1,380	1,130	1,533	1,317
40 - 44	810	620	1,339	1,112
45 - 49	650	530	775	606
50 - 54	390	310	616	514
55 - 59	310	220	365	299
60 - 64	160	180	280	208
65 - 69	100	120	137	165
70 OVER	160	230	162	244
TOTAL	26,000	22,150	28,285	24,537

/1: Number of birth, previous 5-year period and not included in total.

Table III.1.14 SEX AND AGE DISTRIBUTION OF 2001 MIGRANTS

Age Group	MALE	FEMALE	TOTAL
0 - 4	1,370	1,350	2,720
5 - 9	1,450	1,430	2,880
10 - 14	1,430	1,380	2,810
15 - 19	2,650	2,650	5,300
20 - 24	6,060	4,060	10,120
25 - 29	2,280	2,130	4,410
30 - 34	1,160	990	2,150
35 - 39	1,030	840	1,870
40 - 44	600	460	1,060
45 - 49	480	400	880
50 - 54	290	230	520
55 - 59	230	170	400
60 - 64	120	130	250
65 - 69	80	90	170
70 OVER	120	170	290
TOTAL	19,350	16,480	35,830

Table III.1.15 NUMBER OF BIRTH IN THE NEW TOWN

YEAR \ MIGRANT GROUP	1991 MIGRANTS	1996 MIGRANTS	TOTAL
1991 - 1996	3,284	-	3,284
1996 - 2001	2,814	5,632	8,446
TOTAL	6,098	5,632	11,730

Table III.1.16 SUMMARY OF NUMBER OF MORTALITY IN THE NEW TOWN

YEAR \ MIGRANT GROUP	1991 MIGRANTS	1996 MIGRANTS	TOTAL
1991 - 1996	510	-	510
1996 - 2001	558	952	1,510
TOTAL	1,068	952	2,020

Table III.1.17 NUMBER OF MORTALITY, 1991 MIGRANT GROUP

AGE	1991 - 1996 PERIOD					1996 - 2001 PERIOD				
	MALE		FEMALE			MALE		FEMALE		
	POP	MORTALITY	POP	MORTALITY	TOTAL	POP	MORTALITY	POP	MORTALITY	TOTAL
0 - 0	1,690	36	1,594	27	63	1,448	29	1,366	22	51
0 - 4	920	5	910	4	9	1,654	8	1,567	7	15
5 - 9	970	4	960	3	7	915	4	906	3	7
10 - 14	960	8	930	5	13	966	8	957	5	13
15 - 19	1,770	25	1,770	11	36	952	13	925	6	19
20 - 24	4,060	60	2,720	17	77	1,745	25	1,759	11	36
25 - 29	1,530	23	1,420	10	33	4,000	58	2,703	19	77
30 - 34	780	14	660	7	21	1,507	27	1,410	13	40
35 - 39	690	22	570	10	32	766	23	653	10	33
40 - 44	400	18	310	8	26	668	29	560	13	42
45 - 49	320	18	260	8	26	382	20	302	8	28
50 - 54	200	14	160	6	20	302	19	252	9	28
55 - 59	150	15	110	6	21	186	17	154	9	26
60 - 64	80	12	90	8	20	135	19	101	9	28
65 - 69	50	12	60	9	21	68	15	82	12	27
70 -	80	40	110	45	85	78	38	116	50	88
		326		184	510		352		206	558

Table III.1.18 NUMBER OF MORTALITY, 1996 MIGRANT GROUP

(1991-2001 PERIOD)

Age	MALE		FEMALE		TOTAL
	POP	MORTALITY	POP	MORTALITY	MORTALITY
0 - 0	2,898	58	2,734	44	102
0 - 4	1,840	10	1,820	7	17
5 - 9	1,950	8	1,930	6	14
10 - 14	1,920	14	1,860	9	23
15 - 19	3,560	48	3,560	23	71
20 - 24	8,140	114	5,450	32	146
25 - 29	3,070	44	2,860	19	63
30 - 34	1,560	28	1,330	12	40
35 - 39	1,380	41	1,130	18	59
40 - 44	810	34	620	14	48
45 - 49	650	34	530	15	49
50 - 54	390	25	310	11	36
55 - 59	310	29	220	12	41
60 - 64	160	22	180	15	37
65 - 69	100	22	120	17	39
70 OVER	160	77	230	90	167
		608		344	952

1.5 Site Selection For The Urban Development

The available land for the new urban development area will be defined as follows, referring to the existing land use and projected new development area for the port and the industry, and also the topography and the physical constraints in the Siracha - Laem Chabang area.

- The south of the existing Siracha built-up area
- The north of the Huai Yai river swamp area
- The east of the route 3
- The west of the Chachoengsao - Sattahip railway
  (the east of the railway will be preserved as the farm and the forestry)

Among these areas, three alternative locations for the urban development and the New Town, which accommodate the target population around 120,000 in 2001, are proposed as explained below.

(1) Alternative Site A

The area is located adjacent to the area for the industrial estate and the port on the east which the ESS recommended as the urban development area.

The reasons for selecting this location for establishing a New Town are as follows:

- Immediate proximity to the deep water port and industrial development area
- Proximity to a number of other centers of employment
- Easy access from the Route 3 and, subsequently, from the new railway
- Suitability of the topography for servicing, with access to the sea for a marine sewerage outfall
- Ease of establishment of new drainage and flood control system
- Potential for long term expansion

(2) Alternative Site B

The area is located between Chachoengsao - Sattahip railway track on the east and the foot of a hill on the west. The northern part of the area will be adjacent to the existing Siracha built up area.

The reasons for proposing this alternative location for a New Town are as follows:

- Immediate proximity to the existing built up area of Siracha (Tambon) and achieving continuity of the communities
- Easy access for the residents of the New Town to the existing urban services, such as medical, higher educational, commercial and etc.
- Availability of existing infrastructure, especially streets
- Generation of higher urban activities as a result of combination of the existing Siracha Town and the New Town

(3) Alternative Site C

The area is located in between Alternative Site A and Alternative Site B.

Site of the three alternatives are presented in Fig. III.1.5 Principal features of each alternative is explained in Table III.1.19 Three alternatives are comparatively analyzed from every aspect of development potential. As a result, alternative A is considered to be most desirable for the new town development and alternative B is desirable for a large scale residential development. For reference, three alternatives are tried to be numerically analyzed and compared as shown in Table III.1.19 and Table III.1.20.

Table III.1.19 COMPARISON of ALTERNATIVE SITES for URBAN DEVELOPMENT (1/2)

Factors to be Compared		Alternative A : The Site proposed by Eastern Seaboard Study	Alternative B : The Southern Area Adjacent to the existing Siracha build-up District	Alternative C : Combination of Alt. A and B	Remarks
Factors Related to Development Cost (by phasing)	Land Acquisition	Relatively costly.	Same as Alt. A	May be less expensive than Alt. A and Alt. B.	
	Infra-structure utilities	Water supply, drainage and sewerage system can be one system respectively.	Two (or three) systems for water sypply, drainage and sewerage may be required. Early construction of R = 3 bypass or service road is necessary.	Same as Alt. B (with more complication)	
	Earth work etc.	Minimum earth works are required for land formation.	More earth works than Alt. A are required for land formation.	Combination of Alt. A and Alt. B	
Availability of Land for Future Expansion (after year of 2000)	Industrial Area and (Port Area)	Industrial area can be expanded toward the south of the complex.	Industrial area can be expanded toward the south and east (Alt. A urban development area)	Combination of Alt. A and Alt. B.	
	Urban Area	Urban area can be expanded toward the north, eventually the urban area and the natural growth of Siracha Town will be combined.	Urban area can be expanded toward the south (Alt. A area etc.)	Combination of Alt. A and Alt. B.	
	Siracha Town (Natural growth)	Existing Siracha Town can be extended to the south, east and north.	Siracha Town can be extended to the east and north, southward extension will be limited by proposed new town (Alt. B site)	Same as Alt. B.	Extension toward the north and east are limited by a hill and railway truck.
Environmental Factors	Poilution from the oil refineries	Judging prevailing wind direction and the location of the plants, the area will not be affected heavily by the polluted exhaust from the existing oil refineries.	The area might be affected by polluted exhaust from the existing oil refinery plants.	Combination of Alt. A and Alt. B.	The new Industrial Development will not produce major hazard of poll pollution (Mostly light Industry)
	View from the Urban Development Area	The area is gradual sloping down to the coast, wide variety of views can be provided.	A hill located between the coast and the area will block the view to the sea from the area.	Combination of Alt. A and Alt. B.	
Others			Induced population of the new town will require and result upgrading urban functions of Siracha Town.		

Table III.1.19 COMPARISON of ALTERNATIVE SITES for URBAN DEVELOPMENT (2/2)

	Factors to be Compared	Alternative A : The Site proposed by Eastern Seaboard Study	Alternative B : The Southern Area Adjacent to the existing Siracha build-up District	Alternative C : Combination of Alt. A and B	Remarks
Availability of Land for Urban Development	Existing Land Use and Land Land Tenure	The area mostly used for agriculture with some local settlements. Parts of public owned land can be utilized for the development (IEAT, Ministry of Welfare)	The area mostly used for agriculture with some local settlements.	Combination of Alt. A and Alt. B.	
	Existing Facilities	A satelite station is located within the area. Transmission lines along railway truck.	Transmission lines running across the area. Large scale development may require re-alignment of the lines.	Combination of Alt. A and Alt. B.	Railway Stations are planed near to both Alt. A and Alt. B.
Suitability for Urban Development	Topography Drainage (Water supply)	The area is low lying coastal plain, the heig heights ranging from approx. 15 m. to 35 m.above sea level. Slope grade 2.5 3% approx.	The area is mostly low lying plain defined by a coastal hill on the west. The heights ranging from approx. 50 m. to 65 m. slope grades 2.5 5%. The areas is divided to be two separate basins.	Combination of Alt. A and Alt. B.	For Alt. B . and C, at least two separate drainage and sewerage systems are required.
	Soil Conditions	Sound soil conditions for Medium-rise Buildings.	Same as Alt. A.	Same as Alt. A	
Relationships Urban Development Area Industrial Complex and Siracha Town	Urban Development area - Industrial Complex.	Distance = approx. 0.2 8 km. along the boundary of these two area, buffer zone will be required.	Distance = approx. 2 12 km. more commuting services are required than Alt. A.	Combination of Alt. A and Alt. B.	
	Urban Development area- Siracha Town.	Distance : approx. 4 11.5 km. common facilities for the residents will be required from the early stage of the development. (or busing service to Siracha Town)	The urban development area can be considered as a extension of busing Siracha Town, Positively utilizing existing common facilities, especially at the early stage of development.	Combination of Alt. A and Alt. B.	

Table III.1.20 COMPARISON OF THREE ALTERNATIVE SITES

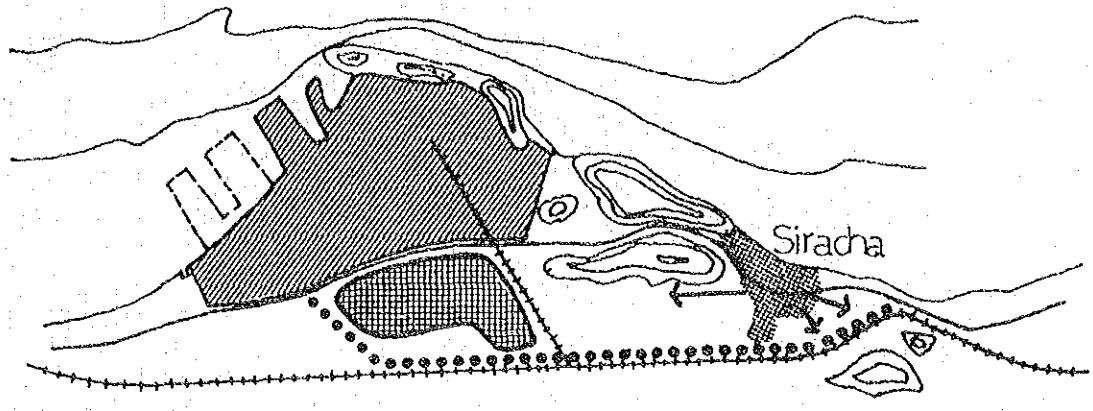
Factor to be considered	Weoght	Alt. A		Alt. B		Alt. C	
		Point	Score	Point	Score	Point	Score
Land Availability as a Large Parcel	3	3	9	2	6	2	6
Suitability of Topography, Soil Condition	2	3	6	3	6	3	6
Constrain by Existing Land Use	1	3	3	3	3	2	2
Availability of Existing Facilities	2	1	2	3	6	2	4
Constrain by Vegetation, Plants	1	3	3	2	2	2	2
Accesibility for the Route 3 and Railway	3	3	9	2	6	2	6
Proximity to Industrial and Port Site	3	3	9	1	3	2	6
Proximity to Existing Towns	3	1	3	3	9	2	6
Easiness of Sewage, Drainage Construction	3	3	9	2	6	2	6
Potential for Long Term Expansion	2	2	4	2	4	3	6
Environmental Impacts, Pollution and Noise	2	2	4	3	6	3	6
Cost of Land Acquisition	2	1	2	3	6	2	4
Easiness of Land Acquisition	3	3	9	2	6	1	3
TOTAL - SCORE	-	-	73	-	69	-	63

Note: (1) The degree of effects

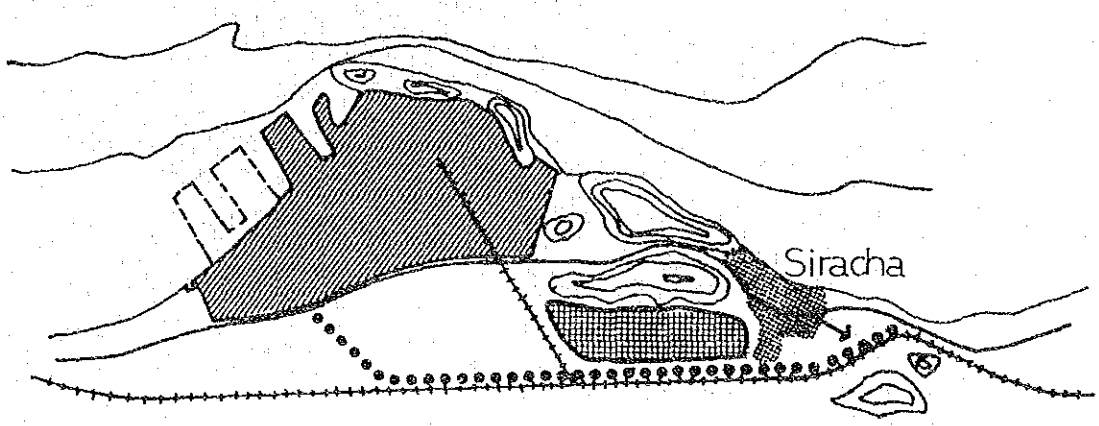
Point 3 : desirable or very good
2 : intermediate effect
1 : not desirable or no good

(2) Weight is given to each factor in proportion to importance.

(3) Score = weight x point



ALTERNATIVE A



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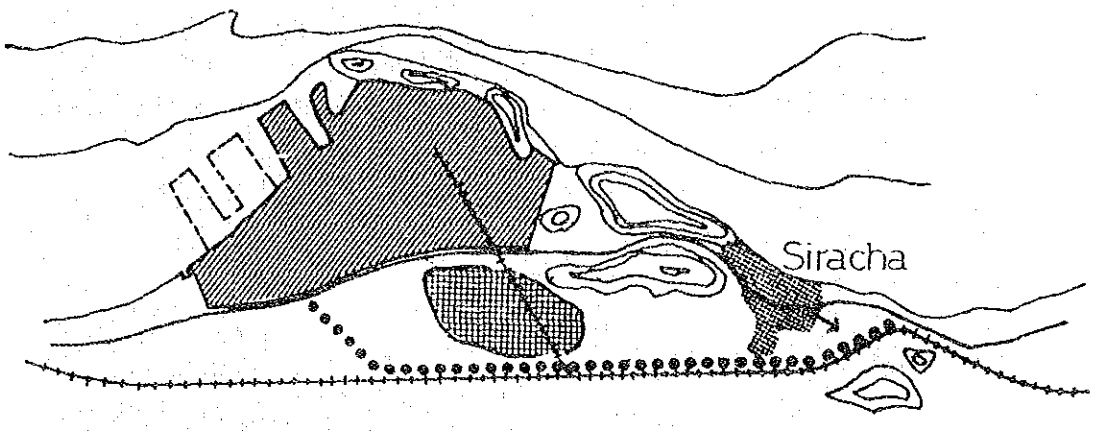

ALTERNATIVE C

LEGEND

URBAN DEVELOPMENT

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Fig. III.1.5
Three Alternative Sites for Urban Development

1.6 Land Use Plan

1.6.1 Basic Structure of Land Use

1) Principles for Planning

Land use plan is formulated in accordance with the following principles.

- The residential area in the new town will accommodate the estimated number of housing classified into several income groups.
- The common facilities, to support the daily lives of the new town residents, will be provided to meet the demands caused by the growth of population.
- The commercial center (New Town center) will be a new core to serve for the new town and the surrounding area with easy access from all residential areas in the Laem Chabang Development Planning Area.
- The communication system (Road Networks) will be designed to integrate all forms of transport and must be based on a clearly defined hiearchy of roads, and public transport routes.
- The development should be based upon a series of environmental areas from which extraneous traffic is excluded. These should be based on a maximum walking distance of about 500 - 800 m to primary schools, shops, public transport (Ex. bus stop) and other facilities.
- Pedestrians and vehicles should basically be separated. Well-defined pedestrian networks is to be achieved throughout the new town, linking the housing quaters with other various facilities.
- The buffer zones will be placed along the Inter and Intra Urban Primary Roads to protect residential environment from noises and air pollutions.

Land use characteristics by NHA	Percentage (%)
Land for housing and car park	60 - 70
Road, walkway and children park	17 - 22
Other component shopping center, park schools, car parking area, work office etc.	8 - 18

1.6.2 Community Facilities

The institutional, educational, medical, welfare and recreational facilities for the new town will be provided by the public sector, while commercial facilities would be basically developed by the private sector.

1) Neighborhood Community Facilities

There will be eight neighborhood units in the residential area in the new town in 2001 with the population of about 120,000 (117,680) and two neighborhood units with a population of about 24,000 in 1991.

A basic neighborhood unit in the new town will accommodate 12,000 to 15,000 people, which corresponds to a primary school district. In the Study, each neighborhood unit is assumed to have an average in formulating the development plan of community facilities such as schools, shopping area, parks and open space for the dwellers.

(1) Educational Facilities

The characteristics of the education in Thailand are summarized as follows:

Category	Age of Pupils & Students	Years of School
Pre-primary school (day-care center)	4 - 5	2 or 1
Primary school	6 - 11	6 /1
Secondary (lower)	(11 - 14)	3 /1
Secondary (upper)	(15 - 17)	3
University	18 - 23	4 - 6
Vocational school		

/1: Compulsory education for the planning criteria of educational facilities. The NHA's standard is primarily applied with modification where necessary.

In the Study, educational facilities required in the new town are planned according to the NHA's upper-ceiling standard. Basic assumptions and major factors for facilities planning are as summarized below.

Item	Kindergarden	Primary School	Secondary School
Population	3,600	14,500	29,000
Ratio (pupil/student per population)	0.07	0.14 /1	0.1
No. of pupil/student per facility	250	2,000 /2	2,900
Area of a facility (ha)	0.32	2.4	5.6-8.0
Total number of facilities	24-32	8	4
Total area in NT	7.68-10.24	19.2	22.4-32
Area allocated in the study (ha)	10	20	32

/1: 0.11 in the Amphoe Siracha
/2: Average figure of the Amphoe Siracha is 500.

Our study on the age structure of the population in the New Town shows less number of population in school aged group at the early stage of immigration. However, there is a remarkable tendency of the growing population in school aged group caused by the fact that the majority of the immigrant would be younger generations who would have high fertility rates.

At the early stage of the new town development all of the planned educational facilities would not be necessary to facilitate, but it would be necessary to reserve the land of the planned educational facilities for the later stage of the development.

The changes in school aged population, 1991 migrant group and school aged population 2001 based on the age structure of the population in the New Town and the Business & Commercial Area are shown Table III.1.21, III.1.22.

With reference to higher education, the existing technical colleges and vocational schools in the region will serve for the raising demand for the higher education. However, the port and industrial developments will require well trained personnels, higher educational facilities for these purpose would be essentially necessary in this complex. In the Business and Commercial Area of this development complex, a vacational school for industry and a training school for port are proposed. Those higher education institutions will hopefully grow as regional higher education facilities when the development successfully matures.

(2) Community Center Facilities

Based on the discussions with the NHA, it will be necessary for every two neighborhood units to have a community center to function as core of the community.

These facilities in the community center includes the following.

- A secondary school
- Health center
- Post office
- Police sub-station
- Telephone booth
- Car parking lot
- Shopping facilities

(3) Community Facilities for a neighborhood unit

Community facilities of a neighborhood unit comprises the following.

- A primary school
- Kindergardens and Day-care centers (3 - 4)
- Children playground (4)
- Police box
- Mail box, Telephone booth
- Bus stops
- Laundry (private)
- Pharmacy (private)
- Local health clinic (private)
- Several shops (private)
- Neighborhood Park

2) Commercial Center (New Town Center)

The commercial center has the multi-functional zones comprising the following facilities with the total area of 37 - 40 ha.

- Commercial and Business Zone (14 - 15 ha)

  Nuclear market, fresh market / food market, retails/shops/shopping center, banks, restaurants, offices, hotel, amusement facilities, exhibition hall and theatre, car parking

- Public, Civic and Governmental Zone

  Government offices, police station, fire station, central post office, telephone office

- Cultural Zone (2.5 - 3 ha)

  Civil center (City hall), auditorium, public library

- Health Zone

  A Hospital, clinic, doctors office, dental office and pharmacy shops

- Other Area

  Plaza and open space, bus terminal

Some parts of the commercial and business functions would be performed by shophouses along Local Roads and Collectors which would encourage the residents in the commercial and business activities and would reinforce the human activities along the streets in the New Town. In this case, the area for the commercial center would be reduced to around 20 ha.

The detail information on the community facilities is shown in appendix III-7.

1.6.3 Parks and Open Space

Parks and open spaces would be planned to provide a good living environment for the inhabitants. They comprise the district park, neighborhood parks, playgrounds, malls and tot lots etc.

1) District Park

District park is a spot with amenity and rest provided with benches, pergolas, ponds, trees and botanical gardens for recreational activities and various sports facilities. The total area would be about 22 ha (138 rai) or 2.4% of the new town area, composed of the park and recreational spaces and sports fields.

2) Neighborhood Parks and Playgrounds

One neighborhood park will be provided for each neighborhood unit, with land area of 2 ha with outdoor sports fields. For community open space, the field of secondary school could be utilized.

In addition to the neighborhood parks, four playgrounds will be provided in a neighborhood unit within a walking distance of about 250 to 300 meters and about 0.25 ha of each area to be used by children in a kindergarden area.

Total neighborhood parks' area is assumed at 16 ha. Total area for playgrounds is about 8 ha for the new town.

Playlots (tot lots) will be provided for each 40 - 50 dwelling units and will have around 400 m^2 per lot.

3) Malls and Pedestrian Ways

Malls and pedestrian ways would be planned in addition to roads and streets in the new town.

4) Buffer Zones

Along the Inter Urban and Intra Urban Primary Roads, buffer zones will be provided in order to protect a healthy and confortable living environment in the New Town from traffic nuisances.

