

FINAL REPORT

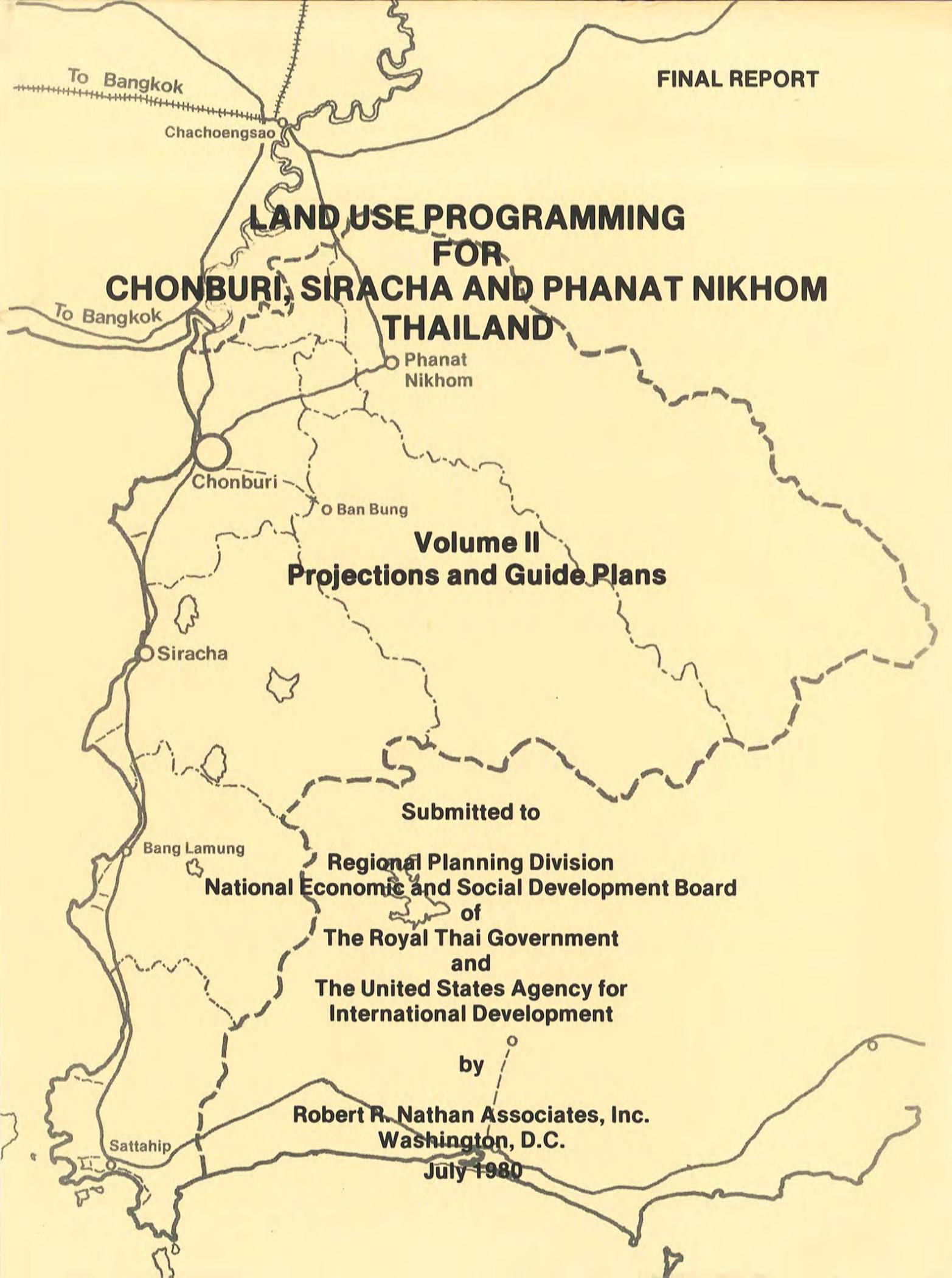
**LAND USE PROGRAMMING  
FOR  
CHONBURI, SIRACHA AND PHANAT NIKHOM  
THAILAND**

**Volume II  
Projections and Guide Plans**

Submitted to  
**Regional Planning Division  
National Economic and Social Development Board  
of  
The Royal Thai Government  
and  
The United States Agency for  
International Development**

by  
**Robert R. Nathan Associates, Inc.  
Washington, D.C.**

July 1980



# RRN A

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July 24, 1980

Kuhn Vithya Siripongse  
Director  
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Regional Planning Division  
National Economic and Social  
Development Board  
Bangkok, THAILAND

Dear Kuhn Vithya:

Robert R. Nathan Associates, Inc., is pleased to submit Volume II of the Final Report on the Chonburi Land Use Programming Project. With this volume, the Final Report is complete.

Volume II is a complete revision of the materials presented in the draft final report. In addition, it contains materials made available to the Consultant following completion of field work in Thailand, and reflects a number of very useful suggestions made by Kuhn Utis Kaothien, for which the Consultant is deeply appreciative. In a very real sense Volume II represents a joint effort by NESDE and RRNA in the manner contemplated in the project paper. However, RRNA assumes responsibility for the contents.

In behalf of Robert R. Nathan Associates, I would like to express our appreciation to you and members of your staff for the assistance and cooperation extended to us during the project -- and especially to you for your patience with the delays in submission of this volume completing the Final Report.

Sincerely yours,



Robert H. Johnson  
Senior Vice President

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## I. INTRODUCTION

As the terminology indicates, Guide Plans provide a general frame of reference for identification of areas suitable for development to accommodate future growth, and within which projects to lead development in "planned" directions can be identified. Guide Plans differ in several important respects from conventional Master Plans:

- (a) Guide Plans contain less detail than Master Plans. The former indicate general areas and major physical linkages, while the latter indicate specific areas for each type of land use, location of secondary and tertiary roads, public facilities such as schools, etc.;
- (b) Guide Planning is a continuing process, facilitating modification of plans to accommodate unanticipated changes in the rate and/or composition of growth in population and economic activity; i.e., Guide Plans may be characterized as dynamic while Master Plans remained fixed for substantial periods of time;
- (c) Master Plans generally do -- while Guide Plans do not -- have a legal basis for enforced compliance;
- (d) The process of Guide Planning leads to the identification of specific projects to accommodate and lead development in desired directions (areas). Thus, Guide Planning is viewed as action-oriented, in comparison with the process by which Master Plans are prepared; and

- (e) In the case of the urban centers in the study area, a Master Plan has been prepared only for Chonburi. While the planning area in the Chonburi Master Plan is somewhat larger than the area within the municipal boundaries, the Guide Plans for Chonburi and Siracha extend over a wider contiguous area.

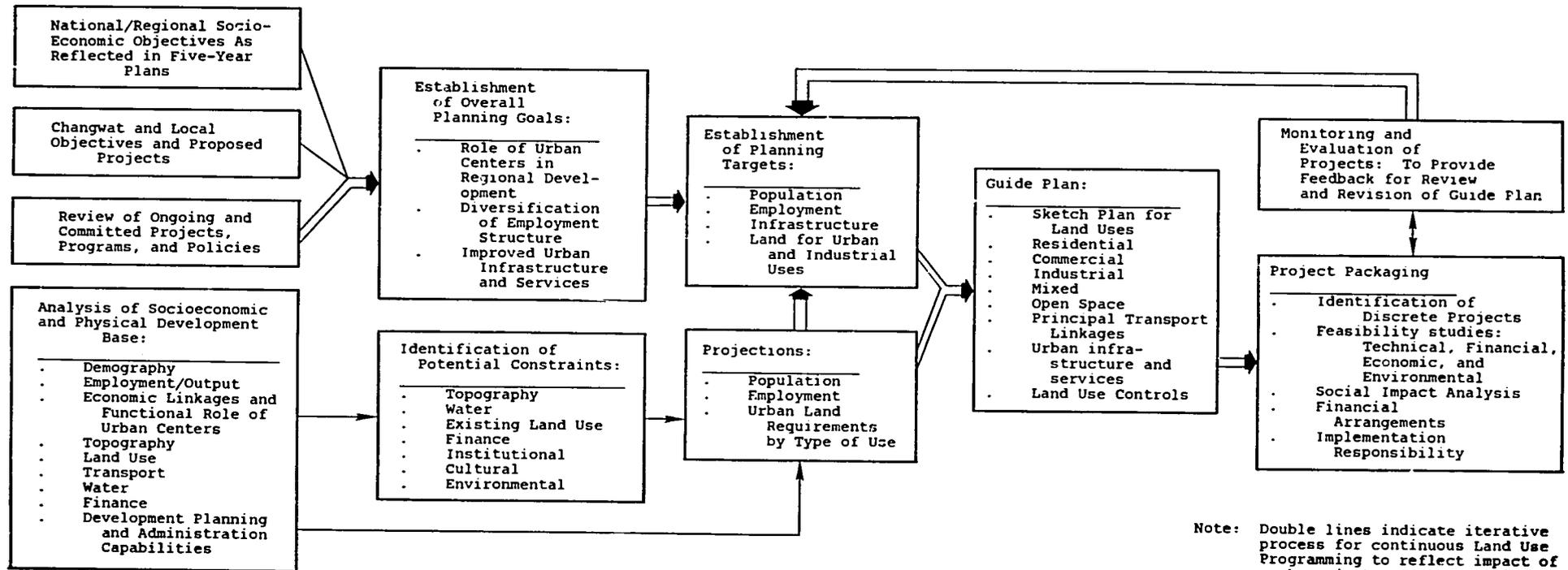
The steps involved in the preparation of Guide Plans, the relationships of project identification, evaluation and packaging, and the iterative process through which Guide Plans are updated are shown schematically in Figure 1. While the process may be viewed as proceeding logically from left to right in Figure 1, it is noted that the establishment of targets, projections, the Guide Plan and project identification is mutually interdependent; that is, all must be considered in relation to one another to achieve internal consistency.

#### Data Base

The physical and socioeconomic characteristics of the study area are presented in Section III, Volume I of the Final Report. This section also contains available information on infrastructure and medical and educational facilities.

The objectives of the Land-Use Programming Project, local and national, are described in Section IV, Volume I. It is noted that these objectives are important "inputs" in the Land-Use Programming process and, consequently, in the configuration of the Guide Plans and projects that emerge from the process. Also, the roles of national agencies responsible for regional and town planning are described in Section IV, pp. 59-68 of Volume I.

Figure 1. The Land Use Programming Process



In general, the statistics presented in Section III, Volume I are not reproduced in this volume. However, where relevant, the pertinent data in Volume I will be cross-referenced for the convenience of the reader.

### Methodology

The methodologies employed in Land-Use Programming are described in detail in Volume III of the Final Report. This volume also contains English language summaries of the lectures presented in the formal training program. Therefore, the materials presented in Volume II will not repeat those elaborated in Volume III. However, the assumptions underlying the projections of population, employment, and land requirements will be made explicit in Volume II.

## II. POPULATION AND LABOR FORCE PROJECTIONS

Although projected increases in population, labor force, employment, and land required for urban uses are presented separately, internal consistency requires that the projected variables be considered simultaneously. Before presenting these projections, several caveats are in order.

First, it is to be understood that the projections are not unconditional forecasts. Rather they are rough estimates of what could reasonably be expected to occur if the Government is able to implement the planned development of the Eastern Seaboard into an industrial zone, to be served by one or two deepwater ports, and an extension of the rail system to one or both ports.

The prospects that the planned development will occur have been enhanced by the World Bank's proposed "structural adjustment program" for Thailand. Inter alia, the program calls for a shift in emphasis from an industrial strategy based on import substitution to one that would place heavy emphasis on industrial exports.<sup>1</sup> The Bank is reportedly

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1. The structural adjustment program is described briefly in the Far Eastern Economic Review, May 23, 1980, pp. 43-45. Other components of the program include an energy adjustment program and an agricultural development program.

advocating rapid industrialization of the Eastern Seaboard Region as an export-processing zone, rather than scattering the export-oriented industries throughout the country.

Assuming that the program being advocated by the Bank is accepted and implemented by the Government, the "high" growth rate projections presented below may well be realized, although the timing of implementation is uncertain.

Second, even if the export-processing zone feature of the proposed program is implemented, it is not known at this time what type of industries will be located in the zone. Abundant labor and wages below those in such export-oriented countries as Taiwan, Hong Kong, and Korea point to the development of labor-intensive industries; the availability of natural gas, rock salt, and other industrial raw materials suggests more capital-intensive industries may be appropriate. Until the composition of the industrial zone is determined, projections of employment, population, and land requirements must remain subject to revision as the nature of industrial development is known -- the type of flexibility Guide Plans are designed to accommodate.

Third, until specific sites for the proposed export-processing zone, or zones, are determined, the impact of the industrialization of the Eastern Seaboard Region on population growth, economic activity, and land requirements in the Municipalities of Chonburi, Siracha, and Phanat Nikhom, and their respective contiguous built-up areas, cannot be projected with any degree of precision. This uncertainty may be mitigated to some extent by the probability that the existence of excellent North-South transport facilities

throughout the Eastern Seaboard Region will facilitate a widespread distribution of secondary supporting industries outside the industrial estates, i.e., an acceleration of the ribbon development along Sukhumvit. The final decision on the location(s) of the seaport will provide some guidance for refined projections.

Finally, it is noted that the projections of growth in population, employment, and land for urban uses will be subject to error because they cannot rely on an assumed continuation of the same basic demographic and economic forces that have produced population, economic, and land use changes in the region. In other words, the urban centers and their hinterlands will be under the influence of unprecedented (in the region) forces for change. The results will depend on a variety of factors, some of which have been noted above. But other factors, external to Thailand, also will affect the rate at which employment opportunities, population, and land requirements for nonagricultural uses will increase.

#### Population Projections

Demographic trends since 1960, by municipality, by amphoe, and for Chonburi Changwat as a whole, are presented in Table 1, Volume I, p. 26. For the entire period as a whole, the population of Chonburi Changwat increased at a higher rate than in the nation. Of the three amphoes, including the urban centers as well as the rural areas, none experienced as rapid growth in population as the Changwat as a whole, or as high as the rate in the nation between 1960 and 1970. In the same period, however, Siracha Municipality

experienced a rate of growth well above both the national and Changwat averages. The rate of growth in the Municipality of Chonburi was slightly above the national average, but below the Changwat average from 1960 to 1970.

In summary, while the rate of population growth in Chonburi Changwat as a whole was substantially above the overall national rate, 1960-76, the rate of growth in the three amphoes in which the Municipalities of Chonburi, Siracha, and Phanat Nikhom are located grew at a rate of only 2.4 percent per annum, compared with the Changwat average of 3.7 percent per annum. In the more recent period (1970-76), however, the rate of growth in the three amphoes equaled the rate in the Changwat, 3.6 percent per annum; in the areas of the amphoes outside the boundaries of the three municipalities, the annual growth rate averaged 4.2 percent. Exclusive of the areas within their municipal boundaries, the annual rates of growth in population (1970-76) were 5.0 percent, 3.0 percent, and 4.3 percent, respectively, in Chonburi, Siracha, and Phanat Nikhom Amphoes. In contrast, the annual rates of growth within the municipal boundaries were 1.4 percent, 1.3 percent, and 1.1 percent in Chonburi, Siracha, and Phanat Nikhom, respectively.

The comparative growth rates cited above indicate that:

- (a) From 1960 to 1970, population within the municipalities grew more rapidly (3.4 percent per annum) than in their respective amphoes (1.4 percent per annum), excluding the municipalities;
- (b) From 1970 to 1976, the differential in population growth rates was sharply reversed, with a combined rate of only 1.3 percent in the three municipalities,

and 4.2 percent in the amphoes outside the municipalities; and

- (c) While population in the Changwat as a whole increased at an annual rate substantially above that in the nation over the entire period, 1960-1976, the combined population of the three amphoes increased at a slower rate (2.4 percent per annum) than the rate for Chonburi Changwat (3.7 percent per annum) and the rate for the nation as a whole (approximately 3 percent per annum).

The persistently above-national-average rates of growth in the population of Chonburi Changwat since 1960 are the result of a number of factors, of which the following are noted:

- (a) The gradual spread of manufacturing and agro-processing activities southward from Bangkok along Sukhumvit Highway;
- (b) The development of Pattaya as an international tourism facility. It is noted that Pattaya is scheduled to become a municipality;
- (c) Increased activity at military installations in the southern part of the Changwat in the late 1960s and early 1970s;
- (d) Expansion of areas under cultivation in eastern portions of Phanat Nikhom and Ban Bung Amphoes since 1970.<sup>1</sup> In the case of Phanat Nikhom, population outside the municipal boundaries increased by more than 25,000 (28.7 percent) from 1970 to 1976, while population of the municipality increased by less than 1,000 (6.6 percent) during the same period. Cassava, sugarcane and, to a lesser degree, maize give rise to important processing activities in the study area. For the most part, these activities are found outside of the municipalities.

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1. Between 1960 and 1975, the following increases occurred in areas planted to specified crops in the Central Region of Thailand, which includes Chonburi Changwat:

	Area Planted (000 rai)	
	1960	1975
Maize	762	2,986
Cassava	376	2,367
Sugarcane	462	2,268

Some of the factors noted above will continue to influence growth of population and expansion of economic activities in Chonburi Changwat, although the impacts are likely to be less significant than the planned industrialization and transport developments in the Eastern Seaboard Region.

Projected Populations of  
Amphoes Chonburi, Siracha,  
and Phanat Nikhom, 1984-1999

Population projections for the Amphoes of Chonburi, Siracha, and Phanat Nikhom are presented in Table 1. The projections for each amphoe are disaggregated to indicate the projected growth of population within the municipal boundaries, and the projected growth in the amphoes outside the municipal boundaries. Although data are not available on the basis of which projections can be further disaggregated, most of the projected increases in population outside the municipal boundaries of Chonburi and Siracha are expected to be in areas contiguous to the municipalities.<sup>1</sup> In these two amphoes, the increased population will be essentially urban, although located outside of existing municipal boundaries.

Three sets of projections -- at "low," "medium," and "high" growth rates -- are provided for each municipality, and for each amphoe, inclusive and exclusive of the projections for the municipalities. The high, medium, and low rates of growth are intended to provide a range within which

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1. In the case of Siracha Amphoe, the largest share of the increase in population under Scenario "B" and "C" will occur in the new urban center at the proposed Laem Chabang Port.

Table 1. Population, 1976, Estimated, 1979, and Projected, 1984-1999,  
by Municipalities and Amphoes of Chonburi, Siracha and Phanat Nikhom  
(in thousands)

	<u>Base</u>	<u>Est.</u>	<u>Proj. 1984</u>			<u>Proj. 1989</u>			<u>Proj. 1994</u>			<u>Proj. 1999</u>		
	<u>1976</u>	<u>1979</u>	<u>Low</u>	<u>Med</u>	<u>High</u>									
<b><u>Municipalities</u></b>	<b><u>79.2</u></b>	<b><u>82.6</u></b>	<b><u>90.8</u></b>	<b><u>91.5</u></b>	<b><u>93.6</u></b>	<b><u>99.8</u></b>	<b><u>101.9</u></b>	<b><u>107.1</u></b>	<b><u>109.7</u></b>	<b><u>114.8</u></b>	<b><u>124.7</u></b>	<b><u>119.9</u></b>	<b><u>127.8</u></b>	<b><u>142.2</u></b>
Chonburi	48.7	51.1	55.8	56.3	57.7	61.0	62.2	65.9	66.7	69.3	76.4	72.9	76.5	86.4
Annual growth rates		1.5	1.8	2.0	2.5	1.8	2.0	2.7	1.8	2.2	3.0	1.8	2.0	2.5
Siracha	17.4	18.1	20.5	20.7	21.0	23.2	24.0	24.7	26.2	28.5	30.1	28.9	33.0	35.7
Annual growth rates		1.4	2.5	2.7	3.0	2.5	3.0	3.3	2.5	3.5	4.0	2.0	3.0	3.5
Phanat Nikhom	13.0	13.5	14.5	14.5	14.9	15.6	15.7	16.5	16.8	17.0	18.2	18.1	18.3	20.1
Annual growth rates		1.2	1.5	1.5	2.0	1.5	1.6	2.0	1.5	1.6	2.0	1.5	1.5	2.0
<b><u>Amphoes Including Municipalities</u></b>	<b><u>388.3</u></b>	<b><u>432.6</u></b>	<b><u>506.2</u></b>	<b><u>514.7</u></b>	<b><u>529.1</u></b>	<b><u>594.8</u></b>	<b><u>624.6</u></b>	<b><u>655.0</u></b>	<b><u>694.7</u></b>	<b><u>746.5</u></b>	<b><u>817.0</u></b>	<b><u>785.5</u></b>	<b><u>862.3</u></b>	<b><u>965.5</u></b>
Chonburi	156.5	176.6	208.5	212.7	217.9	248.6	257.1	275.3	297.1	312.2	350.1	340.0	365.0	419.4
Annual growth rates		4.1	3.4	3.8	4.3	3.6	3.9	4.8	3.6	4.0	4.9	2.7	3.2	3.7
Siracha	95.5	103.9	122.4	125.1	133.1	144.2	152.2	171.2	169.9	188.3	226.1	194.5	236.9	297.9
Annual growth rates		3.5	3.3	3.8	5.1	3.3	4.0	5.2	3.3	4.3	5.7	2.7	4.7	5.7
Phanat Nikhom	136.3	152.2	175.3	176.9	178.1	202.0	205.8	208.5	227.7	234.2	240.8	251.0	260.5	271.9
Annual growth rates		3.7	2.9	3.1	3.2	2.9	3.1	3.2	2.4	2.6	2.9	2.0	2.2	2.5
<b><u>Amphoes Excluding Municipalities</u></b>	<b><u>309.2</u></b>	<b><u>350.0</u></b>	<b><u>415.4</u></b>	<b><u>423.2</u></b>	<b><u>435.5</u></b>	<b><u>495.0</u></b>	<b><u>522.7</u></b>	<b><u>547.9</u></b>	<b><u>585.0</u></b>	<b><u>631.7</u></b>	<b><u>692.3</u></b>	<b><u>665.6</u></b>	<b><u>734.5</u></b>	<b><u>823.3</u></b>
Chonburi	107.8	125.5	152.7	156.4	160.2	187.6	194.9	209.4	230.4	242.9	273.7	267.1	288.5	333.0
Annual growth rates		5.2	4.0	4.5	5.0	4.2	4.5	5.5	4.2	4.5	5.5	3.0	3.5	4.0
Siracha	78.1	85.5	101.9	104.4	112.1	121.0	128.2	146.5	143.7	159.8	196.0	165.6	203.9	262.2
Annual growth rates		3.2	3.5	4.0	5.5	3.5	4.2	5.5	3.5	4.5	6.0	3.0	5.0	6.0
Phanat Nikhom	123.3	138.7	160.8	162.4	163.2	186.4	190.1	192.0	210.9	217.2	222.6	232.9	242.2	251.8
Annual growth rates		4.0	3.0	3.2	3.3	3.0	3.2	3.3	2.5	2.7	3.0	2.0	2.2	2.5
Changwat Chonburi	669.2	748.4												
Annual growth rate		3.8												

the future rates of growth might be expected to fall under alternative assumptions regarding the nature, timing, and location of large development projects.

It will be noted that the annual growth rates vary not only among the three amphoes, but also from one quinquennium to another. This variation is introduced to allow for different scenarios, particularly with respect to the timing of project implementation.

Assumptions Underlying  
Scenario "A" Population Projections

The Scenario "A" populations are based on the following set of assumptions:

- . Future population growth in the three amphoes will be influenced by basically the same "natural forces" that prevailed in the 1970 to 1976 period, with the rates declining slightly toward the later years of the century.
- . Most of the population growth will occur outside the existing municipal boundaries.
- . Proposed land reclamation projects within the boundaries of Chonburi and Siracha Municipalities will not be implemented.
- . Each of the municipalities will continue to play essentially the same role in the urban hierarchy as in 1979; in the case of Chonburi and Siracha Municipalities, the "service" area will include an increasing (and increasingly urbanized) population residing outside the boundaries of the municipalities.
- . Also, Scenario "A" is based on the assumption that the proposed port cum industrial zone at Laem Chabang will not be built before the year 2000.

- . Nonagricultural activities (manufacturing, agro-processing, trade, and transport) will continue to expand along Sukhumvit Road, both north and south of the Municipalities of Chonburi and Siracha.
- . Sattahip will be developed as the international commercial port, with a petrochemical and "heavy," capital-intensive industrial zone served by the proposed rail extension from Chacheongsao.

In Scenario "A," at the "low" growth rate assumptions shown in Table 1, the combined municipal and nonmunicipal populations of the three amphoes are projected to increase from an estimated 432.6 thousand in 1979, to almost 595 thousand in 1989, an annual rate of 3.25 percent; for the three municipalities as a whole, population is projected to increase by only 17 thousand, as compared to an increase of 145 thousand in areas outside the municipalities. The annual growth rates over the 10-year period are 1.8 percent for the municipalities and 3.5 percent in the amphoes, exclusive of municipalities. The projected rate of population growth in the three municipalities is slightly higher than that experienced from 1970 to 1976, but lower than the longer-term rate of 2.6 percent from 1960 to 1976. The projected rate of population growth of the three amphoes, including the municipalities (3.25 percent per annum), 1979-1989, is somewhat below the annual average rate (3.6 percent) from 1970 to 1976, but well above the 2.4 percent per annum rate of population growth, 1960-76.

The rates of growth in population projected under Scenario "A" assumptions are somewhat below the rates experienced in the amphoes as a whole between 1970 and 1976, in the case of Chonburi and Phanat Nikhom Amphoes. However, the projected rate of growth for Siracha Amphoe is slightly above the rate observed during the 1970-76 period.

In the case of the three urban centers, the projected rates of growth to 1989 are somewhat lower for Chonburi and Phanat Nikhom, but slightly higher for Siracha; in effect, the differential rates of growth projections reflect to some extent the comparative population growth over the longer period 1960-76.