Table III.1.21 CHANGES OF SCHOOL AGED POPULATION, 1991 MIGRANT GROUP IN THE NEW TOWN AND BUSINESS & COMMERCIAL AREA

AGE	1991			1996			2001		
	NEW TOWN	B&C AREA	TOTAL	NEW TOWN	B&C AREA	TOTAL	NEW TOWN	B&C AREA	TOTAL
4 - 5	752	31	783	1,008	42	1,050	1,194	50	1,244
6 - 11	2,300	96	2,396	2,227	93	2,320	3,291	137	3,428
12 - 17	3,258	136	3,394	2,280	95	2,375	2,234	93	2,327

Table III.1.22 SCHOOL AGED POPULATION, 2001 TOTAL IN THE NEW TOWN AND BUSINESS & COMMERCIAL AREA

AGE	POPULATION
4 - 5	4,290
6 - 11	11,560
12 - 17	12,070

Table III.1.23 LAND USE OF NEW TOWN (MASTER PLAN)

			(ha)	(Rai)	(%)
1.	Residential Use		(484)	(3,025)	52.0
2.	Community Use		(33)	(206)	3.5
	1)	Town Centre	20	125	
	2)	Community Centre (4.3 x 3)	13	81	
3.	Schools		(62)	(387)	6.7
	1)	Secondary School (8ha x 4)	32	200	
	2)	Primary School (2.5ha x 8)	20	125	
	3)	Kindergarden (0.32hax32)	10	62	
4.	Parks		(56)	(350)	6.0
	1)	District Park (22ha x 2)	22	138	
	2)	Neighborhood park (2ha x 8)	16	100	
	3)	Playground (0.25hax32)	8	50	
	4)	Play lot (0.04hax240)	10	62	
5.	Buffer Green	(4,700ha x 100m)	(47)	(293)	5.1
6.	Roads		(205)	(1,280)	22.0
	1)	District Distribution 40m x 6,600m	26	162	
	2)	Local Road 25m x 13,400m	34	212	
	3)	Collector 15m x 7,700	12	75	
	4)	Access & Pedestrian way 4-9mx221,700	133	831	
7.	River & Canal		(9)	(56)	1.0
8.	Water Filtration Plant		(12)	(75)	1.3
9.	Water Distribution Basin		(4)	(25)	0.4
10.	Power line & Gas pipeline		(18)	(113)	2.0
Total:			930.0	5,810	100.0

1.7 Housing Development Plan

1.7.1 Housing Planned in the New Town

Based on the assumptions on the employment and population for the New Town, around 26,100 dwelling units are estimated. For the immigrant employees, the number of the dwelling units are figured out applying the NHA's method, and the natural growth of households are added for the 1996 and 2001 planned dwelling units.

DWELLING UNITS IN NEW TOWN

	1991	1996	2001	TOTAL
1991 MIGRANT GROUP	5,133/1	384/2	1,719/2	7,236
1996 - DO -	-	10,335/1	764/2	11,099
2001 - DO -	-	-	7,803/1	7,803
TOTAL	5,133	10,719	10,286	26,138

/1: Dwelling units were figured out by NHA method, employments in New Town ⟶ D.U. in New Town.

/2: Natural growth of households, excluding one-person households and unrelated individuals.

The detailed informations on the number of households in the new town are shown table III.1.24 - III.1.29

1.7.2 Income Structure of Households/1

Considering income structure of workers in transportation and industries and others who will be induced by the development and the NHA's method of classifying income level of induced employment, following classification of income structure of households are estimated.

/1: In this case, a household represents a person or a group of persons who live in a housing unit.

Category	Income Level	NHA's Standard	Pattaya	Laem Chabang D.U. /2
Group A	3,000-5,000 B/mo.	35%	25%	25% 6,520
Group B	5,001-9,000 B/mo.	50%	54%	65% 16,970
Group C	Over 9,001 B/mo.	15%	21%	10% 2,610

Note: Income includes basic salary, bonus and pension etc.

/2: Dwelling Units in the New Town.

The detailed informations on the work status of the employees to live in the new town are shown Table III.1.30, III.1.31.

1.7.3 Types and Number of Housing Units

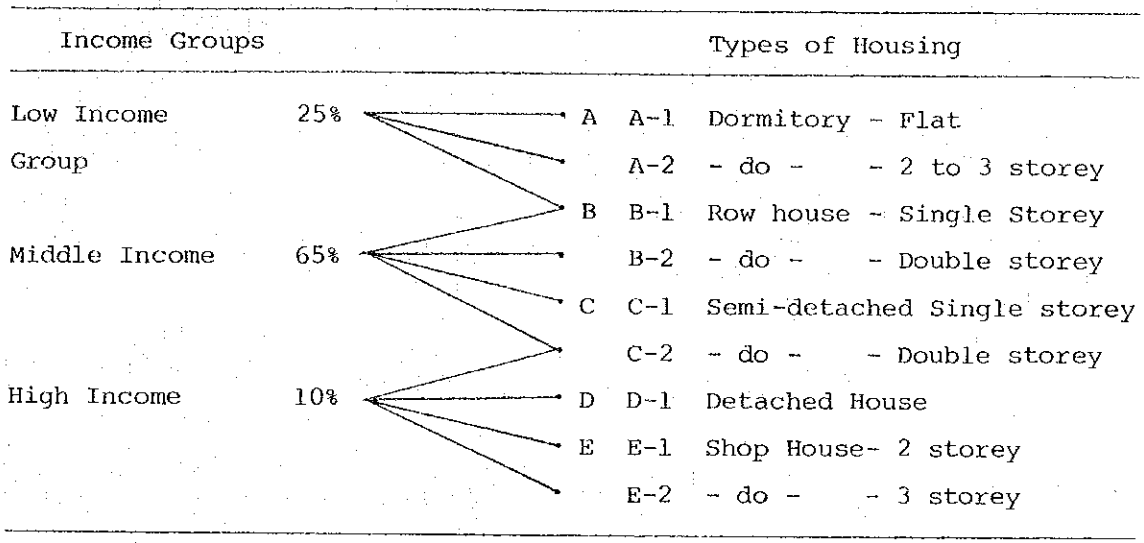
1) Types of Housing Units

It was clarified through discussing with NHA, that there are five basic different housing types with different plot sizes and family types as below.

		Type of Housing	Average Plot* Size (M^2)	Family Types
A	A-1:	Domitory - Flat	80 - 100	for Single
		- do - - 2 to 3 storey		- do -
B	B-1:	Row House- Single storey	100 - 120	- do - for Family
		- do - - Double storey		- do - with children
C	C-1:	Semi-Detached	180 - 200	- do -
D	D-1:	Detached House	240 - 400	- do -
E	E-1:	Shop House - 2 storey	56 - 64	- do -
	E-2:	- do - - 3 storey		- do -

* For longterm plan the average plot size will vary related to the future social and economic conditions.

Employment and population distribution over these categories of housing type is assumed as below.



2) Types and Number of Housing Units and Land Requirement

Types and number of housing units are figured out applying the NHA's method and the natural growth of households are alocated following the same pattern as dwelling units distribution of induced employment. The result of the caliculation of the types and number of housing units and the land area requirement for the net residential use based on the NHA standard are shown below.

Type of Housing	Average * Plot Size (m^2)	No. of Houses	Net Res. Area (ha)
B-1 or -2	100 - 140	20,140	201.4 - 282.0
C-1	180 - 200	3,340	60.1 - 66.8
C-2	180 - 200	1,150	20.7 - 23.0
E-1 or -2	56 - 64	940	5.3 - 6.0
D-1 or -2	240 - 400	530	12.7 - 21.2
Total	-	26,100	300.2 - 399.0

* For the long term plan the average plot size will vary related to the future social and economic conditions.

Some parts of the New Town would be developed by private developers and the average plot size may be larger than NHA standard. In this case the net residential area requirement would be larger than this figure.

1.7.4 Density Distribution

It will be essential to keep a balance among the low, middle and high density areas with the mixture of all types of housing in the residential area of the new town.

With reference to the density distribution of housing in the new town, peak density areas will usually concentrate on around the commercial center area and the density will decrease gradually toward the outer area of the new town. (Fig. III.1.6)

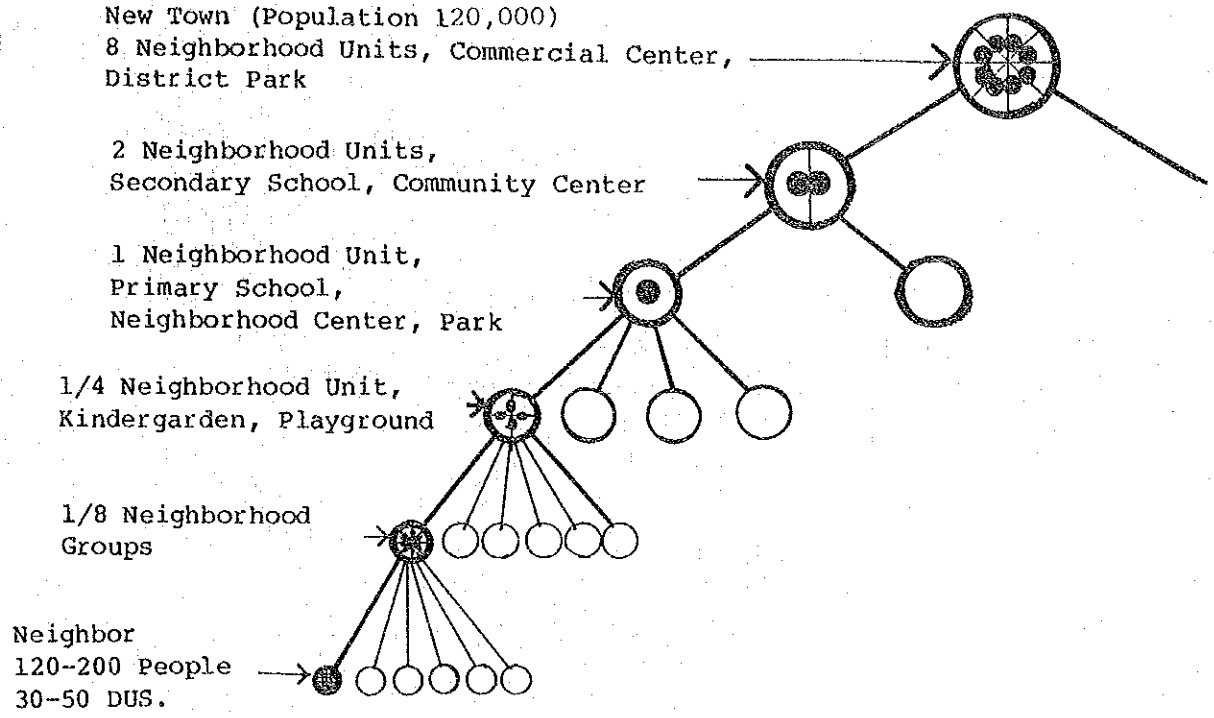
1.7.5 Typical Zoning of Housing Estate

1) Neighborhood Units and Community Structure

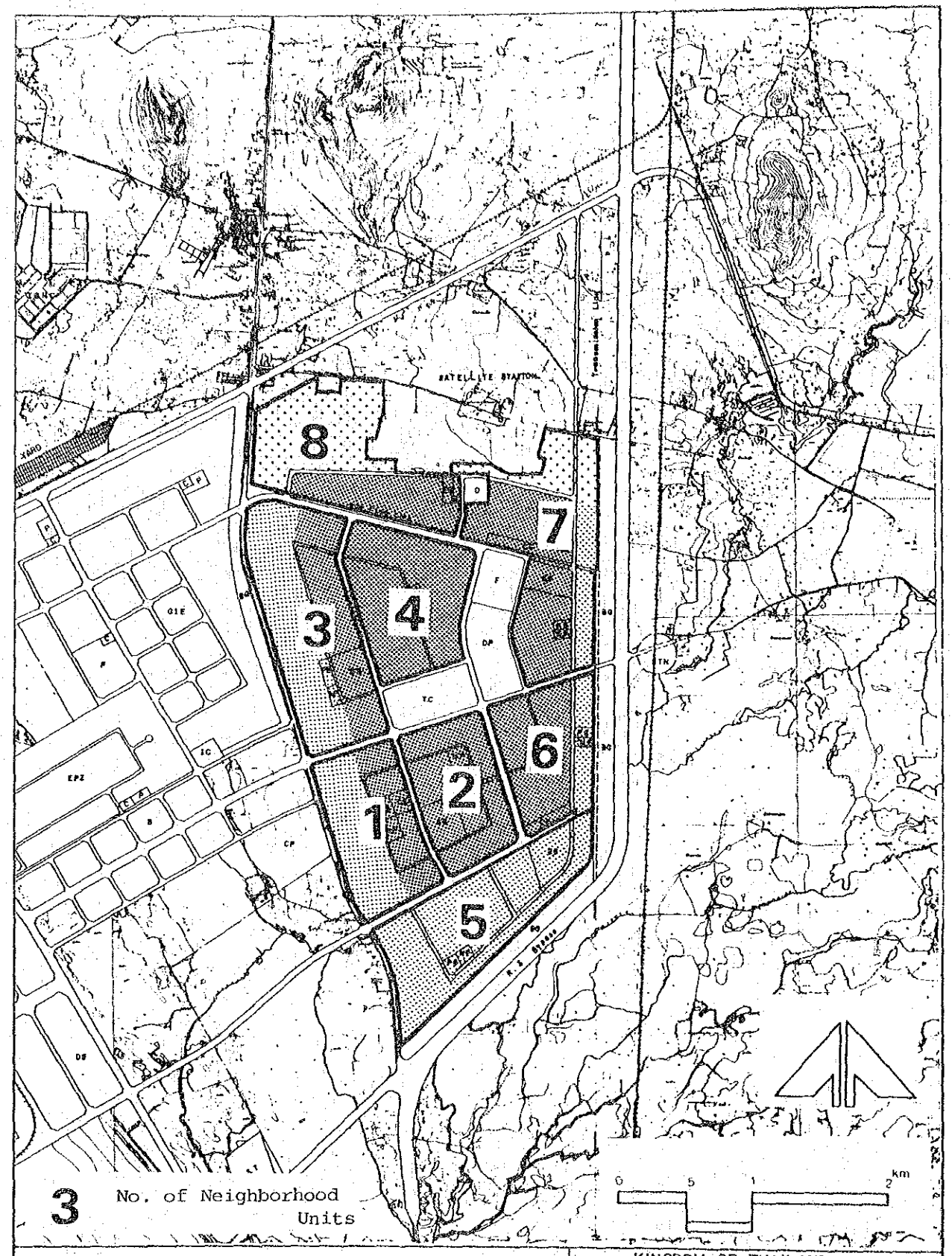
A basic unit in the community structure comprises primary school, local shops, public transport facilities and has a support population of around 14,450 in a planned area of about 100-120 hectare with a variety of the density.

The maximum desirable distance to transport facilities will be taken as 0.5 to 0.8 km or 5 to 10 minutes walking time. Usually distance for walking travel is up to 1.6 km. A public transport service will be available with stops about 800 meter interval. Basic residential unit is planned with flexibility capable of allowing variations in densities and housing types.

The hierarchy of grouping of dwellings in relation to the residential dwelling units is considered as follows:



Hierarchy of Grouping by Dwellings
Related to the Residential Units



3 No. of Neighborhood Units

LEGEND

- High Density Area
- Medium Density Area
- Low Density Area

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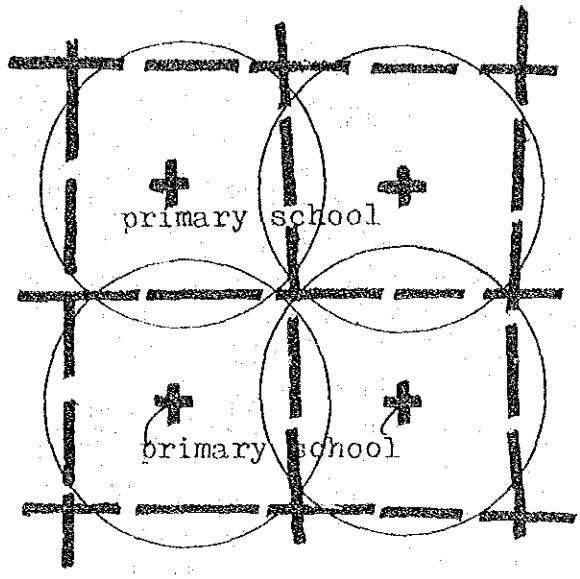
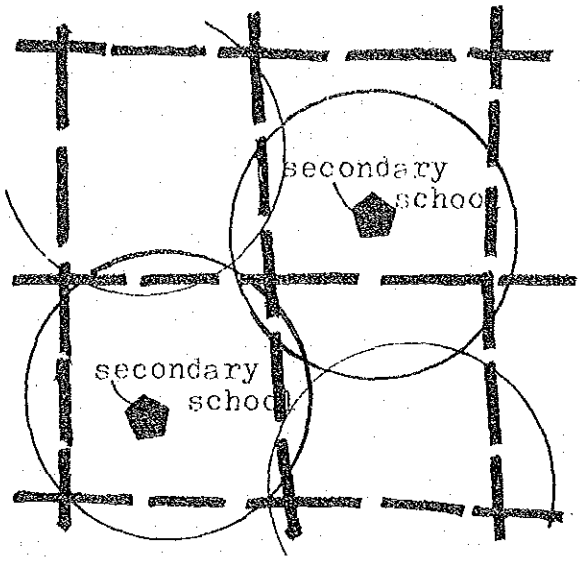
Fig. III.1.6
Housing Distribution by Density

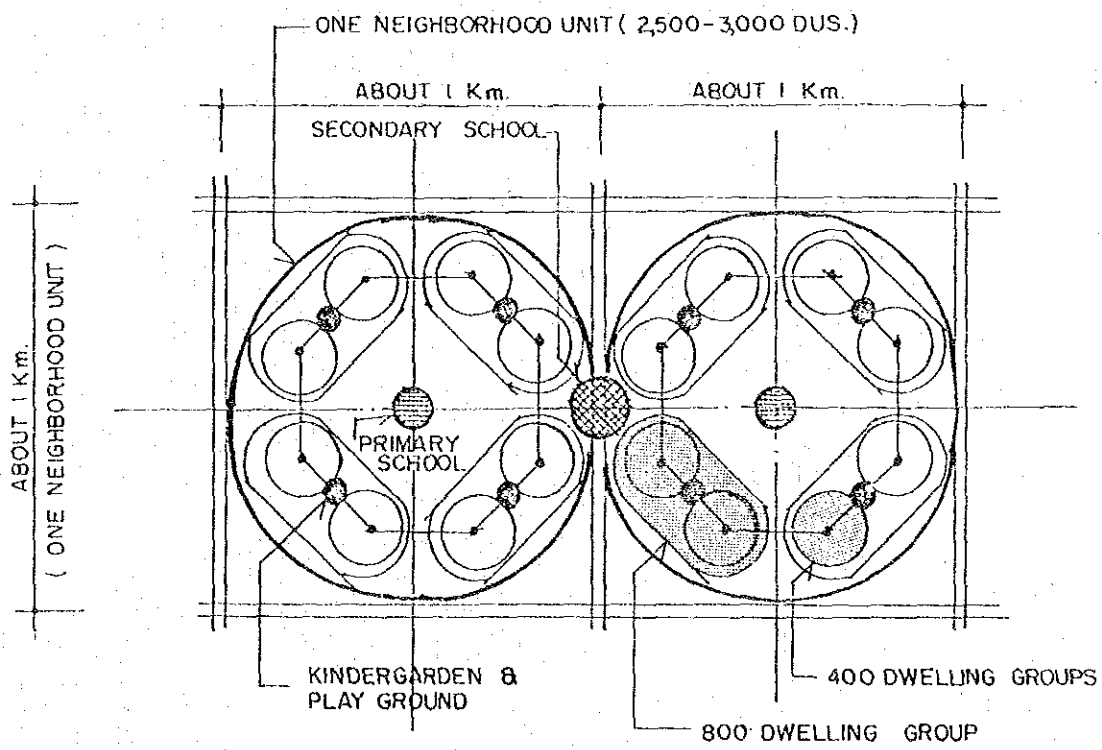
Neighborhood unit related to primary school



Neighborhood unit related to secondary school



The diagram shows the relation between dwellings and community facilities in two neighborhood units.



2) Residential Area Layout

The basic guideline for residential development is to establish a healthy and comfortable living environment with sufficient infra-structures and urban facilities. Layout plan should be formulated in line with the following principles.

(1) The existing roads and paths would be utilized as community route or pedestrian ways. An efficient use of other existing infrastructure facilities which at present links community facilities in the new town and villages must be kept in mind.

(2) Pedestrian ways or malls will be designed to connect the entire residential areas for people's daily life.

(3) Natural condition in the residential site should be fully utilized in residential layout.

(4) Car parking spaces should be conveniently accessible from residential area. Car spaces for low income and middle income groups housing or flats, rows and semi-detached houses will be centralized into some lots. Detached house, some of semi-detached houses and shop houses would be provided with garages in their own plots.

A typical residential layout is shown in Fig. III.1.7.

Table III.1.24 HEAD OF HOUSEHOLD RATIO BY SEX AND AGE GROUPS AND HOUSEHOLD RATIO OF UNRELATED INDIVIDUALS BASED ON 1980 POPULATION & HOUSING CENSUS, CHANGWAT CHON BURI

AGE GROUP	MALE		FEMALE	
	HEAD OF HOUSEHOLD RATIO	HOUSEHOLD /1 RATIO OF UNRELATED INDIVIDUALS	HEAD OF HOUSEHOLD RATIO	HOUSEHOLD /1 RATIO OF UNRELATED INDIVIDUALS
14 - 19	0.0194	0.3513	0.0075	0.4254
20 - 24	0.1230	0.1681	0.0267	0.3888
25 - 29	0.4492	0.0843	0.0533	0.2838
30 - 34	0.6387	0.0489	0.0788	0.2035
35 - 39	0.7824	0.0305	0.1119	0.1380
40 - 44	0.8466	0.0288	0.1600	0.0819
45 - 49	0.8756	0.0261	0.2104	0.0879
50 - 59	0.8757	0.0285	0.2689	0.0658
55 - 59	0.8875	0.0398	0.3038	0.0950
60 - 64	0.8520	0.0406	0.3500	0.1276
65 - 69	0.8183	0.0540	0.3900	0.1503
70 OVER	0.6754	0.0547	0.8219	0.1715

/1 : Including one-person households

Table III.1.25 NUMBER OF HOUSEHOLDS IN THE NEW TOWN, FIGURED OUT BY APLLYING HEAD OF HOUSEHOLD RATIO, 1980 CENSUS, CHANGWAT CHON BURI

(1991 MIGRANT GROUP, 1991 HOUSEHOLDS)

AGE GROUP	MALE			FEMALE			TOTAL		
	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	EXCLUDING UNRELATED INDIVIDUALS H.
14 - 19	1,960	38	13	1,960	15	6	53	19	34
20 - 24	4,060	500	84	2,720	73	28	573	112	461
25 - 29	1,530	688	58	1,420	76	22	764	80	684
30 - 34	780	499	24	660	52	11	551	35	516
35 - 39	690	540	16	570	64	9	604	25	579
40 - 44	400	339	10	310	50	4	389	14	375
45 - 49	320	281	7	260	55	5	336	12	324
50 - 54	200	176	5	160	43	3	219	8	211
55 - 59	150	134	5	110	34	3	168	8	160
60 - 64	80	69	3	90	32	4	101	7	94
65 - 69	50	41	2	60	24	4	65	6	59
70 OVER	80	54	3	110	91	16	145	19	126
TOTAL	10,300	3,359	230	8,430	609	115	3,968	345	3,623

Table III.1.26 NUMBER OF HOUSEHOLDS IN THE NEW TOWN, FIGURED OUT BY APLLYING HEAD OF HOUSEHOLD RATIO, 1980 CENSUS, CHANGWAT CHON BURI

(1991 MIGRANT GROUP, 1996 HOUSEHOLDS)

AGE GROUP	MALE			FEMALE			TOTAL		
	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	EXCLUDING UNRELATED INDIVIDUALS H.
14 - 19	1,145	23	8	1,116	9	4	32	12	20
20 - 24	1,745	215	36	1,759	47	18	262	54	208
25 - 29	4,000	1,797	151	2,703	144	41	1,941	192	1,749
30 - 34	1,507	963	47	1,410	112	23	1,075	70	1,005
35 - 39	766	600	18	653	73	10	673	28	645
40 - 44	668	566	16	560	90	7	656	23	633
45 - 49	382	335	9	302	64	6	399	15	384
50 - 54	302	265	8	252	68	5	333	13	320
55 - 59	186	165	7	154	47	4	212	11	201
60 - 64	135	115	5	104	37	5	152	10	142
65 - 69	68	56	3	82	32	5	88	8	80
70 OVER	78	53	3	116	96	16	149	19	130
TOTAL	10,982	5,153	311	9,211	819	144	5,972	455	5,517

Table III.1.27 NUMBER OF HOUSEHOLDS IN THE NEW TOWN, FIGURED OUT BY APPLYING HEAD OF HOUSEHOLD RATIO, 1980 CENSUS, CHANGWAT CHON BURI

(1991 MIGRANT GROUP, 2001 HOUSEHOLDS)

AGE GROUP	MALE			FEMALE			TOTAL		
	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	EXCLUDING UNRELATED INDIVIDUALS H.
14 - 19	1,168	23	8	1,110	9	4	32	12	20
20 - 24	939	116	19	919	25	10	141	29	112
25 - 29	1,720	773	65	1,748	94	27	867	92	775
30 - 34	3,942	2,518	123	2,684	212	43	2,730	166	2,564
35 - 39	1,480	1,158	35	1,397	157	22	1,315	57	1,258
40 - 44	743	629	18	643	103	8	732	26	706
45 - 49	639	560	15	547	115	10	675	25	650
50 - 54	362	317	9	294	79	5	396	14	382
55 - 59	283	252	10	243	74	7	326	17	309
60 - 64	169	144	6	145	51	7	195	13	182
65 - 69	116	95	5	95	37	6	132	11	121
70 OVER	94	64	4	142	117	20	181	24	157
TOTAL	11,655	6,649	317	9,967	1,073	169	7,722	486	7,236

Table III.1.28 NUMBER OF HOUSEHOLDS IN THE NEW TOWN, FIGURED OUT BY APPLYING HEAD OF HOUSEHOLD RATIO, 1980 CENSUS, CHANGWAT CHON BURI

(1996 MIGRANT GROUP, 1996 HOUSEHOLDS)

AGE GROUP	MALE			FEMALE			TOTAL		
	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	EXCLUDING UNRELATED INDIVIDUALS H.
14 - 19	3,940	77	27	3,930	30	4	107	31	76
20 - 24	8,140	1,001	168	5,450	146	62	1,147	230	917
25 - 29	3,070	1,379	116	2,860	153	43	1,532	159	1,373
30 - 34	1,560	997	49	1,330	105	21	1,102	70	1,032
35 - 39	1,380	1,080	33	1,130	127	18	1,207	51	1,156
30 - 44	810	686	33	620	100	8	786	41	745
45 - 49	650	570	15	530	112	10	682	25	657
50 - 54	390	342	10	310	84	6	426	16	410
55 - 59	310	276	11	220	67	6	343	17	326
60 - 64	160	137	6	180	63	8	200	14	186
65 - 69	100	82	4	120	47	7	129	11	118
70 - OVER	160	108	6	230	189	32	297	38	259
TOTAL	20,670	6,735	478	16,910	1,223	225	7,958	703	7,255

Table III.1.29 NUMBER OF HOUSEHOLDS IN THE NEW TOWN, FIGURED OUT BY APPLYING HEAD OF HOUSEHOLD RATIO, 1980 CENSUS, CHANGWAT CHON BURI

(1996 MIGRANT GROUP, 2001 HOUSEHOLDS)

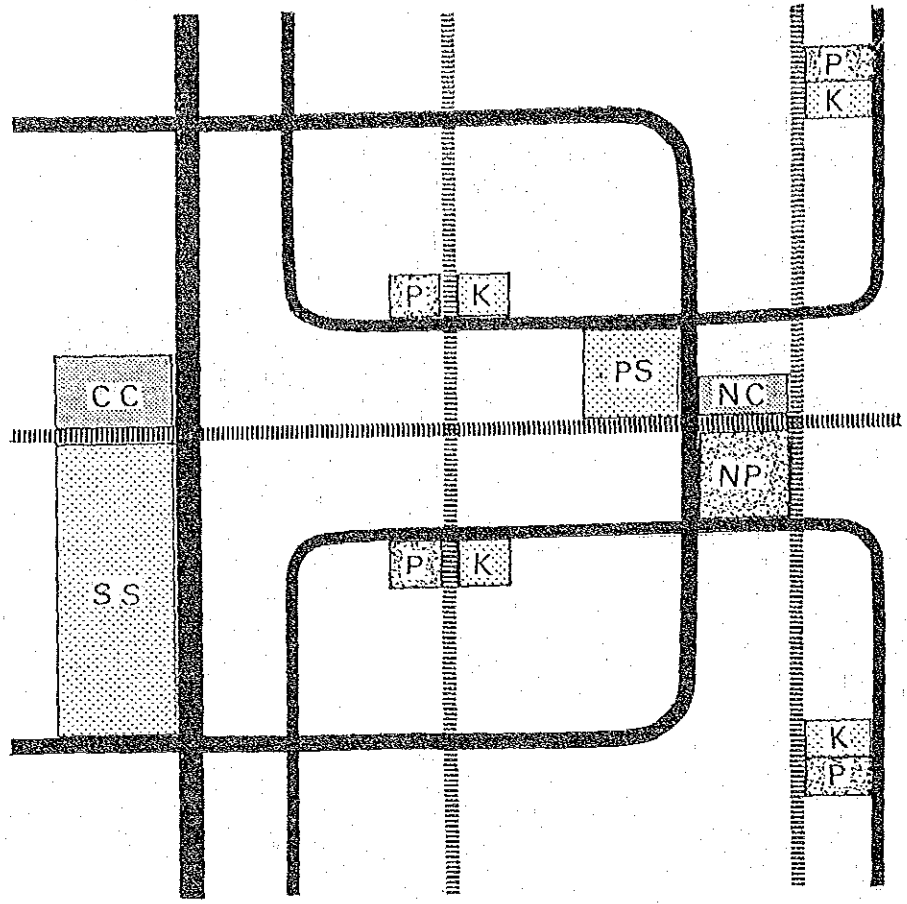
AGE GROUP	MALE			FEMALE			TOTAL		
	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	POPULATION	HOUSEHOLD	UNRELATED INDIVIDUALS	HOUSEHOLD	UNRELATED INDIVIDUALS HOUSEHOLD	EXCLUDING UNRELATED INDIVIDUALS H.
14 - 19	2,295	45	16	2,235	17	2	62	18	44
20 - 24	3,512	432	73	3,539	95	32	527	105	422
25 - 29	8,026	3,606	304	5,418	289	82	3,895	386	3,509
30 - 34	3,026	1,933	95	2,841	224	46	2,157	141	2,016
35 - 39	1,533	1,200	37	1,318	148	20	1,348	57	1,291
40 - 44	1,339	1,134	33	1,112	178	15	1,312	48	1,264
45 - 49	775	679	18	606	128	11	807	29	778
50 - 54	616	540	15	515	139	9	679	24	655
55 - 59	365	324	13	299	91	9	415	22	393
60 - 64	281	240	10	208	73	9	313	19	294
65 - 69	138	113	6	165	65	10	178	16	162
70 - OVER	162	110	6	244	201	34	311	40	271
TOTAL	22,068	10,356	626	18,500	1,648	279	12,004	905	11,099

Table III.1.30 WORK STATUS OF THE EMPLOYEES TO LIVE IN THE NEW TOWN

Item	1996 Total	1996 Manager	1996 Skilled Labor	1996 Unskilled Labor	2001 Total	2001 Manager	2001 Skilled Labor	2001 Unskilled Labor
1. Direct Induced Employee								
1) Industrial Estate	12,100	290	908	10,902	7,590	182	569	6,839
	(100)	(2.4)	(7.5)	(90.1)	(100)	(2.4)	(7.5)	(90.1)
2) Port	3,060	61	673	2,326	3,060	61	673	2,326
	(100)	(2.0)	(22.0)	(76.0)	(100)	(2.0)	(22.0)	(76.0)
3) Higher Education & Research & Development	450	12	405	33	450	12	405	33
	(100)	(2.7)	(90.0)	(7.3)	(100)	(2.7)	(90.0)	(7.3)
4) Construction	810	8	105	697	450	5	58	387
	(100)	(1.0)	(13.0)	(86.0)	(100)	(1.0)	(13.0)	(86.0)
5) Offices	900	37	294	569	900	37	294	569
	(100)	(4.1)	(32.7)	(63.2)	(100)	(4.1)	(32.7)	(63.2)
6) Multiplier Effect	7,010	287	2,292	4,431	5,710	234	1,867	3,609
	(100)	(4.1)	(32.7)	(63.2)	(100)	(4.1)	(32.7)	(63.2)
7) TORC, ESSO, SRI	750	18	56	676	500	12	38	450
	(100)	(2.4)	(7.5)	(90.1)	(100)	(2.4)	(7.5)	(90.1)
TOTAL	25,080	713	4,733	19,634	18,660	543	3,904	14,213
	(100)	(2.8)	(18.9)	(78.3)	(100)	(2.9)	(20.9)	(76.2)

Table III.1.31 SUMMARY OF WORK STATUS OF THE EMPLOYEES TO LIVE IN THE NEW TOWN

Item	Total	Manager	Skilled Labor	Unskilled Labor
1991	12,600	330	2,193	10,077
1996 + 2001	43,740	1,256	8,637	33,847
TOTAL	56,340	1,586	10,830	43,924
	(100)	(2.8)	(19.2)	(78.0)



Road

Pedestrian Way

S S Secondary School

PS Primary School

K Kinder Garden

NP Neighborhood Park

P Play Ground

C C Community Centre

N C Neighborhood Centre

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Fig. III.1.7
Typical Residential Layout

2. SHORT-TERM DEVELOPMENT PLAN

2.1 Population Projection

2.1.1 Employment Projection

Employment for short term development of Laem Chabang Complex is estimated as below.

Table III.2.1 EMPLOYMENT FOR SHORT TERM DEVELOPMENT

1.	Direct Induced Employee	1) Industrial Estate Employee	
		EPZ	5,430 persons
		GIE	4,040
		2) Port	7,200
2.	Multiplier Effect Employee		8,130
	Total		24,800

Employees above are allocated to each area of the Complex as shown in Table III.2.2.

Table III.2.2 ALLOCATION OF EMPLOYEE FOR SHORT TERM

Item	(persons)	(%)
1. Industrial Estate		
EPZ	5,430	19.5
GIE	4,040	14.5
Industrial Center	112	0.4
2. Port (wharf & distribution area)	3,636	13.1
3. Business and Commercial Area/1	7,177	25.8
4. Transportation	960	3.5
5. New Town	3,379	12.2
6. Others	66	0.2
Sub-total	24,800	89.2
7. SRI, TORC, ESSO	3,000	10.8

Note: /1: See Appendix III-1 for detail.

2.1.2 New Town Population Projection

Population in New Town is calculated according to the procedure summarized in Table III.2.3 and obtained as below.

Population in New Town : 24,000

Population in other area (including business and commercial area) : 8,100

The multiplier effect of the direct induced employment will not be fully expected in short-term.

Population in the New Town for the short term development is forecasted to be 21,400 persons as minimum case and 27,000 persons as maximum case. A planned population 24,000 persons in the New Town is calculated as the mean of minimum and maximum numbers.

Table III.2.3 PROJECTION OF EMPLOYMENT AND POPULATION IN NEW TOWN FOR SHORT TERM

	A. Employment	B. Locally Available Employment	Allocation of Employment	
			New Town	Other ARea
EPZ & GIE	9,470	3,450	5,420/2	600
Port	7,200	2,620	4,120/2	460
Multiplier Effect	5,700 (Min.) -10,530 (Max.)/7 (mean = 8,130)	3,840	1,100 -4,010/3 (mean=2,580)	760 -2,680 (mean=1,710)
SRI, TORC, ESSO	3,000	1,090	480/4	1,430
Total	25,370 -30,200 (mean = 27,800)	11,000/1	11,120 -14,030 (mean=12,600)	3,250 -5,170 (mean=4,200)
Population			21,400 -27,000/5 (mean=24,000)	6,250 -10,000 (mean=8,100)

Note: /1: 7.5% of labor force in 30 km radius from Laem Chabang

/2: 90% of Migrant Employment = (A - B) x 0.9

/3: 60% of Migrant Employment = (A - B) x 0.6

/4: 25% of Migrant Employment = (A - B) x 0.25

/5: $\frac{\text{Population}}{\text{Employment}} = 1.92$

/6: For minimum case of multiplier effect, refer to Appendix III-1.

/7: Maximum case of multiplier effect is calculated based on ESS coefficient.

2.1.3 Age and Sex Distribution

1) Male and Female Distribution of Migrants

Male and Female distribution of migrants is assumed to follow the same pattern as induced employments.

Following assumption was made to figure out the sex distribution of induced employments, as shown Table III-2.4.

Table III.2.4 MALE AND FEMALE DISTRIBUTION OF INDUCED EMPLOYMENT

Area	No. of Employee			Male		Female	
				%	No.	%	No.
Port	7,200	Wharf & Commercial Distribution	3,636	95	3,454	5	182
		Business/1 & commercial	3,564	52	1,853	48	1,711
EPZ/2	5,430			15	815	85	4,615
GIE	4,040			58	2,343	42	1,697
Multiplier/3	8,120			59	4,791	41	3,329
SRI, TORC, ESSO	3,000			58	1,740	42	1,260
Total	27,790			54	14,996	46	12,794

Note: /1: Based on the sex distribution of economically active population of Commerce; Services and Banks & other Financial Institutions, Insurance and Real Estate. (1980 Population & Housing Census, Changwat Chonburi)

/2: Based on Lad Krabang EPZ.

/3: Based on the sex distribution of economically active population of all industry excluding Agriculture, Forestry, Hunting & Fishing; Mining & Quarring and Activities not Adequately Described or Unknown. (1980 Population & Housing Census, Changwat Chonburi)

As a result, male and female distribution of migrants is calculated to be 54% and 46% for male and female respectively.

2) Age Sex Distribution of Migrants

Following datas of age sex distribution of migrants are studied related to migrants to the study area, outcome is shown in Table III-2.5 - III-2.8 and Fig. III-2.1 - III-2.2.

- Migrant to Changwat Chonburi 1965 - 1970, 1975 - 1980
- Migrants to Central Region (excluding Bangkok Metropolis) 1975 - 1980
- Migrants to Bangkok Metropolis 1975 - 1980

Generally, age sex distributions of migrants in three cases show similar pattern as follows.

(1) 20 - 24 age group of migrants shows highest percentage among other age groups.

(2) 25 - 29 or 15 - 19 age groups are next highest.

Comparing three cases following characteristics of age sex distribution can be mentioned.

(1) In case of Bangkok, Female 15 - 19 age group shows higher percentage than Central Region and Changwat Chonburi and both male and female of 10 - 14 age group and lower age groups show extremely low percentage than other two cases.

(2) In case of Changwat Chonburi, 20 - 24 age group of male shows extremely high percentage, and during 1975 - 1980 figure shows much higher percentage than during 1965 - 1970.

(3) In case of Central Region, age sex distribution of migrants shows better ballance than other two cases.

For age sex distribution of migrant population, there is no decent example exactly applicable to Laem Chabang Development Project. It is considered that either age sex distribution of migrants to central Region or Changwat Chonburi could be used as basic pattern of age sex distribution of migrants for the development area. Considering that Laem Chabang is located in Changwat Chonburi, age sex distribution of Changwat Chonburi 1975 - 1980 is basically applied to the New Town population in this study with some adjustments that is required by the characteristics of Laem Chabang development. Adjustments made are summarized as follows:

(1) Sex distribution

	Male	Female
Changwat Chonburi	58%	42%
New Town	54%	46%

These percentages for the New Town are from male and female distribution of induced employments.

(2) Male and Female distribution of age groups 15 - 19 and 20 - 24 is adjusted, because large number of employments in EPZ will be female of these age groups.

The result of calculation is shown as follows:

Age Group	Total	Male (%)	Female (%)
0 - 4	1,830	920 (7.1)	910 (8.2)
5 - 9	1,930	970 (7.5)	960 (8.7)
10 - 14	1,890	960 (7.4)	930 (8.4)
15 - 19	3,540	1,770 (13.7)	1,770 (16.1)
20 - 24	6,780	4,060 (31.3)	2,720 (24.6)
25 - 29	2,950	1,530 (11.8)	1,420 (12.9)
30 - 39	2,700	1,470 (11.3)	1,230 (11.1)
40 - 49	1,290	720 (5.6)	570 (5.2)
50 - 59	620	350 (2.7)	270 (2.4)
60 over	470	210 (1.6)	260 (2.4)
Total	24,000	12,960 (100) (54%)	11,040 (100) (46%)

11 over 19,860 (82.75%)

2.2 Land Use Plan

2.2.1 Selection of the Site for the Short Term

The site for the Short Term Development is selected considering following factors.

- Proximity to the short term development area of the port and industry
- Easy access from the Route 3
- Suitability of topography for sewerage system, drainage system and flood control system
- Avoiding the area of existing settlements (100 to 200 m from Route 3)
- Avoiding the district distributor (V3, 40 m R.O.W.) road to cut through school district

Table III.2.5 CHOMBURI CHANGWAT 1975 - 1980 MIGRATION OF POPULATION BY AGE GROUP, SOURCE: 1980 CENSUS

	A		B		D		E	F			H	D		
Age Group	Population	B/Ax100%	Migrant	B/Cx100%	From Bangkok Metropolis	D/Ex100%	Population Male	Migrant Male	F/Ex100	F/Gx100	Population Female	Migrant Female	I/Hx100	I/Jx100
0 - 4	(78,000)	(8.6)	6,700	7.66	(675)	7.40	38,260	3,370	(8.6)	6.65	(38,740)	3,330	(8.6)	9.07
5 - 9	83,444	8.4	7,029	8.04	710	7.79	42,868	3,693	8.6	7.28	40,576	3,336	8.2	9.08
10 - 14	87,806	7.8	6,886	7.88	543	5.95	44,694	3,570	8.0	7.04	43,112	3,316	7.7	9.03
15 - 19	84,819	15.2	12,919	14.78	1,004	11.01	42,859	6,826	15.9	13.46	42,059	6,093	14.5	16.59
20 - 24	79,136	31.2	24,688	28.24	2,427	26.61	42,604	17,107	40.2	33.74	36,531	7,581	20.8	20.65
25 - 29	55,580	19.3	10,732	12.28	1,572	17.29	26,838	5,814	21.7	11.47	28,741	4,918	17.1	13.39
30 - 39	79,717	12.3	9,843	11.26	1,299	14.24	39,266	5,541	14.1	10.93	40,451	4,302	10.6	11.72
40 - 49	62,082	7.5	4,685	5.36	486	5.33	31,111	2,754	8.8	5.43	30,970	1,931	6.2	5.26
50 - 59	38,807	5.8	2,243	2.57	212	2.32	19,306	1,276	6.6	2.52	19,500	967	5.0	2.63
60 over	38,904	4.4	1,696	1.94	191	2.09	17,660	750	4.2	1.48	21,243	946	4.4	2.58
			C		E			G				J		
Total	688,395 (100.00)	12.7	87,421	100.01	9,119	100.03	346,466 (50.33)	50,701	14.6	100.00	341,923 (49.67)	36,720	10.7	100.00

G/Cx100=58.0 J/Cx100=42.0

Central Region Total Population: 8,624,454

Male: 4,341,190 (50.34%)
Female: 4,283,264 (49.66%)

Table III.2.6 CHOMBURI CHANGWAT 1965 - 1970 MIGRATION OF POPULATION BY AGE GROUP,
SOURCE: 1970 CENSUS

AGE GROUP	POPULATION (A)	MIGRANT (B)	B/Ax100	B/Cx100	POPULATION MALE (E)	MIGRANT MALE (F)	F/Ex100	F/Gx100	POPULATION FEMALE (H)	MIGRANT FEMALE (I)	I/Hx100	I/Jx100
0 - 4	87,031	13,054	(15.00)	11.33	44,203	(6,630)	(15.0)	10.17	42,828	(6,424)	(15.0)	12.84
5 - 9	80,990	14,384	17.8	12.49	41,225	7,378	17.9	11.32	39,765	7,006	17.6	14.00
10 - 19	127,687	26,253	20.6	22.79	65,114	13,885	21.3	21.31	62,573	12,368	19.8	24.72
20 - 29	86,373	33,459	38.3	29.04	46,253	21,389	46.2	32.82	40,120	12,070	30.1	24.13
30 - 39	65,568	15,025	22.9	13.04	34,000	8,813	25.9	13.52	31,568	6,212	19.7	12.42
40 - 49	41,223	6,650	16.1	5.77	21,442	3,833	17.9	5.88	19,781	2,817	14.2	5.63
50 - 59	26,384	3,255	12.3	2.83	12,993	1,744	13.4	2.68	13,391	1,511	11.3	3.02
60 -	25,989	2,911	11.2	2.53	12,018	1,395	11.6	2.14	13,971	1,516	10.9	3.03
UNKNOWN	452	211	46.7	0.18	217	104	47.9	0.16	235	107	45.5	0.21
	541,695	115,202 (C)	21.2	100.00	277,465 (51.22)	65,171 (G)	23.5	100.00	264,230 (48.78)	50,031 (J)	18.9	100.00

G/Cx100=56.57

J/Cx100=43.43

Table III.2.7 BANGKOK METROPOLIS 1975 - 1980 MIGRATION OF POPULATION BY AGE GROUP, SOURCE: 1980 CENSUS

AGE GROUP	POPULATION (A)	B/Ax100%	MIGRANT (B)	B/Cx100%	POPULATION MALE (E)	MIGRANT MALE (F)	F/Ex100	F/Gx100	POPULATION FEMALE (H)	MIGRANT FEMALE (I)	I/Hx100	I/Jx100
0 - 4	445,798	(7.0)	31,205	5.07	230,322	16,122	(7.0)	5.49	215,476	15,083	(7.0)	4.68
5 - 9	427,986	8.6	36,922	6.00	219,765	19,158	8.7	6.52	208,130	17,764	8.5	5.52
10 - 14	477,363	10.2	48,674	7.90	238,146	21,514	9.0	7.32	239,490	27,160	11.3	8.43
15 - 19	635,511	20.4	129,341	21.00	301,262	53,277	17.7	18.13	334,249	76,064	22.8	23.62
20 - 24	657,160	22.5	147,822	24.00	319,614	73,549	23.0	25.03	337,545	74,273	22.0	23.07
25 - 29	503,595	16.5	82,971	13.47	240,921	40,543	16.8	13.80	262,674	42,428	16.2	13.18
30 - 39	622,230	11.9	74,049	12.03	302,579	38,300	12.6	13.03	319,651	35,749	11.2	11.10
40 - 49	434,377	8.0	34,777	5.65	211,876	17,998	8.5	6.13	222,501	16,779	7.5	5.21
50 - 59	254,350	6.2	15,878	2.58	122,965	7,442	6.0	2.53	131,384	8,436	6.4	2.62
60 over	237,606	6.0	14,189	2.30	104,040	5,924	5.7	2.02	133,565	8,265	6.2	2.57
TOTAL	4,697,071	13.1	615,828 (C)	100.00	2,292,052	293,827 (G)	12.8	100.00	2,405,019	322,001 (J)	13.4	100.00
					(48.80)				(51.20)			
					G/Cx100=47.71				J/Cx100=52.29			