The rates of growth in the contiguous areas of Chonburi and Siracha Municipalities are projected to be substantially higher than those in both the Municipality and rural areas of Phanat Nikhom because of the transport network and the continuing ribbon development of nonagricultural activities and agro-processing in the corridor of Sukhumvit Road. While the production facilities will be located outside of the municipalities themselves, along with substantial growth in residential settlement, the two Municipalities of Chonburi and Siracha will continue to expand -- although at higher rates -- as a result of increased commercial and service activities.

As shown in Tables 1 and 2-A, the rate of population growth in Amphoe Phanat Nikhom is projected to decline from a rate of 4 percent per annum, 1970-76, to 2.9 percent, 1979 to 1989, and further to 2 percent by 1999, in the Scenario "A" case. The rapid rate of increase in the population of Phanat Nikhom during the 1970s was attributable, in large measure, to the influx of farmers to cultivate newly cleared forest lands. The clearing of forests and cultivation of additional farmland is not likely to occur at comparably high rates in the 1980s, partly because of growing concern over the environmental effects of deforestation, and partly because of the diminished areas suitable for cropping. The

Table 2-A. Projected Population, Scenario "A" (in  
Thousands) and Annual Growth Rates, by Amphoe,  
(in Percent), 1979-1999

Year	Amphoe Chonburi		Amphoe Siracha		Amphoe Phanat Nikhom		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	176.5		103.9		152.2		432.6	
		3.4		3.3		2.9		3.2
1984	208.5		122.4		175.3		506.0	
		3.6		3.3		2.9		3.3
1989	248.6		144.2		202.0		594.8	
		3.6		3.3		2.4		3.2
1994	297.1		169.9		227.0		694.7	
		2.7		2.7		2.0		2.5
1999	340.0		194.5		251.0		785.5	

Note: Population projections in Scenario "A" are based on "low" growth rates in Table 1 for all amphoes.

"abnormal" nature of the 4.0 percent per annum population growth rate in Amphoe Phanat Nikhom, 1970-76, is suggested by the absolute decline in population in the nonmunicipal portion of the amphoe over the earlier, longer period, 1960-70, barely offset by the growth of population in the municipality.

While it is not unreasonable to expect a modest rate of growth in Amphoe Phanat Nikhom, under the assumptions of Scenario "A" the rate of growth in the Municipality is not likely to exceed 1.5 to 2.0 percent per annum, 1979-89.

Scenario "A" Labor Force  
Projections: 1979-1989

The Scenario "A" population projections imply the existence of employment opportunities on a scale that will attract households and/or individuals in the projected numbers. The projected labor force that would be available from the population projected in Table 2-A are presented in Table 2-B.

The number of persons in the labor force, i.e., employed or actively seeking work, is determined by a variety of factors. Given a population of a specified size, the labor force will be determined by:

1. The number of persons of "working age," a rather flexible and culturally influenced cohort. The "working age" tends to be lower in some rural subsistence agricultural societies than in developed urban societies; prevailing cultural and legal factors exert an influence on the accepted lower and upper limits of "working age." For the

Table 2-B. Projected Labor Force, Scenario "A" (in Thousands) and Annual Growth Rates, by Amphoe (in Percent), 1979-1999

Year	Amphoe Chonburi		Amphoe Siracha		Amphoe Phanat Nikhom		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	79.8		46.9		68.7		195.3	
		3.7		3.6		3.1		3.4
1984	95.4		56.0		80.2		231.6	
		4.1		3.9		3.4		3.8
1989	116.9		67.8		95.0		279.7	
		3.9		3.6		2.7		3.4
1994	141.6		81.0		108.5		331.1	
		2.7		2.7		1.9		2.4
1999	161.7		92.5		119.4		373.6	

Note: Labor force projections in Scenario "A" are derived from "low" growth ratios in Table 1, for all amphoes.

projections shown in Table 2-B, persons 15 years of age and over are defined as the "working age population." While it is recognized that children below the age of 15 are members of the labor force in both rural and urban areas of Thailand, the percentage is relatively small, roughly 11 percent in 1970.<sup>1</sup> The declining ratio of the under-15 year old cohorts of the population to total population also serves to minimize the under-estimation of growth of the labor force from the use of the 15 years and above definition of the working age population.

2. With a population of a given size, the number of persons in the labor force is a function of the age, sex, and location specific composition of the working age population. In Thailand, the percentage of persons of working age in the labor force in 1970 varied from 77.3 percent of those in the 15-19 year age group, to 88 percent of those in the 30-49 age group; the ratio declined sharply to 80.8 percent of persons 50-59 years of age, and to 42.3 percent of those 60 years and over. In 1970, the combined "participation rate" of working age males and females 15 years and over was 80.6 percent of the number in this age group.<sup>2</sup>

As in many developing countries, the participation rate (percentage of persons of working age in the labor force) has declined. For example, the combined male and female participation rate, 15 years of age and over, declined from 85.4 percent of the combined age group in 1960, to 80.6 percent in 1970. Most of the decline was attributable to a drop of almost 8 percentage points (from 81.3 to 73.5 percent) in the participation rate for females of working age. The decline was significant at all ages of 15 years and over,

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1. National Statistical Office, Census of Population, 1970. Cited in World Bank Country Study, Thailand: Toward A Strategy of Full Participation, March 1980, p. 69.

2. Ibid.

but was sharpest among women 50 years of age and over. Inter alia, the increased urbanization of Thailand's population has probably contributed to the declining participation rate of working age females, although other factors have undoubtedly influenced the decline.

The two key variables that have been employed in projecting the labor force (Table 2-B), from the population projections shown in Table 2-A are: (1) the percentage of total population 15 years of age and above, and (2) the percentage of the working age population that will be economically active, i.e., the participation rate. In developing the projections shown in Table 2-B, the values of the two variables have been derived from estimates published in a World Bank Country Study for Thailand.<sup>1</sup> The values used in the projections are as follows:

	<u>Population, 15 years and over (Percent of total population)</u>	<u>Participation Rate (percent of population 15 years and over in labor force)</u>
1970	54.8	80.8
1976	56.5	78.5
1979	57.9	78.0
1984	60.2	76.0
1989	62.7	75.0
1994	65.3	73.0
1999	67.0	71.0

The data published in the World Bank study are for Thailand as a whole, rather than specifically for Chonburi

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1. Thailand: Toward A Strategy for Full Participation, March 1980, pp. 67-70.

Changwat. However, application of the national rates to the Changwat population for 1970 yields an estimate of a Changwat labor force of just under 240 thousand, as compared with the Changwat labor force of 229.5 thousand enumerated in the 1970 Census. If, as is generally accepted, the Census of 1970 was subject to an underenumeration of 6 to 9 percent, an upward adjustment of 6 percent in the enumerated Changwat labor force of 229.5 thousand would indicate the labor force of roughly 243 thousand, only 3 thousand (1.4 percent) above the estimate derived from the World Bank rates for 1970, shown above.

Two distinct trends may be noted in the rates shown above. First, an increasing percentage of the population will be of working age, as the "under 15" cohort of the population declines from 45 percent of the total population in 1970, to a projected 36.8 percent in 1990. Second, the participation rate is projected to decline from 80.8 percent of the working age population in 1970, to 75 percent of the working age population by 1989. The two trends noted have opposite effects on the size of the labor force, with a given population. On balance, the projections indicate that the labor force would increase from 44.4 percent in 1976 to 47.6 percent of the total population by the end of the century. Thus, over the period of the projections, the labor force will increase more rapidly than population. For the three amphoes, the indicated labor force, based on the rates shown above, was approximately 139 thousand in 1970, rising to an estimated 195.3 thousand in 1979 and 279.7 thousand in 1989, in the low-growth Scenario "A." Projected labor force in 1994 and 1999 is shown also in Table 2-B.

Population Projections,  
Scenario "B," 1984-1999

Projected population for the three amphoes under the assumptions of Scenario "B" are presented in Table 3-A, for the period 1984-99. In this projection, the "medium" growth rates from Table 1 are employed in projecting population growth in Chonburi Amphoe 1979 to 1999; for Siracha amphoe, the "medium" growth rates are used for the 1979-89 period, and the "high" growth rates for the period 1989-99. For Phanat Nikhom, the "low" growth rates are used throughout the projection period.

The assumptions underlying the Scenario "B" population projections are as follows:

- . The planned industrialization of the Eastern Seaboard Region will have only modest effects on the rate of growth of population in Amphoes Chonburi and Siracha prior to 1983 or 1984;
- . The growth of population in Amphoe Phanat Nikhom will be less rapid in the post-1979 period than during the 1970-76 period;
- . Sattahip Port will be developed as the commercial port on the Eastern Seaboard in the early 1980s;
- . An industrial zone will be established in the vicinity of Sattahip, serving largely petrochemical and other relatively capital-intensive industries;
- . The population from which the labor force for the Sattahip Port/industrial zone will be drawn will reside in Sattahip Amphoe and/or Rayong, rather than in the amphoes in the study area;
- . By 1990, the proposed Laem Chabang Port, with an industrial zone, and commercial and residential areas will be established in the southern part of Amphoe Siracha;

Table 3-A. Projected Population,  
Scenario "B" (in Thousands), an Annual  
Growth Rates, by Amphoe, (in Percent), 1979-1999

Year	Amphoe Chonburi		Amphoe Siracha		Amphoe Phanat Nikhom		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	176.6 <sup>a</sup>		103.9 <sup>a</sup>		152.2 <sup>a</sup>		432.6	
		3.8		3.8		2.9		3.5
1984	212.7 <sup>b</sup>		125.1 <sup>b</sup>		175.3 <sup>c</sup>		513.1	
		3.9		4.0		2.9		3.6
1989	257.1 <sup>b</sup>		152.2 <sup>b</sup>		202.0 <sup>c</sup>		611.3	
		4.0		8.2		2.4		4.6
1994	312.2 <sup>b</sup>		226.1 <sup>d</sup>		227.7 <sup>c</sup>		766.0	
		3.2		5.7		2.0		3.6
1999	365.0 <sup>b</sup>		297.9 <sup>d</sup>		251.0 <sup>c</sup>		913.9	

a. Estimated, using reported 1976 population and annual growth rates of 4.1 percent, 2.8 percent and 3.7 percent, respectively, for Chonburi, Siracha, and Phanat Nikhom. These rates are slightly above observed rates for the period 1970-76 in the case of Chonburi and Siracha, and slightly lower for Phanat Nikhom.

b. "Medium" growth rate projection, Table 1.

c. "Low" growth rate projection, Table 1.

d. "High" growth rate projection, Table 1.

- . The industries locating in the industrial zone will be more diversified and -- on the whole -- more labor-intensive than those in the Sattahip zone; and
- . Population growth in the contiguous built-up areas of Chonburi and Siracha will continue to grow at roughly the rates experienced between 1970 and 1976, at least until the mid-1990s.

Projected growth in population in the three municipalities, and in the amphoes in which each municipality is located, is shown separately in Table 1. It is noted that most of the increase in population is projected to occur outside the existing boundaries of the municipalities. In 1976, the three municipalities contained 20.4 percent of the total population of the three amphoes; this ratio is projected to decline to 17.7 percent in 1984, 16.3 percent in 1989, and 14.8 percent by 1999 -- at the medium rates of growth. The projected decline in the percentage of amphoe population within the municipal boundaries reflects a continuation of the trend since 1970. The factors contributing to this trend are discussed in Vol. I of the Final Report, pp. 25-27.

While population of three amphoes, particularly Chonburi and Siracha, is projected to increase more rapidly than population within the existing municipal boundaries, the population growth will occur in a pattern that, in terms of densities, economic activities, and occupational distribution of the population, is urban in nature. Viewed in terms of these criteria, the population of Chonburi and Siracha Amphoes is projected to be increasingly urbanized over the remainder of the century.

Projected Labor Force  
Scenario "B," 1984-1999

Labor force projections, based on the population projections shown in Table 3-A, are shown in Table 3-B. The methodology and ratios used for projecting the labor force under Scenario "B" assumptions are the same as described earlier for the labor force projections under the Scenario "A" assumptions. Only the total population projections differ.

Projected Population  
Scenario "C," 1984-1999

The assumptions underlying the population projections in Scenario "C" differ in several respects from those in Scenario "B" with respect to the phasing and spatial distribution of industrialization of the Eastern Seaboard Region. First, it is assumed that Laem Chabang, rather than Sattahip, will be the site for the major deepwater commercial port/ industrial zone for the region; second, that the port will become operational in the mid-1980s. Third, it is assumed that industrialization along the Eastern Seaboard will continue to move south from Bangkok along Sukhumvit and the rail extension from Chachengsao, rather than being concentrated, at an early stage, in Sattahip Amphoe. It is assumed that a labor-intensive, light industry zone would be developed in Chonburi Amphoe, to the east of the municipality in an area having easy (but controlled) access to the Chonburi bypass of Sukhumvit and the rail extension connecting Chachengsao and the port at Laem Chabang.

Finally, in Scenario "C," it is assumed that projects to reclaim foreshore areas in both Siracha and Chonburi

Table 3-B. Projected Labor Force,  
Scenario "B," (in Thousands), and Annual  
Rates of Growth (in Percent), 1979-1999

Year	Amphoe Chonburi		Amphoe Siracha		Amphoe Phanat Nikhom		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	79.7		46.9		68.7		195.3	
		4.1		4.05		3.15		3.75
1984	97.3		57.2		80.2		234.7	
		4.4		4.6		3.4		4.14
1989	120.9		71.6		95.0		287.5	
		4.2		8.5		2.7		4.9
1994	148.8		107.8		108.5		365.1	
		3.1		5.6		1.9		3.6
1999	173.6		141.7		119.4		434.7	

Note: Population projections in Table 3-A converted to labor force projections by use of the ratios shown on p. 19.

Municipalities will be implemented between 1984 and 1989, as the value of the reclaimed land rises relative to the costs of the reclamation projects, and financial sources become available under the general program of regional development.

Under the Scenario "C" assumptions, the "high" growth rate projections in Table 1 are applied to obtain the population projections shown in Table 4-A for Chonburi and Siracha Amphoes, with the "low" growth rates for Phanat Nikhom Amphoe. It will be noted that rates of growth are projected to decline slightly in two of the amphoes during the final 5-year period of the projections.

Projected Labor Force  
Scenario "C," 1984-1999

The labor force projections presented in Table 4-B are derived from the population projections shown in Table 4-A, using the methodology and rates described above. It is noted that the projected labor force increases more rapidly than population through 1994 as a result of the rising proportion of the population of working age. Beyond 1994, however, the labor force will increase less rapidly as the age composition of the population becomes more stable and the participation rate of the working age population continues to decline.

General Observations  
on the Projections

Land-use programming is most appropriately employed in situations experiencing rapid increases in employment and

Table 4-A. Projected Population,  
Scenario "C," (in Thousands), and Annual  
Rates of Growth (in Percent), 1979-1999

Year	Amphoe Chonburi <sup>a</sup>		Amphoe Siracha <sup>a</sup>		Amphoe Phanat Nikhom <sup>b</sup>		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	176.6		103.9		152.2		432.7	
		4.3		5.1		2.9		4.0
1984	217.9		133.1		175.3		526.3	
		4.8		5.2		2.9		4.3
1989	275.3		171.2		202.0		648.5	
		4.9		5.7		2.4		4.4
1994	350.1		226.1		227.7		803.9	
		3.7		5.7		2.0		3.8
1999	419.4		297.9		251.0		968.3	

a. "High" growth rate projection, Table 1.

b. "Low" growth rate projection, Table 1.

Table 4-B. Projected Labor Force,  
Scenario "C," (in Thousands), and Annual  
Rates of Growth (in Percent), 1979-1999

Year	Amphoe Chonburi		Amphoe Siracha		Amphoe Phanat Nikhom		Total, Three Amphoes	
	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate	(,000)	Growth Rate
1979	79.7		46.9		68.7		195.4	
		4.6		5.4		3.1		4.3
1984	99.7		60.9		80.2		240.8	
		5.4		5.7		3.5		4.8
1989	129.5		80.5		95.0		305.0	
		5.2		6.0		2.7		4.7
1994	166.9		107.8		108.5		383.2	
		3.6		5.6		1.9		3.7
1999	199.5		141.8		119.4		460.6	

Note: Labor force projections for Chonburi and Siracha based on "high" population growth rate projections, Table 1. Population projections converted to labor force projections by ratios shown on p. 19.

population resulting from marked increases in the level of economic activity and changes in economic structure, all of which give rise to demands for additional lands for urban uses. As shown in Table 1, Volume I of the Final Report, population increases in the three amphoes in which the study area is located were modest between 1960 and 1976, 2.4 percent per annum, below the rate in the Changwat as a whole (3.7 percent per annum) and in Thailand (approximately 3.1 percent).

However, a marked acceleration in population growth is noted in Chonburi and Phanat Nikhom Amphoes from 1970 to 1976. In the case of Chonburi, the increased rate of population growth is most clearly evident in built-up areas around the Municipality, i.e., in the urbanizing areas of the amphoe. In the case of Phanat Nikhom, the higher rate of growth in population, 1970-1976, reflected the movement of population into rural areas to expand land areas under cultivation. However, even the "low" growth rate projections for Phanat Nikhom Amphoe may overstate future population growth in the absence of expansion of employment in the nonagricultural sectors.

Thus, it is concluded that the largest increases in demand for land for urban development are likely to occur in Siracha and Chonburi Amphoes in areas near their respective municipalities and north and south of the municipalities in the Sukhumvit Highway corridor.

If this prognosis holds for future patterns of population growth -- and there is visual evidence of continued expansion in this pattern, at least through late 1979 -- the principal areas in which land-use programming can contribute

to orderly urbanization are likely to be outside existing municipal boundaries and, therefore, the jurisdiction of municipal planning bodies.

### III. LAND REQUIREMENTS

#### Chonburi Municipality

In 1960, Chonburi Municipality contained 8.6 percent of the total population of the Changwat and 35.1 percent of the total population in the Amphoe; by 1976, these ratios had declined to 7.3 percent of the Changwat and 31.1 percent of the Amphoe population. Based on population estimates for 1979, the ratios decline further to 6.8 percent and 28.9 percent, respectively. The projections of population growth, 1984-1999, shown in Table 1, reflect a continuation of this trend, even with a combination of the "high" growth rate projection for the population growth within the existing boundaries of the Municipality, and the "low" rate projection of population in the Amphoe outside the municipality -- assuming municipal boundaries remain unchanged throughout the period of the projections.

The total area within the municipal boundaries of Chonburi, including the foreshore, is estimated to be 2,828 rai (452.5 hectares), of which approximately 1,049 rai (167.8 hectares) is in the submerged foreshore. The breakdown of the remaining land area, 1,829 rai, by use, is as shown in Table 5 below.

Table 5. Land Use, Excluding  
Foreshore, Chonburi Municipality

Use	Area in rai	Area in hectares	Percent Distribution
Residential	807	129.1	44.1
Commercial	212	33.9	11.6
Industrial and Warehousing	81	13.0	4.4
Governmental	164	26.2	9.0
Educational	91	14.6	5.0
Religious	139	22.2	7.6
Recreational	41	6.6	2.2
Transportation	139	22.2	7.6
Vacant & Other	155	24.8	8.5
Total	1,829	292.6	100.0

The spatial distribution of the several types of uses are shown<sup>1</sup> in Figure 2. It will be noted that the area between Wachirapraikan-Phiphit roads and Thanon Sukhumvit contains almost no land in purely residential use, although a significant proportion of the population resides in the shophouses in the commercial areas that dominate this portion of the city.

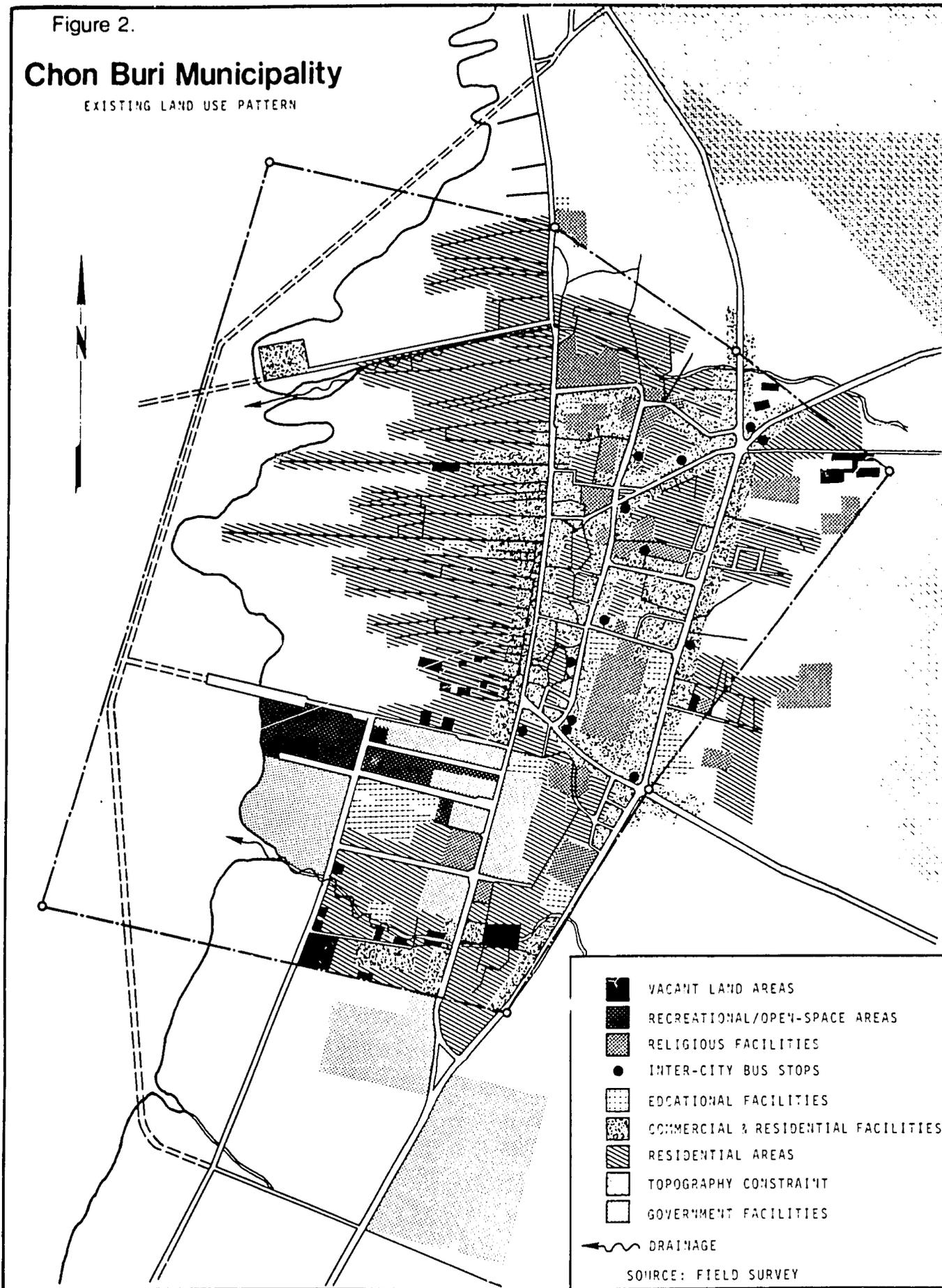
The principal residential area is found in the coastal area, west of Wachirapraikan-Phiphit roads and between Khlong Sang Khep and Phaspetra road where an estimated population of 16,660 -- about one-third of the population in Chonburi Municipality -- is housed in an area of almost 500 rai, at an average density of over 33 persons per rai (208 per hectare).<sup>1</sup> Other residential areas are found just within the northern and, especially, the southern boundaries of the Municipality.

1. Applied Scientific Research Corporation of Thailand, The Feasibility Study of The Land Reclamation in Chonburi Municipality, Final Report, March 1979.

Figure 2.

# Chon Buri Municipality

EXISTING LAND USE PATTERN



The configuration of land use shown in Figure 2 indicates that future growth in population within the existing boundaries of Chonburi Municipality will require either:

- (1) reclamation of submerged areas in the foreshore and/or
- (2) increased density of population. These alternatives are examined in the following sections.

#### Scenario "A"

Under the assumptions of this scenario, population of Chonburi Municipality is projected to increase at the "low" rate shown in Table 1. The projected increases over the estimated population for 1979 are shown in Table 6, together with the estimated overall density rates at the end of each quinquennium, and the additional land required to hold the density level constant in 1979.

By 1999, the overall density level, within the existing municipal land area, would rise to about 40 persons per rai at the "low" growth rate in Scenario "A." This level is considered to be generally compatible with standards used by the Department of Town and Country Planning. Suggested projects and other measures to facilitate increased density are contained in the Guide Plan for Chonburi.

#### Scenario "B"

Projected growth in population, the required increase in density to accommodate the enlarged population in the existing land area of approximately 1,829 rai, and the additional land required to absorb the increase in population

Table 6. Projected Population  
Increases, Scenario "A," Population  
Density Levels and Additional Land  
Required to Maintain 1979 Density,  
Chonburi Municipality, 1979-1999

Year	Population Increase (in thousands)	Density, Persons per Rai <sup>a</sup>	Additional Land Required at 1979 Density Level (rai)
1979	51.1 <sup>b</sup>	27.9	-
1979-1984	4.7	30.5	168.5
1979-1989	9.9	33.4	360.0
1979-1994	15.6	36.5	567.0
1979-1999	21.8	39.9	792.7

a. Assumes land area within municipality remains constant at 1,829 rai, exclusive of foreshore area. Density level is at end of periods shown.

b. Total estimated population, 1979.

while maintaining the 1979 density level are shown in Table 7, under the "medium" population growth projections of Scenario "B."

The density rate of almost 42 persons per rai probably approaches the upper limit that could be achieved in Chonburi without a complete rebuilding of the municipality. For one thing, more than one-fourth of the "land area" is occupied by sea dwellers; it will be technically and politically difficult to increase density in these areas even if the mudflats under the existing structures were suitable for other types of buildings that would be compatible with a higher density. For another, the area occupied by the sea dwellers is seriously deficient in access roads. Any significant increase in population in the area will require widening of access sois, and thus serve as an offset to increased population density. The same form of constraint exists in the shortage of recreational space for which the needs will become even more pressing as densities rise.

Under Scenarios "A" and "B," it is concluded that the projected increases in population in Chonburi Municipality can be accommodated within the existing land area of the municipality, at least through the 1980s, although with increasing difficulty under Scenario "B." The Guide Plan contains suggested projects to facilitate increased density that will enhance the holding capacity of the present land area while, at the same time, providing a basis for expansion of the land area through reclamation and/or extension of municipal boundaries to incorporate contiguous areas.

Table 7. Projected Population Increases, Scenario "B," Population Density Levels and Additional Land Required to Maintain 1979 Density, Chonburi Municipality, 1979-1999

Year	Population Increase (in thousands)	Density, Persons per Rai <sup>a</sup>	Additional Land Required at 1979 Density Level (rai)
1979	51.1 <sup>b</sup>	27.9	-
1979-1984	5.2	30.8	186.4
1979-1989	11.1	34.0	397.8
1979-1994	18.2	37.9	652.3
1979-1999	25.4	41.8	910.4

a. Assumes land area within municipality remains constant at 1,829 rai, exclusive of foreshore area. Density level is at end of periods shown.

b. Total estimated population, 1979.

### Scenario "C"

This scenario is based on the "high" population growth rate projections for the Municipality of Chonburi and Amphoe. Total population would rise from an estimated 51,100 in 1979 to 86,400 by the end of the century in Chonburi Municipality. For the Amphoe, including the municipality, population would increase from an estimated 176,600 in 1979 to 419,000 in 1999.

In the absence of any increase in the land area of the municipality, overall population density would rise from an estimated 27.9 persons per rai in 1979 to a projected 47.2 persons per rai by 1999, as shown in Table 8. However, it will be noted that in Scenario "C," it is assumed that a reclamation project to provide approximately 800 rai of land will be implemented between 1984 and 1989, raising the land area within the existing boundaries of Chonburi Municipality to 2,629 rai. With the expansion in land area, the projected 1999 population of 86,400 persons implies a population density of 32.9 persons per rai, a density well within the limits of feasibility. Nevertheless, the projections imply a continued urbanization in the tambons adjacent to the municipality, and along the north-south corridor served by Sukhumvit Road.

### Siracha Municipality

Inclusive of the foreshore, the total area within the municipal boundaries of Siracha is 2,492.5 rai (398.8 hectares). At the estimated 1979 population of 18,100, the overall density within the municipal boundaries was 7.3

Table 8. Projected Population  
Increases, Scenario "C," Population  
Density Levels and Additional Land  
Required to Maintain 1979 Density,  
Chonburi Municipality, 1979-1999

Year	Population Increase (in thousands)	Density, Persons per Rai <sup>a</sup>	Additional Land Required at 1979 Density Level (rai)
1979	51.1 <sup>b</sup>	27.9	-
1979-1984	6.6	31.5	236.6
1979-1989	14.8	36.0	530.5
1979-1994	25.3	41.8	906.8
1979-1999	35.3	47.2	1,265.2

a. Assumes land area within municipality remains constant at 1,829 rai, exclusive of foreshort area. Density level is at end of periods shown.

b. Estimated total population, 1979.

persons per rai, equivalent to 45.4 persons per hectare, roughly comparable to the overall rate in Phanat Nikhom. Excluding the 886.1 rai of foreshore area within the municipal boundaries, the density ratio in 1979 was 11.3 persons per rai (70.6 persons per hectare), approximately 44 percent higher than the density level in Phanat Nikhom.

The distribution of land in the Municipality of Siracha, by type of use, 1977, is shown in Table 9. The spatial distribution of the principal types of land use is shown in Figure 3.

Table 9. Distribution of Land, by Type of Use: Siracha Municipality, 1977

Type of Use	Area (in rai)	Area (in hectares)	Percent Distribution
Residential	268.7	43.0	10.8
Commercial	315.6	50.5	12.7
Industrial	200.0	32.0	8.0
Government	340.3 <sup>a</sup>	54.5	13.7
Education	58.2	9.3	2.3
Religious	5.5	0.9	0.2
Recreation	3.6	0.6	0.1
Roads and Streets	250.0	40.0	10.0
Vacant Land	164.5	26.3	6.6
Subtotal, Land	<u>1,606.4</u>	<u>257.0</u>	<u>64.4</u>
Foreshore	886.1	141.8	35.6
Total Area	<u>2,492.5</u>	<u>398.8</u>	<u>100.0</u>

a. The area shown as being in government "use" includes areas owned by government but not all of which is currently occupied by buildings and other facilities.

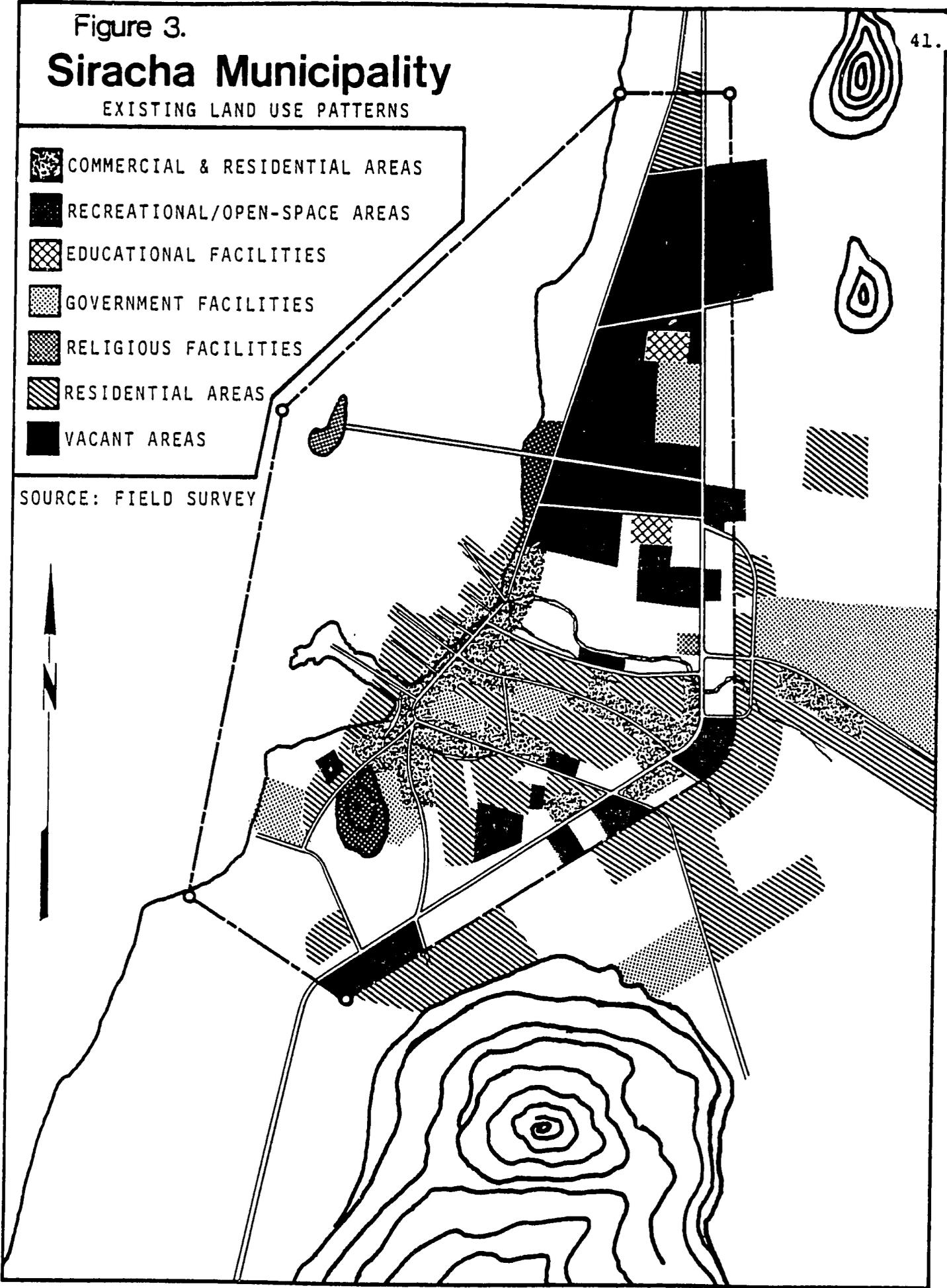
Figure 3.

# Siracha Municipality

EXISTING LAND USE PATTERNS

-  COMMERCIAL & RESIDENTIAL AREAS
-  RECREATIONAL/OPEN-SPACE AREAS
-  EDUCATIONAL FACILITIES
-  GOVERNMENT FACILITIES
-  RELIGIOUS FACILITIES
-  RESIDENTIAL AREAS
-  VACANT AREAS

SOURCE: FIELD SURVEY



Land Requirements:  
Scenario "A"

In estimating land requirements to accommodate projected growth in population in Siracha, the three scenarios described earlier<sup>1</sup> will be utilized. In general, for Siracha Municipality and Amphoe, Scenario "A" is based on the "low" population growth rates presented in Table 1, Volume I of the Final Report. For the Amphoe as a whole, population increases at an annual rate of 3.3 percent, 1979-1994, declining to 2.7 percent per annum, 1994-1999.

The modest rates of growth projected for the Amphoe reflect the assumptions, in Scenario "A," that a deepwater, international port, and industrial zone will not be constructed at Laem Chabang prior to the year 2000; that the proposed reclamation in the foreshore area of the Municipality will not be implemented during the period before the year 2000; and that Sattahip will be developed as the port and heavy industry zone during the period covered by the projections. In effect, population and labor force projections shown in Tablea 2-A and 2-B, reflect a combination of factors that assumes growth of population, labor force, and economic activity in Siracha Amphoe will continue to be influenced by the same basic determinants that led to the increases experienced from 1970 to 1976, during which the annual rate of population growth averaged 1.3 percent in the Municipality, 3.0 percent in the Amphoe outside the Municipality, and a combined rate of 2.6 percent including both areas.

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1. See pp. 11ff.

The projected rate of population growth, 3.3 percent per annum, 1979 to 1994, is based on the assumption that the "ribbon" development along Sukhumvit will accelerate somewhat during the period covered by the projections, under the influence of the Government's plans to intensify industrialization of the Eastern Seaboard Region. Even without the port and industrial zone at Laem Chabang, population growth in Siracha -- and other coastal areas -- can be expected to experience some acceleration in economic activity and population growth through the multiplier, or secondary, impact of large-scale industrial developments elsewhere in the Changwat, i.e., in Scenario "A," at Sattahip.

Projected increases in population in the Amphoe as a whole, in the Municipality, and the areas outside the Municipality are shown in Table 10 below, for the period 1979 to 1999.

Table 10. Projected Increases in Population,  
Scenario "A," Siracha Amphoe, 1979 to 1999  
(in Thousands)

Period	Siracha Municipality	Outside Municipality	Amphoe Total
1979-1984	2.4	16.1	18.5
1979-1989	5.1	35.2	40.3
1979-1994	8.1	57.9	66.0
1979-1999	10.8	79.8	90.6

Over the 2 decades, 1979-1999, 88 percent of the growth in population in the Amphoe is projected to occur

in those portions of the Amphoe outside, but largely contiguous to, the Municipality, and along Sukhumvit Road, north and south of Siracha Municipality -- a pattern of growth already evident.

As shown in Table 9, there is reportedly 164.5 rai of vacant land in the Municipality of Siracha. Exclusive of these lands, and the areas in the submerged foreshore, the overall population density in the built-up areas of Siracha Municipality was 12.6 per rai (78.5 per hectare) in 1979. Because of location, topography, and other constraints, it is not likely that all of the vacant land could be used for urban purposes. Assuming that 5 rai per year of the vacant land could be so used, population density levels would rise as shown in Table 11 below, for the projected population within the Municipal boundaries, excluding the foreshore areas, and the residual vacant land (64.5 rai by 1999).

Tabl 11. Projected Population Increases, Scenario "A,"  
Population Density Levels and Additional  
Land Required to Maintain 1979  
Density, Siracha Municipality, 1979-1999

Year	Projected Population (In Thousands)	Built-up Land Area In Rai	Population	
			per <u>rai</u>	per <u>ha.</u>
1979	18.1	1441.9	12.6	79
1984	20.5	1466.9	14.0	88
1989	23.2	1491.9	15.6	98
1994	26.2	1516.9	17.3	108
1999	28.9	1541.9	18.7	117

The calculated density of 18.7 persons per rai by 1999, based on the projected population of 28,900 in that year, and a built-up urban area of 1,541.9 rai, would be well below the estimated 1979 population density of 27.9 persons per rai within Chonburi Municipality, with the latter density based on an estimated population of 51,000 and a total land area of 1,829 rai, exclusive of the foreshore area of 1,049 rai.

Thus, it is concluded that the projected 1999 population of Siracha Municipality can be accommodated within existing boundaries of the municipality, under the Scenario "A" assumptions. Whether the relatively modest increase in urban population density will occur within, or outside of the existing municipal boundaries, will be influenced by comparative land costs, availability, and costs of providing potable water, electricity, schools, local transport, and health facilities within and outside the municipality, and the steps taken by responsible agencies -- local and national -- to bring about more intensive utilization of Siracha's land area in an orderly manner that will enhance the ambiance of the town. Some projects that would contribute to this process are identified in the Guide Plan for Siracha.

Land Requirements:  
Scenario "B"

The post-1990 projected growth of population for Siracha Amphoe, shown in Table 3-A, is much higher in Scenario "B" than in Scenario "A." The assumptions underlying Scenario "B" are stated on pages 21-23 above. The most important of these assumptions is that Laem Chabang will be developed as

a principal port/industrial zone in the Eastern Seaboard Region, beginning in the early 1990s; and that the industries to be established in the industrial zone will be more diversified and more labor-intensive than those established earlier in an industrial zone at Sattahip.

Based on these and other assumptions stated on pp. 21-23, population in Siracha Amphoe is projected to increase from an estimated 104 thousand in 1979, to 298 thousand by the end of the century, with the most rapid increases occurring in the early and mid-1990s. Most of the increase in population is projected to occur outside the existing municipal boundaries of Siracha, especially in the proposed "new town" to be established in the vicinity of the port at Laem Chabang but, also, significant increases in population are anticipated in contiguous areas of Siracha Municipality and along Sukhumvit between the municipality and the port area. In short, that portion of the amphoe west of the proposed railway alignment, and from the northern limits of the municipality south to the border of Amphoe Bang Lamung would become an urbanized metropolitan area, with the port/industrial zone separated from Siracha by a topographically dictated "buffer zone".

Any disaggregation of the population increase into subtotals for Siracha Municipality (with its existing boundaries), and the remainder of the Amphoe, is speculative, for the following reasons:

- (1) Despite the difficulties of expanding the administrative boundaries of municipalities, the pressures to enlarge the area in the southwestern portion of Siracha Amphoe to provide municipal level services to a large urbanized population will be very strong -- if the Scenario "B" pattern

of assumptions is realized. That is, the municipal boundaries of Siracha in 1979 may not be those that will exist in 1999.

- (2) The extent to which additional population can be absorbed in the existing Municipality of Siracha will be determined by the effectiveness of measures to increase density. For example, at the density level in Chonburi Municipality in 1979 (27.9 persons per rai), the area within the existing boundaries of Siracha Municipality would have a population of 43 thousand -- roughly 25 thousand more than the estimated 1979 population.

As a rough approximation, under the assumptions of Scenario "B," it is projected that of the total Amphoe population of almost 300 thousand by 1999, almost two-thirds will be in an urbanized zone stretching from Ban Bang Phra in the north, to the southern boundary of Siracha Amphoe, and extending from the coast inland to the vicinity of the railway, an area covering from 60 to 65 square kilometers, of which perhaps 25 to 35 square kilometers would be suitable for some type of urban use.

Within this general area, population densities will vary; concentrations of populations will be heaviest in the "new town" at the Laem Chabang port, in Siracha Municipality and its contiguous areas. Other concentrations will occur along Sukhumvit, particularly at east-west intersections, a continuation of existing trends.

The pattern of growth of the "urban" cohort of population envisaged in Amphoe Siracha in Scenario "B" presents precisely the set of conditions for which the land use program approach was designed, and the circumstances in which it can be effectively applied. However, there is a

major difficulty: there is no viable agency with planning and implementing jurisdiction in the areas in which most of the growth in urban population is expected to occur. Suggested institutional arrangements to resolve this difficulty are presented in a later section of the report.

Land Requirements:  
Scenario "C"

Scenario "C" includes the assumption that a portion of the foreshore will be reclaimed in two stages: Stage I, 80 rai, beginning in 1984, and Stage II, 270 rai, beginning in 1989, to provide a total addition of 350 rai to the land area within the existing municipality.

Although the populations of Siracha Amphoe and the Municipality are projected to reach the same levels, by 1999, in both scenarios, in Scenario "C" the accelerated rate of growth occurs in the mid-1980s, reflecting the earlier projected construction of Laem Chabang Port and new town. By the end of the century, total projected population would be the same as in Scenario "B" for the Amphoe -- 298 thousand. The foreshore reclamation in Siracha Municipality would facilitate absorption of the projected increase in population within existing boundaries. On completion of the Phase I of the reclamation, population density at the projected 1989 municipal area of 1,572 rai would be 15.7 persons per rai in the built-up area, including conversion of 5 rai per annum of the 1979 vacant land to built-up area, and the addition of the 80 rai (Stage I) of reclaimed land, as compared with the estimated density of 12.6 persons per rai in 1979.

With the completion of the Stage II reclamation in 1994 and conversion of an additional 25 rai of vacant land to urban use, the overall density in the built-up area of Siracha Municipality, 1,867 rai, would rise to only 16.1 persons per rai -- at the projected 1994 population of 30,000.

With the addition of the total area of reclaimed land -- 350 rai -- and partial utilization of vacant land, the Municipality of Siracha could accommodate a substantially larger urban population in 1994 than the 30,000 shown as the "high" growth rate projection in Table 1. At the "high" population growth rate projection, the Municipality would contain 35,700 persons in 1999; assuming no further conversion of vacant lands to urban uses after 1984, but completion and utilization of the reclaimed area of 350 rai, the 1999 density would reach only 19.1 persons per rai. Without the reclaimed area, the population density would reach 23.5 persons per rai at the "high" growth rate projection for 1999.

If a decision is reached by 1982 or 1983 to construct the Laem Chabang Port/Industrial Complex/New Town, a detailed feasibility study for a phased reclamation of the foreshore area shown in Figure 4 should be commissioned, i.e., if it appears that the pattern of development along the Eastern Seaboard is to resemble that in Scenario "C" -- rather than that in "A" or "B."

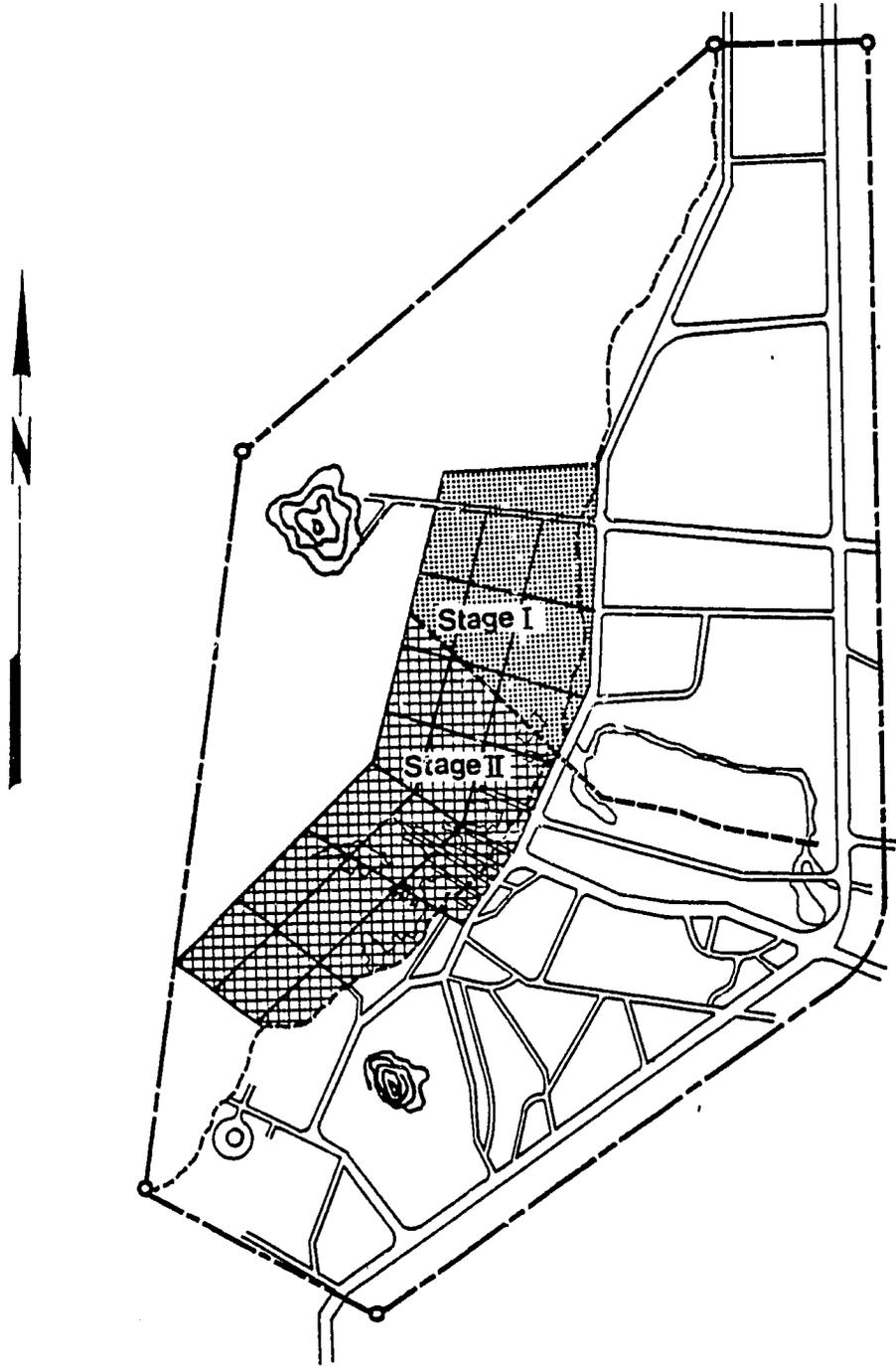
#### Phanat Nikhom

The total area within the municipal boundaries of Phanat Nikhom is approximately 1,725 rai (276 hectares). In

Figure 4.

# Siracha Municipality

PROPOSED AREAS OF RECLAMATION



STAGE I - PROPOSED BY GOVERNMENT (80 rai)  
STAGE II - ADDITIONAL AREA PROPOSED BY  
PRIVATE DEVELOPER

1978, land was distributed as shown in Table 12 below; the spatial pattern of land use is illustrated in Figure 5.

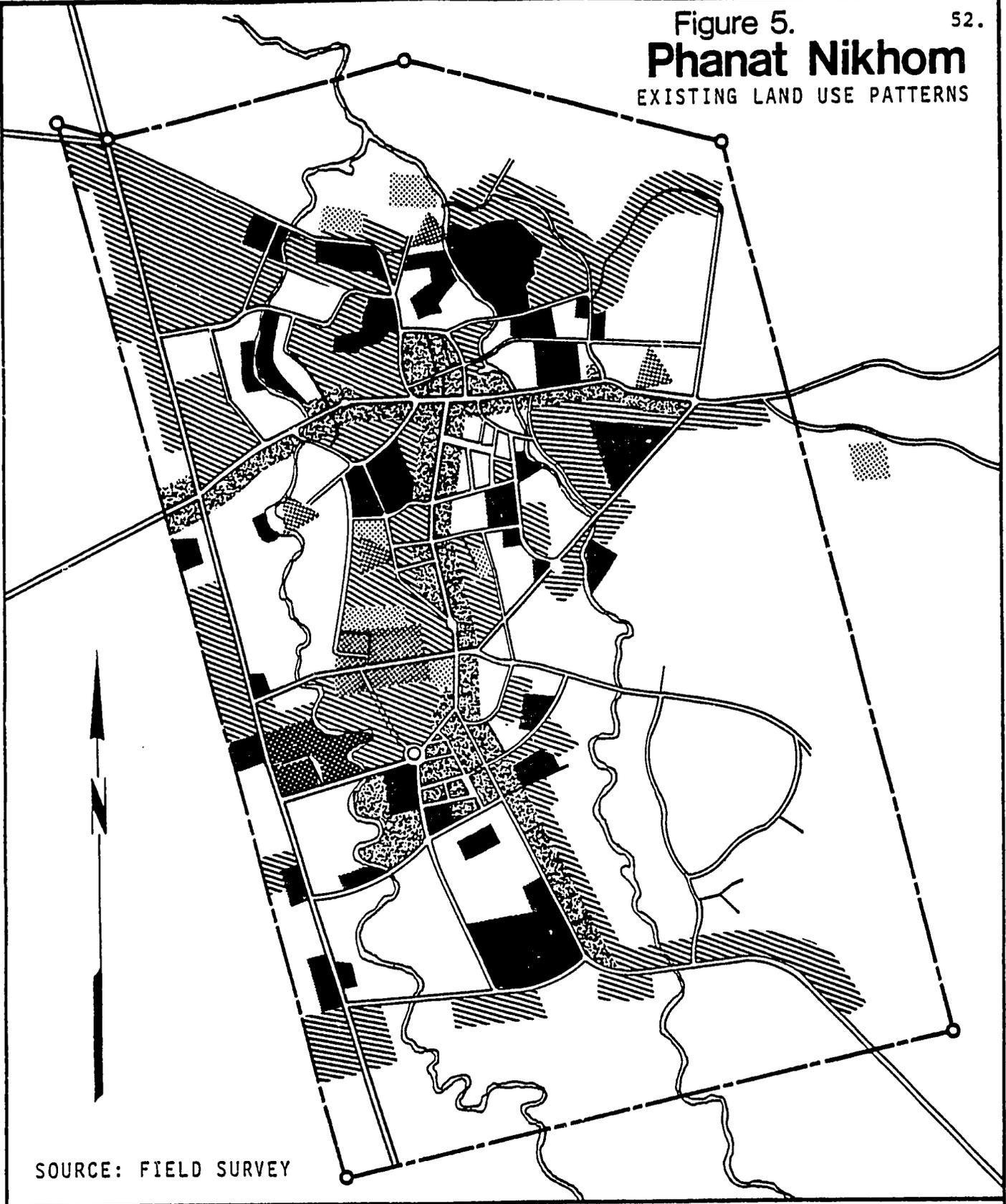
Table 12. Distribution of Land, by Use, Phanat Nikhom Municipality, 1978

Use	Area (in rai)	Area (in hectares)	Percent of total
Residential	511	81.8	29.6
Commercial	31	5.0	1.8
Industrial	16	2.6	0.9
Government	11	1.8	0.6
Education	28	4.5	1.6
Religious	31	5.0	1.8
Roads/Local Streets	101	16.2	5.9
Recreation Areas	17	2.7	1.0
Farms	925	148.0	53.7
Vacant Land	54	8.6	3.1
Total	1,725	276.2	100.0

As in other urban centers in Thailand, the areas designated "commercial" contain some residential quarters, usually on the upper floors of shop houses. The mixed commercial/residential areas are heavily concentrated along a north-south axis between the two klongs running through the center of the Municipality. Residential areas are located between the klongs, along the road paralleling the western border of the municipality, and particularly in the northwestern portion of the municipality. Although not shown in Figure 5, limited commercial and residential development can be observed outside the municipal boundary, especially along the road to Chonburi.