Table III.2.8 CENTRAL REGION 1975 - 1980 MIGRATION OF POPULATION BY AGE GROUP, SOURCE: 1980 CENSUS

AGE GROUP	POPULATION (A)	B/Ax100%	MIGRANT (B)	B/Cx100%	POPULATION MALE (E)	MIGRANT MALE (F)	F/Ex100%	F/Gx100%	POPULATION FEMALE (H)	MIGRANT FEMALE (I)	I/Hx100%	I/Jx100%
0 - 4	1,090,000	(7.5)	81,750	8.66	558,000	41,850	(7.5)	8.11	532,000	39,900	(7.5)	9.32
5 - 9	1,167,103	[illegible]	87,264	9.24	596,979	44,604	7.5	8.64	570,124	42,660	7.5	9.96
10 - 14	1,257,587	6.4	80,773	8.56	639,907	42,328	6.6	8.21	617,680	38,445	6.2	8.98
15 - 19	1,184,256	10.5	124,408	13.18	591,390	60,747	10.3	11.78	592,866	63,661	10.7	14.86
20 - 24	991,798	21.4	211,849	22.45	496,079	124,448	25.1	24.13	495,719	87,401	16.7	20.41
25 - 29	771,094	16.8	129,236	13.69	372,609	72,137	19.4	13.99	398,485	57,099	14.3	13.34
30 - 39	1,070,629	11.0	117,414	12.44	520,666	67,798	13.0	13.15	549,963	49,616	9.0	11.59
40 - 49	923,082	6.3	58,175	6.16	450,051	33,778	7.5	6.55	473,031	24,397	5.2	5.70
50 - 59	616,875	4.8	29,600	3.14	296,952	16,451	5.5	3.19	319,923	13,149	4.1	3.07
60 over	643,935	3.6	23,455	2.48	288,308	11,609	4.0	2.25	355,627	11,846	3.3	2.77
TOTAL	9,716,359	9.7	943,924 (C)	100.00	4,810,941	515,750 (G)	10.7	100.00	4,905,418	428,174 (J)	8.7	100.00
					(49.51)				(50.49)			
						G/Cx100 = 54.6				J/C = 45.4		

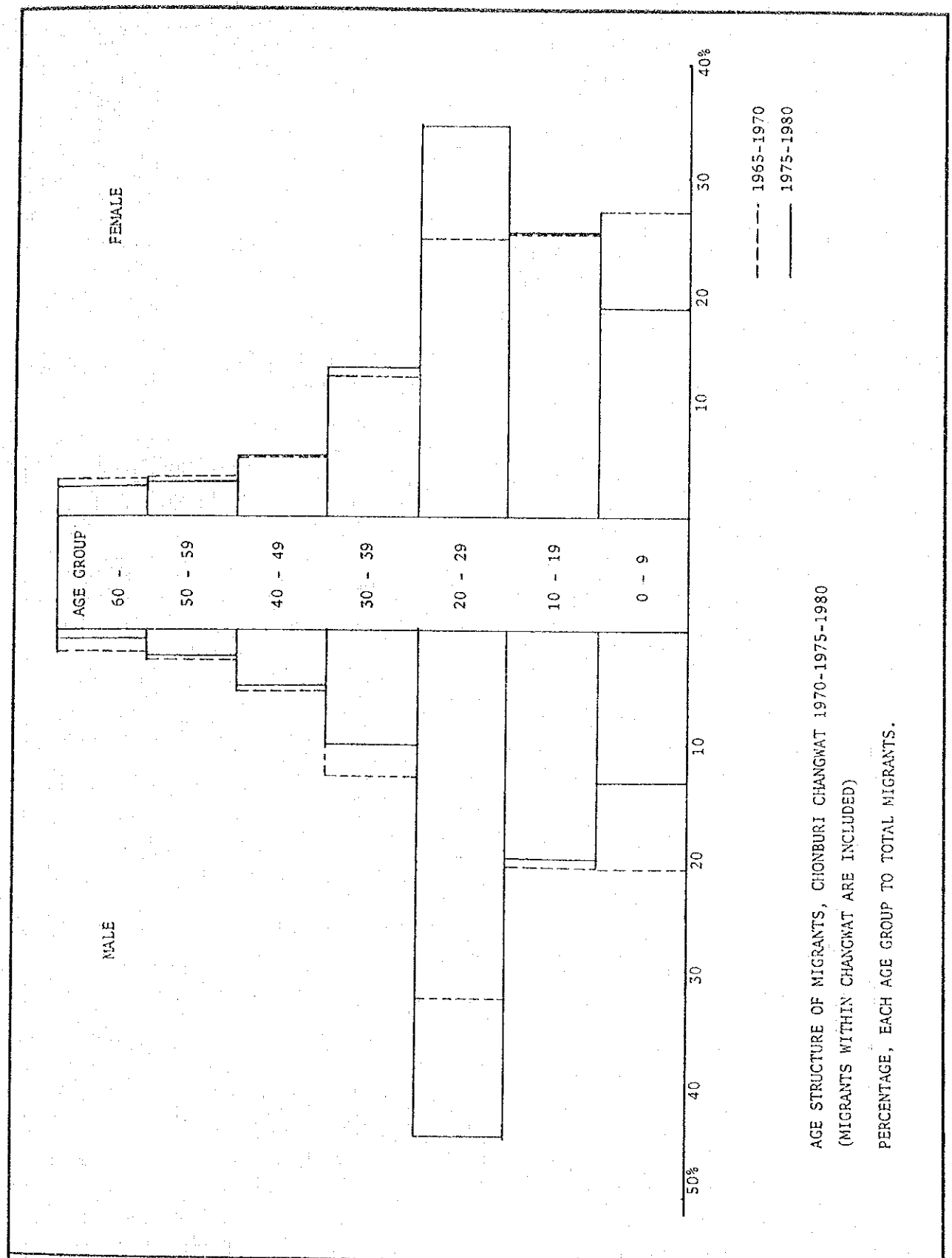

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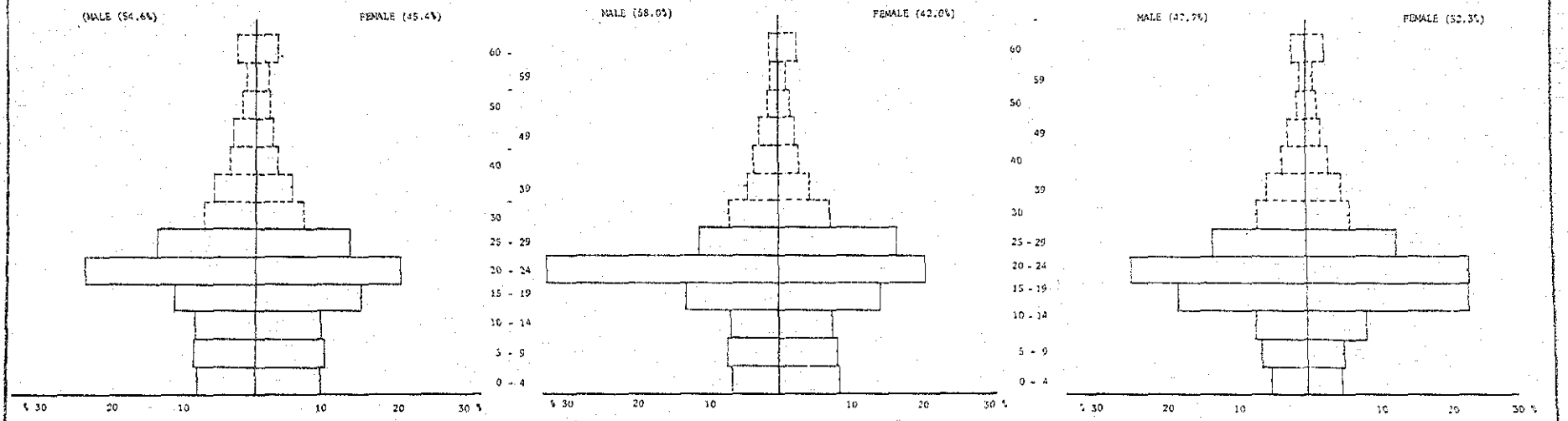
Fig. III.2.1
Age Structure of Migrants to Changwat Chonburi, 1965–1970, 1975–1980



AGE STRUCTURE OF MIGRANTS CENTRAL REGION 1975-1980
(EXCLUDING BANGKOK METROPOLIS)

PERCENTAGE, EACH AGE GROUP TO TOTAL MIGRANTS.

AGE STRUCTURE OF MIGRANTS. CHONBURI CHANGWAT 1975-1980
(MIGRANTS WITHIN CHANGWAT ARE INCLUDED) PERCENTAGE,
EACH AGE GROUP TO TOTAL MIGRANTS.

AGE STRUCTURE OF MIGRANTS BANGKOK METROPOLIS 1975-1980
PERCENTAGE, EACH AGE GROUP TO TOTAL MIGRANTS.

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Fig. III.2.2
Age Structure of Migrants

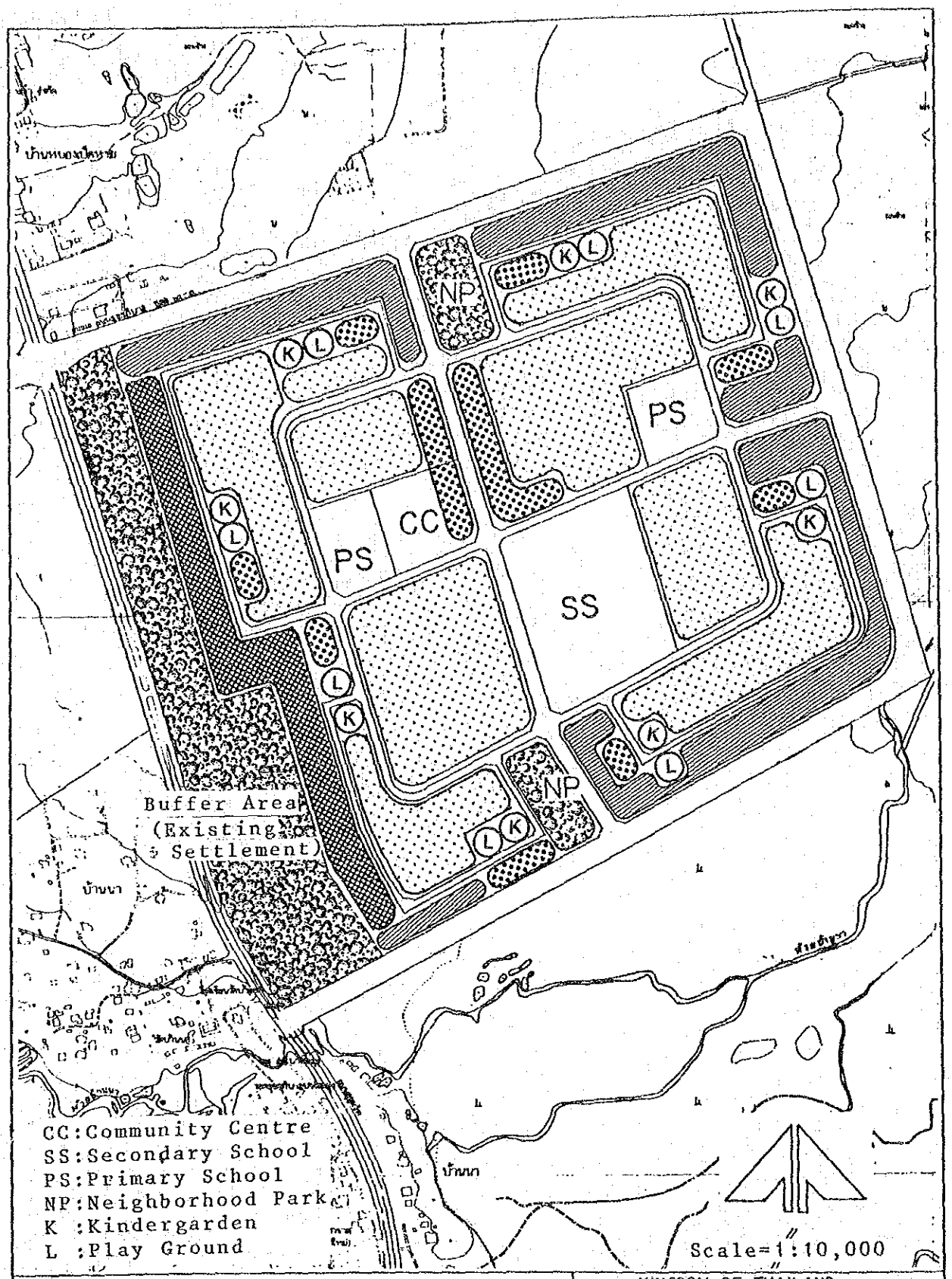
For the site the south of the central west-east Distributor Road, the north of the southern east-west District Distributor Road, the west of the north-south Distributor Road was selected.

2.2.2 Area Allotment by Land Use for Short Term Development

Area allotment of the New Town is planned as follows:

	Item	Area (ha)	(Rai)	Ratio (%)
1.	Residential Use (net)	61.0	381	52.9
2.	Community Center	4.3	27	3.7
	(shop houses)	(2.0)	(13)	
	(other community facilities)	(2.3)	(14)	
3.	Schools	15.6	97	13.5
	Secondary School (8 ha x 1)	(8.0)	(50)	
	Primary School (2.5 ha x 2)	(5.0)	(31)	
	Kinder Garden (0.32 ha x 8)	(2.6)	(16)	
4.	Parks	8.8	55	7.6
	Neighbourhood Park (2 ha x 2)	(4.0)	(25)	
	Play Ground (0.25 ha x 8)	(2.0)	(12)	
	Play Lot (0.04 ha x 70)	(2.8)	(18)	
5.	Roads and Car Parking	25.7	161	22.3
	Roads Area/1	(21.7)	(136)	
	Car Parking Area	(4.0)	(25)	
	Total	115.4	721	100.0

Note: /1: Area of V3 road surrounding new town is not not included.



LEGEND

- Row House
- Semi Detached House
- Detached House
- Shop House

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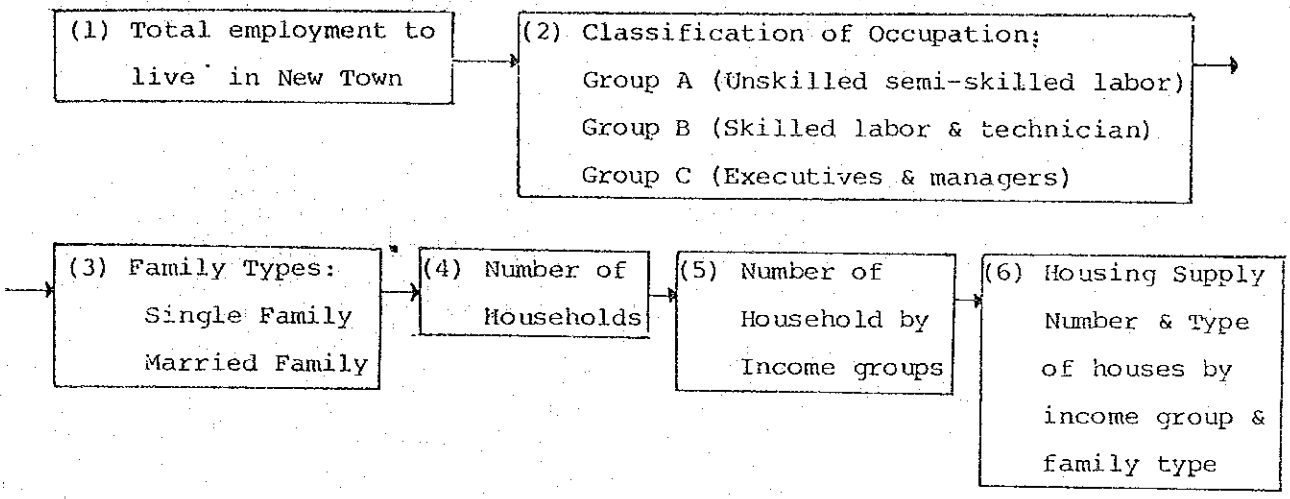
Fig. III.2.3
Short-Term Residential Development Plan

2.3 Housing Development Plan

2.3.1 Methodology

Housing Demand and Supply for the short term development has been calculated according to the following procedure.



2.3.2 Numbers of Total Employment and Work Status

Number of the total employment to live in the New Town were calculated by the following procedures. The proportion of employee types which is based on the characteristics of the manpower for each industry is as follows:

The Numbers of Employees to live in the New Town by Work Status for the Short Term Development

(unit persons)

	Total	Manager	Skilled Labor	Unskilled Labor
1. Direct Induced Employee				
1) Industrial Estate	5,420 (100)	130 (2.4)	407 (7.5)	4,883 (90.1)
2) Port	4,120 (100)	82 (2.0)	906 (22.0)	3,132 (76.0)
2. Multiplier effect	2,580 (100.0)	106 (4.1)	844 (32.7)	1,630 (63.2)
3. SRI, TORC,ESSO*	480 (100.0)	12 (2.4)	36 (7.5)	432 (90.1)
Total	12,600	330 (2.6)	2,193 (17.4)	10,077 (80.1)

* Calculated using the proportion of work status in the Industrial Estate.

Note: (1): ( ) indicates percent

(2): on the % figure for the number of the occupational groups shown in the above table, please see the Appendix III-4.

2.3.3 Classification of Employment by Income Level

Various kinds of employment are classified into the following three groups according to their income levels.

Group	Income level (฿/month)	Occupation
A	Low income (Less than 5,000)	Unskilled, Semi-skilled workers: Transportation Equipment operatiors, Craftmen, Production workers and Laborers Service workers
B	Middle income (5,001 - 9,000)	Skilled workers: Professional, Technical, Clerical and Sales workers
C	High income (More than 9,001)	Executive, Administrative, Managerial staffs and Government officials

Source : 1980, Population & Housing Census by NSO

1981, Labor Force Survey by NSO

2.3.4 Household Structure by Type of Family

Proportion of single and married family in Laem Chabang was assumed with reference to the current situation in Bangkok and Central Region as follows.

(Unit: %)

	Single	Married
Bangkok	43.5	56.5
Central Region (Municipal Area)	48.4	51.6
Laem Chabang	50.0	50.0

Source : Report of the Labour Force Survey, 1981

See Appendix III-5-1 to III-5-5 on the existing employed population & household structure by age, sex & occupation.

Average number of earners in a family was assumed to be 2.1 for Laem Chabang based on the available date for the Central Region, which indicated 2.1, 2.5 and 2.9 for municipal area, sanitary district and rural area respectively according to the "Socio-Economic Survey, 1975 - 1976".

2.3.5 Types of Housing Units

After discussing with the NHA, the housing types with average plot sizes are classified in the following B to E groups which are corresponding to dweller's income levels.

Group		Types	Average plot size (m^2)
B.	B-1	Row House-1 storey	100
	B-2	Row House-2 storey	100
C.	C-1	Semi-Detached House-1 storey	200
	C-2	Semi-Detached House-2 storey	200
D.	D-1	Detached House-1 storey	300
	D-2	Detached House-2 storey	300
E.	E-1	Shop House-2 storey	64
	E-2	Shop House-3 storey	64

2.3.6 Number of Households by Group, Family Types

Number of households is calculated for three cases as below by the medium case is applied for planning in the Study.

	Maximum case			Medium case			Minimum case		
	Household Numbers of Families HH			Household Numbers of Families			Household Numbers of Families		
	Total HH	Married Family	Single Family	Total HH	Married Family	Single Family	Total HH	Married Family	Single Family
Group A -unskilled	8,516 HH (4,736 DU)	3,476 HH (3,476 DU)	5,040 HH (1,260 DU)	7,280 (3,500)	2,240 (2,240)	5,040 (1,260)	7,280 (3,500)	2,240 (2,240)	5,040 (1,260)
Group B -skilled labor	1,850 HH (1,303 DU)	755 HH (755 DU)	1,095 HH (548 DU)	1,850 (1,303)	755 (755)	1,095 (548)	1,582 (1,035)	487 (487)	1,095 (548)
Group C -Executives	330 HH (330 DU)	99 HH (99 DU)	231 HH (231 DU)	330 (330)	99 (99)	231 (231)	330 (330)	99 (99)	231 (231)
Total HH	10,696	4,330	6,366	9,460	3,094	6,366	9,192	2,826	6,366
Total (DU)	(6,369)	(4,330)	(2,039)	(5,133)	(3,094)	(2,039)	(4,865)	(2,826)	(2,039)

Note: ( ) indicates dwelling units (DUs)

Relationship between number of households and population in the New Town is summarized as follows:

		population
Households number of Married family (HH)	3,094 HH x 5.7[1)] person/HH	= 17,635
Households number of Single family (HH)	6,366 HH x 1 person/HH	= 6,366
Total households	9,460 HH	= 24,001 population in new town

Note: 1): Average households (excluding unrelated individuals household) size in Changwat Chonburi in 1980 was 5.7 according to 1980 population housing census by NSO.

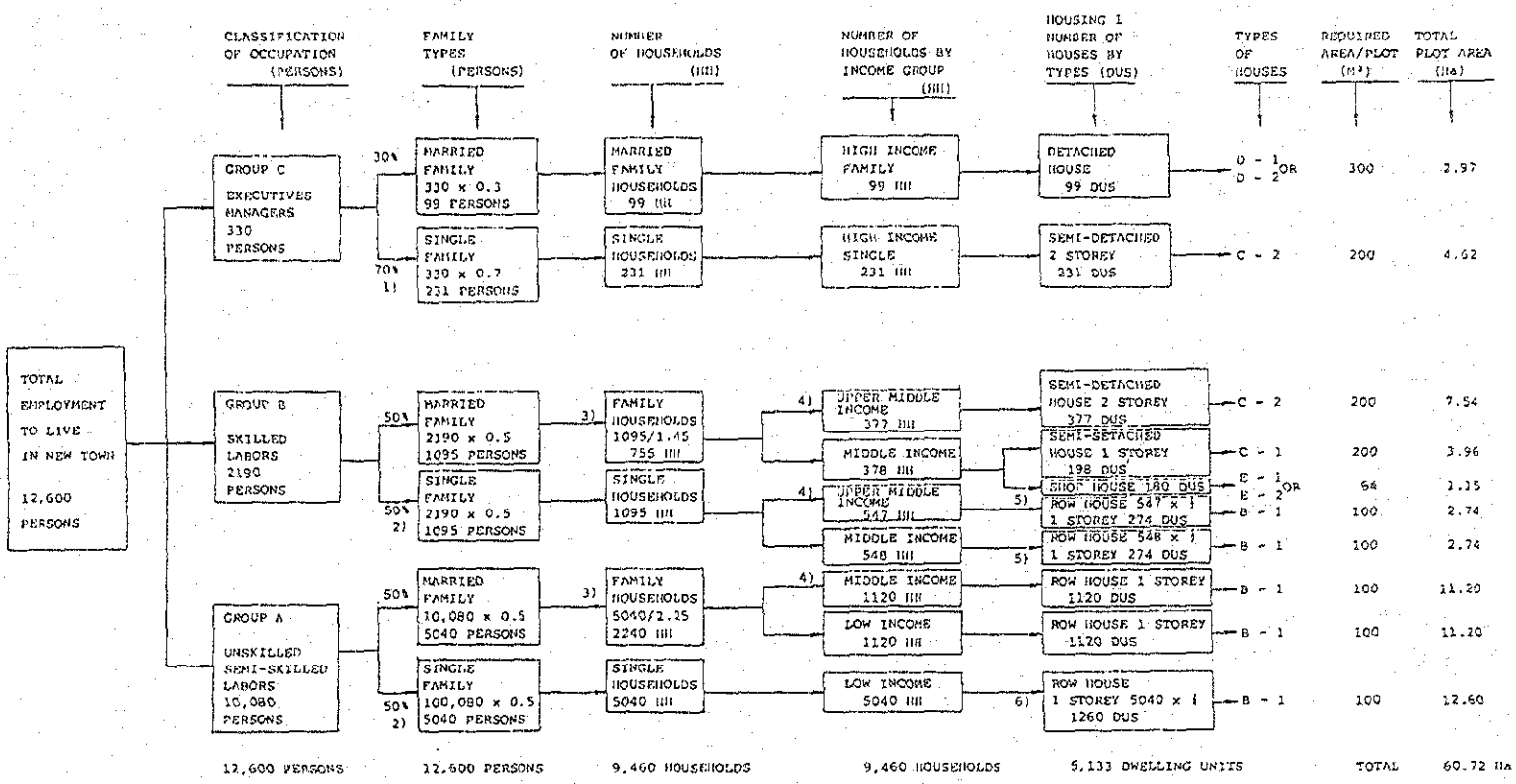
2.3.7 Number of Houses Required by Type

Number of houses required as well as area in the New Town is presented by each type of housing in the Table III-2-9, together with the summarized flow of calculation procedure.