Phanat Nikhom Municipality is unique among the three urban centers in the study in one important respect: there

Figure 5. 52.  
**Phanat Nikhom**  
EXISTING LAND USE PATTERNS



SOURCE: FIELD SURVEY

- |   |  |
|---|--|
|  VACANT AREAS                  |  COMMERCIAL & RESIDENTIAL AREAS |
|  RECREATIONAL/OPEN-SPACE AREAS |  RESIDENTIAL AREAS              |
|  RELIGIOUS FACILITIES          |  GOVERNMENT FACILITIES          |

exists within the municipal boundaries a comparatively large amount of land currently not utilized for urban purposes. A total of approximately 54 rai (8.64 hectares) in 16 parcels of privately owned land, located primarily in residential areas, is vacant, or planted in fruit. A much larger amount of land within the municipal boundaries, 925 rai (148 hectares), is used largely for farming. While some of the smaller parcels are subject to flooding and other constraints on their use for residential/commercial use, 10 of the 16 parcels have values that suggest suitability for urban uses.

The much larger area of farm land is privately owned, and some portions are used for poultry and livestock production, as well as crops. Because these lands, estimated to contain slightly over one-half of the total land area in the Municipality, do not contain expensive structures, the lands provide a favorable option for expansion of urban facilities. However, current urban expansion into the areas is constrained by: (1) periodic flooding, and (2) lack of access of the type and density suitable for an urbanized area. Both constraints can be alleviated by projects identified in the Guide Plan. As in other instances, financial resources and -- in the case of flood control measures -- coordination of governmental agencies with the Municipality will be required to implement the projects.

In 1979, the estimated population of Phanat Nikhom Municipality was 13,500; the total area of the Municipality, 1,725 rai, indicated a population density of 7.83 persons per rai, or 48.9 per hectare. However, excluding the land areas vacant and in farms, the density rate in the remaining built-up area is 18.1 persons per rai, or 113 persons per

hectare. The additional land required for urban uses, under alternative growth assumptions, to the years shown, are shown in Table 13, assuming the density in areas newly utilized for urban purposes will remain at the 1979 overall rate of 7.83 persons per rai.

Table 13. Land Requirements, Phanat Nikhom  
1979-1999

Period	Population Increase (000) <sup>a</sup>			Additional Land, at assumed incremental density of 7.83 p/rai		
	Low	Med	High	Low	Med	High
1979-1984	1.0	1.0	1.4	127.7	127.7	178.8
1979-1989	2.1	2.2	3.0	268.0	281.0	383.1
1979-1994	3.3	3.5	4.7	421.0	447.0	600.3
1979-1999	4.6	4.8	6.6	587.5	613.0	842.9

a. See Table 1 for growth rates.

At the projected rates of growth shown in Table 1, the total requirement for additional land for urban uses in Phanat Nikhom Municipality between 1979 and 1999, at an incremental density of 7.83 persons per rai (48.9 persons per hectare) is less than the sum of vacant and farmland now within the Municipality -- even at the "high" rate of population growth. At the "low" rate of population growth, only 60 percent of the vacant and farmlands would be required to accommodate the additional urban population requirements at the density level that prevailed in 1979.

At the "low" rate of population growth projections, the

density level, based on the total area of 1,725 rai would rise from 7.83 per rai to 8.4 in 1984; 9.0 in 1989; 9.7 in 1994; and 10.5 in 1999. Excluding areas remaining in non-urban uses, the corresponding density rates would decline from 18.1 persons per rai in 1979, to 16.6 in 1984; 15.4 in 1989; 14.4 in 1994; and 13.6 persons per rai in the built-up (nonfarm) areas within the present boundaries of the Municipality.

By 1999, at the "high" rate of projected population growth, and assuming an incremental density rate of 7.83 persons per rai, the overall density rate in the Municipality would be 11.7 persons per rai; in the urbanized (nonfarm) portions of the Municipality, the density rate would be approximately 12.7 persons per rai -- slightly below the density rate in the land area in Siracha Municipality (13 persons per rai), and one-half the rate in the land area of Chonburi Municipality (25.9).

On the basis of the assumptions and projections described above, it is concluded that an expansion of Phanat Nikhom municipal boundaries to accommodate the projected increase in urban population is not indicated. Therefore, the Guide Plan for the Municipality will focus on projects to facilitate orderly growth within the existing municipal boundaries.

Finally, it is noted that the only foreseeable development that would invalidate the conclusion stated above would be the siting of an industrial zone in the immediate vicinity of the Municipality and/or a major manufacturing plant on farmland within the Municipality. Neither is regarded as likely, given road network, and proposed natural gas, rail,

and port facilities along the Eastern Seaboard. In addition, the costs of providing the urban infrastructure to serve large increases in population are likely to be somewhat lower in the two larger municipalities on the coast.

It is recognized that something less than 100 percent of the vacant and farmlands may be convertible for urban uses because of location, ownership, and topography. Nevertheless, in the absence of a major shift in the spectrum of socioeconomic factors determining population growth in Phanat Nikhom, it appears that -- unlike the Municipalities of Chonburi and Siracha -- Phanat Nikhom can, by land programming techniques, accommodate likely increases in population within its present boundaries.

The comparatively low rates of population growth projected for Phanat Nikhom in all three development scenarios reflect an assumption that the industrialization of the Eastern Seaboard Region will occur along the transport corridors of the rail extension and Sukhumvit Road, and in the vicinity of the port(s), all of which are some distance from the Municipality of Phanat Nikhom. Population growth in the rural areas of the amphoe is projected to occur at a somewhat higher rate than in the Municipality, although the rate is expected to be lower than during the 1970s, as the availability of areas suitable for conversion from forest to cropland diminishes, while industrial employment opportunities are being expanded in the coastal areas of the Changwat.

### Industrial Land Requirements

The estimates of additional urban land requirements to accommodate projected growth in population in the three urban centers presented above do not include the land areas that will be required for industrial uses. Exclusion of estimated requirements for industrial lands is based on the following considerations:

- (1) The gradual spread of industrial plants south of Bangkok along Sukhumvit Road has occurred outside the municipalities, a pattern of location that can be expected to continue for a number of reasons, including facility of transport, availability of comparatively large sites not available within the municipalities, and cost considerations.
- (2) In the case of Chonburi -- but to a lesser degree in Siracha Municipalities -- land suitable for further industrial growth is simply not available. The areas classified as industrial in Chonburi contain relatively small-scale establishments, frequently located in shophouse types of structures, employing few workers, and requiring comparatively little space. It is assumed that installations of this type will continue to operate within existing Municipal boundaries.
- (3) There exists in Siracha Municipality a wood processing plant that occupies a significant area of land. Local sources report that the plant has encountered difficulties in securing adequate supplies of timber, and may relocate. Should the plant vacate the land it now occupies, the area should be reserved for nonindustrial uses.
- (4) Given the constraints on expansion of municipal boundaries and the resulting high prices for land within the Municipalities of Chonburi and Siracha, financial considerations will dictate the selection of industrial sites on cheaper lands outside the municipalities and their immediate environments. The generally good transport along the Eastern Seaboard facilitates the selection of the cheaper, less crowded sites outside the municipalities.

- (5) Finally, it is noted that industrial zones -- or estates -- are planned for the areas adjacent to the Ports of Laem Chabang and Sattahip. These will provide sites for a large portion of the projected labor force, particularly for industries producing for export.

Projected Increase in  
The Labor Force

The projected labor force in each of the three amphoes is shown in Tables 2-B, 3-B, and 4-B, based on Scenarios "A," "B," and "C," respectively. The projections are summarized in Table 14 below.

Table 14. Projected Increases in Labor Force, Chonburi, Siracha, and Phanat Nikhom Amphoes, Under Scenarios "A," "B," and "C," 1979-99 (in Thousands)

	Scenario "A"	Scenario "B"	Scenario "C"
1979, est.	195.4 <sup>a</sup>	195.4 <sup>a</sup>	195.4 <sup>a</sup>
1979-1984	36.3	39.4	45.4
1979-1989	84.4	92.1	109.6
1979-1994	135.8	169.7	187.8
1979-1999	178.3	239.3	265.2

a. Estimated total labor force in Chonburi, Siracha, and Phanat Nikhom Amphoes, 1979.

During the 6-year period, 1979-84, the labor force in the three amphoes is projected to increase by 36.3 thousand under the assumptions of Scenario "A"; under the high growth rate assumptions of Scenario "C," the projected

increase in the labor force over the same period is 45.4 thousand. By 1999, the projected labor force would reach 373.6 thousand, 434.7 thousand, and 460.6 thousand under Scenarios "A," "B," and "C," respectively.

Distribution of Labor Force,  
by Major Sectors

The historical distribution of the labor force of Chonburi Changwat provides a useful base -- but not a reliable guide -- for projection of the future composition of a much larger labor force, the sectoral distribution of which will be sharply altered by the announced program to transform the Eastern Seaboard into an industrial zone.

The projected distribution of the labor force, by a three-sector classification, under the assumptions of Scenarios "A," "B," and "C" for the years 1984, 1989, and 1994 is shown in Table 15. It should be noted that the distribution, by sector groups, and the totals in the first column are for Chonburi Changwat; all other columns are for the three amphoes.

The projected distributions shown in Table 15 for 1984, 1989, and 1994 have been derived from statistics compiled by Simon Kuznets from cross-section data from 59 countries at different stages of industrialization.<sup>1</sup> Kuznets' data have been modified in each of the three scenarios to reflect existing conditions in the three amphoes, and especially to take into account the government's plans to develop the Eastern Seaboard as an industrial zone.

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1. Kuznets, Simon, Economic Growth of Nations: Total Output and Production Structure, Chapter V, Harvard University Press, Cambridge, Mass., 1971.

Table 15. Percentge Distribution  
of Labor Force, 1970, and Projected 1984,  
1989, and 1994 Total for Chonburi,  
Siracha, and Phanat Nikhom Amphoes,  
Under Assumptions of Scenarios  
"A," "B," and "C," by Sector Groups  
(in Percent and Thousands of Workers)

Sector Groups <sup>a</sup>	1970 <sup>b</sup>	Scenario "A"			Scenario "B"			Scenario "C"		
		'84	'89	'94	'84	'89	'94	'84	'89	'94
P % (,000)	59 135.1	47 109.0	43 120.0	40 132.4	45 105.7	39 112.1	32 116.8	35 84.3	30 91.5	23 88.1
I % (,000)	15 35.4	23 53.3	25 70.0	27 89.4	25 58.7	29 83.4	33 120.5	26 62.6	30 91.5	35 134.1
S % (,000)	26 59.0	30 69.5	32 89.2	33 109.3	30 70.4	32 92.0	35 127.8	39 93.9	40 122.0	42 160.9

a. Sectors grouped as follows:

P: Agriculture, forestry, and fishing.

I: Mining and quarrying, manufacturing, construction, electricity,  
gas and water, transport, and communication.

S: Trade; banking, insurance, and real estate; public administration  
and defense; and services.

b. Source: Census, 1970. Ratios and numbers in labor force are for  
Chonburi Changwat.

In 1976, the three amphoes contained 62 percent of the total Changwat employment in nonagricultural, private establishments with five or more workers in sector group I; this percentage will increase in all three scenarios, particularly in Scenario "C," where sector group I employment is projected to account for 35 percent of the labor force by 1994. Conversely, sector group P (agriculture, forestry, and fishing) is projected to absorb a diminishing share of the labor force, while the commercial and services group (S) will absorb an increasing proportion of the projected labor force in all scenarios.

Amphoe data on the distribution of the total labor force in 1979 are not available. However, based on employment in nonagricultural, private establishments with five or more workers, the three amphoes contained 62 percent of the employment in sector group I in 1976. On the basis of this ratio, employment in sector group I is estimated to have been about 23,000 in 1979. Under the assumptions of Scenarios "A," "B," and "C," the increase in labor force to be absorbed in sector group I by 1984, 1989, and 1994 are shown in Table 16.

Table 16. Increases in Labor Force  
Sector Group I, and in Manufacturing, by Time  
Periods, Chonburi, Siracha, and  
Phanat Nikhom Amphoes, in  
Thousands

Time Period	Increases in Labor Force		
	Scenario "A"	Scenario "B"	Scenario "C"
1979-84: Total	30.3	35.7	39.6
Mfg. Only	(18.2)	(21.4)	(23.8)
1985-89: Total	26.7	24.7	28.9
Mfg. Only	(16.0)	(14.8)	(17.3)
1990-94: Total	19.4	37.1	42.6
Mfg. Only	(11.6)	(22.3)	(25.6)

Within the sector group I, Kuznets' data indicate that 58 to 60 percent of total sector group I employment will be in manufacturing. Using the 60 percent ratio, the increases in labor force in manufacturing is indicated by the figures in parentheses in Table 16.

As is now the case, some small-scale manufacturing will continue to be located in "mixed use" urban areas within and without the municipal boundaries, particularly in the rapidly growing areas adjoining Chonburi and Siracha Municipalities. But, given the nature of the proposed industrialization program, most of the additional manufacturing employment may be expected to occur on industrial sites, both within and without industrial estates, rather than in built-up areas in -- or adjacent to -- existing municipalities.

Employment Coefficients:  
Worker-Land Ratios

Land requirements for industrial use show a wide range of variation depending on the particular type of industry, standards imposed by authorities, land prices, and services provided by nonmanufacturing establishments on industrial estates, e.g., banks, fire stations, service stations.

In a recently completed study for the Korea Research Institute for Human Settlements, the coefficients shown in Table 17 were utilized.

Table 17. Workers per Gross  
Hectare of Industrial Land

<u>Industry</u>	<u>Workers per Hectare</u>
Food and beverages	173
Textiles, apparel	97
Textiles	72
Apparel	180
Wood and wood products	54
Paper and paper products	43
Rubber products/drugs	108
Nonmetallic (mainly cement) products	22
Iron and steel - Basic metals	25
Iron and steel - rolling, casting, etc.	72
Nonferrous molding, drawing, extruding	90
Fabricated metal products, machinery	79
Machinery, except electrical	72
Electrical machinery, appliances and supplies	130
Transport equipment	68
Other manufacturing	72

The coefficients shown in Table 17 were derived, in large part, from studies by the Korea Institute for Industrial Development, and published in Study of Industrial Unit Coefficients, Vols. I and II, Seoul, Korea, 1977 and 1978. Some of the coefficients were obtained from a United Nations' publication, Profiles of Manufacturing Establishments.

A list of industries with typically high and low coefficients of workers per hectare is presented in Table 18.

Finally, it is noted that the preliminary planning for the Laem Chabang industrial area provides 1,100 hectares on which an estimated 38,500 workers would be employed, an average coefficient of 35 per hectare. This coefficient is somewhat lower than the average coefficient found in a sample

Table 18. Selected Industries with Typically  
"High" and "Low" Coefficients<sup>a</sup>  
of Workers per Hectare

<u>"High"</u> <u>Over 75/ha</u>		<u>"Low"</u> <u>Less than 25/ha</u>	
<u>Product</u>		<u>Product</u>	
Electronic equipment	206	Beer	3.5
Commercial dishwashers	99	Grain processing	4
Food flavoring	96	Transformers	6
Bakery	93	Farm machinery	16
Plastics	82	Auto parts	16
Insulation	82	Printing machinery	19
Floor polishers	82	Research laboratory	22
Lithographing	80	Tractors	21

a. Source: This selection has been made from existing establishments operating in industrial estates (parks) in Canada and the United States. Urban Land Institute, Technical Bulletin No. 44, "Industrial Districts, Principles in Practice," Washington, 1970.

of industrial estates in the United States and Canada. The coefficient used in the Laem Chabang preliminary planning suggests that the industrial area would contain a substantial number of capital intensive, low coefficient, heavy industries.

Taking the projected increase in the labor force to be employed in manufacturing in the three amphoes shown in Table 16 (the figures in parentheses), in Scenario "C," and an average coefficient of 50 workers per gross hectare, additional industrial land requirements would be as follows:

1979-1984	476 hectares
1985-1989	346 hectares
1990-1994	<u>512</u> hectares
Total, 1979-94	1,334 hectares, or 8,337.5 rai

Scenario "C" assumes the implementation of the proposed Port/Industrial Complex/New Town at Laem Chabang; the development of a smaller, generally labor-intensive industrial area east of Chonburi; and continued siting of industrial plants along the Sukhumvit Road -- Rail Corridor on the Eastern Seaboard -- all of which will provide jobs in the manufacturing sector.

In view of the planned industrial zone of 1,100 hectares at Laem Chabang, comprising 82 percent of the total requirement shown above, it is concluded that land for industrial use is not a constraint on achievement of the projected levels of population and labor force. The more immediate constraints are likely to be water for industrial and residential use; capital to finance plant and equipment to provide jobs for the projected labor force and infrastructure to meet the needs of both industry and population of an increasingly urbanized population; and a viable and effective institutional arrangement to implement the programs and projects to effect industrial development of the Eastern Seaboard.

#### IV. GUIDE PLANS

##### Introduction

The principal features of the guide plans have been developed in conjunction with the establishment of goals and objectives of socioeconomic and physical development and regional linkages. Other factors influencing the formulation of the guide plans are the policies, programs, and recommendations for feasibility studies of selected short-term projects, one of the preliminary components of the land-use programming process. The guide plans will constitute a framework for targeting, identifying a general development pattern, formulating strategies, and examining alternative approaches. Within the general guide plans, specific projects can be identified and priorities established.

For the period 1979 to 1984, the future growth, direction, and suggested approach for development of each municipality and its contiguous built-up areas are described in the following sections.

Alternative development strategies that could be applicable, either individually or combined, are presented.

It is recognized that existing conditions, e.g., the legal framework governing the urban planning process, or local fiscal powers, may change. Therefore, alternative strategies are considered, with priorities established according to the institutional framework in which each would be applied, and the three scenarios elaborated earlier.

Annex A to this chapter of the Final Report also contains preliminary studies, prepared by municipal officials and project counterpart staff, of several projects that have been identified by municipal officials. The intent of these studies is threefold: first, they will provide the municipal officials with a rough guide on the costs of each project; second, they should be used by municipal officials as an aid in deciding whether the project merits more definitive study; and third, they should be used as a model to assist municipal officials in the type of analysis suitable for establishing priorities when a number of projects are under consideration.

This report is intended to provide guidelines for municipal action and project implementation during the development period of 1979-84. The guide plans also identify longer-term directions of growth and suggest measures and projects to direct growth in directions compatible with phased, orderly urbanization. However, the emphasis is on the action program guidance for municipalities and central planning bodies to use not only in project implementation but also in preparation of urban master plans, settlement programming, and formulation of urban-regional policies. This report represents a practical and realistic approach that the municipalities can take in reducing some of their known deficiencies while, at the same time, they prepare for longer-term development planning.

### Strategy Options

There are, in general, four ways in which the projected increases in urban population can be accommodated in the study area:

- (1) By increasing population density in the three municipalities by means of more intensive use of available land areas, including vacant and underutilized areas. This is an attractive option in Phanat Nikhom, but somewhat less so in the other two municipalities, especially in Chonburi.
- (2) Expand municipal boundaries into contiguous sukapibans and tambons in which urbanization trends are evident, or in which urban growth can be anticipated because of location, topography, and access.
- (3) Development of a strategy to limit population growth within existing municipal boundaries accompanied by direction of population growth to areas outside present boundaries of municipalities, through provision of urban infrastructure and services. While compatible with the second option, the third option does not necessarily require annexation of areas to which urban growth is directed.
- (4) In the Municipalities of Chonburi and Siracha, a fourth option exists: the reclamation of foreshore areas to increase the land area within the existing boundaries of the municipalities.

Each of the four options described above offers certain distinct advantages, and presents specific problems. Higher densities may produce undesirable effects on urban ambiance -- air and water pollution, congestion in transport, and higher costs of infrastructure. The annexation of lands reportedly encounters serious obstacles in Thailand, and

expanding municipal boundaries is not always conducive to a net gain in the fiscal position of the expanded municipality -- even if the obstacles to annexation can be surmounted.

The third option probably offers the least costly means of meeting the requirements for additional land to accommodate urban population growth -- but potentially at the expense of lower standards of urban infrastructure and services for the population residing outside the established municipalities. Also, land-use programming applied to "lead" population into the desired growth areas will require application by some administrative organization other than the municipalities. Appropriate institutional arrangements will be necessary for the "planning" and implementation of measures to guide urban growth outside municipalities.

Provision of space to accommodate population growth through land reclamation in Chonburi and Siracha Municipalities will be costly, and may encounter opposition from the "sea dwellers" and fishermen. However, it may be less costly than the second or third options with respect to provision of urban infrastructure and services.

The proposed creation of a "New Town" as a component of the port/industrial complex at Laem Chabang would accommodate most of the projected increase in population, even at the high growth rates shown in Table 1. At the high growth rate, total population in the three amphoes would increase by 533,000, 1979-99; the proposed New Town has been projected to have an eventual population of an estimated 350,000. From a national -- or regional -- standpoint, the New Town can be viewed as a fifth option.

### Chonburi Subregion

In the short-run, and under any of the three scenarios, the recommended strategy for development of the subregion is a combination of increased population density within the existing boundaries of the municipality, and direct growth to the south, between Sukhumvit Road and the Gulf of Siam; to the east in the general direction of Ban Bung; and to the northeast along the road to Phanat Nikhom. The recommended strategy is illustrated in the sketch map presented in Figure 6.

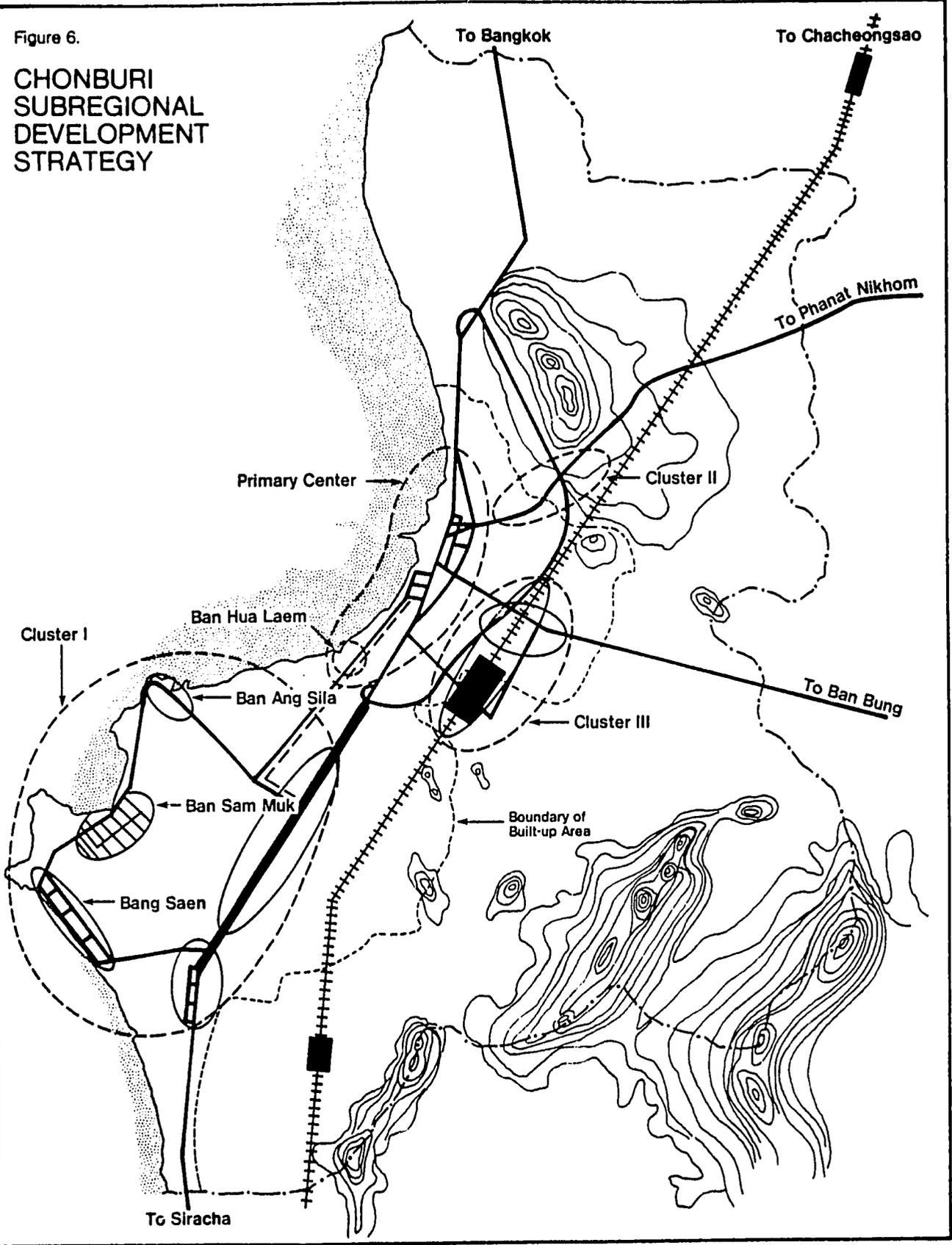
The numbers of the settlement clusters shown in Figure 6 do not necessarily represent priorities. However, the contiguous area immediately south of Chonburi's southern boundary should be given early priority for inclusion in what is considered the primary urban center.

If regional development follows the pattern visualized in Scenario "C," reclamation of the foreshore area could add roughly 800 rai (128 hectares) of land suitable for residential, recreational, governmental, and "mixed" urban uses. At the overall density level in the land area of Chonburi Municipality in 1979 of 27.9 persons per rai, the reclaimed area would have a potential holding capacity of approximately 22,300 persons, roughly equal to the projected increase in population to 1999, at the medium growth rate shown in Table 1.

The economic feasibility of the reclamation will depend on the value of the reclaimed land, while the financial feasibility will be influenced, also, by the amount of the land to be retained -- rather than sold or leased -- by

Figure 6.

# CHONBURI SUBREGIONAL DEVELOPMENT STRATEGY



governments for use as open space or administrative purposes.

Short-term projects designed to increase density and improve circulation within the primary center, and to facilitate population growth in the area immediately south of the municipality, are identified in Figure 7. Within the latter area, the existing road from the southern boundary of Chonburi to the road connecting Aug Sila and Sukhumvit Road should be upgraded and provided with an all-weather surface (Project A). Electric power lines are already in place in part of the area, and should be made available in the remaining area on a phased schedule; drainage improvements should be made, and; as supply constraints are removed, piped water should be made available (Projects C).

The National Housing Authority has initiated construction of residential housing in a portion of the area, and most of the area has been partially filled, although drainage requires improvement.

Should circumstances change to lessen the obstacles to annexation, the area immediately south of the municipality, between Sukhumvit and the coast -- at least as far south as Ban Hua Laem -- should be the first priority for annexation. This area is substantially larger than the additional land that would become available from the reclamation project. The reclamation option is viable only if circumstances render the annexation option unattainable.

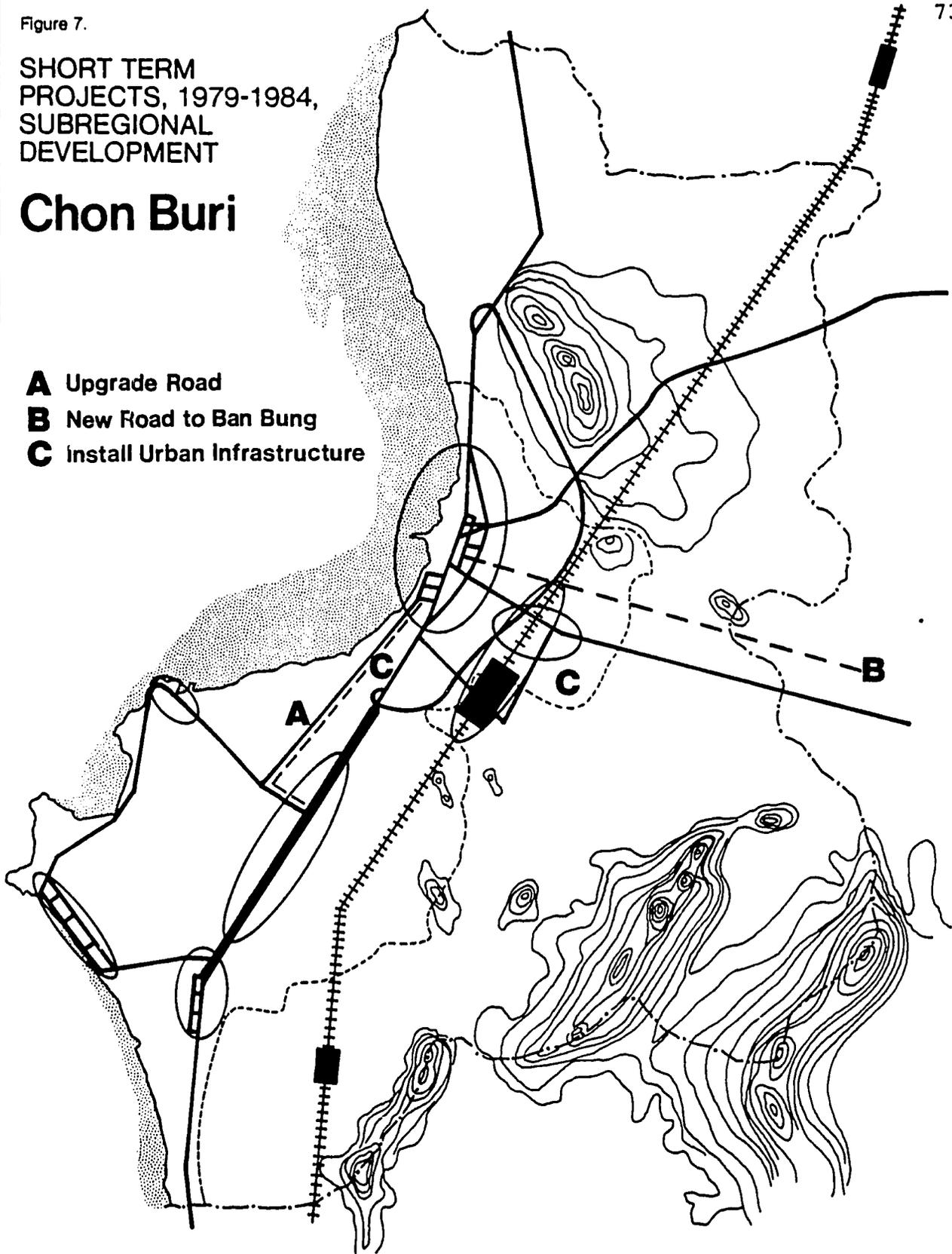
Project C also includes extension of urban infrastructure and -- if legally and financially feasible -- acquisition of land for development of an area in the general vicinity of

Figure 7.

SHORT TERM  
PROJECTS, 1979-1984,  
SUBREGIONAL  
DEVELOPMENT

# Chon Buri

- A** Upgrade Road
- B** New Road to Ban Bung
- C** Install Urban Infrastructure



the rail station and the intersection of the railway and Sukhumvit bypass with the road to Ban Bung. In Scenario "C," an industrial area for labor-intensive, light industry is proposed for this area. However, any major developments in this area should be deferred until it is known if the pattern adopted for regional development is likely to follow the Scenario "C" pattern.

Finally, as a component of the subregional projects, a new road from Chonburi to Ban Bung is proposed (Project B), Figure 7.

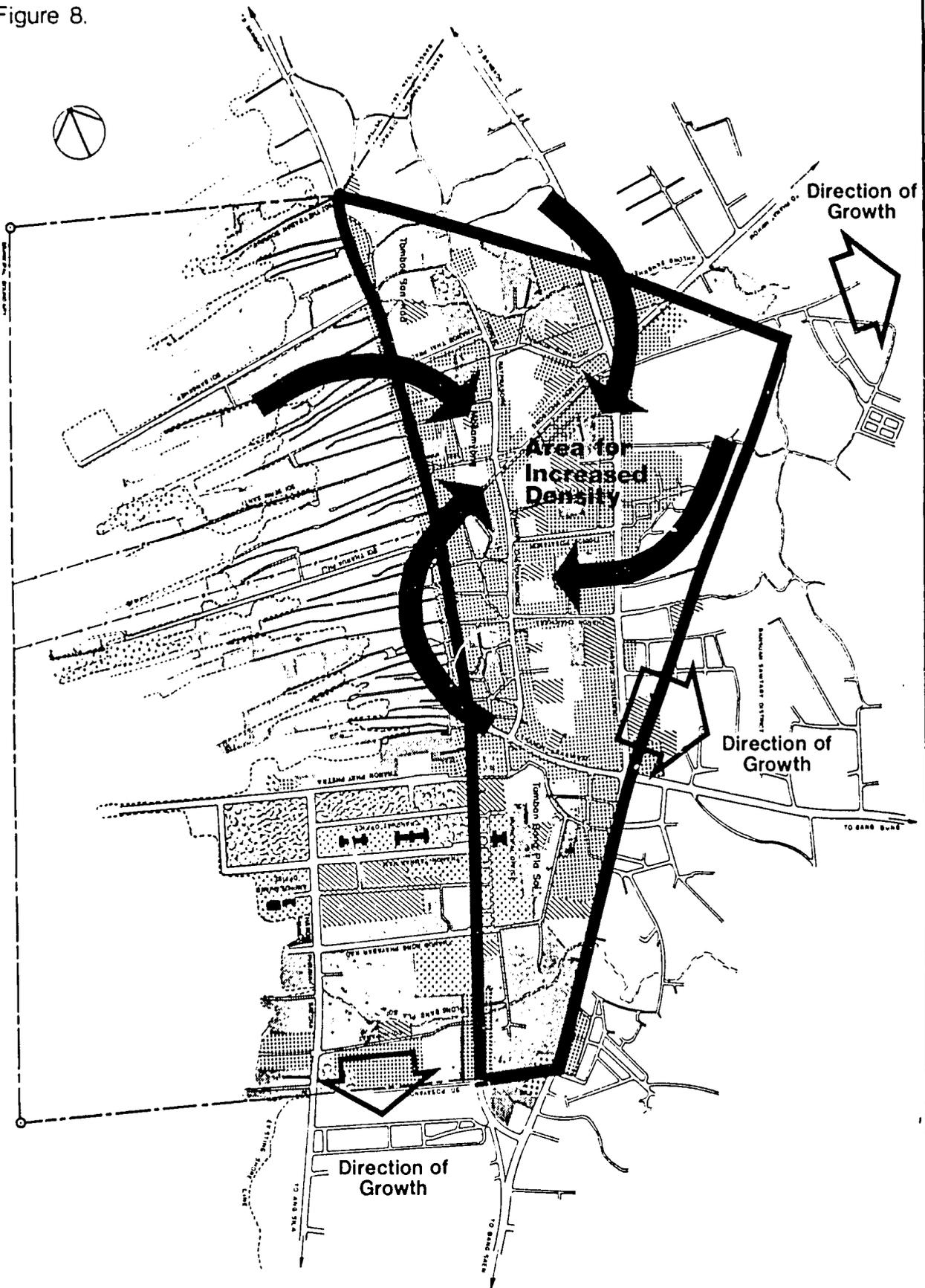
#### Strategy for Chonburi Municipality

The appropriate development strategy for Chonburi Municipality is viewed as a combination of increased density, and directed population growth outside existing municipal boundaries. The measures required to effect the latter will require coordination with other governmental authorities, as land use controls and the provision of urban infrastructure and services in the "growth" areas are currently outside the Municipality's jurisdiction.

A schematic representation of the suggested strategy is shown in Figure 8. The indicated directions of population growth outside the municipality follow, in general, the principal transport linkages to Chonburi's hinterland, along which urban development is evident.

As visualized in the strategy described above, the area within the present boundaries of Chonburi Municipality between Sukhumvit Road and Thanon Phiphit-Thanon Wachirapakan

Figure 8.



EXISTING LAND USE

- Residential Area
- Business Area
- Institutional Area
- Religious Places

EXISTING LAND USE

- Educational Area
- Industrial Area
- Sport Stadium
- Park & Open Space Area
- Utilities Area

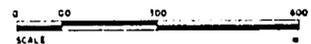


Figure 8.  
DEVELOPMENT  
STRATEGY CHONBURI  
MUNICIPALITY

would become the Central Business District (CBD) and government administrative center. The CBD will serve an expanded urbanized population residing largely outside the municipal boundaries. With implementation of the Eastern Seaboard Regional industrialization plan, government administrative functions will take on added importance.

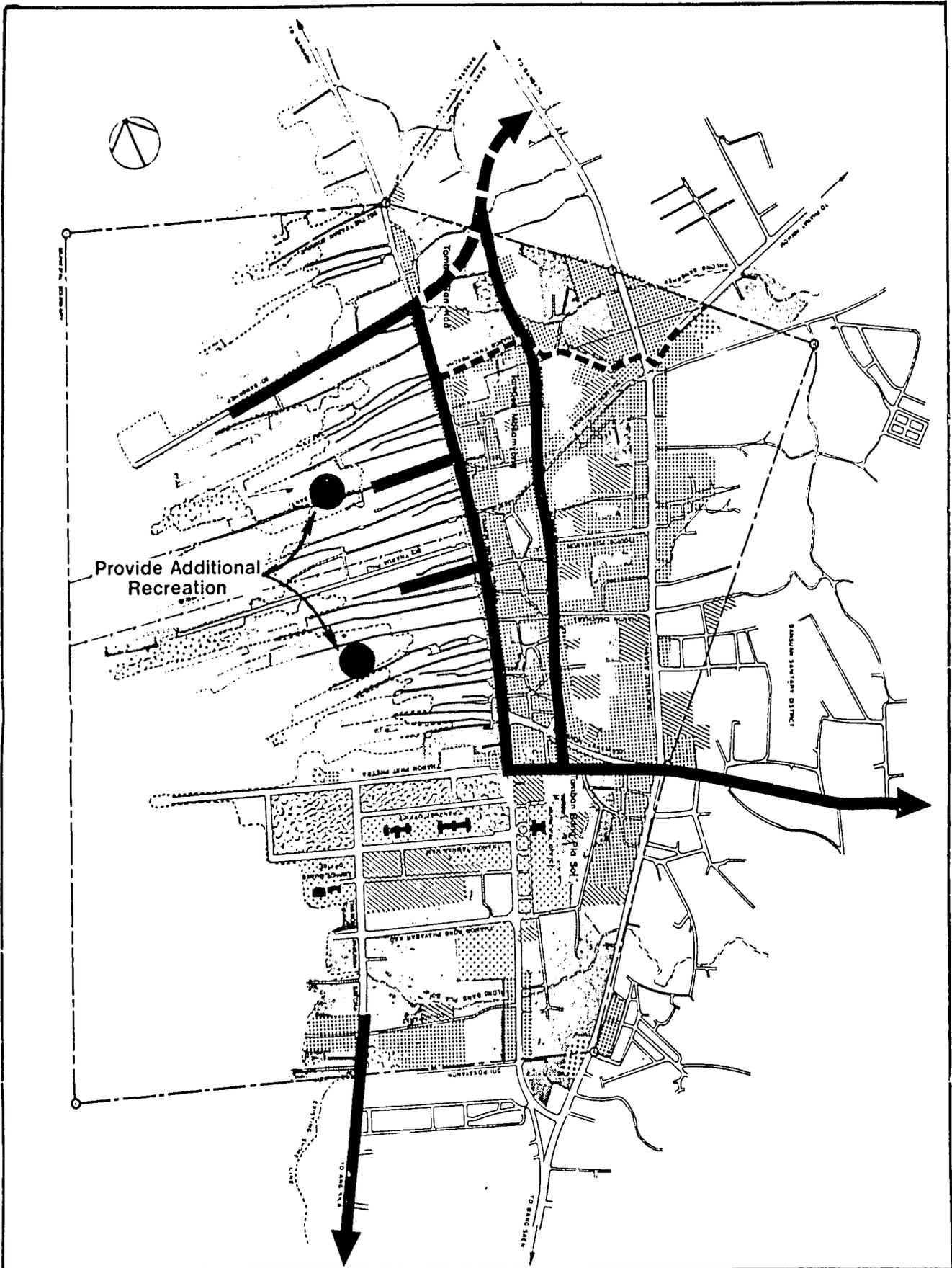
Within the municipal boundaries, residential land use will be confined primarily to the foreshore area and the northern and southern extremities of the municipality. However, a significant portion of the population will continue to reside in the CBD in the upper floors of shop-houses.

Several selected short-term projects to facilitate development of Chonburi Municipality as the primary regional commercial/administrative center are illustrated in Figure 9. These projects include:

- (a) Improvement of access to the new fish market at the western end of Soi Sangkhep by widening the soi and by construction of a new road from the eastern end of Soi Sangkhep to intersect Sukhumvit Road.<sup>1</sup>
- (b) Urban road improvements (widening and alleviation of traffic obstructions) on: Thanon Ratprasong-Thanon Chetchamng, between Thanon Thai Pracha and Thanon Phat Phetra; Thanon Phiphit-Thanon Wachira Prakan, between the intersection with Soi Sangkhep and Thanon Phat Phetra; and construction of an extension of Thanon Phat Phetra eastward from the intersection with Vachira Prakan to the intersection of Sukhumvit Road and the road to Ban Bung.

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1. An evaluation of the proposed connecting road is contained in "The Feasibility Study of The Land Reclamation in Chonburi Municipality," Chapter IV. The evaluation was made by Applied Scientific Research Corporation of Thailand, as a component of the Land Use Programming Project.



Provide Additional Recreation

PROJECT IDENTIFICATION

-  Roads
-  Traffic Improvement
-  Open Space
-  Proposed New Road

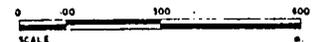


Figure 9.  
SHORT TERM  
PROJECTS CHONBURI  
MUNICIPALITY

- (c) Upgrading and provision of an all-weather surface of the road from the southern boundary of the municipality at Thanon Phraya Satcha, south to the intersection with the Ang Sila-Sukhumvit Road.
- (d) Improved access to residential areas located in the foreshore to permit entry of emergency vehicles, by widening selected sois.
- (e) Increasing the carrying capacity of Khlongs Sangkhep and Bang Pla to reduce flooding and pollution, by renovation of drainage system flowing into the khlongs, and straightening and removal of obstructions in the khlongs.
- (f) Use of small vacant areas in the densely built-up foreshore to provide neighborhood recreational areas.

The projects described above, and partly identified in Figure 9, are technically implementable in small increments, as local funds are available, i.e., they are compatible with the existing practice of annual budgeting of capital improvements; most of the projects are entirely within the jurisdiction of the municipality; all will contribute to an improved urban environment; and -- from a longer run perspective -- enhance the capabilities of Chonburi to serve as the principal sub-regional center of the Eastern Seaboard.

In addition to the specific projects listed above, and identified in Figure 9, measures to improve access and traffic flow and upgrade housing conditions are discussed in the following paragraphs.

#### Measures to Improve Municipal Traffic Flows

In order to ensure the full benefits from the new inter-urban bus terminal and to reduce some of the unnecessary traffic within the municipality, action should be taken by

the traffic control authorities to prohibit the large inter-city buses from entering the urban center proper. That is, the new terminal facilities should serve as a transfer point for the inter-city buses, minibuses, taxis, or samloris.

Other actions to improve the flow of traffic within the urban center would include: revising the parking space requirements to provide adequate space provisions for all categories of building types (for example, each unit, especially the shophouses, would be required to provide at least one off-street parking space), or the provision of several strategically located large, off-street parking areas either developed by the municipality or by the private investors. These off-street parking areas could be located either on the fringe of the municipality, thus further reducing inner urban traffic and reinforcing the system of intra-city public transport, or conversely in the inner urban area, which would eventually lead to some decline in the role of lower level transport systems. The latter alternative, however, also has a further negative effect of utilizing prime available land area in an inefficient manner.

The above measures for improving the flow of traffic within the urban center will not necessarily require the municipality to finance any of these actions. What is required is coordination and action between the municipality and the traffic control authorities. There are, however, other areas that will require specific municipal intervention in terms of financial commitments. These include the eventual realignment of certain side streets that connect Chetchampong and Wachira Prakan roads, as well as providing proper access to many of the sois that lead into the residential coastal area settlement. These actions would first require concurrence among municipal officials as to the priorities for such actions

and the eventual programming of fiscal and time elements. To accomplish much of this, the municipality must be willing to take the lead by providing positive land use control techniques in the form of tax postponements. By allowing short-term tax benefits, the municipality could encourage private developers to redevelop certain areas and, in the process, acquire the necessary land required to widen, re-align, or provide improved or adequate access to designated areas.

#### Relocation of Traffic Generating Activities

Another alternative that should be considered is the removal of some of the traffic generators. In one way, this has already taken place with the recent relocation of the wholesale fish market from the center of the municipality. Other similar actions could be the relocation of the two retail product markets on Wachira Prakan.

Research has shown that the introduction of a market place has functioned as a generator of other forms of formal and informal commercial activities. The same research has also revealed that as the market grows, so do the accompanying "urban" problems, namely, traffic congestion and pollution. It was suggested earlier that consideration be given to relocating the two markets that are presently on Wachira Prakan road. One of the key considerations in relocating the fish market was to reduce traffic congestion and pollution. The same considerations apply to the two retail produce markets. Although one market is on "Royal Property" (King's land) research has indicated that there are no "actual" restrictions on the use of this category of land. The other market is on privately owned land.

Accessibility to alternative locations presents no problem with the existing hierarchy of transport. At present very few of the users of these markets walk to them, as evidenced by the large numbers of inter- and intra-city buses, mini-buses and samlors that are seen waiting on both Chetchamnong and Wachira Prakan roads, especially in the morning hours, and to a lesser degree after mid-day.

It is suggested that consideration be given to re-location of the specific market areas to the fringe of the urban center. One location would be on the southeast side of Sukhumvit road, and another would be at the northeast corner of the municipal boundary. The areas now occupied by the two markets could then be redeveloped in a manner that will provide additional revenues to the municipality as well as relieving traffic congestion and pollution problems.

The area occupied by the old fish market area should also be redeveloped. Because the land area is owned by a Wat, two alternatives should be considered in the redevelopment of this land: use as a recreational area, or use as a commercial area. As land owned by a religious institution is reportedly nontaxable when it is not used for commercial purposes, careful study by municipal officials in close concert with the religious leaders should be initiated to plan for the reuse of this land as a recreational area or, as an alternative, reuse for commercial purposes (which would then require the landowner to pay building and land taxes). The appropriate action can only come about through a careful study of future requirements.

An excellent example of private development with public interest is the recently redeveloped area at the intersection of Thanon Chaichana and Sukhumvit roads. This development

includes a two-level market facility with provision for over 150 vendors on the ground level and many small dry goods vendors on the second level. This area has both on-street and off-street parking facilities.

### Housing

There is little direct action the municipality can take with regard to housing, although it does have the nominal authority to undertake slum clearance and possibly provision of new housing. However, slum clearance has several social and political ramifications. Briefly, slum clearance activities would have the effect of total demolition of a designated area and its eventual redevelopment. Usually, slum clearance is associated with poor housing conditions. Although there are areas within the municipality where the concept of slum clearance could be applied, it is highly doubtful if the municipal officials could marshal the necessary support from local residents, changwat or national agencies to supplement such action.

One possible alternative to slum clearance is residential settlement upgrading in the area occupied by sea dwellers, such as has been done in Klong Toey-Bangkok and Tondo Fore-shore-Manila. Even though the municipality does not, at this time, have the direct authority or fiscal resources to enter into such large-scale activities as cited in the examples above, it can control and improve the existing situations in several ways. Some examples of such action: it can disapprove additional permit requests for construction in this area until it is properly serviced by water, electricity, and drainage supplied (control); it can provide such services to all legal land areas (improvement); it can provide better access to these areas through the redevelopment of commercial

areas along Wachira Prakan road which functions as the "feeder" road to this area (improvement); it can reclaim smaller portions of the foreshore area (not extending the existing soils) and thus correct the circulation problems within these areas by stricter building code enforcement (both control and improvement). Some of the above actions will undoubtedly require the municipality to acquire portions of land, mostly for roads, during the redevelopment process.

In terms of meeting the actual demand for housing, the municipality could encourage private developers to participate in the small reclamation projects for which such land could be used as residential areas. As an alternative to this action (should the small-scale reclamation project costs act as a deterrent to private developers), the municipality could, in cooperation with the National Housing Authority, undertake to provide a limited portion of the total requirements for housing units. This action would, because of the nature of the implementing agencies, be geared expressly to the low income sector.

#### Phasing of Proposed Reclamation Project

The conditions under which the reclamation of some 800 rai of the foreshore for urban use have been noted elsewhere. This project is not considered suitable for implementation as a "short-term" project. However, if development along the Eastern Seaboard follows the pattern described in Scenario "C," the project should be reconsidered in the latter half of the 1980s. It is noted, here, that the short-term projects described above would contribute to the usefulness of the reclaimed foreshore by improving access to -- and

circulation within -- the CBDs to accommodate the additional residential population that will occupy the reclaimed area.

### Siracha Municipality

The selection of an appropriate long-term development strategy for Siracha Municipality is complicated by the lack of knowledge concerning the timing of the installation of the proposed port at Laem Chabang, and of the size and nature of the industrial estate and new town to be established in the vicinity of the port.

As noted earlier, overall population density within the existing boundaries of the municipality is quite low, reflecting a high degree of underutilization of available land area, particularly of government lands. Some of the locally proposed projects, such as the sports complex and a municipal library building, could be located on government land.<sup>1</sup> However, some, and perhaps most, of the government lands are required to be used for "public" purposes -- thus excluding the possibility, under existing provisions, of using the lands for private residential or commercial structures.

The area in which available information -- and observations in the field -- indicate as being seriously underutilized, or vacant, are shown in Figure 10; as a short-term development strategy, priority should be directed to a more intensive utilization of the shaded areas shown in Figure 10.