The income structure of households related to the number of houses in the new town in 1991 is as follows

Income Level	Number of houses		
3,000 - 5,000 B/mo.	1,260	25%	a part of Row Houses
5,001 - 9,000 B/mo.	3,363	65%	a part of Row Houses & Semi Detached Houses
	510	10%	
9,001 over B/mo.	510	10%	Detached Houses, a part of Semi Detached Houses and Shop Houses
Total	5,133	100%	

Table III.2.9 TYPES AND NUMBER OF HOUSES FOR SHORT TERM DEVELOPMENT



NOTE) 1) The proportion of married & single for Executives; 30% : 70% was determined by discussion with NHA.

2) 50% : 50% for skilled & unskilled labors by the Report of Labor Force Survey in 1981 by N.S.O.

3) Number of earners in a household; 1.45 for skilled, Married family & 2.25 for Unskilled Married familywere determined by discussion with NHA.

4) The proportion of High & Middle or Middle & Low Income family; 50% : 50% was determines by discussion with NHA.

5) 2 people/unit.

6) 4 people/unit were determined by discussion with NHA.

7) Shop House is considered as High Income Housing.

2.4 Educational Facilities

The New Town with a population of 24,000 is estimated to require one secondary school, two primary schools and eight kinder gardens in the year 1991. At the beginning of the short term development, however, less number of schools would be required to be built considering the characteristics of the age structure of inhabitant of the New Town as shown in the master plan, population projection. The total number of schools said above must be provided within several years after people start living in the New Town.

Requirement for schools are calculated according to the following process.

Item	Kinder Garden	Primary School	Secondary School
(1) Population in N.T.			
(2) Pupil/student per population	0.07	0.14	0.10
(3) No. of pupil/student (1) x (2)	1,680	3,360	2,400
(4) No. of pupil/student per one school	250	2,000-2,600	2,400-2,800
(5) No. of schools (3)/(4)	7-8	2	1
(6) Area per one school (ha)	0.32	2.5	8.0
(7) Total Area (ha)	2.56	5.0	8.0

For the higher education, the existing technical college in the Sattahip would be utilized after expanding the facilities in accordance with the future increasing demand for higher education, particularly related with industrial activities in the Complex.

A training school and a vocational school is proposed to be established in the business & commercial area for providing technical training related with port and industrial activities.

According to the population allotment by age, number of pupils and students in the short term development can be assumed as follows:

Age	No. of person[1]	No. of pupils	No. of pupils/school	No. of schools
4	366	752 x 90%[2] = 680	250	3
5	386			
6	386			
7	386	2,300 x 82.6%[3] = 1,900	2,000 - 2,600	1
8	386			
9	386			
10	378			
11	378			
12	378			
13	378			
14	378	3,258 x 69.5%[3] = 2,300	2,400 - 2,800	1
15	708			
16	708			
17	708			

Note: 1) See age structure.

2) The assumed percentage of kinder garden attendance.

3) The percentage of school attendance which is based on population of age by school attendance of "Population & Housing Census, 1980, Bangkok Metropolis, NSO"

For the future demands of the educational facilities by 1991 migrant group, refer to the changes in 1991 migrant group, sex and age structures, Table III.1.12 and the changes in school aged population, 1991 migrant group, Table III.1.21.

2.5 Community Facilities

Two neighborhood units are planned for short term development. One neighborhood unit comprises the following community facilities in the central area of each neighborhood to serve as the neighborhood center.

- Mail box, Telephone booth
- Retall shop & Restaurant (shophouse : 110 shops x 64 m^2 = 7,040 m^2)
  (car parking is prepared in each building)

Based on the discussions with NHA, it is considered that a community center will be necessary for two neighborhoods, functioning as a core of the new town in the short term development.

The following facilities would be included in a Community Centre. The area required for a community centre is about 4.3 ha.

- Shopping centre (private, 70 shops x 64 m^2 = 4,480 m^2)
- Health office (1,000 m^2)
- Post office (1,500 m^2)
- Police station (1,000 m^2)
- Municipal office (2,000 m^2)
- Bank (3,000 m^2)
- Service shops (barber, laundry, photographic, gas service, 60 shops x 64 m^2 = 3,840 m^2)
- Restaurant (30 shops x 64 m^2 = 1,920 m^2)
- Hospital (private, 30 facilities x 200 m^2 = 6,000 m^2)
- Car park and others (18,260 m^2)

For the fire protective facilities, existing Ao Udom fire station can be utilized with some innovation.

Telephone, telegramme office (area of 0.32 ha) of TOT and post office centre of CAT (area of 1.6 ha) would be located in the business and commercial area of the port area as the centre of Laem Chabang Complex.

2.6 Parks and Open Space

Parks and open space are planned to be provided as follows in the short term development.

Item	Remarks
1) Neighborhood park	2 x 2 ha = 4 ha
2) Play ground	8 x 0.25 = 2 ha
3) District park	no development for short term
4) Playlot (Totlot)	1 per 40 - 50 dwelling units

In addition to the neighborhood parks, 8 playgrounds will be provided in the short term development. They will be located near kinder gardens to ensure easy access for children. The playground will be planned in the walking distance of about 300 meter.

No district park is planned in the short term plan. It will be planned in the master plan phase providing one district park for four neighborhood units.

The buffer area between the Sukhumvit Road (Route 3) and the New Town will be provided for decreasing noise from the route 3 as well as to avoid compensation for relocation of the inhabitants now residing along the Sukhumvit Road by leaving the area as it is.

For the use of sports activity, the ground of the secondary school can be utilized.

A P P E N D I X

APPENDIX III-1 PROJECTION OF WORKERS FOR SHORT TERM

Item	No. of Workers		Remarks
	Short-term	Master Plan	
1. Industrial Estate			
1) EPZ	5,430		
2) GIE	4,040	31,400	
3) Industrial Centre	112		See Fig. A
2. Port			
(Wharf & Distribution and Storage Area)	3,636	11,400	See Table A
3. Business and Commercial Area	7,177	22,500	See Table A
4. Transportation	960	3,000	See Table B
5. New Town			See Table C
1) Community Centre	2,424		
2) Neighborhood Shopping Centre	550	10,500	
3) Educational Facility	405		
6. Others			
1) Sewerage treatment plant	34		See Table D
2) Water Filtration plant	22	200	
3) EGAT Sub Station	10		
7. Total	24,800	79,000	

Note: 1) Direct Induced Employee: 5,430 (EPZ)
4,040 (GIE)
7,200 (Port, see Table A)
16,670 (Total)

2) Multiplier Employee: 24,800 - 16,670 = 8,130

Table A EMPLOYEES IN THE PORT AREA AND BUSINESS AND COMMERCIAL AREA FOR THE SHORT TERM PLAN

	Item	Employee Total	Business & Commercial Area	Port (Wharf) Area
Direct Induced Employee	1. Port Related Industry			
	1) Transportation & Communication (Shipping, Cargo Transportation Business)	4,248	1,699 (40%)	2,549 (60%)
	2) Manufacturing (Ship Repairing, Container Repairing)	432	43 (10%)	389 (90%)
	3) Commercial (Commercial for ship, Ship Fuel)	288	-	288 (100%)
	4) Public Service (Port Administration, Public concerned)	432	324 (75%)	108 (25%)
	5) Service (Marine & Land Transportation Service Organization)	144	72 (50%)	72 (50%)
	6) Construction (Port Related)	288	58 (20%)	230 (80%)
	2. Port Reliant Industry			
	1) Bank, Insurance	72	72 (100%)	-
	2) Commercial (Trade Business, Oil wholesale)	1,224	1,224 (100%)	-
	3) Construction (Port Reliant)	72	72 (100%)	-
	3. Sub Total	7,200	3,564 (49.5%)	3,636 (50.5%)
Multiplier Employee	4. Commercial (Retail Shop, Restaurant) (100 shops x 6 employee/shop = 600 employee)	600	600	-
	5. Vocational School for Industry, Training School for port, Reserch & Development Institute	250	250	-
	6. Telephone, Telegramme Office	200	200	-
	7. Port Office	150	150	-
	8. Other Unidentitied Function	2,413	2,413	
	9. Total	10,813	7,177	3,636

Table B TRANSPORTATION INDUSTRY EMPLOYEE FOR SHORT TERM

1) No. of Buses needed for commuter : 100 Buses

2) No. of Employee

(1) Driver and conductress:

100 buses x 2 employee/bus x 3 shifts = 600 persons

(2) Manager 20% x 600 employee = 120 persons

(3) Total 720 persons

3) Total public transportation employee

$$\frac{720}{0.75} = 960 \text{ persons}$$

75% : proportion of bus employee in the total public transportation employee.

TABLE C EMPLOYEE IN THE NEW TOWN FOR THE SHORT TERM PLAN

	No. of Employee	No. of Shop	Remarks
1. Community Centre	(2,424)		
1) Shopping Centre	700	70	0.5 m²/pop.x 30,000 pop. /1 = 12,000 m², 12,000 m²/64 m²/shop = 230 shops 180 shops x 40% = 90 shops 90 shop x 8 employees/shop = 700 employees 180 x 60% = 180 shops ---→ 2 neighborhood shops
2) Health Centre	4	-	See Table E
3) Post Office	50	-	150 employee/100,000 pop. x 30,000 pop. = 50 employees
4) Police Station	30	-	100 employee/100,000 pop. x 30,000 pop. = 30 employees
5) Municipal Office	200	-	600 employee/100,000 pop. x 30,000 pop. = 200 employees
6) Bank	150	3	1 shop/10,000 pop. x 30,000 pop. = 3 shops, 3 shops x 50 employee/shop = 150 employees
7) Service (Barber, Laundry, Phot, Gas etc.)	600	60	20 shops/10,000 pop. x 30,000 pop. = 60 shops, 60 shops x 10 employee/shop = 600 employees
8) Restaurant	300	30	10 shops/10,000 pop. x 30,000 pop. = 30 shops, 30 shops x 10 employee/shop = 300 employees
9) Medical facility (private)	390	30	10 shops/10,000 pop. x 30,000 pop. = 30 shops, doctor : 30, nurse : 30 x 5 = 150, labor : 30 x 7 = 210 30 + 150 + 210 = 390 employees
2. Neighborhood Shopping Centre	(550)		
Neighborhood Shops		110	140 shops x 4 employee/shop = 550 employees
3. Schools	(450)		See Table F
1) Secondary School	136		Principal : 1, Teachers : 130, Labor : 5, Total : 136 [2,600 (student) ÷ 20 (St./T.) = 130]
2) Primary School I	96		Schoolmaster : 1, Teachers : 90, Labor : 5, Total : 96 [2,250 (student) ÷ 25 (St./T.) = 90]
3) Primary School II	96		- ditto -
4) Kindergarden x 7	77		Director : 1, Teachers : 8, Labor : 2, Total 11, 11 x 7 gardens = 77

/1 30,000 population = (Population in the New Town) + (Population in the surrounding area of the New Town)

Table D EMPLOYEE FOR UTILITIES IN SHORT TERM

Item	OXIDATION DITCH SEWERAGE PLANT	FILTRATION PLANT	EGAT SUB STATION
Manager	1	1	1
Technician (mechanic)	7	2	-
Technician (electric)	7	2	3
Technician (water quality)	2	2	-
Technician (supplementary)	14	12	2
Clerk	1	1	1
Labor	2	2	3
Total	34	22	10

Table E CHONBURI PROVINCE, NUMBER OF HEALTH CENTER AND RESIDENT STAFF (1980)

Number of Station	82
Health officer	197
No. of officer/station	2.4

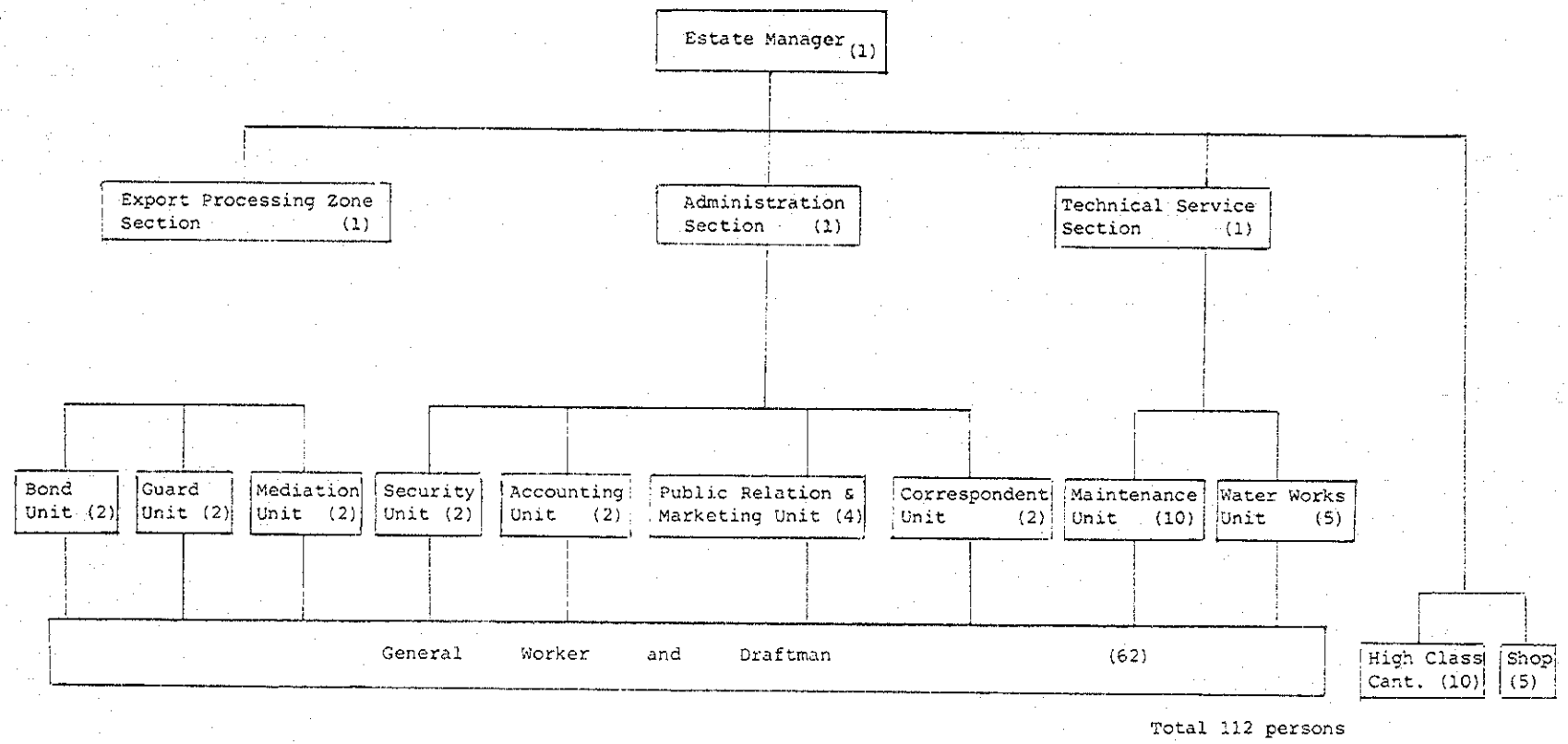
(Source: Statistical Report of Changwat Chonburi, NSO)

Table F CHONBURI PROVINCE, EXISTING SCHOOLS (1977)

Item		Kindergarden		Elementary		Secondary		General Edu. (Private)	
Students	boy	914		39,863		7,379		24,025	
	girl	960		35,007		6,782		20,877	
	total	1874		74,870		14,161		44,902	
Teachers	Male	5	8%	1,303	44%	326	44%	508	28%
	Female	55	92%	1,660	56%	416	56%	1,278	72%
	Total	60	100%	2,963	100%	742	100%	1,786	100%
Students/Teacher		30		25		20		25	

(Source: Op. Cit.)

Fig. A ORGANIZATIONAL STRUCTURE OF LAEM CHABANG INDUSTRIAL ESTATE (DRAFT)



Note : Figures in parentheses are number of persons.

APPENDIX III-2

Employed Persons by Industry (Whole Kingdom, 1981)

	Municipal area (in Thousand)	(%)	Non-municipal area (in Thousand)	(%)	Total (in Thousand)	(%)
1. Agriculture, Forestry, Hunting	124.9	4.0	17,403.4	81.8	17,528.3	71.9
2. Mining and Quarrying	6.4	0.2	54.6	0.3	61.0	0.3
3. Manufacturing	646.7	20.9	1,095.1	5.1	1,741.8	7.1
4. Construction, Repair and Demolition	132.6	4.3	335.0	1.6	467.6	1.9
5. Electricity, Gas, Water and Sanitary Services	34.6	1.1	36.0	0.2	70.6	0.3
6. Commerce	967.9	31.3	1,078.4	5.0	2,046.3	8.4
7. Transport, Storage and Communication	189.5	6.1	204.0	1.0	393.5	1.6
8. Services	992.6	32.1	1,063.3	5.0	2,055.9	8.5
9. Activities not Adequately Described	.3	-	-	-	.3	-
Total	3,096.0	100.0	21,270.1	100.0	24,366.1	100.0

(SOURCE: Labor Force Survey, July - September 1981, NSO)

Employed Persons by Industry (Bangkok Metropolis, 1981)

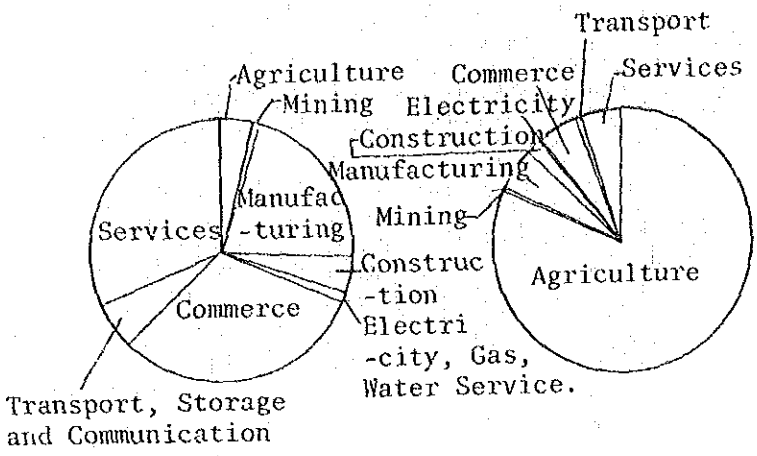
	Municipal area (in Thousand)	(%)	Non-municipal area (in Thousand)	(%)	Total (in Thousand)	(%)
1. Agriculture, Forestry, Hunting	29.2	1.6	264.8	45.1	294.0	12.2
2. Mining and Quarrying	2.0	0.1	-	-	2.0	0.1
3. Manufacturing	456.5	24.9	162.8	27.7	619.3	25.6
4. Construction, Repair and Demolition	88.1	4.8	23.1	3.9	111.2	4.6
5. Electricity, Gas, Water and Sanitary Services	21.1	1.2	3.8	0.7	24.9	1.0
6. Commerce	559.8	30.6	64.7	11.0	624.5	25.8
7. Transport, Storage and Communication	114.7	6.3	14.5	2.5	129.2	5.3
8. Services	559.1	30.5	54.1	9.1	613.2	25.4
9. Activities not Adequately Described	.3	-	-	-	.3	-
Total	1,831.3	100.0	588.1	100.0	2,419.4	100.0

(SOURCE: Op. Cit.)

Employed persons by industry (Central Region, 1981)

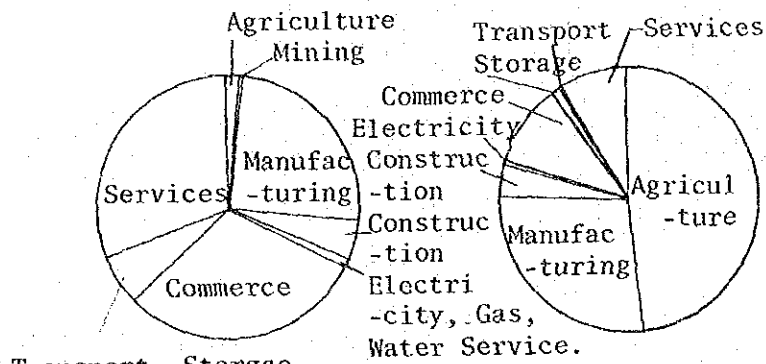
	Municipal area (in Thousand)	(%)	Non-municipal area (in Thousand)	(%)	Total (in Thousand)	(%)
1. Agriculture	26.2	6.3	3,054.9	68.2	3,081.1	62.9
2. Mining and Quarrying	.8	-	9.9	0.2	10.7	0.7
3. Manufacturing	72.3	17.3	483.4	10.8	555.7	11.3
4. Construction	14.5	3.5	125.9	2.8	140.4	2.9
5. Electricity, Gas, Water, Sanitary	4.0	1.0	14.5	0.3	18.5	0.4
6. Commerce	139.7	33.4	368.1	8.2	507.8	10.4
7. Transport, Storage	26.3	6.3	69.8	1.6	96.1	2.0
8. Services	133.9	32.0	352.7	7.9	486.6	9.9
9. Unknown	-		-		-	
Total	418.2	100.0	4,479.5	100.0	4,897.7	100.0

(SOURCE: Op. Cit.)



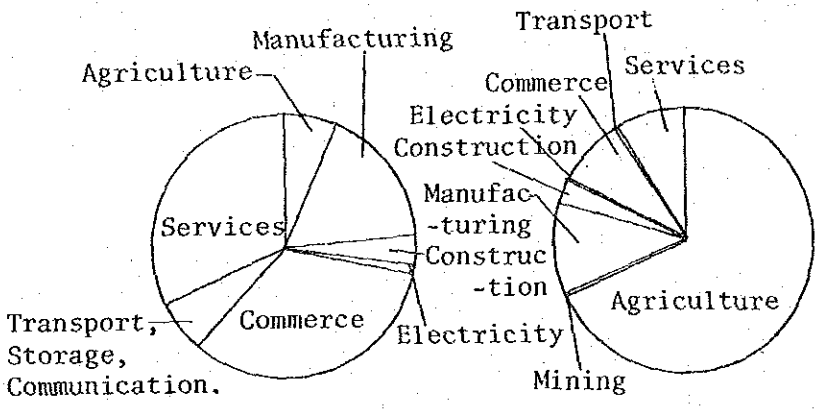
(Municipal Area) (Non Municipal Area)

(Whole Kingdom)



(Municipal Area) (Non Municipal Area)

(Bangkok Metropolis)



(Municipal Area) (Non Municipal Area)

(Central Region)

LEGEND

(SOURCE: Labor Force Survey July - September 1981, NSO)

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Employment Structure by Region in 1981

APPENDIX III-3 BUSINESS & COMMERCIAL AREA

APPENDIX III-3-1 LAND REQUIREMENT OF BUSINESS & COMMERCIAL AREA FOR SHORT TERM DEVELOPMENT

1. NET LAND REQUIREMENT

I T E M	NUMBER OF EMPLOYEE	LAND AREA (Net Hectare)
Port Related Industry & Reliant Industry	3,564	9.0
Commercial	600	1.5
Vocational School for Industry, Training School for Port Research & Development Institute	250	3.0
Telephone & Telegramme (Exchange Station)	200	0.5
Post Office	150	0.4
Other Unidentified Funtion/1	2,413	6.0
Total	7.177	20.4

2. LAND REQUIREMENT

Net Land Area	20.4 ha (55%)
Road, Parking & Bus Terminal and others	16.6 ha (45%)
Total	37.0 ha (100%)

/1: OTHER UNIDENTIFIED FUNCTION

(1) Public Service

City Hall

Changwat Branch Office

Government Branch Offices

etc.