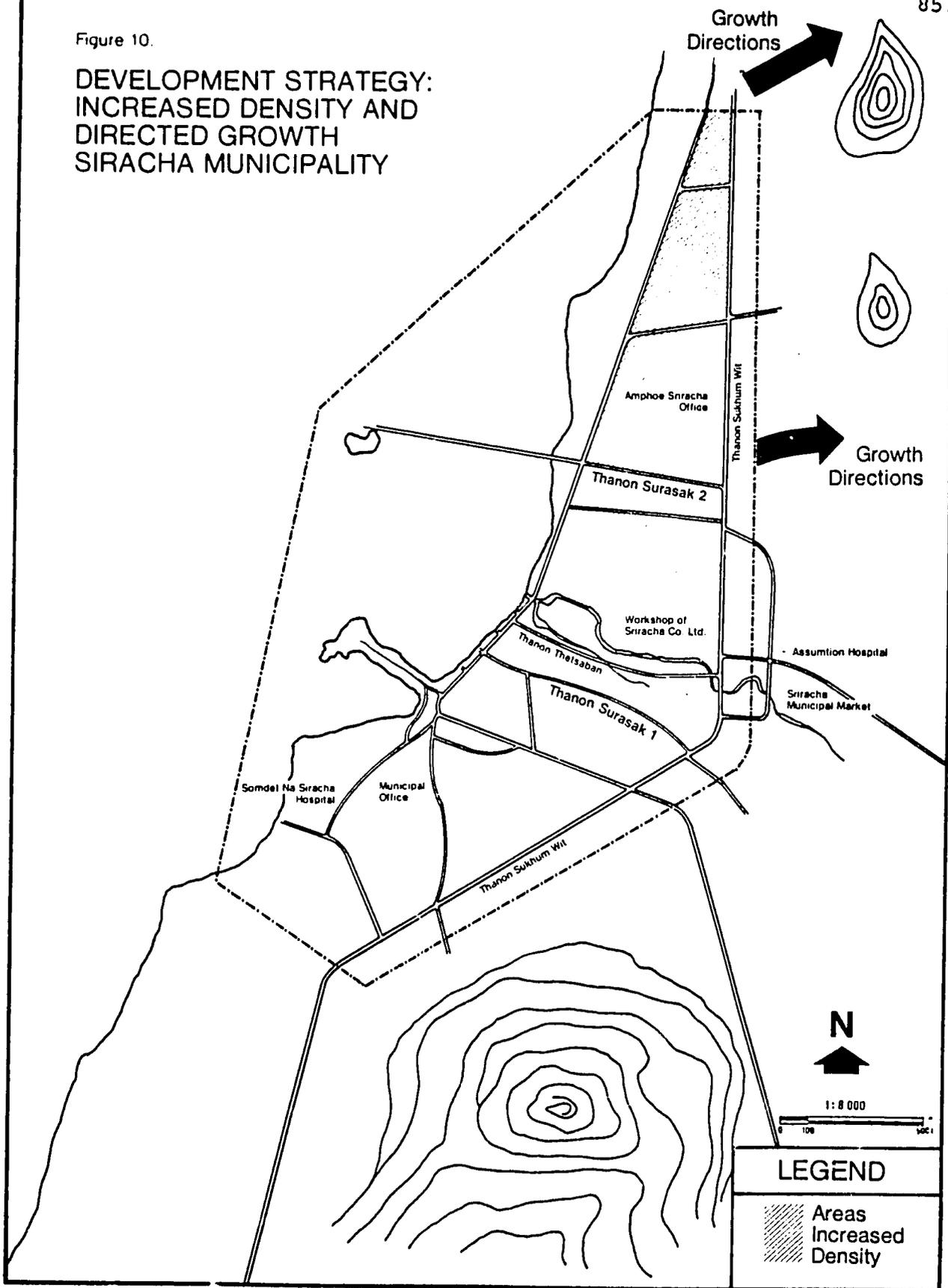
Where existing constraints on the use of government-owned lands preclude its use for nongovernmental, i.e.,

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1. See Annex A-

Figure 10.

### DEVELOPMENT STRATEGY: INCREASED DENSITY AND DIRECTED GROWTH SIRACHA MUNICIPALITY



private purposes, future requirements for land for government use should be evaluated. Should a realistic evaluation indicate that the areas in this category are in excess of future needs, the possibility of modifying the terms covering the purposes for which such lands can be used should be explored.

The general areas in which "directed growth" outside the existing boundaries of Siracha Municipality could be directed also are shown in Figure 10. Growth in the areas immediately south of the municipality will encounter topographical constraints.

As in the case of Chonburi Municipality, Siracha Municipality will experience expansion in its commercial activities from an increase in urbanization in areas outside the municipal boundaries: along Sukhumvit Road, in contiguous built-up areas, and eventually, in the construction area at Laem Chabang. This will contribute to increased space requirements for commercial and service establishments and, to a lesser degree, for residential use. In the short-run, these requirements can probably be met by increasing intensity of use of existing built-up areas, and use of the rather large areas of land that are not currently occupied.

From a longer-term perspective, the "new town" proposed as a component of the Laem Chabang port and industrial complex would serve as a counter magnet to Siracha Municipality as the "high growth" urban center in Siracha Amphoe, and thus constrain population growth and requirements for additional urban land in Siracha Municipality.

In selection of a development strategy for the post-1984 period, consideration should be given to expanding the land area within the existing boundaries of Siracha Municipality by a phased reclamation of submerged foreshore areas.<sup>1</sup> The timing for consideration would be determined by a firm decision as to when the port/industrial zone is to be established at Laem Chabang. Also, the decision as to the size of the proposed new town near the port will be a critical factor in the evaluation of the need for additional land within the existing boundaries of Siracha Municipality. Even under the assumptions of Scenarios "B" and "C," reclamation of the submerged foreshore in Siracha is not likely to be justified prior to the late 1980s, although the project should be subjected to a definitive feasibility analysis at the time the decisions noted above are made. In any case, the reclamation project is not viewed as an appropriate short-term project.

A number of potential projects have been identified by municipal officials. These, together with other projects, are described briefly in Annex A, pp.

#### Phanat Nikhom

Of the three municipalities in the study area, Phanat Nikhom has the largest amount of land not currently used for urban purposes within the municipal boundaries. If even a fraction of these land areas can be converted to urban-type uses, the projected population -- even at the "high" growth rate -- can be accommodated within the existing boundaries.

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1. A summary of a prefeasibility study of the proposed reclamation is contained in Annex A, pp

Accordingly, the appropriate development strategy for Phanat Nikhom Municipality is viewed as one of increasing the intensity of land utilization for urban purposes. While almost 54 percent of the area within the municipality is reportedly in farms (crops, livestock, and poultry), there are some constraints on the conversion of parts of these lands to urban uses.

The short-term projects recommended for implementation are, for the most part, designed to alleviate these constraints and facilitate the achievement of a more balanced spatial distribution of urban activities and population, along with an improved ambience in the areas adjacent to the khlongs.

The shaded areas in Figure 11 are those in which available information, partially confirmed by site inspections, indicate vacant sites and areas used for farming of one type or another. It is noted that within the shaded areas there may be found occasional residential housing and/or some type of agricultural processing activity. Thus, the shaded areas are to be taken as general indicators of those portions of the municipality in which significant space to accommodate urban growth are present.

Constraints on urbanization in these areas include:

- (1) Periodic flooding during the rainy season, from the two khlongs flowing through the center of the municipality.
- (2) The existence of poorly drained marsh areas where roads have been constructed by fills that raise the levels of the roads above adjacent land.



- (3) Severely polluted water in the khlongs during the dry season that render adjoining land unattractive for use as residential areas.
- (4) The lack of access roads and other infrastructure, particularly in the southeastern quadrant of the municipality, that would facilitate the development of urban uses in these areas.

The principal short-term action projects to alleviate these constraints are described in the following paragraphs; other projects identified by municipal officials are described in Annex A, pp. .

As a component of the Land Use Programming Project, a consortium of Thai consultants was subcontracted, by RRNA, to carry out engineering and economic feasibility studies, and to prepare preliminary designs for projects to reduce pollution and minimize the probability of flooding within the municipality.<sup>1</sup>

The proposed project to reduce pollution involved installation of a number of pumping stations at points at which wastes were discharged into the khlongs, a main pumping station at the northwestern corner of the municipality from which polluted water would be pumped to an oxidation pond located outside the municipality.<sup>2</sup>

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1. The consortium consisted of: Four Aces Consultants Co., Ltd.; Interdesign Co., Ltd.; and Pollution Control Engineering Co., Ltd. The final report, "Feasibility Studies, Flood and Pollution Control for the Municipality of Phanat Nikhom" was submitted in March 1979.

2. A detailed description of the pollution control system is presented in the consortium's final report, pp. 149-158.

The implementation of the project would provide numerous benefits both within the municipality, including increased value of lands along the khlongs, and outside the municipality, where the improved water quality would permit use for irrigation.

Although many of the benefits of the proposed pollution control project, e.g., reduced incidence of water borne diseases and aesthetic benefits, were not quantified, phased implementation of the project was recommended. It is reported that some steps to implement pollution control were initiated in late 1979.

The proposed flood control project involves construction of a dike upstream of the municipality, and lowering the road surface of the Phanat Nikhom-Ban Bung; Phanat Nikhom-Chonburi; and Phanat Nikhom-Ban Nong Muang Roads to provide emergency spillways. The design would reduce flooding in the municipality by diverting water over a large area to the west of the municipality.<sup>1</sup> The estimated internal rate of return on the system to provide protection at the 20-year frequency level is just under 14 percent.

While the proposed flood control is economically viable, i.e., benefits are in excess of costs, the project encounters two sets of difficulties: First, there is no satisfactory means by which the costs can be recovered from the beneficiaries, a problem also present in the pollution abatement project. Both will require governmental funding. A second difficulty in the case of the flood control project is that

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1. For a detailed description of design, see Four Aces, et al., Final Report, pp. 55ff.

that at least three government agencies would be involved: those responsible for roads and irrigation, and the municipality -- and possibly the changwat, tambons, and sanitary districts. As has been noted in connection with other projects, land use programming in the study area encounters difficulties when the "program" crosses administrative boundaries.

In addition to the pollution and flood control projects which have received rather thorough evaluation, several other projects that will contribute to the development objectives in Phanat Nikhom Municipality are noted.

- (1) The construction of an access road between Thanon Chiang Sua, roughly paralleling the eastern boundary of the municipality. The general area is indicated in Figure 11, although the location of the southern end of the proposed road is regarded as highly tentative. This road would open a large area -- outside of the flood area -- for urban development.
- (2) Relocation of Municipal Market No. 1 to a site in the vicinity of the northern end of the proposed new road, to relieve congestion in the central area where the market is now located, and permit better (higher returns) use of the area now occupied by the market. This proposal is described in Annex A, pp. .
- (3) Construction of a sports complex/community hall. A number of alternative sites have been considered, one of which is in the same general area as one of the sites considered for relocation of Municipal Market No. 1. This project is described in Annex A, pp. .
- (4) Expansion of piped water supply and treatment plant. It is estimated that an additional 10 rai of land will be required for the plant.

- (5) Completion of a circumferential (ring) road to open up land for commercial and residential uses. The proposed road shown in Figure 11 would serve this purpose.

## V. PROJECT PACKAGING

The practical usefulness of land use programming in bringing about orderly urbanization will depend critically on three related factors, all of which can be considered as institutional in nature. These are:

- (a) The types of control over land use available to the units of government attempting to apply land use programming techniques;
- (b) Designation of the unit of government, or other agency, to be responsible not only for the preparation of guide plans, but also for project identification, evaluation, implementation, and post-implementation management.
- (c) Availability of financial resources to provide an adequate staff for preparation of guide plans and to meet the capital (investment) and operating costs of projects.

The three sets of factors are discussed in some detail, and recommendations are made in respect to certain organizational matters.

### Budgetary Controls

Although not generally considered as a land use control mechanism, the budgetary process constitutes a necessary step in any programming of land use involving the expenditure of public funds. In principle, the budgeting of funds for implementation of projects should reflect agreed priorities for urban development. As budget requests are typically developed by ministries, departments, or other functionally oriented agencies, each is likely to propose projects reflecting its own priorities. Therefore, if budgeting is to allocate limited resources in a manner that supports general development objectives, various budget requests require to be screened by use of a uniform set of criteria.

The application of feasibility analysis has been developed to provide a technique broadly applicable to proposed projects of all sizes, and in all sectors. Properly applied, the techniques of feasibility analysis facilitate consideration of alternative project designs to reduce costs and/or increase benefits; to distinguish between the financial and general economic worth of competing projects; to provide a framework within which complementarities (and incompatibilities) can be identified and taken into account in overall assessment of the merits of alternatives for budget support; and provide the data base for cash flow projections, the basis for budgetary planning.

The agency or department responsible for land use planning, under an ideal organizational structure, would serve as an advisory body to the budgetary agency at two stages in the process: first, it should assist budgetary

authorities in the formulation of guidelines for the preparation of capital budget requests in order that the various departments be aware, at the time their budget requests are being prepared, of the general development framework in the context of which requests will be evaluated for funding. Second, the land use planning agency should participate in the budgeting process to the extent of advising budget officials on the relevance, size, and timing of capital products vis-a-vis the general development objectives and strategies for achieving the objectives.

In the Guide Plans presented in Chapter III, there are several specific examples of projects for which timing is a critical factor, e.g., the development of industrial zones, or estates, and provision of infrastructure in areas in which increased urban growth is planned. In order to maximize benefits and/or revenues, all components of a project should be completed at a point in time as close as possible to the time at which the services (output) of the project will be required. For example, roads, piped water, electricity, etc., should be budgeted for industrial areas and/or areas in which growth in urban population is expected only when prospective industrial development/general urban growth into areas to be services are reasonably assured in time and magnitude. Premature investment is a frequent and significant source of waste in development projects. On the other hand, delays in completion of a necessary component of multifaceted projects, such as water or electricity for an industrial park, can be equally wasteful.

Thus, the budgetary process comprises an effective form of land use control where public funds are required

to provide some critical element in the use of land. The process also provides an opportunity to planners and administrative officials to allocate financial resources in a pattern that will make the most cost effective contribution to the overall development objectives.

### Land Use Controls

The land use programming approach is highly compatible with what Rivkin<sup>1</sup> terms "positive controls," although other forms of control may be used alone, or in combination with positive types of control to bring about "planned" uses of land in urban areas.

#### "Positive Controls"

Positive controls over land use include "direct" measures such as purchase of land by government and direct development by government for planned uses. Other forms of "positive" controls are based on private decisions made in response to various types of inducements provided by government to bring about planned patterns of use. In some instances, the two forms of control may be combined, for example, in the purchase of land by government for an industrial estate, the sale or lease of such lands to manufacturing enterprises, frequently on concessional terms, and the offering of tax concessions to firms selecting sites in the estates. Similar combinations of "positive" controls could also be applied for directing residential and/or commercial development in planned directions. In both

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1. Rivkin, M.D., Land Use and The Intermediate-Size City in Developing Countries, Praeger Publishers, New York, 1976, pp. 32-37.

types of development, however, the provision of infrastructure suitable for the planned use of the land will be required, another type of positive control.

An even more direct type of government control takes the form of land purchases and government investment thereon in housing, industrial buildings, schools, and medical facilities -- as well as infrastructure. This technique of land use control is not feasible in the three municipalities in the study area for at least two reasons: (a) the legal constraints on land purchases by municipal governments; and (b) the lack of financial resources with which to provide structures and public service infrastructure. Additionally, unless the submerged foreshore is reclaimed, there is no unused area of land in Chonburi suitable for large-scale residential or industrial sites.

As cited earlier, tax incentives are frequently used as an inducement to private investors to select sites in industrial zones, or estates. These may include full or partial exemption for a period of several years, from levies on real property, income taxes, and taxes on domestically produced inputs. In the case of industries located in export zones, exemptions from import duties on imports used in production of goods for export are another form of positive control used to attract these industries to planned areas in which leakage of duty-free imports into domestic markets can be minimized.

### Negative Controls

Slum Clearance. As slums and squatter settlements have proliferated in the rapidly growing population centers in the LDCs, forced removal and relocation of the residents of

these areas has been proposed often -- and carried out less frequently -- to permit use of razed sites for higher yield structures, e.g., commercial and middle income housing. This device usually generates strong opposition from displaced residents who are frequently relocated at great distances from employment opportunities.

In Chonburi and -- to a lesser extent in Siracha -- Municipalities, some, but by no means all, of the seadwellers reside in substandard housing; and some of the housing is illegally occupying land. But an effort to clear the area of existing substandard housing, and squatters, is not recommended. Rather, a systematic program to improve access, extend utility services, and establish sanitary waste disposal should be implemented. Should the submerged foreshore be reclaimed at some future time, these services will have to be provided in any case if the full benefits of the land reclamation are to be realized.

Establishment of Standards by Zones. While this form of land use (and building and density standards) control has been applied with some success in the more recently developed portions of cities in the developed world, other than in areas designated for modern industry, it would appear to have a questionable chance of acceptance and enforceability in the three municipalities. In all three municipalities, densities will probably increase with growth in urban population -- within and outside the existing municipal boundaries. The "mixed use" of land for urban purposes exists in and near all three cities, and is likely to continue as the predominant pattern of land use as population and densities increase. In fact, given existing and prospective costs of transportation, the mixture of

residential and work place land use in close proximity has much to be said for it, particularly for commercial and light, nonpolluting industry.

Construction Permits. The power to issue -- or deny -- construction permits may be used as a means of enforcing compliance with zoning regulations, or with detailed provisions in master plans. In addition to being difficult to enforce in an area experiencing rapid growth in population, expansion in urbanizing areas in which neither zoning standards nor master plans exist, heavy reliance on a rigid set of detailed regulations governing the issue or denial of permits would appear to be too rigid.

Nevertheless, the power to deny permits has a role in the general package of controls that should be applied in the two coastal municipalities and the built-up areas surrounding them. As a minimum, approval of construction material, location with respect to rural and urban roads, and principal use of building should meet certain standards and criteria of suitability.

Land Banks. Where financial resources and authority of local governments permit, the early acquisition of undeveloped land suitable (in location and topography) for identified urban uses is sometimes acquired well in advance of the planned development of the area. There are distinct advantages in this technique for controlling future land use: (a) it gives to the government unit the broadest possible discretion in the type of use, the timing of development, and installation of infrastructure; (b) the land can generally be acquired more cheaply than after development has begun; (c) the government will generally recover costs of development

of the unimproved land through sales or leases to private users of the developed area.

As areas for future development, such as for the Laem Chabang port/industrial complex/new town, are identified and announced, land prices in the area tend to rise, and thus increase the costs of acquiring land for development. To prevent -- or limit -- rising costs, governments frequently impose a "freeze" on land prices in the area to be developed. If purchases are made within a short time after the imposition of the "freeze," or if prices of similar (in type and general location) lands remain stable between the date of the freeze and government purchase, the imposition of the freeze may be justified to prevent large windfall gains. However, if prices of comparable lands elsewhere are rising, and a period of several years elapses between the freeze, and actual purchase of land by government, landowners in the development areas will be penalized.

#### Recommendations: Land Use Controls

Different types and mixes of controls are appropriate for the several land use projects described in Chapter III, and Annex A.

#### Industrial Estates

In the case of areas to be developed as industrial estates, the control over use should be through ownership of land by the government, or quasi-government, body responsible for the development and management of the estate. The same agency should be responsible for coordination of construction

of infrastructure and other facilities on the estate, including buildings for lease to tenants if these are to be provided.

The responsible ownership/management body may -- or not -- be financially self-supporting, depending on government policy with respect to subsidies to stimulate industrialization and spatial balance in economic activity.

#### Areas in "Directions of Growth" Outside Municipalities

The specification of the type of land use controls for application in these areas is made difficult by the fact that, as currently envisaged, land use programming is a function of municipalities, rather than the sanitary districts and the tambons in which the lands viewed as potential areas for urbanization are located.<sup>1</sup> Suggestions for the restructuring of the responsibility for the land use programming type of planning are offered in the following section of this chapter.

Assuming that the jurisdictional problem is resolved, the appropriate form of land use control is viewed as the extension of infrastructure and urban services into these areas on a carefully phased schedule. (The underling is to emphasize the importance of avoiding premature investment.) The phasing should be determined by such criteria as application for construction of residential or multipurpose buildings, excessive crowding in adjacent areas, and rising prices of lands suitable for urban uses in the general area

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1. The Municipality of Phanat Nikhom is an exception, as there is adequate land within the Municipality.

of directed growth, including prices of land within the municipalities.

The installation of roads, electricity, piped water, drainage, and sanitary services, schools and clinics in the designated growth areas will tend to increase land values if the circumstances indicated in the criteria for phasing are satisfied. At least some -- if not all -- of the costs of infrastructure can be recovered through the higher tax revenues on the serviced land and buildings, and charges for water, electricity, and waste disposal.

The recommended type of land use control for areas of directed growth illustrate an approach designed to lead urban development in a "planned" pattern, while minimizing government investment in land.

#### Land Use Controls to Increase Density

Measures to lead private landowners to increase the intensity of land use will require tailoring to fit several categories of cases, some of which can be identified here.

- (1) Where land is unused, or is used in what is obviously less than an optimum manner, it is frequently being held in the expectation that its future price will increase substantially. In this type of case, imposition of the land and building tax should be imposed at an estimated rental value of the land (and building) reflecting "optimal," rather than actual, use. The higher tax will provide an incentive for the owner to bring the actual use closer to the optimal.

- (2) Where applications for building permits propose one or two structures in the CBDs of Chonburi and Siracha Municipalities, these might be denied as contrary to development policy.
- (3) Increased density in Chonburi Municipality will require improvements in internal circulation roads, as well as construction of a new road to connect the new fish market with Sukhumvit Road. Many of the components in these projects will probably require some land acquisition by purchase, or a negotiated exchange with private owners. The specific nature of such transaction can not be specified here. But, in general they should minimize expenditures for land acquisition by recognizing that improved circulation within the CBD will enhance the value of land -- thus providing at least partial compensation to private owners of land in the CBD.

In general, it is recommended that, wherever the circumstances permit, the type of land use controls established at the land use programming stage of planning should be those that will induce private sector decisionmakers to respond in ways compatible with Guide Plans. The recommended types of control can be modified and properly phased to meet altered conditions that will affect urban development in what may be a very dynamic development program along the Eastern Seaboard.

It is noted, also, that the more detailed and specific types of land use controls (of the negative types described by Rivkin) will be embodied in the master plans for municipalities in the region by the Department of Town and Country Planning, Ministry of Interior.

Organizational Structure  
for Land Use Programming  
and Project Implementation

At several places in the Final Report, it has been noted that land use programming frequently involves areas lying outside the area over which the designated governmental units for this type of planning have jurisdiction. The problem is especially critical in the case of Chonburi Municipality, in which there is virtually no undeveloped land to be "programmed," in the absence of reclamation of the submerged foreshore. The problem is slightly less serious in Siracha Municipality, in which there are some areas of unused and underutilized land; moreover, should the wood processing plant relocate, from Siracha, an area estimated at 200 rai (32 hectares) would become available for other uses. In the case of Phanat Nikhom, the jurisdictional issue need not arise.

The selection of the three urban centers in Chonburi Changwat for the land use programming project was based, in part, on what was understood to be the rapid rate of growth in population. As shown in Table 1, p. 26, Volume 1 of the Final Report, the rapid increase in population since 1970, has occurred not in the municipalities, but in the contiguous built-up areas around Chonburi and Siracha, along Sikhumvit Road, and in the newly developed farming areas of Phanat Nikhom Amphoe.

Two other considerations also influenced the selection of the three urban centers: (1) the policy of decentralization in government administration, including the planning function; and (2) the regional plans proposed by the National Economic and Social Development Board to develop

the Eastern Seaboard Region as an industrial zone and site for a new international port to be constructed at Laem Chabang.

The issue raised in this section of the report is: Are the three municipalities (plus, perhaps, the recently established Municipality of Pattaya and, later, possibly Sattahip and Rayong) the appropriate units to be responsible for land use programming and the implementation, monitoring and management of urban development projects?

First, from the standpoint of cost effectiveness, it is doubtful that municipalities of the size and with the financial resources of Phanat Nikhom, Siracha and, marginally, Chonburi are justified in expenditures of the amounts necessary to employ even a core of two or three planning specialists, e.g., a regional economist/demographer; an architect planner and a civil engineer/cost estimator. Experience in the Chonburi Land Use Planning Project was not reassuring with regard to the reliance on full-time local government personnel for significant inputs in planning and evaluation of projects. Such personnel are generally fully occupied in day-to-day activities that are largely of a nature unrelated to planning, but that leave little time for participation -- except on an ad hoc basis -- in planning activities.

However, this is not intended to imply that local officials have no role to play in land use planning and project identification, evaluation, implementation, and management. Rather, experience suggests that they do not have the time and -- in some cases -- the training and breadth of view to function as the initiating force in land

use programming. Thus, a small core of trained personnel should be employed.

Second, as noted, land use programming cuts across jurisdictional boundaries in the case of Chonburi and Siracha Municipalities.

Third, the impetus for the type of growth that will justify land use programming in urban centers in the Eastern Seaboard will come from the national level with implementation of industrial and transport plans. From the standpoint of compatibility with national and regional objectives, the pattern of urbanization that emerges from the regional development program should be designed to achieve national benefits, i.e., by planning for urban growth in those areas in which it will make the maximum contribution to employment creation; national economic objectives (GDP and balance of payments); have the minimum unfavorable environmental impacts; and require the minimum outlays for land and infrastructure. It is by no means certain that such a pattern of urban development will be forthcoming if each municipality formulates its own land use plan, probably based on mutually incompatible assumptions with respect to the magnitude and timing of population growth for which Guide Plans are being developed.

If, as is concluded here, the comparatively small municipalities in the region are not the appropriate administrative unit to carry out the type of planning described by Rivkin as "land use programming," what is the appropriate institutional arrangement? Some alternatives are described below:

- (1) A Metropolitan Planning Authority (MPA) comprising a municipality and its contiguous built-up

tambons and/or sanitary districts. In the case of Chonburi, the delimitation of the MPA would not present unsurmountable obstacles. In the case of Siracha, the problems encountered would probably be complicated by the proposed development at Laem Chabang.

An MPA would overcome the following problems noted if each municipality attempts to undertake the preparation of Guide Plans:

- . Jurisdictional obstacles would be eliminated, or take place in a different context, as the boundaries of the MPA could be drawn to coincide with those of the Guide Plan;
- . The combined population and financial resources of the governmental subdivisions included in the MPA would justify the expense of hiring a professional planning staff; and

The responsibilities for project implementation and administration could be allocated in a rational manner among the local units in the MPA.