(2) Sales Promotion & Exhibition

Exhibition Hall
Conference Rooms
etc.

(3) Lodgings, Accomocations and Hotels

For Ship crews
Comming on Business Workers
Visitors

(4) Offices for Construction Business

(5) Banks and other Financial Institions, Insurance, and Real Estate

(6) Others

Around 1,000 population assumed to reside in B & C Area.

APPENDIX III-3-2 LOCATION & SHAPE OF BUSINESS & COMMERCIAL AREA FOR SHORT TERM DEVELOPMENT

Business & Commercial Area will be supported and will serve centralized activities of following area,

at the early stage of development

- ° Port Area
- ° Industrial Area
- ° New Town
- ° Nearby Industrial & Residential Area

the more development matures, the area, to be supported and to serve, will expand gradually to

- ° Siracha
- ° Chonburi City
- ° Changwat Chonburi
- ° Eastern Seaboard Area
- (° Eastern Part of Thailand)
- (° Whole Nation)

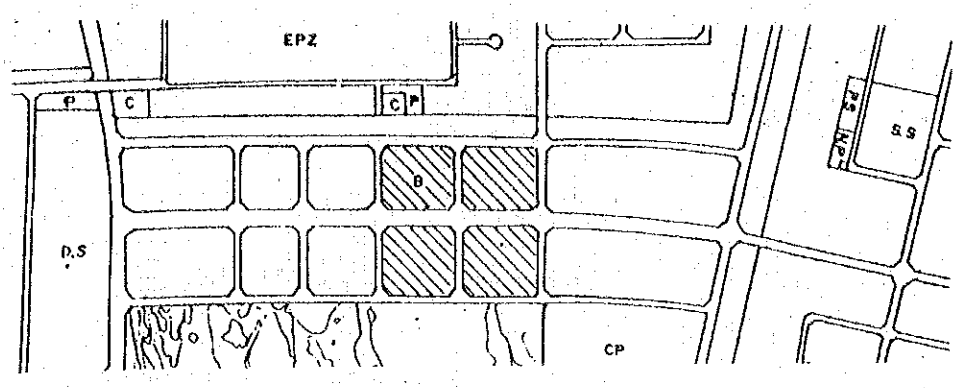
The prosperity of this Business & Commercial Area will follow the prosperity of the deep sea commercial port. Since the Laem Chabang deep sea port is the only deep sea commercial port to be planned in Thailand, the posibility of prosperity of Laem Chabang deep sea commercial port is highly rated.

Considering above mentioned Area to be served by the Business & Commercial Area the Location of the Area should be immediate proximity to Port, Industrial and Residential Area with easy access from other Eastern Seaboard Area.

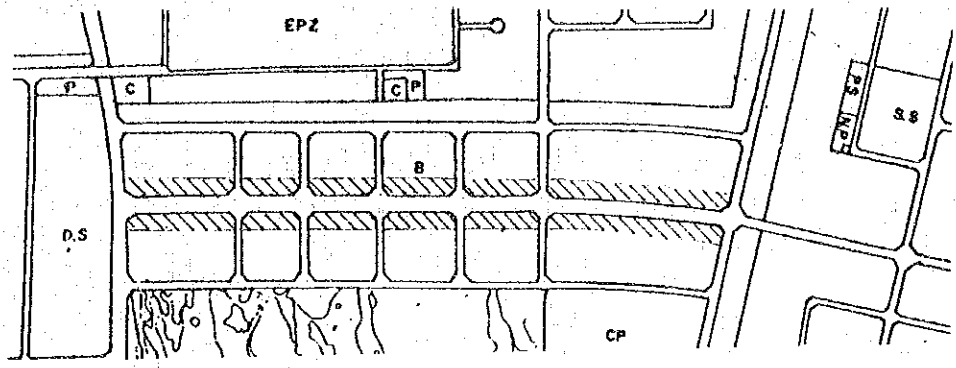
Consequently the location of the Area was decided to be the east of the Distribution & Storage Area, the west of Route 3, the south of the Industrial Area.

For the short term development, there will be many alternatives which will show both advantages and disadvantages for short term and long term development, due to the nature of this large scale development.

Some alternatives will show advantages for the short term development but will show disadvantages for the long term development and some alternatives will show advantages for the long term development and will show disadvantages for the short term.



ALT. A



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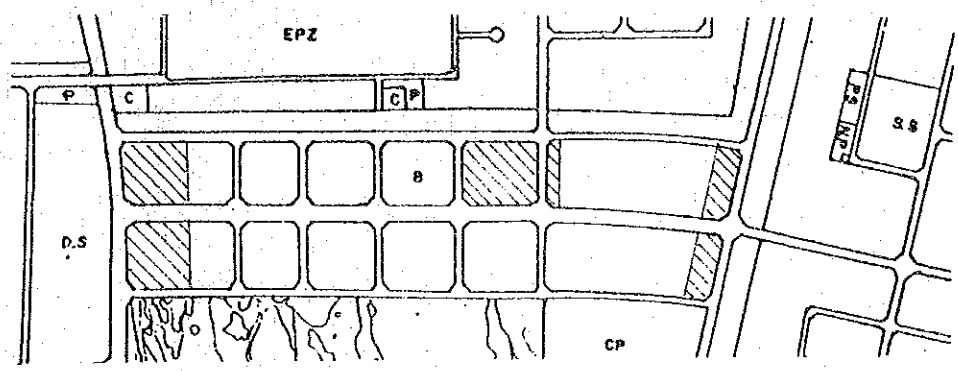

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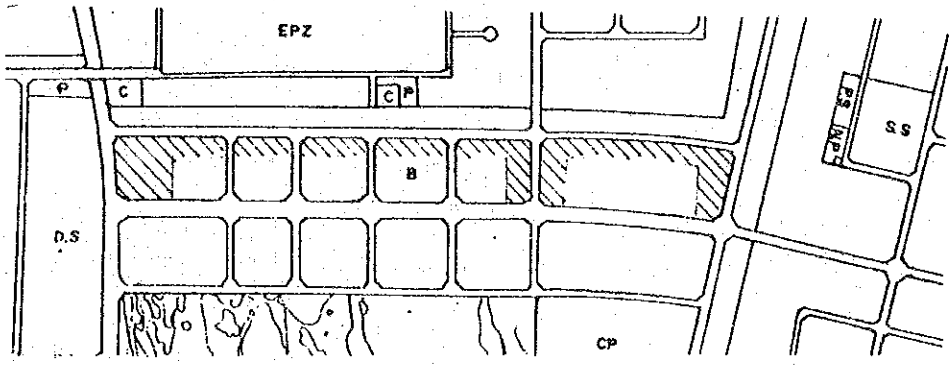

ALT. D

LEGEND

Business & Commercial Area for the Short Term Dvelopment

KINGDOM OF THAILAND

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JAPAN INTERNATIONAL COOPERATION AGENCY

. Alternative Location & Shape of Business & Commercial Area for Short Term

Major characteristics of the alternatives are as follows,

Alternative A.

- enough area for the future expansion is well reserved.
- functions and facilities which will have varieties of activities can be allocated in adequate site accordingly e.g. to allocate large scale and important facilities to the sites along the central E - W Distributer Road, small and less important facilities to sites along back streets.
- vast reserved area between the developed B & C Area and the New Town and the Distribution & Storage area will exist for long period.

Alternative B.

- continuity of the activities along the central E - W Distributor Road will be preserved from the early stage of development.
- for the future expansion, the lands along back streets are reserved-----enough area but less valued, the sites which will suite for large scale facilities will be limited in future.

Alternative C. allocate B & C facilities to three different locations which relate to the Port Area, the Industrial Area and the New Town respectively.

- proximities to the area to be served by each B & C functions are well preserved.
- enough area for the future expansion is reserved.
- valuable and important spaces are occupied in early stage of development-----the gateway to the B & C Area form Route 3, the gateway from the Port.
- multipling effects of centralized functions in the B & C activities will not be well expected.

APPENDIX III-4 EMPLOYMENT

APPENDIX III-4-1 EMPLOYMENT BY OCCUPATION FOR SHORT TERM

Table III-4-1-1 PROPORTION OF WORK STATUS (MINIMUM CASE)

	No. of Employee							
	(Total	(Manager)	%	(skilled Labor)	%	(unskilled Labor)	%	
1. Industrial Estate	(9,582)	(229)	24	(715)	7.5	(8,638)	90.1	
1) EPZ/1	5,430	183		365		4,882		
2) GIE/2	4,040	44		311		3,685		
3) Industrial Centre/3	112	2		39		71		
2. Port	(8,400)	(168)	20	(1,848)	22.0	(6,384)	76.0	
1) Wharf & Commercial Distribution	3,636	73		800		2,763		
2) Business Area	4,764	95		1,048		3,621		
3. Others (Multiplier effect)	(4,405)	(176)	4.1	(1,432)	32.7	(2,797)	63.2	
1) Transportation	960	18		211		731		
2) New Town								
(1) Community Centre	2,424	116		656		1,652		
(2) Neighborhood Shopping Centre	550	28		148		374		
(3) Educational Facility	405	11		364		30		
3) Others								
(1) Sewerage treatment plant	34	1		30		3		
(2) Water Filtration plant	22	1		18		3		
(3) EGAT Sub Station	10	1		5		4		
4. Total	22,387	573	2.6	3,995	17.9	17,819	79.5	

/1 : See Table III-4-1-2

/2 : See Table III-4-1-3

/3 : See Table Fig. A

Table III-4-1-2 EPZ EMPLOYEE FOR SHORT TERM BY OCCUPATION

Japanese Standard Industry Number	Short Term			
	Total	Manager	Skilled	Unskilled
18-19 Food				
20 Artificial Fiber Processing	734		37	638
21 Textile	1,092	87	55	950
22 Wood	46	1	1	44
23 Lumber Processing and Furniture	187	2	4	181
24 Paper Craft	27			
26 Chemical	140			
28 Rubber	120			
29 Chamois-Leather	117			
30 Pottery	101			
32 Nonferrous Metal	30	3,333	33	267	3,033
33 Metals	258			
34 General Machine	92			
35 Electrical Machine	1,132			
36 Transport Machine	1,078			
37 Precision	138			
39 Others	100			
Total	5,430	183	365	4,882

Note: Calculated based on the employed persons ratio by occupation of Table III-4-1.4.

Table III-4-1-3 GIE EMPLOYEE FOR SHORT TERM BY OCCUPATION

Japanese Standard Industry Number	Short Term			
	Total	Manager	Skilled	Unskilled
18 - 19	123	2	2	119
20	34	3	2	29
22	19	1	1	56
23	39			
	58			
26	60			
28	114			
29	44			
30	94			
31	70			
32	73	38	306	3,481
33	339			
34	197			
35	1,278			
36	1,457			
39	99			
	3,825			
Total	4,040	44	311	3,685

Table III-1-4-4 EMPLOYED PERSONS RATIO BY OCCUPATION

	Total			Male			Female		
	Manager	Skilled labor	Unskilled labor	Manager	Skilled labor	Unskilled labor	Manager	Skilled labor	Unskilled labor
Textile	8%	5%	87%	21	6	73	4	5	91
Wood Working	1	2	97	1	2	97	-	-	100
Food	2	2	96	2	3	95	-	1	99
Other Manufacturing	1	8	91	1	10	89	-	3	97
Commerce	5	27	68	7	28	65	2	25	73
Services	2	35	63	2	38	60	2	33	65
Transport, Storage and Communication	2	22	76	2	17	81	2	54	44
Construction	1	13	86	1	13	86	-	14	86

Note: Calculated based on the data the number of employee by level of education of "LABOR FORCE SURVEY July-September 1981"

APPENDIX III-4-2 INCOME STRUCTURE OF INDUCED EMPLOYMENT

1. Port Employee

Income structure of the employees, induced by the port development, would be assumed by the existing A port in Thailand. The everage income of port workers are as follows.

	Average Monthly Income (1984)	
Clerical and Mangerial	7,570	BAHT
Longshoreman and etc.	6,360	
Other Employee	7,450	

2. EPZ, GIE and Other Employment

Income structure of the employees, induced by the EPZ development, would be assumed by "Wage Structure in Thailand 1982/1983, Department of Labour". Average monthly income of Unskilled Salaried Workers (1982) in Central Region excluding Bangkok Metropolis, Medium in scale is as follows.

Average Monthly Income of Unskilled Salaried Workers 1/ (1982)		
Manufacturing	2,031	BAHT
	(41)	
Food and Beverages	2,100	
	(62)	
Textiles and Wearing Apparel	1,902	
	(135)	
Wood, Wood Products and Furniture	2,007	
	(104)	
Paper, Paper Products and Printing	2,403	
	(n.a.)	
Chemical, Petroleum, Rubber and Plastic Products	2,015	
	(225)	
Non-Metallic, Pottery and Glass Products	2,011	
	(333)	
Iron, Steel and Basic Metal Products	-	
	-	
Machinery, Equipment and Fabricated Metal Products	1,884	
	(n.a.)	
Other Manufacturing Industries	-	
	-	

1/ Average Monthly Income in Average of Monthly Wage Plus Fringe Benefits and Welfare Plus Bonus

Distributions of workers by income are shown in Table III-4-2.

Table III-4-2

สัดส่วนของคนงานที่ได้รับรายได้ระดับต่าง ๆ ในปี 2525 จำแนกตามอุตสาหกรรม (ภาคกลาง)[1]

Distribution of Workers by Income in 1982, classified by Industry (Central)[1]

หน่วย : ที่ละร้อย
Unit : Percent

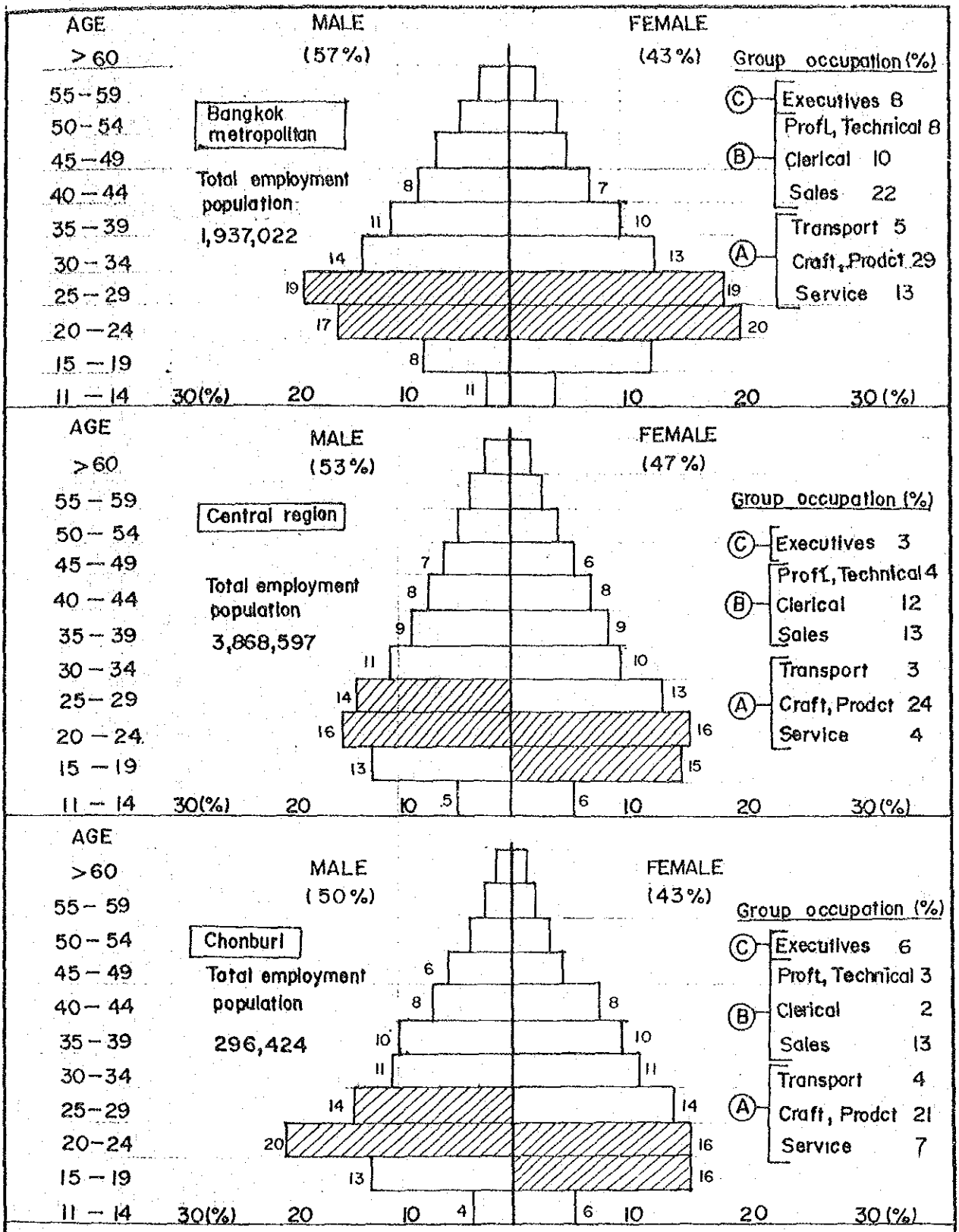
ประเภทอุตสาหกรรม	ระดับรายได้ (บาท) Income Levels (Baht)									Type of Industries
	ต่ำกว่า 1,200 Less than 1,200	1,201–1,500	1,501–1,800	1,801–2,100	2,101–2,400	2,401–2,700	2,701–5,000	สูงกว่า 5,001 More than 5,001	รวม Total	
หมวดอุตสาหกรรม	3.0	10.0	36.6	11.9	8.8	6.3	14.4	9.0	100.0	Manufacturing
อาหาร และเครื่องดื่ม	2.3	9.9	43.8	11.7	7.8	5.5	12.2	6.8	100.0	Food and Beverages
สิ่งทอ สิ่งถัก และเครื่องแต่งกาย	2.2	5.8	21.6	9.9	19.8	14.8	24.4	1.5	100.0	Textiles and Wearing Apparel
ไม้ ผลิตภัณฑ์ไม้ และเครื่องเรือน	7.8	14.3	37.6	13.3	5.5	4.2	15.0	2.3	100.0	Wood, Wood Products and Furniture
กระดาษ ผลิตภัณฑ์กระดาษ และการพิมพ์	3.3	6.6	1.7	0.8	–	0.8	66.1	20.7	100.0	Paper, Paper Products and Printing
ผลิตภัณฑ์เคมี ปิโตรเลียม ยาง และพลาสติก	0.2	24.6	48.2	9.8	1.7	3.0	7.8	4.7	100.0	Chemical, Petroleum, Rubber and Plastic Products
อโลหะ เครื่องปั้นดินเผา และผลิตภัณฑ์แก้ว	6.1	8.3	8.1	2.8	3.2	2.9	18.1	50.5	100.0	Non-Metallic, Pottery and Glass Products
เหล็ก เหล็กกล้า และผลิตภัณฑ์โลหะขั้นมูลฐาน	31.6	42.1	–	–	–	10.5	15.8	–	100.0	Iron, Steel and Basic Metal Products
เครื่องจักร อุปกรณ์ และผลิตภัณฑ์โลหะ	3.2	12.4	16.4	34.9	10.6	6.2	12.8	3.5	100.0	Machinery, Equipment and Fabricated Metal Products
อุตสาหกรรมอื่น ๆ	–	69.2	–	–	15.4	–	7.7	7.7	100.0	Other Manufacturing Industries
การก่อสร้าง	–	25.2	47.3	10.9	4.5	5.7	5.2	1.2	100.0	Construction
การค้าส่ง	2.7	8.9	24.3	12.1	12.2	11.3	22.6	5.9	100.0	Wholesale Trade
การค้าปลีก	4.9	10.9	22.5	13.6	14.2	5.6	24.5	3.8	100.0	Retail Trade
การบริการ	3.3	6.5	12.8	11.9	17.2	15.6	30.3	2.4	100.0	Services
ภัตตาคาร และโรงแรม	1.6	3.6	6.5	3.8	20.4	29.1	32.5	2.5	100.0	Restaurants and Hotels
การขนส่ง คลังสินค้า และการคมนาคม	3.6	17.0	18.4	13.8	19.5	8.9	16.7	2.1	100.0	Transport, Storage and Communication
บริการอื่น ๆ	4.3	6.8	15.7	16.4	15.0	8.5	30.9	2.4	100.0	Other Services
การทำเหมืองแร่	0.6	2.0	16.2	23.4	10.3	6.7	30.4	10.4	100.0	Mining
รวมทุกประเภทอุตสาหกรรม	3.0	9.8	33.8	12.2	9.6	7.1	16.3	8.2	100.0	All Industries

[1] ไม่รวมกรุงเทพมหานคร และ 5 จังหวัดใกล้เคียง

[1] Excluding Bangkok Metropolitan and Nearby Provinces

WAGE STRUCTURE IN THAILAND 1982/1983, DEPARTMENT OF LABOUR.

APPENDIX III-5 Age and Sex Distribution of Employment



APPENDIX D

EMPLOYED POPULATION 11 YEARS OF AGE AND OVER BY AGE GROUP AND SEX

SOURCE : 1980 - POPULATION AND HOUSING CENSUS BY N.S.O.

KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
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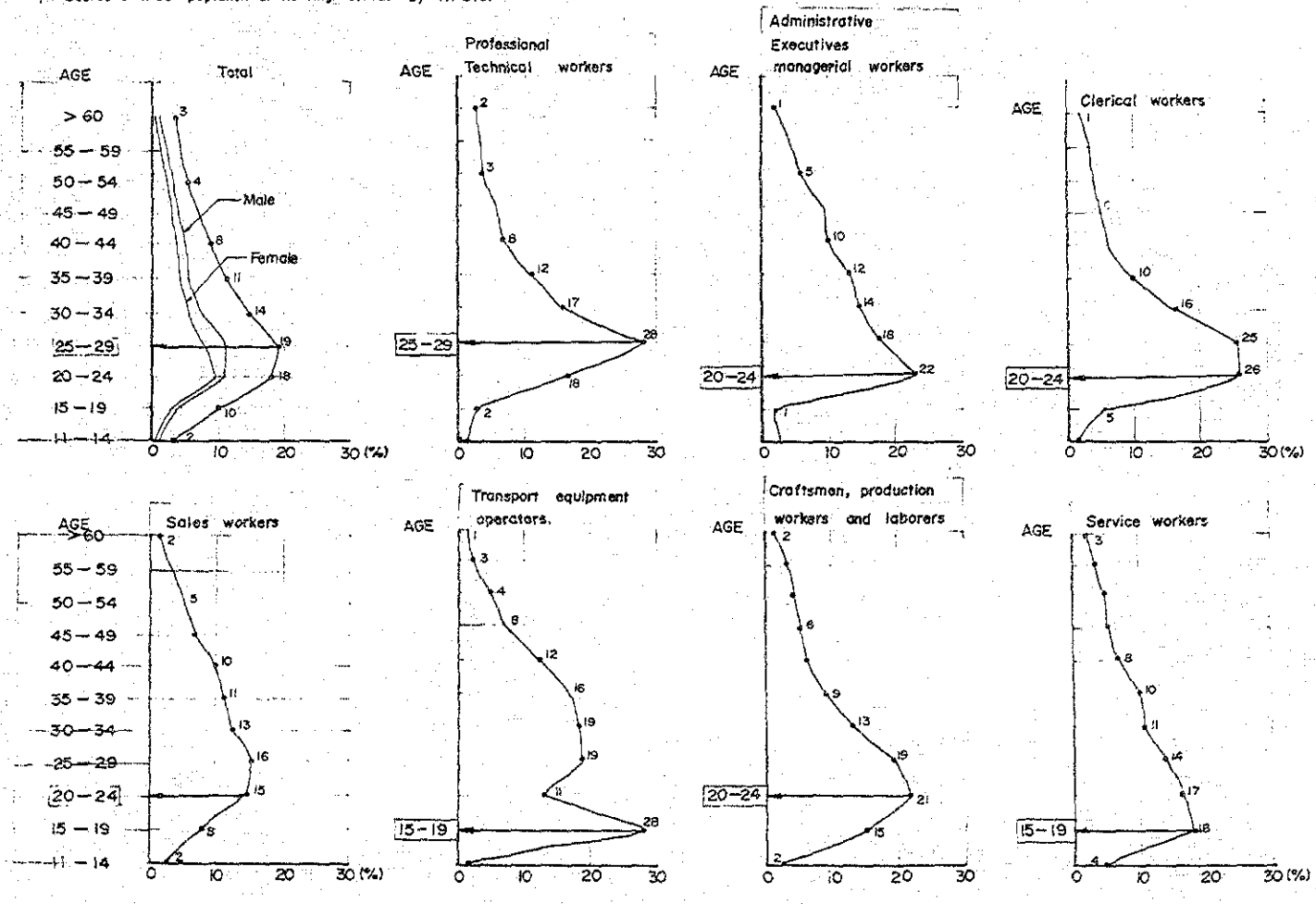
Appendix III.5.1

Employed population 11 years of age & over by occupation, age group., sex and municipal area in Bangkok metropolis.

Source : 1980 poplation & housing census by N. S.O.



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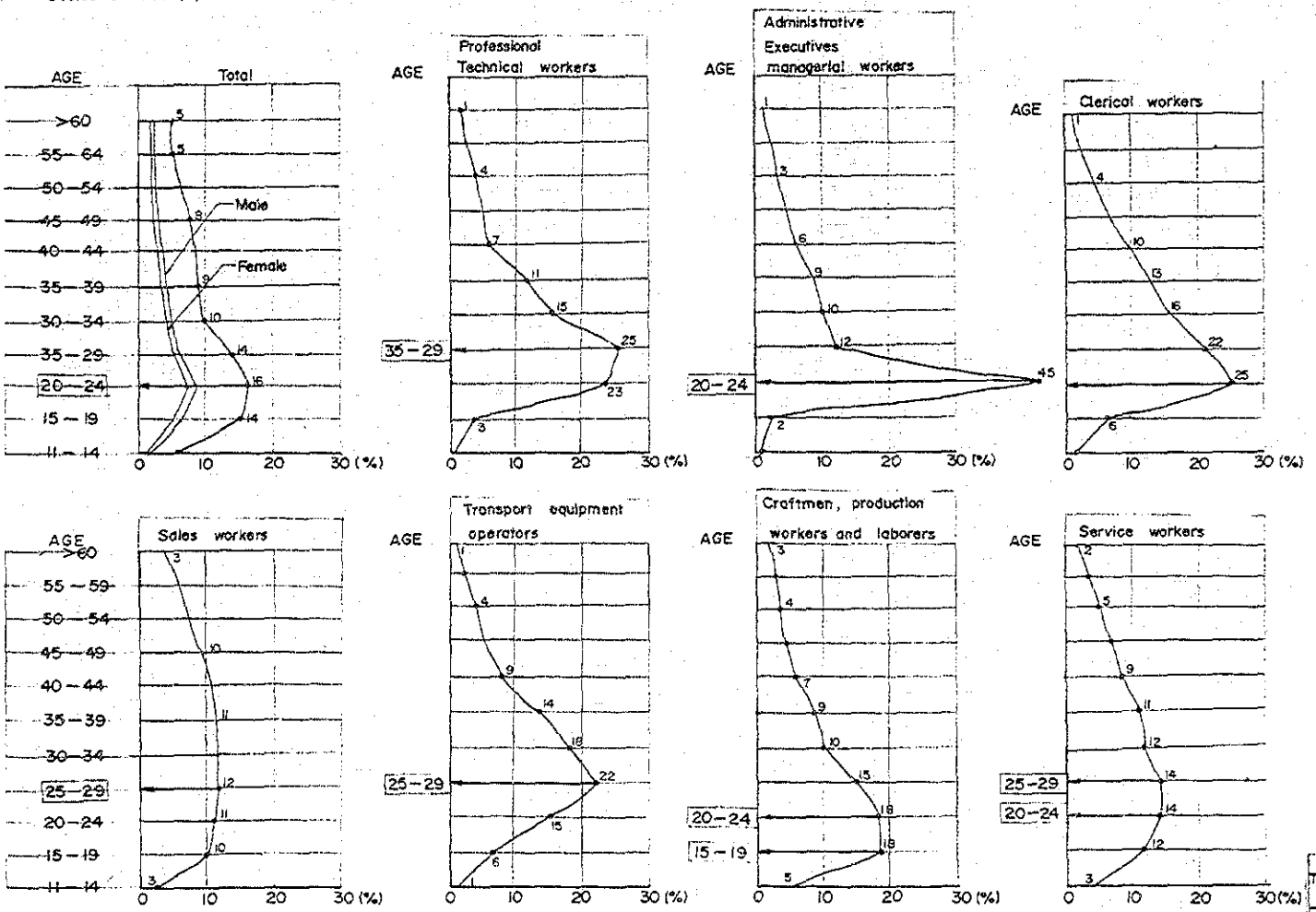
Appendix III.5.2

Employed population 11 years of age & over by occupation, age group, sex and municipal area in the central region

Source : 1980 population & housing census central region by N.S.O.



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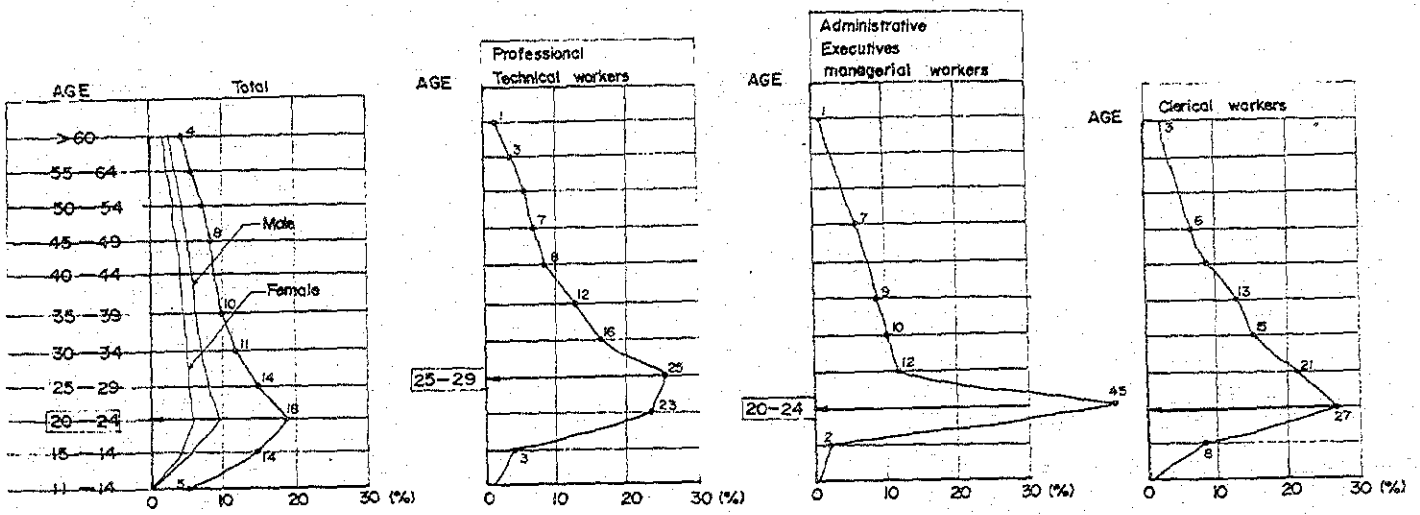
Appendix III.5.3

Employed population 11 years of age & over by occupation, age group, sex and municipal area in the Changwat Chonburi

Source : 1980 population & housing census - by N. S. O.



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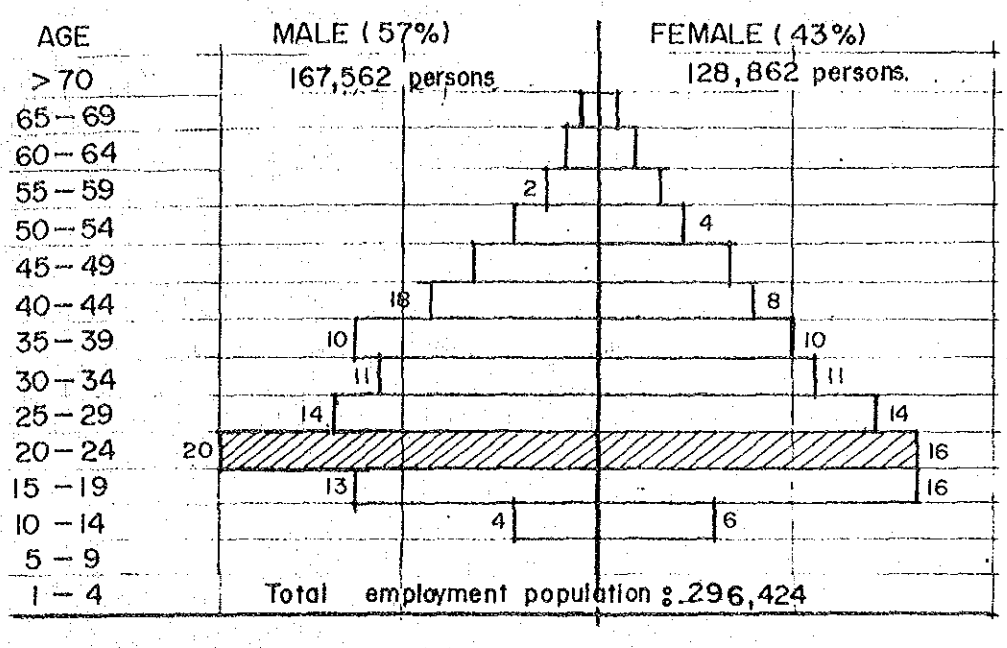
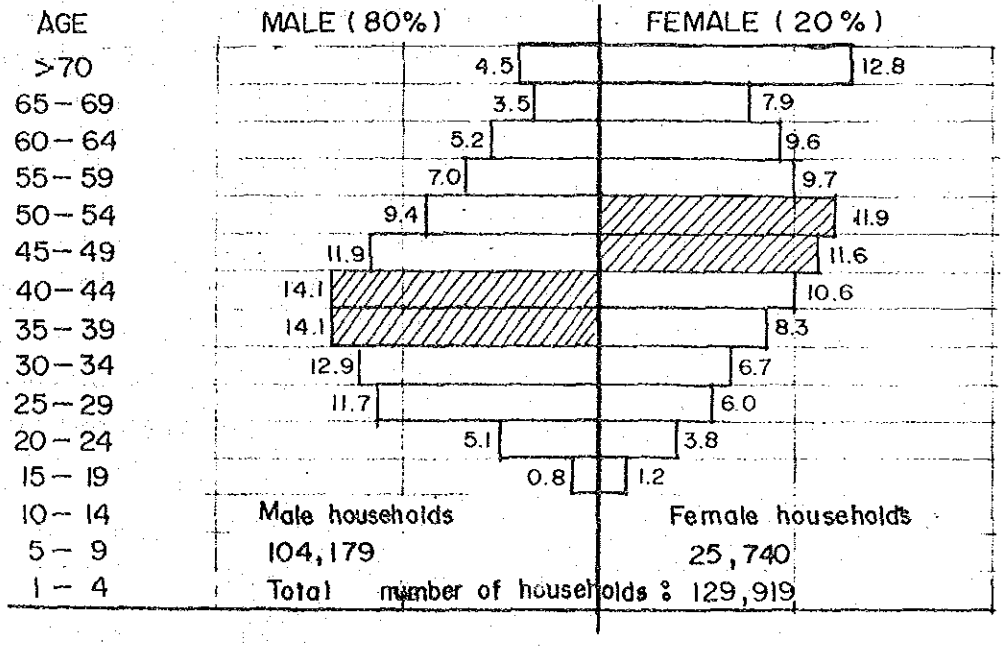
Appendix III.5.4

CHANGWAT CHONBURI



Employed population 11 years of age and over by age group and sex in Changwat Chonburi — 1980 population & housing census by N. S. O.



Household structure by type of family, age group and sex of household head 1980- Changwat Chonburi population and housing census by N. S. O.

Appendix E EMPLOYED POPULATION & HOUSEHOLD STRUCTURE BY AGE AND SEX.	KINGDOM OF THAILAND THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA JAPAN INTERNATIONAL COOPERATION AGENCY Appendix III.5.5

APPENDIX III-6 LAND-USE ALTERNATIVE

Two alternatives of basic land use plan have been worked out as shown in Fig. A and B. Main factor to distinguish the Alternative A and B is the allocation of residential area. The residential area is located in the east of the Route 3 in the Alternative A, while certain portion of residential area is allocated to the IEAT acquired land in the Alternative B. Area allocation in both cases is as presented in Table A. Advantages and disadvantages of the two alternatives are listed hereunder.

Alternative A

(Advantage)

- Residential and other two functions can be clearly separated.
- More land is available in the PAT owned land for the future expansion resulting from industrial and port development.

(Disadvantage)

- The land for residential area has to be purchased immediately in order to meet housing demand in early stage of development.
- Initial investment for land acquisition proves not to be efficient, since a part of the area purchased by PAT is remained unused for long period. Besides, investment cost of infrastructure facilities will be relatively high since facilities will have to be rather disposed.

Alternative B

(Advantage)

- An immediate utilization of the purchased land is possible, since the land for residential development in the short term is allocated within the area already purchased by IEAT and PAT.

- Speaking limited to the short term development, the construction cost of the infrastructures will be minimized because facilities to be constructed are located close to each other.

(Disadvantage)

- Buffer zones will be required between the residential area and the industrial and port area to protect the residential environment from the industrial activities.
- Available land for future expansion for industrial and port development will be more limited than Alternative A.
- The residential area for the short-term will be surrounded by the industrial and port area.
- Administrative procedures will be required to exchange a part of the expropriated land between PAT and IEAT.

As the conclusion, Alternative A is preferable from the viewpoint of long-term perspective, provided that the necessary measures is promptly taken for land expropriation.

Plan A' is shown in Fig. A' that is drawn as an alternative of Plan A based on the idea that Export processing zone (EPZ) must be adjacent to the the port custom area.

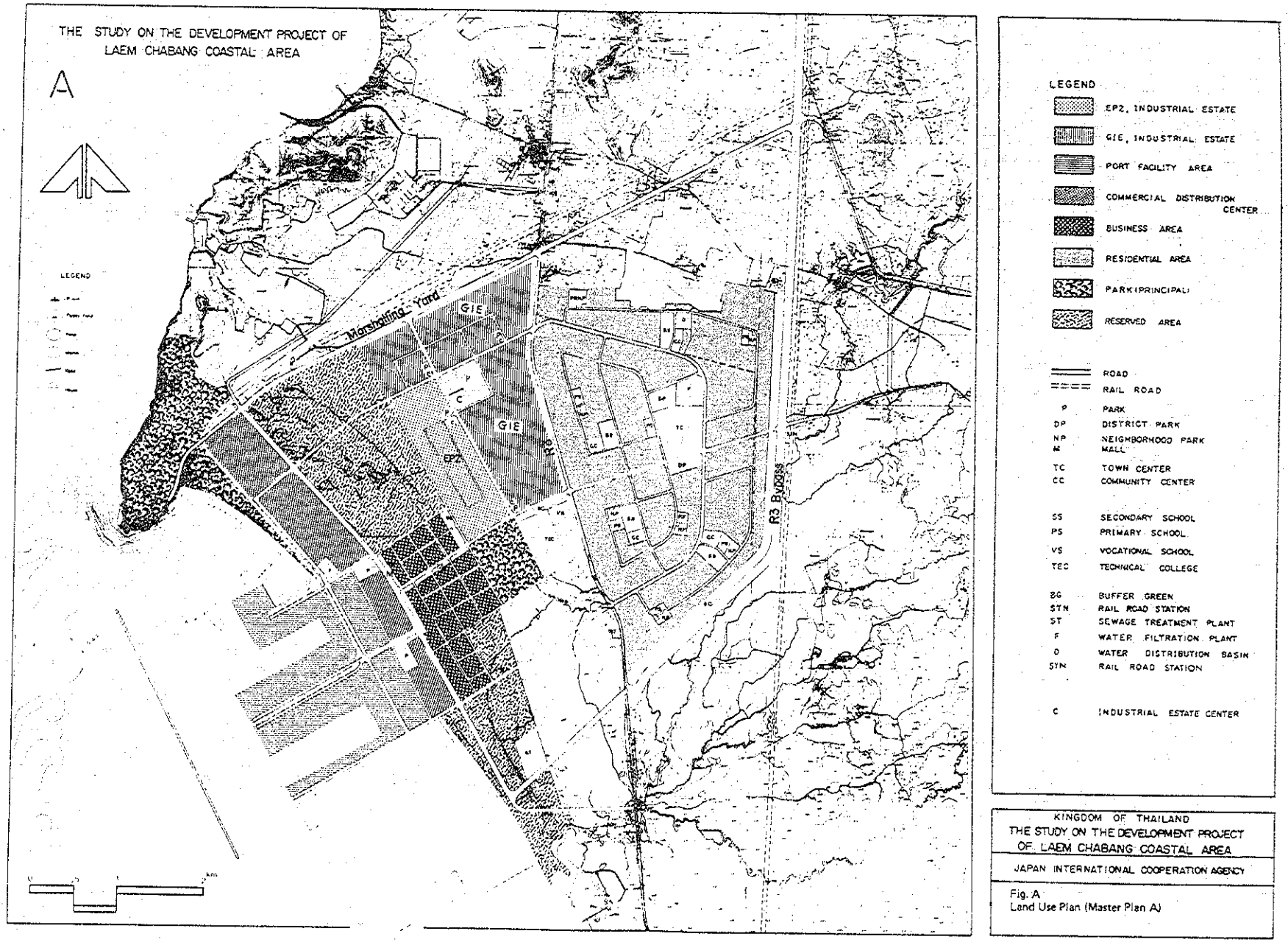
Finally, Plan A' with some modification was adopted as a Land-Use master plan.

Land use plans for the short-term development for the two alternatives are presented in Fig. C and D. It is roughly estimated that the development cost of the Alternative A is a little more expensive as the Alternative B.

Table A Land Use Plan

Area		(Master Plan A) (ha)	(Rai)	(%)	(%)	(Master Plan B) (ha)	(Rai)	(%)	(%)
1) Industrial Estate	(1) EPZ (Net)	77	480		(17.1)	86	540		(19.1)
	(2) GIE (Net)	201	1,330		(44.7)	189	1,320		(42.0)
	(3) Road	58	360		(12.9)	66	410		(14.7)
	(4) Park	16	100		(3.6)	16	90		(3.6)
	(5) River, Canal	8	50		(1.8)	5	30		(1.1)
	(6) Centre	5	30		(1.1)	5	30		(1.1)
	(7) Others (Green Belt, Utility)	85	450		(18.9)	83	380		(18.4)
	Sub Total	450	2,800	15.5	(100.0)	450	2,800	17.0	(100.0)
2) Port Area	(1) Port Facility Area	275	1,720		(19.1)	275	1,720		(23.1)
	(2) Commercial Distribution Area [1]	160	1,000		(11.1)	160	1,000		(13.4)
	(3) Park	234	1,460		(16.3)	236	1,480		(19.8)
	(4) Business Area [2]	135	840		(9.4)	135	840		(11.3)
	(5) Road	88	550		(6.1)	86	540		(7.2)
	(6) River, Canal	27	170		(1.9)	27	170		(2.3)
	(7) Railroad (spur)	103	640		(7.2)	103	640		(8.7)
	(8) Others (Reserved area, utility, technical college, vocational school etc.)	418	2,620		(28.9)	168	1,050		(14.2)
	Sub Total	1,440	9,000	49.5	(100.0)	1,190	7,440	45.0	(100.0)
3) New Town	(1) Residential Use (Net)	468	2,930		(50.3)	456	2,850		(49.0)
	(2) Community Use [3]	58	360		(6.2)	53	330		(5.7)
	(3) Schools [4]	60	370		(6.5)	60	380		(6.5)
	(4) Park	34	210		(3.7)	34	210		(3.7)
	(5) Buffer Green	56	350		(6.0)	75	470		(8.1)
	(6) Road	205	1,280		(22.0)	205	1,280		(22.0)
	(7) River, Canal	16	100		(1.7)	16	100		(1.7)
	(8) Others [5]	33	200		(3.6)	31	180		(3.3)
	Sub Total	930	5,800	32.0	(100.0)	930	5,800	35.0	(100.0)
4) Total		2,820	17,600	96.9		2,570	16,050	97.0	
5) Others	(1) Road (R.3, [6] connected Roads) [7]	60	380	2.1		50	310	1.8	
	(2) Rail road (spur from R.3 to trunk line)	10	60	0.3		10	60	0.4	
	(3) Canal	20	120	0.7		20	120	0.8	
6) Grand Total		2,910	18,160	100.0		2,650	16,540	100.0	

1) Track Terminal, Warehouse.
2) Including Local Roads of 48 ha (Plan A) or 60 ha (Plan B).
3) Town Centre, Community Centre, Neighborhood Shopping Centre.
4) Secondary school, primary school, kindergarden.
5) Water Filtration Plant and Distribution tank, power line, gas pipeline.
6) R.3 bypass is not included.
7) Northern connected road with PTT, ESSO, TORC and Eastern connected roads with Siracha park are not included.


THE STUDY ON THE DEVELOPMENT PROJECT OF
LAEM CHABANG COASTAL AREA
A
LEGEND
Marshalling Yard
GIE
IC
GIE
EP2
R6
R3 Bypass
LEGEND
EP2, INDUSTRIAL ESTATE
GIE, INDUSTRIAL ESTATE
PORT FACILITY AREA
COMMERCIAL DISTRIBUTION CENTER
BUSINESS AREA
RESIDENTIAL AREA
PARK(PRINCIPAL)
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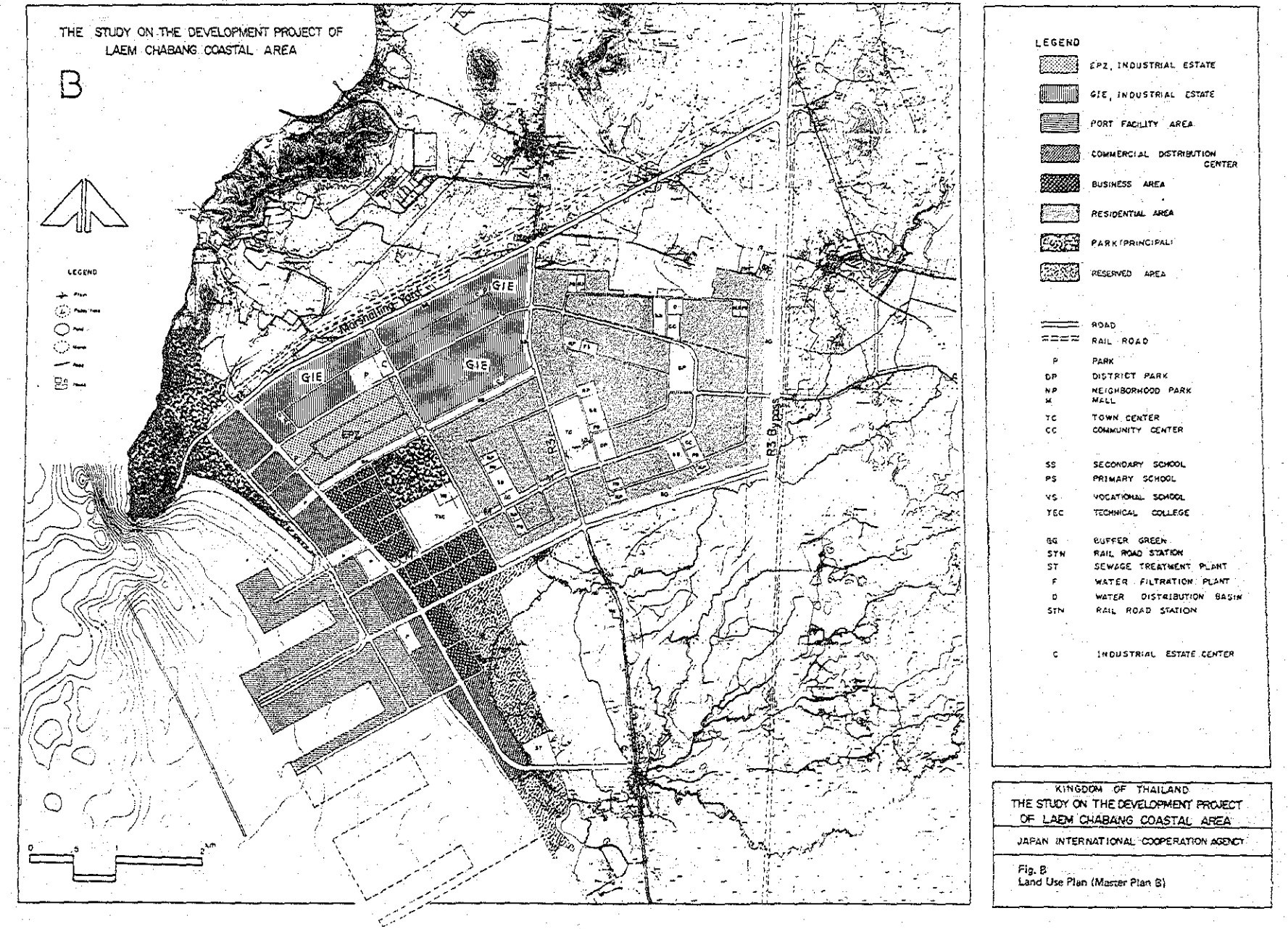
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. A
Land Use Plan (Master Plan A)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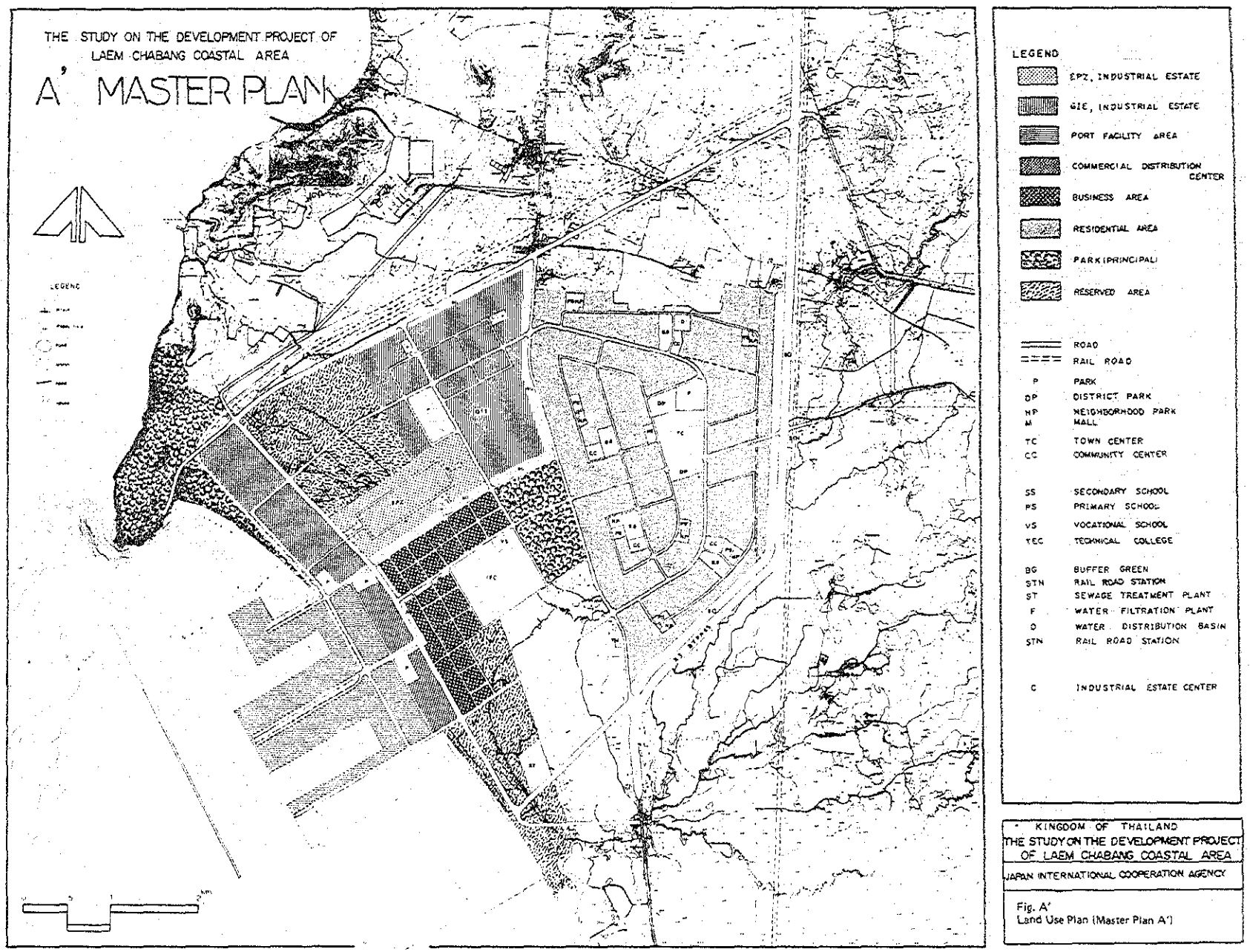
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. 8
Land Use Plan (Master Plan B)


THE STUDY ON THE DEVELOPMENT PROJECT OF
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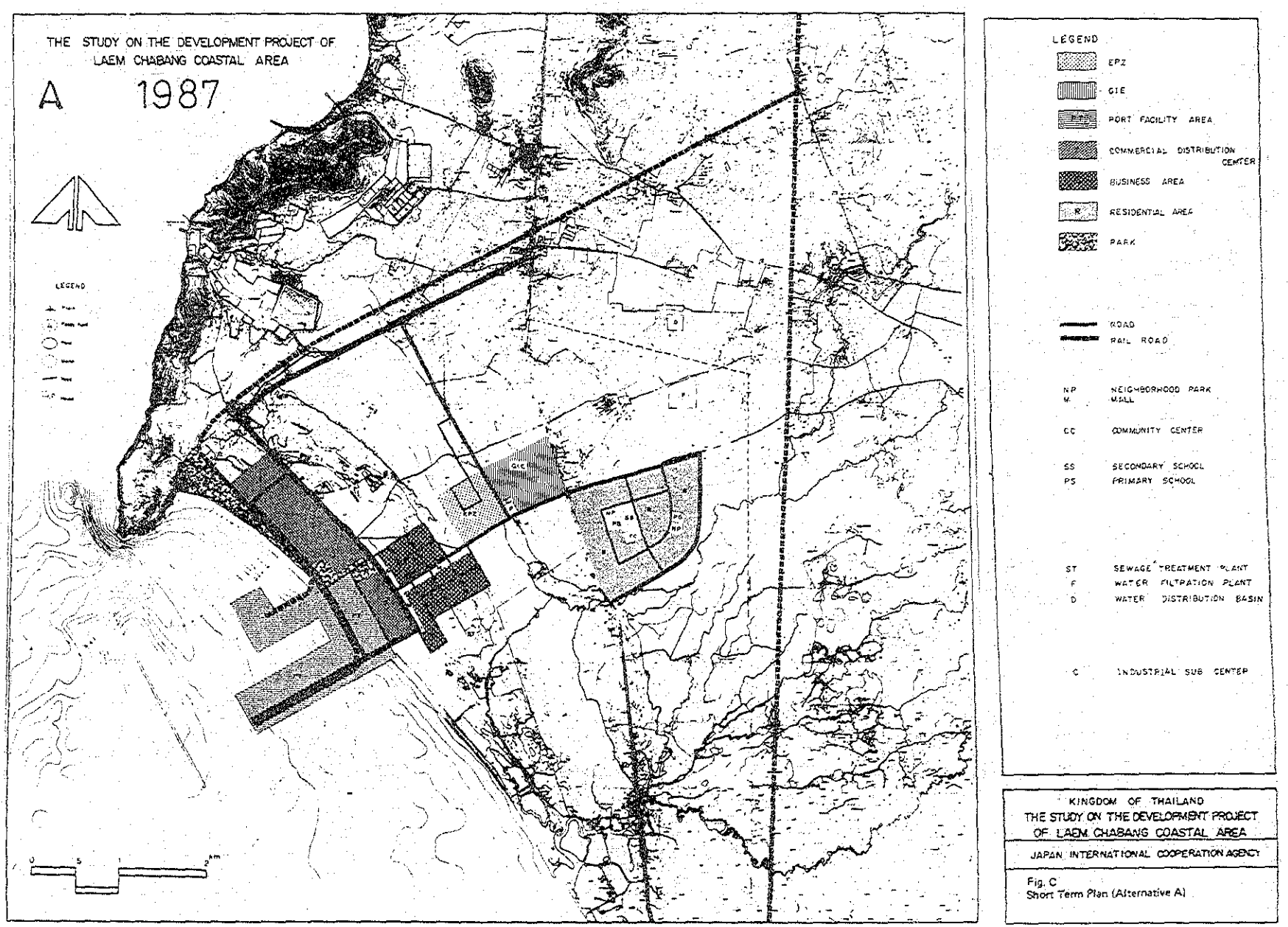
C INDUSTRIAL ESTATE CENTER
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. A'
Land Use Plan (Master Plan A')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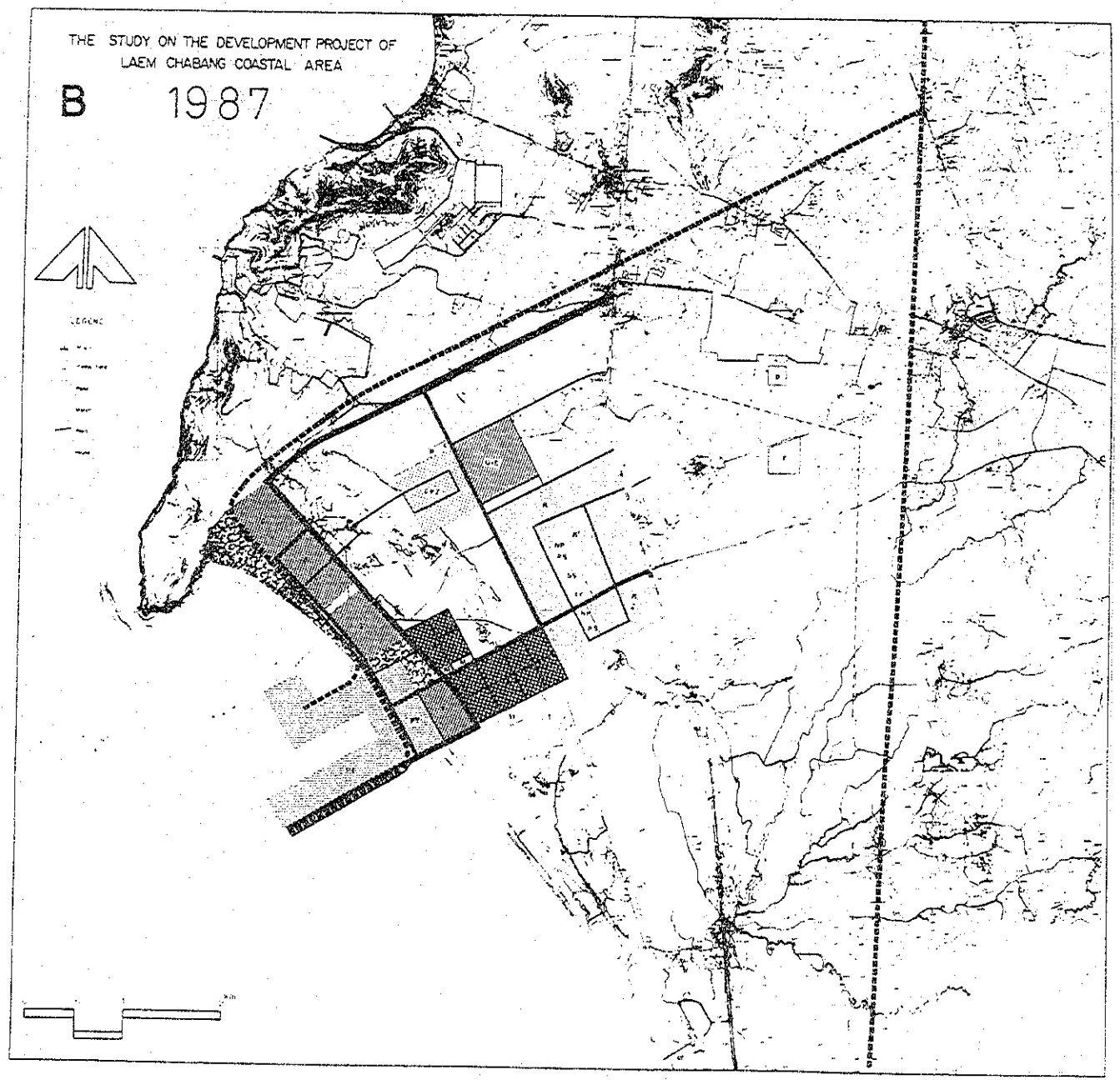
C INDUSTRIAL SUB CENTER
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. C
Short Term Plan (Alternative A)


THE STUDY ON THE DEVELOPMENT PROJECT OF
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KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT
OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. D
Short Term Plan (Alternative B)

APPENDIX III-7 DETAILS ON PROPOSED COMMUNITY FACILITIES

General features of community facilities are presented in the attached III-7-1. These figures are estimated based on the example of the city in Japan with nearly the scale of population in 1960's for the reference of the present study. Capacity of facilities are tentatively proposed to meet the requirement arising from the population of around 120,000. Some of these facilities may be better to be developed in the context of the whole Eastern Seaboard Development Programme.

Planning of community facilities are deeply related with policies of the Royal Thai Government and the local administration office. It is recommended that the further investigation will be made by the Thai Government in consideration of policies of each responsible agency and prospected future requirement for community facilities.

Regarding the existing facilities, following facilities could be utilized at the very early stage of development.

1) Primary School

The primary school located on the west of the Skumvit Highway and in the south of development area in 2001 could be used. The school is located about 2.5 km from the center of the short term new town development area, which is rather far for children to commute on foot. Moreover, they will have to cross the Highway which may have heavy traffic. For these reasons it is recommended to provide a pedestrian bridge across the Highway or bussing system, if the school is to be utilized for the new town residents. However, utilizing this school may encourage the urbanization of the area around the school, and may cause some trouble when the port, the industrial estate and other functions expand toward this area.

Present condition of existing schools is shown in Table III-7-2.

2) Fire Station

The fire station at Ao Udom can be utilized at the early stage of development of the new town. If so, the port and industrial estate may be covered by this station with substantial reinforcement of the fire extinguishing machineries and man power. The station could be remained as the cental fire station of Laem Chabang area with two sub-stations; one for the new town and the other for the port, industrial estate and business and commercial area.

Table III-7-1 LIST OF COMMUNITY FACILITIES (1/2)

Facility	Number of Workers	Floor Area (m^2)	Land Area (m^2)	Location and Number of Facilities
Revenue Office (National Government)	120	1,900	2,400	New Town Center or B & C Area
Labor Standards Office	16	260	330	B & C Area
Public Employment Security Office	30	570	700	B & C Area or New Town Center
Judicial Branch Office	17	370	460	B & C Area or New Town Center
Public Procecutor's Office	10	820	1,000	New Town Center or B & C Area
Telephoen and Telegram Central Station	230	5,400	6,700	B & C Area
Telephone and Telegram Substation	-	-	-	New Town Center
Post Office Central Office	180	4,300	5,400	B & C Area
Post Office Sub-Central Office	-	-	-	New Town Center
Post Office Branch Office	-	-	-	Community Center (4)
Local Taxation Office	55	880	1,100	New Town Center or B & C Area
Committee of Education Office	20	300	380	New Town Center
Branch Office of Changwat Chon Buri	170	4,750	6,000	New Town Center or B & C Area
Office of Social Security	50	660	820	New Town Center

Note: B & C Area; Business and Commercial Area

Table III-7-1 List of Community Facilities (2/2)

Facility	Number of Workers	Floor Area (m^2)	Land Area (m^2)	Location and Number of Facilities
Health Center Main Center	55	1,400	1,750	New Town Center
Health Center Sub-Center	-	-	-	Community Center (4)
Municipal Office	660	11,000	14,000	New Town Center or B & C Area
Municipal Office Branch Office	-	-	-	Community Center (4)
Fire Station Central	80	1,250	1,600	Ao Udom or B & C Area
Fire Station Sub-station	-	-	-	New Town Center and B & C Area or Ao Udom
Police Station Main Station	150	2,000	2,500	New Town Center
Police Station Sub-station	-	-	-	Community Center (4) and B & C Area
Office of Social Welfare	45	800	1,000	New Town Center
Public Library	-	-	-	New Town Center
Gymnasium & Auditorium	-	-	-	New Town Center
Chamber of Commerce (and Industry)	20	1,100	1,380	B & C Area
Hospital (Public)	130	6,500	8,000	New Town Center or B & C Area

Others (Commercial and Business Facilities)

nuclear market, fresh markets, food markets, retail shops, service shops, wholesale shops, restaurants, banks, insurance sales office, offices, hotels, amusement facilities, exhibition hall, theaters (movie & drama)

Note: Features of the following facilities are explained in the main text of this Sectoral Report: medical facilities (clinic, doctors, office, dental office and pharmacy), vocational school, training school, secondary school (upper and low), primary school, kindergarten and day-care center.

Table III-7-2 LOCATIONS NUMBER OF STUDENTS, TEACHERS, ROOMS OF THE EXISTING EDUCATION INSTITUTION WITHIN THE LAEM CHABANG COMPLEX

Name of Tambon / Name of school	Area (Rai)	Level	Number of Student male	Number of Student female	Number of teacher	Number of rooms
Tambon Surasu						
1. Saint Paul Convant	27	Kinderg.-second	79	1657	73	41
2. Assumption Sriracha	476	Kingerg.-second	2227	108	89	56
3. Wat Rangsri Suthavas	2.75	primary	171	179	18	12
4. Wat Piboonsunhatum	11.5	primary	101	89	8	8
5. Wat Pratanporn	Wat	primary	85	65	8	6
6. Wat Sri Rattanaram	Wat	primary	31	25	4	7
Tambon Ton Sukla						
7. Boonjit Phanichkarm	4.5	technical	113	187	36	13
8. Tong Sukla Pittaya	4.5	secondary	358	255	33	15
9. Wat Manorom	10	primary	230	310	30	20
10. Wat Mai Nen Payom	1.8	kinderg.-primary	237	250	21	17
11. Wat Laem Chabang	10	kingerg.-primary	159	143	15	11
12. Ban Sak Yaijean	12	primary	129	133	11	10
13. Wat Ban Na	Wat	primary	119	119	10	8
Tambon Bung						
14. Thai Kasikornsongkhro	15	primary	215	160	16	12
15. Wat Nongkhla	4	primary	64	58	7	6
Tambon Sriracha						
16.Sriracha	42	secondary	830	1020	112	46
17. Tara Samutre	21	kind-secondary	1807	902	101	66
18. Wat Srimaharacha	17	kind-primary	301	281	26	16
Tambon Banglamung						
19. Ban Banglamung	6	primary	75	73	7	6
20. Tanaporn Vidhaya	2.50	primary	87	79	7	6

APPENDIX III-8 INSTITUTIONAL ISSUES FOR THE NEW TOWN DEVELOPMENT

Experience in new town development in Japan indicates various problems may occur in the course of new town development. The following list shows problems which may be faced in the Laem Chabang new town development.

1. Land Acquisition

In the process of the land acquisition for the new town, following problems may arise.

1) Expectation for the rise of land value, which may result in higher land acquisition costs and delay of acquisition.

2) Reduction in the sales tax of the land transaction may be necessary, in cases the land owner cannot find decent farmland to continue their way of living or to engage in an alternate occupation.

3) Problem of the difference of the land area between the surveyed area and the registered area.

4) Public agencies may have to assist the land owners and tenancies to find alternate land or occupation, in the latter case some training or guidance for new occupation would be required.

5) Phased land acquisition development may result in a higher land acquisition cost and in some cases the land value may go up out of reach.

2. Recovery of Investment Cost and Administrative Agencies for the Infrastructure.

Large scale new town development usually requires large amounts of investment to construct infrastructure especially at the early stage

of development. Following are problems which public agencies may face in the process of the development.

1) Recovery of the investment cost for the infrastructure.

Sales price of the developed land may easily become beyond the affordable range of the migrant household, if all of the development cost are put on the sales price, especially at the early stage of development, when the investment cost of major infrastructure per planned dwelling units is relatively higher than at later stages of development. Some government subsidies may be required to keep the afforadability of expenditure for housing. At the later stage of development the land acquisition cost may go up so high that the sales price of the developed land becomes beyond the afforadability of the purchasers if the total investment cost is intended to recover by selling the developed land. Consequently the problem of the difficulty of recovery of the investment cost for the major infrastructure may remain unresolved.

2) Administration and maintainance of the infrastructure

The development ageincies have the responsibility to develop the infrastructure but usually those agencies do not have the responsibility for administration and maintenance of the facilities. And the local agencies usually do not have the enough financial ability and man power for those tasks at the early stage of development.

3. Development Program

1) Co-ordination of various agencies, involving the development

In case of Laem Chabang Development, the port and the industrial development are involved in addition to the new town development. A carefull co-ordination of development among various concerned agencies, will be required, and also the well co-ordinated

phasing of construction of infrastructure and other facilities will be necessary.

2) A well balanced development by the public sector and private developers will be necessary, if the new town development is to be executed by two sectors.

4. Financial Problems of the Local Government

1) Rapid growth of the population and increase in demands for public services.

The local body of administration for the new town would face rapid growth of demands for public services, when the population in the new town grows rapidly. It would be necessary to strengthen the organization and manpower of local government by the national organization.

5. Others

1) Gap between the migrant society and the traditional society.

2) Difficulty of forming a good community among migrants.