However, the success of an MPA would depend on the cooperation and coordination of activities of several local governments not all of which will have the same objectives or views as to the desirable pattern of urban growth to be fostered. In other words, the MPA could become a forum for endless debate. Finally, it may be questionable as to whether the combined financial resources of the MPA

would be adequate to carry out -- with its own resources -- projects required to accommodate projected urban growth; and the competition among MPAs for funds and the leading role in urbanization in the region would probably pose as much of a problem as that among municipalities.

- (2) Strengthening the Changwat Planning Office, and vesting it with authority and providing it with professional staff to initiate Changwat-wide land use programming not only for urban areas but the programming of land use designed to conserve natural resources including: water for domestic and industrial use; agricultural lands; marine resources; and forest lands. Although this alternative represents a broadened concept of "land use programming for intermediate-size cities," it is not inconsistent with the basic concept: the phasing in time and place of land to accommodate the growth in urban population.

Under the existing probable future circumstances along the Eastern Seaboard, urbanization will not be confined to areas designated as municipalities. This alternative would also facilitate proper planning for rural-urban linkages and the spreading of benefits of industrialization to rural, farm residents in the region.

- (3) A third alternative may become available in the form of an "Eastern Seaboard Regional Authority (ESRA)" if, as in other countries, the Regional Development Study recommends the creation of such a body to plan and supervise implementation of the extensive development program contemplated for the region. Such authorities are generally

vested with responsibility for coordinating the activities of line agencies involved in construction and in providing other components of the regional plan. If such an agency is created, it should be vested with the same broad planning and implementation responsibilities as those described in the second alternative for the Changwat Planning Office.

It is recognized that the second and third alternatives presented above represent less than a complete decentralization of planning and supervision of plan implementation that could be inferred from the general policy statements in the current five-year plan. However, within each of the alternative institutional arrangements there could be local representation to reflect the priorities of each municipality and amphoe, as well as delegation of responsibility for implementation of projects having limited local impacts.

Financial Resources for  
Municipal Development Projects

In general, municipalities in Thailand have access to the following sources of funds:

- (a) Local tax and non-tax revenues, including revenues from surcharges on national taxes, and shared taxes; earnings from property and municipally owned enterprises; fees, licenses, and fines; and miscellaneous revenues.
- (b) Loans from the Municipal Development Fund, and from their own reserves held by banks.
- (c) Grants from the Central Government:<sup>1</sup>
  - (i) A general per capita grant, currently 50 Baht per resident, also provided to sanitary districts;
  - (ii) Special program grants, available to all local authorities. The amount received by each local authority varies inversely with the total revenue of the local authority, exclusive of grants from the Central Government;
  - (iii) Special development grants available to municipalities from the Bureau of the Budget; and
  - (iv) Provincial development grants, designed to assist provincial governments in financing projects "to further enhance, on a step-by-step basis, (the) capability of local self-governing bodies to become more responsive and viable tools for integrated development in the rural areas."<sup>2</sup> In 1979, one percent of the national budget was earmarked for allocation among the changwats (provinces) by a formula that gives heavy weight to population and the

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1. A more detailed discussion of the four types of grants is contained in Annex A, "An Analysis of Revenues and Expenditures," pp. 57-63.

2. Vithya Siripongse, "Development of Local-Level Planning in Thailand," (Oct. 1978), p.4.

area of non-irrigated land. Of the total amount received by each changwat, 20 percent is to be further allocated to municipalities and sanitary districts within the Changwat. In 1979, a total of 4 percent of the changwat funds were allocated to the three municipalities, with the remaining 16 percent for urban governments being allocated among sanitary districts.

With the exception of projects financed by loans, such as the new fish market in Chonburi, most capital projects are financed on an annual basis, with funds from current revenues, including shared taxes and grants. This practice has two undesirable effects: (a) funds that would otherwise be available for needed improvements in urban services are diverted to capital improvements for lack of access to long-term sources of capital project funds, and (b) there is a natural tendency to select for funding those projects that are relatively small in size, and that can be completed within the period covered by the annual budget.

The financial constraints to implementation of the urban development projects visualized for the Eastern Seaboard Region are not likely to be surmounted within the existing framework of the local revenue structure, and the funds that are likely to be available through the existing system of grants.

Potentially, the Provincial Development Grant (PDG) is the most promising vehicle for financial assistance to the urban centers. Its present capabilities for this purpose are limited by the comparatively modest total amount budgeted for distribution through the PDG, as well

as by the inflexible ratio of distribution between rural and urban projects. Also, evaluation techniques by which selection of projects is made require to be improved by the use of uniform, standard criteria of project "worthiness" applicable in all changwats and for all types of projects. The latter will require substantial upgrading of the capabilities for project evaluation at the changwat level (the Provincial Planning Committee), with guidance from the Central Committee for Provincial Development, for which NESDB provides technical assistance.

A more promising source of financing to support the proposed infrastructure projects in the urban centers along the Eastern Seaboard may become available through the "structural adjustment program" proposed by the World Bank. The Bank's program includes a proposed large-scale program loan. Such a loan to the Central Government would be available for relending for projects in industrial development, agricultural development, the energy sector, and for infrastructure supportive of these sectors. The proposed program, if adopted by the Government of Thailand, would provide an additional means of financing a multiplicity of individually small projects that, because of their size, would not attract international funding on a project-by-project basis.

## APPENDIX: IDENTIFIED PROJECTS

Introduction

Various types of projects were identified by municipal officials during the course of the land-use programming project. The following summaries of these projects are intended to serve several purposes: to provide the municipality with preliminary cost estimates for the identified projects; to use as a guide to decide if further study is required prior to implementation; and to use as a model to assist municipal officials in setting priorities (capital budgetting) when confronted with a list of many projects.

The preparation of the project studies should be viewed as an exercise in the application of logical evaluation processes, and not as definitive feasibility studies. Additional data and analyses are required to provide more accurate cost and benefit information. However, these preliminary projects represent the efforts of municipal and project staff counterpart personnel in such an evaluation process.

The basic format used in preparing these studies is presented in the following section. Summaries of four studies are presented on pages A-6 through A-17. The projects include: the relocation of Municipal Market 1 in Phanat Nikhom; a municipal sports/library complex in Siracha; and a community hall/multi-purpose recreation facility in Phanat Nikhom. A fourth report, a prefeasibility analysis on land reclamation in Siracha Municipality, is also presented. This report, prepared in January 1979, was undertaken by the counterpart staff of the project office, rather than municipal officials.

### Prefeasibility Study Format

#### 1.0 Problem Statement/Aim of Project

1.1 Determination of land area requirement  
to meet the development requirements of the area  
(changwat, municipality, tambon).

#### 1.2 Issues/Parameters

legal - land tenure  
social - resettlement of residents  
environmental - marine ecology, air, and/or  
water pollution  
political - receptivity to urban growth  
economic and financial feasibility

#### 2.0 Description of Area

amphoe  
municipality

#### 3.0 Physiographic Characteristics

development constraints  
transport linkages  
slopes  
municipal boundary line

4.0 Existing Land-Use Pattern and Population Characteristics within Municipality (Summary)

population and housing characteristics  
population density  
dwelling unit density  
land-use activities  
economic base  
commercial facilities  
educational facilities  
religious facilities  
open space/recreation facilities  
health facilities  
public administration facilities  
utilities  
    water  
    electricity  
    drainage  
transportation  
vacant land areas  
underutilized land areas

5.0 Development Trends within the Municipality

demographic  
economic  
urban functions  
infrastructure

6.0 Land Tenure

ownership pattern (significant features/patterns)

7.0 Land Value Zones

assessment values  
market values  
tax rate

8.0 Infrastructure Constraints

water  
electricity  
drainage  
transportation

9.0 Market Condition (Commercial Purposes Only)

market idea behind the project  
projected demand  
financial requirements

10.0 Components of the Proposed Project

land use  
phasing  
implementation

11.0 Land-Use Requirements

planning standards  
population forecasts  
demand for land

12.0 Alternatives in Meeting the Land Demand for Development

vacant land  
underutilized land  
reclaimed land  
expansion of municipal boundaries/annexation

13.0 Costs/Returns

Costs

site development/land acquisition  
construction  
operational

Benefits

social  
economic  
fiscal/private financial

14.0 Recommendations

phasing  
finance  
implementation responsibility  
post-implementation management

The format set forth above has been applied -- to the extent permitted by the availability of data -- in each of the project studies described in this Appendix. However, the various statistical compilations and tabular materials have been omitted from the summaries presented in this

Appendix. These materials may be found in the various Working Papers (WPs) to which reference is made in the several project studies.

Proposed Relocation of Municipal  
Market No. 1, Phanat Nikhom

Problem Statement/  
Aim of Study

There are four public markets within the Municipality of Phanat Nikhom. Municipal Market No. 1 is presently the main retail produce market that is located in the heart of the urban center. It has outgrown its present structure, as evidenced by the vendor activity that has spread over the adjacent roads surrounding the market, thus making the market area inaccessible to vehicular traffic. The surrounding 2-story commercial shophouses are mostly timber. The present market is owned and operated by the municipality.

Land Value

The actual market value of land within the municipality could not be readily ascertained. The assessment schedule that the municipality uses follows the general pattern of land development. That is, lands along Muang Kao and Sri Khunchorn Roads are assessed at the highest tax rates, whereas the farmland areas are assessed at the lowest.

Infrastructure Availability

With the exception of the farmland areas, most of the municipality has access to piped water, electricity, and street drainage. The road network adequately serves the denser development areas within the municipal area.

Components of the  
Proposed Project

The municipality recognizes that the municipal market is a contributing factor to pollution and traffic congestion within the urban area. Municipal officials have proposed three alternative schemes to improve these conditions: (a) redevelopment of the existing market land and surrounding area by providing a 2-level market facility and street level parking; (b) redevelopment of the existing market land and surrounding area by providing a 2-level market facility and underground parking; and (c) relocation of the existing market to a new area and redevelopment of the existing market land, which the municipality owns, through the sale or lease of the land to a private developer. The above alternatives imply that the municipality will continue to own and operate the market. A fourth alternative (d) similar to (c) would have the market owned and operated by a private developer by the use of various development incentives. The present market site is serviced by electricity and piped water supply.

It is envisaged that a 2-story market facility could be a method of controlling the spread of vendors to the street side. That is, the ground level of the market would be for fresh produce and the first level would be for dry goods vendors and handicraft sales.

Land Area Requirements

It is estimated that 5 rai of land is needed for this facility.

Building	3 rai
Parking and access	<u>2 rai</u>
	5 rai

Alternatives in Meeting  
The Land Demand

Alternatives (c) and (d) are the only schemes that require acquisition of substantial new land areas, although alternatives (a) and (b) will require a small amount of more expensive land. The recommended area is located close to the eastern boundary of the municipality between Sri Phanat and Chaing Sue Roads.

In the 1979-84 development framework for Phanat Nikhom, a recommendation was made for the provision of a road that would connect the two roads mentioned above. It was suggested in the report on the municipal sport complex that the sports facility also be located in this area.

Cost and Return

Estimated Costs (in Baht)

	<u>A</u>	<u>B</u>	<u>C</u>
Construction <sup>1</sup>	6,000,000	10,000,000	5,000,000
Land	<u>200,000</u>	<u>200,000</u>	<u>200,000</u>
Total	6,200,000	10,200,000	5,200,000

Revenues

The municipality receives income from the market operation from water and electricity charges; and rental of market stalls (15-240 Baht per month).

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1. Includes demolition and new construction for alternatives (a) and (b).

The estimated annual revenue from the existing market is  $\text{฿}266,000$ . The estimated annual operating cost is  $\text{฿}77,000$ . At present the market is operating at an annual profit.

The required construction period is estimated to be 6 months (for either alternative), thus enabling the new facility to be operable in the first year.

### Recommendations

Alternatives (a) and (b) will require temporary re-location of the existing market for at least 6 months during the construction period as well as requiring the acquisition of a small parcel of land located north of the market. The construction process could create additional congestion and pollution in the urban center.

The provision of underground parking in alternative (b) could cause additional security and environmental pollution problems.

Alternative (c), however, would allow the municipality to encourage redevelopment of the existing market site and thus provide additional revenues. It would also encourage new development to take place between Sri Phanat and Chiang Sue Roads after the road and infrastructure have been provided. The municipality would consequently receive higher revenues through a higher intensity of land use within the urban center and eventually from the development of new areas along the eastern boundary.

While the analysis does not provide the basis for recommending a specific alternative, it does provide sufficient information to warrant a more detailed investigation on the prospects of undertaking alternative (c) or (d). Although there may be some reluctance on the part of users to relocate to a new area, it will, in all probability, gain acceptance with proper encouragement by municipal officials, and with general development along the eastern boundary of the municipality.

A Sports Complex/Municipal Library  
in Siracha Municipality

Problem Statement/  
Aim of Study

The municipality recognizes that the present form and size of municipal recreational facilities are deficient in meeting the needs of the population and wishes to provide certain facilities that will lessen the deficiencies.

The present municipal library is small and inadequate in terms of physical facilities to meet the present future needs of a growing population.

This investigative study will report on alternative actions that the municipal official may want to follow in improving services to the municipal population. The study includes an outline of anticipated expenditures in providing these services.

The proposed complex will have four components: an indoor sports complex that could serve as a community hall for public or private use; a football/track field; a swimming pool; and a library.

A land area of 7 rai located at the northeast corner of Surasak 2 and Jemjom Roads has been deeded to the municipality with specific land use restrictions that it be used for public recreation activity. The municipality, therefore, wishes to develop this land for a municipal sports complex and library.

Alternatives in Meeting  
The Land Demand

The only alternative location for this complex is the land area behind the municipal building. Because the earlier specified land area has land deed restrictions, any attempt to put it to a more profitable use is negated.

Costs and Returns

Costs

Library

building	Ø620,000
equipment	<u>105,000</u>

Ø725,000

Annual operating Budget

personnel	Ø 47,820
electricity	20,000
books and misc.	
materials	<u>50,600</u>

Ø118,620

Sports Complex

building	Ø800,000
equipment	<u>74,645</u>

Ø879,645

Annual Operating Budget

electricity	Ø 5,000
miscellaneous	3,600
personnel	<u>13,200</u>

Ø 21,800

Football field Ø 20,515

Swimming Pool

Building	1,620,000
Mechanical System	<u>427,200</u>

Ø2,047,200

Annual Operating Budget

administration	Ø 14,200
personnel	<u>13,200</u>

Ø 27,400

<u>Playground</u>		
equipment	₪ 30,000	
personnel and		
administration	60,880	
misc. (fencing, etc)	<u>37,000</u>	
		₪ 127,880

Total Costs:

Capital outlays	₪3,718,845
Annual operating budget	₪ 228,700

Benefits

Although the municipality would charge a nominal user fee for various activities, it is doubtful that this could cover the entire projected operating costs of the complex. If the gymnasium is rented out to private groups for social or sporting events, the derived income plus the user fees could cover the projected annual operating costs.

When the new library is constructed, the existing library site could be redeveloped to a higher land-use intensity and could provide additional tax revenues to the municipality.

Recommendation

The action that the municipality can take is either to implement the entire project within 1 fiscal year or to phase the implementation over a 5-year period. A careful analysis of the municipality's revenues must be prepared prior to reaching a decision on the appropriate action to follow. The municipality should, however, elect to phase the implementation of these facilities if the source of construction funds is to come either from municipal budget or from central agency grants in aid or loans.

Proposed Community Hall/Multi-Purpose  
Recreation Facilities in Phanat Nikhom Municipality

Problem Statement/  
Aim of Study

Municipal recreation facilities presently consist of 16.6 rai of land in the form of a public garden and the use of school playground facilities after school hours. The land area ratio to population is 1 rai to 785 people.

The municipality recognizes the shortcomings in recreational facilities and desires to provide additional facilities in the form of a sports complex. The implicit aim of this project is to improve the health and welfare of the population.

The report contains a brief discussion of alternative sites for the proposed facilities; the priority for the facilities in the light of competing demands on financial resources; and a rough estimate of the costs that would be incurred in the provision and operation of the facilities.

Components of the  
Proposed Project

This facility will have three components: an indoor sports complex that could also serve as a community hall for public or private use; a football/track field; and a swimming pool complex. The required land area is estimated to be 15 rai.

The municipality wishes to locate this facility adjacent to the existing public gardens on land owned by the Roman

Catholic Church. The Church is willing to surrender this land under the following conditions: the municipality is to realign the Huai-E Kak Khlong between Sri Jarusampan 2 and the existing municipal park area and is to provide the necessary access roads and infrastructure to this area.

#### Land Area Requirements

It is estimated that 15 rai of land is needed for the sports complex facility:

Indoor facility	1,974 sq.m.
Football field	16,941 sq.m.
Swimming pool	<u>315</u> sq.m.
	19,230 sq.m.
Access (roads, parking)	14,800 sq.m.
Total	24,030 sq.m. (15 rai)

#### Alternatives in Meeting The Land Requirement

- A - Vacant land -- there are no individual parcels of significant size; nor is it possible, without expropriation of occupied land, to combine several parcels;
- B - Obtain Church-owned land in return for realignment of canal and provision of roads and infrastructure to another Church-owned parcel;
- C - Purchase of desired land;
- D - Locate facility in the eastern part of the municipality after acquiring the appropriate land (farmland) that does not have ready access or infrastructure.

Costs and ReturnsLand costs

B. realign canal, construct roads and infrastructure	Ø 188,650
C. purchase Church land	Ø1,040,000
D. purchase farmland	Ø 900,000

Land preparation and building costs

land fill (as required, alterna- tive B)	Ø 260,000
building costs	Ø 832,765
football field	Ø 921,571
subtotal	Ø2,014,336
swimming pool	Ø2,233,000

Equipment costs

initial (does not include replacement)	Ø 127,235
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Operational costs

administrative	Ø 49,000/annum
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Alternative cost comparison

	<u>B</u>	<u>C</u>	<u>D</u>
land	Ø 188,650	Ø1,040,000	Ø 900,000
construction	2,014,336	2,014,336	2,014,336
swimming pool	2,233,000	2,233,000	2,223,000
equipment	<u>127,235</u>	<u>127,235</u>	<u>127,235</u>
	Ø4,563,221	5,414,571	5,274,571

Benefits

- social improvement in the health and welfare of the population.
- financial - the municipality could recover at least the operation costs through rental of the community hall complex to private organizations for social or sports events and by charging an annual user fee for swimming or track events.

Recommendation

Alternatives B and D should be closely considered. Although alternative D costs Ø711,348 more than B, it provides the necessary incentives (roads, infrastructure) to a larger

area that could eventually become available for commercial or residential development that, in turn, would increase the municipal tax base. Alternative B, however, costs significantly less than D and to a lesser degree provides other land areas with roads, infrastructure, and can possibly contribute to the control of flooding in the municipality.

When viewed in terms of future municipal projects, alternative D could cost less should the municipality choose to relocate Municipal Market No. 1 to an area adjacent to this sports complex. Thus, the construction costs could be reduced when budget allocations are made for the common elements of the two projects (roads and other infrastructures).

With the limited fiscal resources currently available to the municipality, the project is not assigned a high priority for early implementation.

A Prefeasibility Analysis of Land Reclamation  
In Siracha Municipality

Introduction

The purpose of this paper is to highlight the issues required in undertaking a land reclamation project in Siracha as a means of providing developable land to meet the potential growth requirements of the municipality over a 20-year period.

This study will rely on information provided in the following reports: Working Papers 13, 19, and the Applied Scientific Research Corporation of Thailand's (ASRCT) study on "Land Reclamation in Chonburi Municipality."

While a complete prefeasibility analysis would include computations of economic and financial rates of return and cash flow projections, lack of information precluded these computations. This report will describe the estimated land-area requirements and approximate costs and impacts incurred if the foreshore area were developed.

Statement of Problem/  
Aim of Project

The municipality has proposed that 80 rai (12.8 ha) of the foreshore area within its boundaries be reclaimed and developed into a commercial center. As an alternative to the municipal plan, a private developer has submitted a proposal, at the Amphoe level, to develop 350 rai (56 ha) into a mixed use development. These development areas are shown in Figure 4 in the main body of Volume II of this report (see p.50).

### Issues/Parameters

Before any serious consideration can be given to the implementation of a project of this nature, very careful attention must be given to the following issues.

Legal - land tenure: because this land (foreshore area) is classified as public land, national legislative action will be necessary to convert this area to a classification of municipal land that would then allow the municipality to have development rights. Another issue that must be addressed is the relocation of the existing settlers and expropriation of certain privately owned land parcels.

Social - field surveys indicate that there are approximately 2,310 people (sea dwellers) living in an area of 42 rai (7.7 ha). These people are mainly employed as fishermen or in other commercial activities. Within the designated 350 rai study area, there are several commercial facilities (boat landing dock, restaurants, hotel, etc.).

Environmental - it is not possible within the scope of the preliminary evaluation to assess the potential impacts on the marine ecology that would be caused by this project. However, careful consideration must be given to this issue.

Political - the receptivity of the municipal officials towards urban growth and resettlement of residents will play a critical role in "feasibility" of the project.

Economic - in undertaking a project of this nature, one of the paramount issues relates to the developer's (in this

case, the municipality's) ability to adequately finance an investment of this nature. Related to the key issue of project finance is the actual demand for land that would become available. This aspect is discussed later in the paper.

#### Description of the Area Under Study

To fully appreciate the magnitude of this study, this section will discuss briefly the characteristics of the amphoe and municipality.

#### Amphoe Characteristics

Amphoe Siracha is one of 7 amphoes located within Changwat Chonburi. Its boundaries are formed by Amphoe Chonburi to the north, Amphoe Ban Bung to the northeast, and Amphoe Bang Lamung to the south. The western boundary is the Gulf of Thailand. Amphoe Siracha is primarily an agricultural/industrial area. Overland access to the amphoe is via Route 3 (Sukhumvit Highway), the major north-south highway. The 1976 population is reported to be 95,484 or 14.3 percent of the Changwat population. The population density is 200 people per sq. km., spread over an area of 491 sq. km. The natural growth rate from 1973-76 was 2.5 percent per annum.

#### Topographic Conditions within the Municipality

The municipality, which is one of six tambons within the amphoe, is located between Route 3 and the coast (Figure

4, page 50). The terrain is relatively flat in the northern and eastern areas and gently rises in the southern area. The total area within the municipal boundary is 4.058 sq.km. (2,536.25 rai). The actual land area is approximately 2.69 sq.km. (1,681.25 rai). The difference is submerged land in the foreshore area.

Population and Housing  
Characteristics

population of municipal area (1976)	17,386
actual land area (estimated)	2.6 sq.km.
population density ( <u>actual land</u> -estimated)	6,463 sq.km.
registered private households	2,636
household density (estimated)	6.5
growth rate (estimated 1970-76)	1.3% p.a.
dwelling units with piped water	1,885
dwelling units with electricity	7,430
residential <u>land area</u> (estimated)	268.75 rai
percent of <u>actual land area</u>	15.9%

Economic Base - Industry  
and Commercial

large-scale manufacturing	1 facility
wholesale/retail establishments	403 estab.
personal services	160 estab.
general welfare/government	34 facilities

Industrial Land Area

land area (estimated)	200 rai
percent of <u>actual land area</u>	11.9%

Commercial

wholesale/retail/personal	563 estbs.
ratio of shops to municipal population	1:30
ratio of shops to amphoe population	1:169
land area (includes three markets - estimated)	315.5 rai
percent of <u>actual land area</u> (estimated)	18.8%

Government Facilities

land area (estimated)	342.24 rai
percent of <u>actual land area</u> (includes amphoe facilities)	20.4%

Educational Facilities

total number of schools within municipal area (includes government and private)	9
total enrolled student population	5,236
percent of enrolled population to total municipal population (estimate)	30.1%
capacity of existing government schools	2,610
total land area of all schools (estimated)	58.23 rai
percent of <u>actual land area</u> (estimated)	3.5%

Recreational Facilities

land area (estimate-excludes use of school playgrounds)	3.63 rai
percent of <u>actual land area</u> (estimated)	.21%
ratio of land area to population	1 ha/4,788 persons

Vacant Land

land area (estimated)	164.49 rai
percent of <u>total land area</u>	9.8%
municipal land in foreshore (estimated)	886 rai
percent of <u>total municipal boundary area</u> (estimated)	34.9%

Infrastructure Constraints

The following infrastructure constraints were noted from field observations and interviews with municipal officials.

Water - It was noted in WP 13 that the main problems are related to potable water supply. Although this is a problem at the source of supply, municipal officials stated that the existing pipes are old and undersized to meet current demands.

Storm Drainage - The problems stated by municipal officials and reported in WP 13 pertain to the small pipe size of the existing drainage network and the resultant low capacity to accommodate the natural runoff. The municipality is actually located in a valley, and as a result of deforestation of the foothills, the runoff during the rainy season is very high and fast. Municipal officials also state that the existing drainage system cannot accommodate the newer and denser development.

Transportation Network (Roads) - A problem that has been reported by municipal officials and observed from field surveys relates to congestion around the market areas

and a lack of proper terminal facilities for inter and intracity bus service. The calculated land area of 250 rai (41.6 ha) of road network represents 14.8 percent of the actual land area.

Electricity - The source of electricity is the amphoe electrical substation located in the contiguous built-up area. This substation is served by the Provincial Electricity Generating Authority. It was reported by municipal officials that there are periodic fluctuations in the electricity supply because the existing substation is old, the wiring is undersized to carry the required load, and it is the only substation serving the municipality and its built-up area.

Marine Approach - The main issue of this topic is related primarily to the activities of the Marine Police Station. Although neither of the proposed areas will directly affect this facility, consideration must be given to the requirements of this government agency.

Table A-1. Low Population Projections<sup>1</sup>

1979	18,055
1980	18,283
1981	18,516
1982	18,751
1983	18,985
1988	20,233
1993	21,539
1998	22,939

### Land Area Requirements

Based on information that was presented in WP 13 and 17, a compilation of future land area requirements was

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1. These projections are somewhat lower than those in the RRNA projections shown in Table 1, Vol. II, particularly after the mid-1980s.

derived and discussed in WP 19. The estimated land area required for development purposes over a 20-year development period based on the low population forecasts is 265.01 rai (42.4 ha).

Table A-2. Land Area Requirements,  
1979-98, Low Forecast

<u>Year</u>	<u>Commer- cial</u>	<u>Hous- ing</u>	<u>Recre- ation</u>	<u>Educa- tion</u>	<u>Public Facil- ity</u>	<u>Public Utility</u>	<u>Road</u>	<u>Total (rai)</u>
1979	.75	13.5	22.56 <sup>1</sup>	-	2.26	3.02	6.31	48.40
1980	.35	4.1	.29	-	.71	.27	.86	6.58
1981	.39	4.1	.29	-	.71	.27	.86	6.62
1982	.39	4.1	.29	-	.71	.27	.86	6.62
1983	.39	4.1	.29	12	2.51	.96	3.04	23.30
1988	2.00	22.22	1.54	12	3.87	1.48	6.46	49.55
1993	2.03	24.1	1.65	-	4.17	1.59	5.03	37.55
1998	2.91	27.6	1.75 <sup>2</sup> 25.00 <sup>2</sup>	12	6.62	2.50	8.00	<u>61.39</u>
								<u>240.01</u>
								265.01

Note: These projected land requirements differ from those implicit in the estimates prepared by RRNA and shown in Volume II, Table 11.

1. Immediate need.
2. Sports complex.

#### Alternatives in Meeting The Land Area Demand

It is natural that as the population of an area grows there will be a demand for developable land. There are many alternatives available in meeting this demand, namely a higher intensity of development on existing land areas; use of vacant land areas that are available for development; annexation/expansion of municipal boundaries; a no-growth policy on the part of the municipality and redirection

(under development controls) of growth to the surrounding tambons; combinations of the above; reclamation of land already within the municipal boundaries.

The following will discuss these alternatives and their impact on the municipality.

#### A Higher Intensity of Development On Existing Land Areas

At present the municipality can be characterized as a service/commercial center made up of 2- and 3-story shop-houses. An increase in the intensity of land use would mean a much higher plot area ratio (total sq.m. to site area coverage). The overall demands for public services (water, electricity, schools, roads, etc.) would be proportional to the intensity of development, i.e. a 6-story structure would be equal to two 3-story buildings or three 2-story buildings. The requirements for public services (schools, police) are also proportional to the density. However, the need to reclaim land may not be required as the expansion would occur in a vertical direction and not in a horizontal direction.

#### Use of Vacant and/or Underutilized Land

It was reported that there is approximately 164 rai of vacant land in various size plots located throughout the municipality. It was reported earlier that based on the low population forecasts, the projected land area requirements for 1998 are approximately 265.01 rai. Thus, it is obvious that the future land area needs cannot be completely met by

developing all vacant land plots. Although most of these vacant plots appear to have access to the existing infrastructure networks (see WP 13), some of these plots may not be exploitable due to the size of the plot. The use of vacant land in combination with greater intensity of land use could meet the future demands for land.

Underutilized land is in the same category as vacant land. Although most land within the municipality appears to be put to its best use in terms of site value, there are several areas that could be redeveloped to a higher land use intensity.

Should the vacant land be developed, the demand for public facilities will also be proportional to the increase in the population.

It should also be noted that in selecting either of the above alternatives as ways of meeting the land area demands, the majority of the development costs would likely be borne by the individual developers as it would not be necessary for the municipality to provide major improvements to the infrastructure network unless the municipality was to install a complete new system.

#### Annexation/Expansion Of Municipal Boundaries

To adequately evaluate this suggestion, a very detailed study of the fiscal status of the surrounding tambons would be required to determine the cost involved in such a procedure. Although such action may increase the revenue to the municipality, it would also increase its expenditures

for public services. Annexation is legally possible by royal decree, but there are many political ramifications that must also be considered. Only after a careful study on the above issues should annexation be considered.

A No-Growth Policy and Redirection  
Of Growth to Selected Tambon Areas

As an area grows, its functions (public services) must also expand. However, with the present constraints on fiscal revenues, it is doubtful as to the ability of the municipality to provide additional services. Although new development would bring in additional revenues, it is questionable as to the amount that would be derived. For example, a population increase of, say, 10,000 people could possibly incur higher costs than what the revenues would be from this increase. Thus, the municipality would have to provide services for a larger populace but without a proportional increase in revenue.

The implication of the preceding discussion is that no additional development, except for a one to one replacement of facilities, until proper services can be provided to the existing population. However, there is one way by which infrastructure development costs can be met that would allow a "slow-growth" policy to be adopted. This is accomplished by requiring the developer to bear the costs of the necessary infrastructure development (exceptions to this would be schools and government buildings).

By adopting the above concept, development would/should be directed to selected tambons that have available infrastructure capacity. However, attention must be given to the

development of mechanisms that could be used to attract development to these areas.

The question that must be addressed is whether or not there is a need for land reclamation; if so, what would be the composition in terms of land area use; what are the constraints that must be overcome; what are the estimated costs involved; who should develop the area? The following section will discuss these issues.

### Land Reclamation

As estimated above (Table A-2), there is a projected need for an estimated (low) 265.01 rai of land to meet growth requirements to 1998. However, there is approximately 164.49 rai of land that is classified as vacant. Table 7 in WP 13 reported that some of this vacant land is government-owned and intended for expansion of government buildings on these sites. Also, some of these sites are rather small and can be considered as unattractive for large-scale development. Thus, it is concluded that approximately 50 percent of the vacant land cannot be considered as having development potential. As such, it is calculated that there is a need for approximately 140 rai of land to meet the future requirements of the projected 1998 population. It is expected that the actual need for additional land would occur in 1983.

In meeting this future demand, there are many constraints that must be overcome. The magnitude of costs required to overcome these constraints requires the undertaking of an

engineering study primarily related to existing infrastructure issues.

However, it is possible to estimate roughly the magnitude of costs required for some components of a land reclamation project. These costs were derived from the Chonburi Land Reclamation Study and are shown below.

	<u>350 rai</u>	<u>80 rai</u>
Land fill (340,000 ฿/rai)	฿119,080,000	฿27,200,000
Roads (includes culverts - 3,100 ฿ meter)	-	-
Water supply system:		
1 tank and 1 pump station	4,625,000	4,625,000
Pipe (500 ฿ meter)	-	-
Electrical system	-	-
Storm drainage (฿514/meter)	-	-
Refuse collection (฿80,000/ vehicle)	-	-
Sea dike (฿15,519/meter)	24,054,000	10,863,300
Engineering fee - 4 percent of construction cost (ex- cluding landfill cost based on above costs)	5,910,000	1,707,532
Contingency 10 percent	<u>15,366,360</u>	<u>4,439,583</u>
	169,035,720	48,835,415

The above list represents the known elements that will incur costs and is a rough estimate of the costs involved in land reclamation. At this time, it is only possible to say that based on the above information for land reclamation and infrastructure development, this project would cost an estimated ฿200-300 million for the 350 rai area. The landfill and infrastructure development would require approximately 5 years to complete. The actual building construction would

take approximately 2-3 years to complete. The cost for development of the 80 rai would be proportional as the unit costs would remain the same. A rough estimation for land reclamation including infrastructure development would be 75-100 million Baht for the 80 rai area.

It is apparent from earlier discussions in this paper that there will be a demand for developable land that would exceed the 80 rai that municipal officials originally proposed and that the 350 rai proposal is more than adequate, by a factor of 2, in meeting the land area needs for 1998.

This is seen below:

Proposal by municipality to reclaim 80 rai land

Distribution of Land Use

allowing 15 percent of total area for road network:	12 rai
allowing 10 percent of total area for open space:	8 rai
remaining land for development:	60 rai

Proposal by private development of 350 rai of land

Distribution of Land Use

allowing 15 percent for road network:	52.5 rai
allowing 10 percent for open space:	35.0 rai
remaining land for development:	262.5 rai

The next question to be answered is related to market conditions. That is, can the private sector absorb this additional development (especially the commercial sector) and still retain its current level of economic turnover? This question will be addressed in the following section.

Market Conditions  
Commercial Sector

The existing conditions of the commercial sector have been reported in previous working papers (WP) 13 and 19. The total number of newly constructed facilities (from a field survey, January 1979) is reported to be 199 units. Although this number may appear to be high and thus indicate a high rate of economic activity, the following must be noted:

137 units have been recently constructed but are not occupied.

29 units (of the 137) are in locations that indicate a replacement of 2-story timber units.

108 units (of the 137) are considered to be additions to the existing stock.

62 units are under construction.

If this total of 199 newly constructed units is added to the existing stock of 563 units (assuming all 199 units will fall in the category of wholesale/retail or personal services), the total number of commercial units is calculated to be 762. It was reported in WP 19 that by 1998 there would be a calculated need for 239 new facilities. Based on this discussion, it would appear that there would be an additional need for 40 new units by 1998.

However, there are many unknown factors that could influence the actual demand and use of these facilities. At present, all units are in the design of shophouses and thus could be used for commercial or light industrial activities. Also, each unit consists of at least one dwelling unit. A

third point to note is that the development of these units is usually on the basis of speculation and not unsatisfied demand that is determined through an actual market study.

Thus, it is difficult to conclude, with confidence, whether there is an actual demand for new facilities now or in the future. It is also difficult to say how the municipality benefits from the presence of vacant units because the present building and land tax schedule does not consider vacant structures as fully taxable units. It is believed that these vacant structures are taxed as if they were vacant land. Calculations have indicated a need for more land area to meet the future population needs. There are several considerations related to the compatibility of either area (80 rai or 350 rai) with the existing development (commercial) pattern.

#### Compatibility with Existing Development Patterns

This discussion is concerned with the physical relationship or proximity of the designated study area to the existing commercial development pattern.

80 Rai Area: Although this site is not located within the existing town fabric, it has several positive attributes: vehicular access is very good since the site is located at a major intersection; it will not obstruct either of the natural drainage canals. There are, however, several negative factors to consider that could arise, depending on the designated future land-use classifications. If the area is designated as a "new commercial area," there could be severe vehicular congestion, particularly on weekends due to the

heavy flow of visitors to Wat Ko Lan Srimaharacha. The existing causeway leading to this temple does not have the capacity to accommodate a heavy flow of traffic. In terms of urban design aesthetics, the use of this area as a commercial center is questionable because of the proximity of the town park and the island temple. But, any other land-use classification would definitely not prove to be economically feasible.

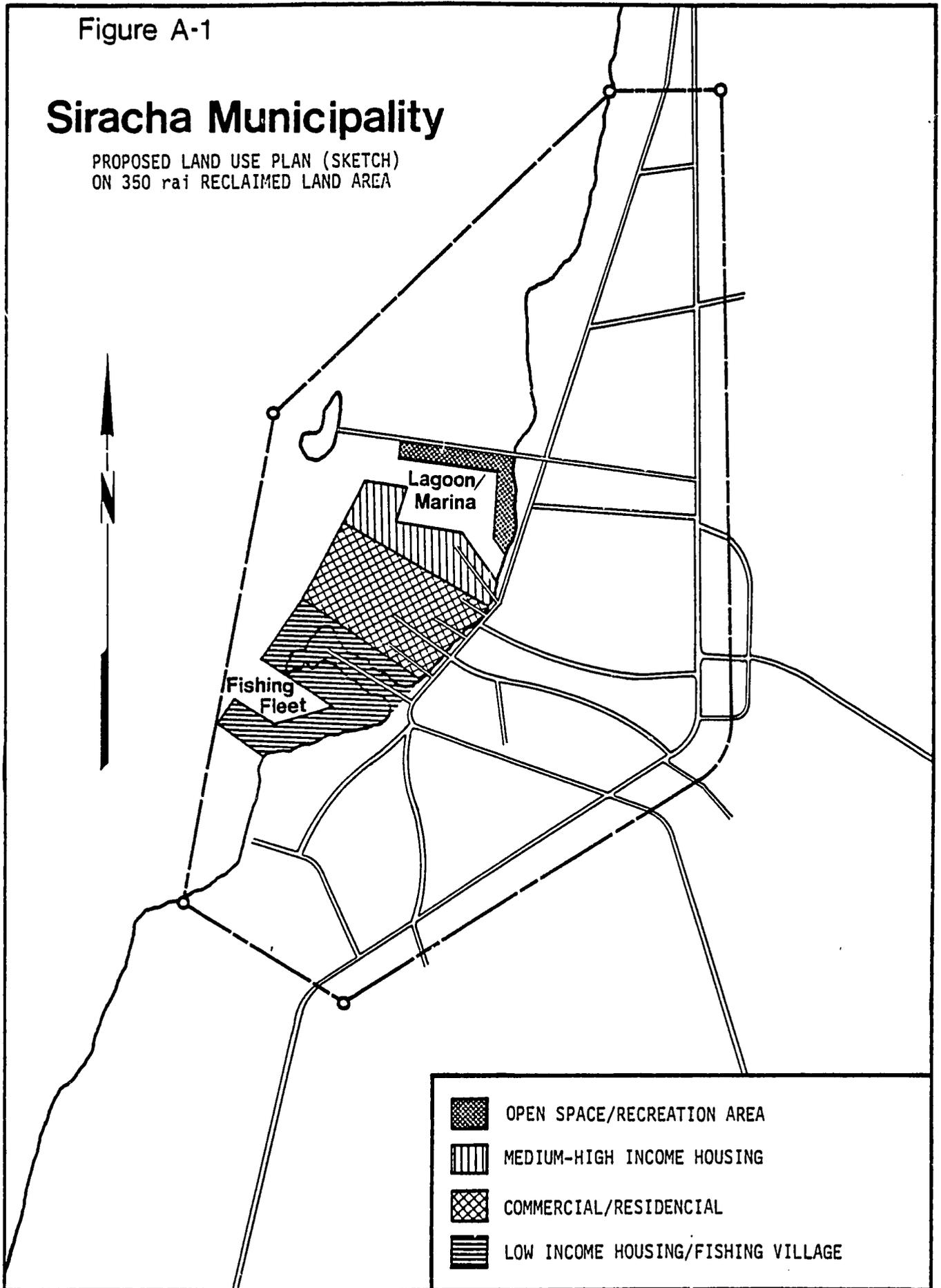
350 Rai Area: This particular site has two significant negative issues which, through sensitive site planning and development, could be overcome. The two negative issues are: displacement of existing residents and disruption of the livelihood of the residents and the potential obstruction of one of the storm drainage canals. Through sensitive site planning, however, this area could be developed as a commercial center that relates very well with the existing development pattern. Although the development of this area would eventually require the relocation of the existing settlers, it does not mean that these settlers would be relocated to a completely new area. Also, this area is large enough to provide the needed open space/recreational area.

The following sketch land use plan (Figure A-1) for the 350 rai area is an example of how the area could be developed into a mixed land-use activity area. This sketch plan shows: open space/recreational spaces adjacent to the existing open space area and the temple, including a lagoon or tidal basin that would continue to serve as a discharge area for the storm drainage system. Located south of the lagoon, but having access to it, would be an area designated

Figure A-1

# Siracha Municipality

PROPOSED LAND USE PLAN (SKETCH)  
ON 350 rai RECLAIMED LAND AREA



for medium to high income housing. South of this housing area is an area designated for commercial activities and the extreme southern portion of the 350 rai area is designated for use of low income housing. This low income area would become the location of a new fishing village with docking facilities.

There does exist one other alternative in meeting the requirement for developable land. This alternative is the Simaharacha Plywood Factory site. This land area will be briefly discussed in the following section.

Alternative Land Area  
Without Land Reclamation

It has been reported by municipal officials that the Simaharacha Plywood Factory may relocate to another changwat.

Should this industry relocate, approximately 200 rai of land could become available for development. However, it has also been reported that a portion of this site area is classified as "Kings Land," which could have certain restrictions as to its future use.

A brief analysis of this site in terms of advantages and disadvantages of using this area for commercial development is presented below.

Advantages

Location is good in relation to existing development pattern  
Little resettlement is required  
Vehicular access is excellent  
Infrastructure is available  
Size of land area is significant for development of large commercial complex.

Disadvantages

site clearing will be required  
loss of taxes  
loss of employment

There are two topics under the negative column that may appear contradictory: loss of taxes and loss of employment, which require a brief explanation. In describing these two statements as negative, the following criteria were used: type of employment and present income derived and the present level of taxation. However, depending on the actual scale of the proposed development, the tax revenue collected could actually exceed the taxes derived from the present industrial use. But, the issue of personal income levels could be critical if the traditional form of development (the shophouses) takes place.

A discussion will be presented in the next section of this paper on the impacts (environmental, socioeconomic, physical) and benefits accrued from the reclamation of land alternative.

#### Impacts Compared with Benefits Of Land Reclamation

A land reclamation project as discussed above may have the following impacts on the municipality.

##### Impact on The Physical Environment

The land filling and construction process of physical infrastructure may create a public nuisance caused by noises from construction vehicles and dust from the land fill area. These conditions would last several years.

##### Impact on Land Use

After the completion of the land reclamation project, various changes in the land-use pattern could take place.

With the construction of new housing and commercial facilities, the present pattern of commercial activity could shift. Also, with a high density area of mixed land use, Thanon Choem Chumplon, as well as the three east-west roads that lead into the municipality, could become heavily impacted. If this condition was to come about, the municipality would have to widen these roads to accommodate the increased traffic flow. The area around the produce market would undoubtedly be heavily congested. A method of solving this potential problem, however, would be a system of one-way traffic streets.

#### Impacts on Socioeconomic Conditions

Although the land reclamation project will create many social and economic benefits for the entire community in the form of employment and business opportunities, it may also have adverse effects on these same groups:

- the project would require the resettlement of residents;
- the project would mean a disruption in the livelihood of the existing residents;
- the project would have an economic impact on the settlers in terms of housing affordability; and
- the project would undoubtedly cause the land values and tax rates of the surrounding land areas to be increased.

#### Impact on The Present Municipal Area

The project could have the following impacts on the present municipal area:

- environmental: increased traffic congestion and refuse collection;
- infrastructure: the project would create a greater demand on the already limited infrastructure network;
- socioeconomic: if the economic growth of the municipality is not fast enough to create more purchasing power, the project area will be in direct competition with the existing commercial sector. Also, during the construction process, the income produced during this period would undoubtedly cause a rise in living costs;
- impact on the administration: if the municipality were to undertake this project, it would experience a very heavy financial burden that may require an increase or restructuring of the present tax base. This action would have a political impact on the municipal council; and
- impact on public service: this project would require additional school, police, and health facilities with appropriate staff increases.

#### Benefits Derived from This Project

If the municipality were to be the developer of this project, it would receive the following direct and indirect benefits.

#### Direct Benefits

The project would yield the following direct benefits:

income from the sale of land: from available information the land area that could be sold to private developers was reported to be 262.5 rai.

revenue from taxation: as the land area becomes developed, the municipality would receive additional tax revenue.

### Indirect Benefits

The indirect benefits that could be accrued from this project are socioeconomic and environmental.

employment opportunity: employment will be created during the land filling process and the subsequent building construction process, as well as in the newly established service and commercial sector;

solution to housing problem: not only will the fishing villagers be rehoused in a higher standard unit but any existing condition of underprovision (overcrowding) could be solved; and

provision of open space/recreational facilities: the project would provide needed recreational open space facilities.

### Conclusions

This paper has identified many factors that must be considered in undertaking a large project of this nature.

It has purposely reached no definite recommendations because of a lack of detailed engineering and other information. However, the following action can be recommended.

Because the municipality is currently experiencing severe financial and manpower constraints that could hinder the municipality being the developer, it is recommended that the municipality initiate the necessary legal steps to have the foreshore area reclassified from "public land" to "municipal land." This action would allow the municipality to lease portions of the foreshore area to private developers. However, while this legislative action is taking place, the municipality must set one specific condition prior to the

actual land fill/construction or leasing process; that is, the developer must prepare, at his cost, an indepth study on the feasibility of developing this area, specifically to meet the needs of the municipality and not just the developer's needs. The following scope of work clearly sets out a detailed outline for such a study. Only after this study has been completed, and after a very careful analysis of the results, should the municipality take further action.

Proposed Scope of Work  
For A Detailed Feasibility  
Study for Siracha Land  
Reclamation Project

Basic Issues

1. Is there a need for expansion of the commercial area? If so, what would be the timing and the amount of commercial land required?
2. Which alternative location of the new commercial areas within the municipal boundary would be suitable?
3. If alternative locations are not available or not suitable, is land reclamation technically feasible; and if so, at what cost?
4. What would be the relative economic and financial merit of the reclamation of 350 or 80 rai as proposed?
5. What strategies could be identified to implement the project?

Scope of Study

1. Assess the present economic, social, and commercial activities in the urban area of Siracha, and evaluate the likely impact of the development of the deepsea port and industrial estates at Laem Chabang, as well as other development projects such as the prospective rail connection and gas pipeline to Laem Chabang.

2. Identify the present land use, land tenure, land prices, and projected land requirements for the future, classified by types of uses. Of specific importance will be the assessment of projected land area required for commercial purposes.

3. Investigate the possibility of obtaining land at the Simaharacha Plywood Complex and the constraints on this land as a commercial center.

4. Conduct an engineering study of alternative methods and cost of land reclamation for the 80 rais and the 350 rai areas.

5. Determine the attitudes of the residents in the foreshore area and identify relocation strategies and cost of relocation.

6. Prepare a land-use plan for the reclaimed area in the context of overall urban growth and prepare cost estimates for the project components, including roads, utilities systems, and reclamation work.

7. Assess the environmental impact of the project.

8. Prepare economic and financial feasibility analyses of the project with computation of benefit/cost ratio and internal rate of return for alternative project schemes.

9. Prepare pro forma cash flow statement.

10. Prepare implementation plan and management guideline.

## Plan of Study

The study should be divided into five overlapping stages:

### 1. Survey of Existing Conditions

(a) Socioeconomic Survey: To cover key economic indicators such as demographic patterns, economic activities, economic role of Siracha, real estate situation, and municipal finance.

(b) Attitude Survey: Sampling survey to assess the attitudes of the residents in the foreshore land.

(c) Physical Survey: Using existing data from various government agencies, topographic maps, aerial photographs, and limited ground survey to assess topographical constraints, land use, land tenure, land prices, and existing infrastructure, including public utilities systems and service facilities within the urban area of Siracha.

(d) Transportation Survey: This includes information on vehicle ownership, road characteristics, volume and speed of traffic, using existing data from government authorities and limited field surveys.

### 2. Engineering Investigations

(a) Hydrology: Existing data on rainfall and water runoff to be gathered and analyzed to provide guidelines for flood control and drainage systems.

(b) Coastal Engineering: Existing hydrographic data (wind, current, waves, and tides) to be obtained from government agencies. Drawing on experience and standard analysis, conclusions to be made to provide guidelines and set limitations on dike road design.

(c) Sub-Surface Soil Investigation: Limited soil tests with an adequate number of boring holes and a study of testing results in the area to be conducted to provide guidelines for land reclamation, foundation design, and construction. Settlement of structure due to consolidation of soil also to be studied.

(d) Topographical Survey: Limited field surveys to be undertaken on land profiles to be used for calculating the volume of fill material.

(e) Material Survey: This should be carried out to obtain information on availability, source, and cost of materials and method of transportation.

(f) Environmental Study: This covers the investigation of the coastal ecological system, which includes the biodegradable capacity of the existing shoreline water to assess the effect of the land reclamation.

### 3. Assessment of Requirements

(a) Demographic Projections: To include studies of factors affecting demographic pattern such as employment opportunities, natural growth rate, and spatial distribution of the population.

(b) Economic Projection: The future role of Siracha in the region and national context should be considered using interregional linkage indicators. The changes in economic activities will be projected based on analysis of agricultural and industrial changes, as well as the likely effects of public projects in the nearby areas, especially the planned development of Laem Chabang area.

(c) Land Use Requirements: To determine the amount of land to be reclaimed, and to define land-use allocations for the reclaimed land in the context of overall urban growth, data input from socioeconomic studies and urban land studies to be analyzed to assess land-use requirements for the municipality. Types of land use should be identified and land area required by type of use should be quantified.

(d) Infrastructure Requirements: Based on land use requirements and projections of socioeconomic data, the demand for public utilities (electrical power supply system, water supply system, sewerage system and treatment facilities, solid waste collection, and disposal system, and communications systems) and service facilities (public parks, school, health, local market, harbour facilities, etc.) in the reclaimed land should be determined. Transportation demand should also be forecasted, using accepted techniques to determine requirement for roads and other transportation facilities.

#### 4. Development of Alternatives

(a) Land Development Concepts: Based on projected land requirements, the role of the foreshore area

in relation to overall urban growth should be identified. The use and composition thereof should be broadly determined. In cases where land requirement falls short of the land available from reclamation, alternative schemes for land development in smaller packages should be proposed.

(b) Land-Use Alternatives: A flexible land-use plan is to be developed for each development concept as the basis for economic and financial evaluation of the project. Spatial organization of various types of land use and density of use are to be proposed for the same purpose.

(c) Transportation Alternatives: Alternative access road networks to the reclaimed area are to be developed. Requirements for right-of-way and road standards should be specified to estimate costs involved.

(d) Construction Alternatives: Data obtained from soil, topography, hydrology, and hydrography investigations and material survey to be used for formulating alternative methods of construction of dikes, roads, drainage, and flood protection systems. Land reclamation techniques also are to be proposed. Cost estimates of all engineering works to be prepared.

(e) Infrastructure Design: Infrastructure is regarded as an essential positive inducement mechanism to direct orderly urban growth. Development of public utility systems will lead to other development, and service facilities will support urban growth when it occurs on

the reclaimed land. The design of infrastructure is to be based on alternative land-use plans and road network systems. Also, improvement of existing utility systems is to be considered, and costs of infrastructure developments estimated.

#### 5. Economic and Financial Evaluation

Based on projections of urban growth, land prices, municipal tax revenues, land-use plans, phasing of future land use (occupancy) is to be projected. Economic and financial analyses, based on present value of costs and benefits and internal rate of return should be prepared for each alternative scheme.

#### 6. Project Implementation Plan and Management Guideline

The final stage is to cover an evaluation of alternative strategies for the execution of the project. Basically, this involves an evaluation of the practicability of having the private sector invest in land reclamation in exchange for land leases from the municipality. Alternatively, if the municipality is to carry out the project by themselves, a cost recovery plan is to be devised.