

**FINAL REPORT  
REVISED**

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

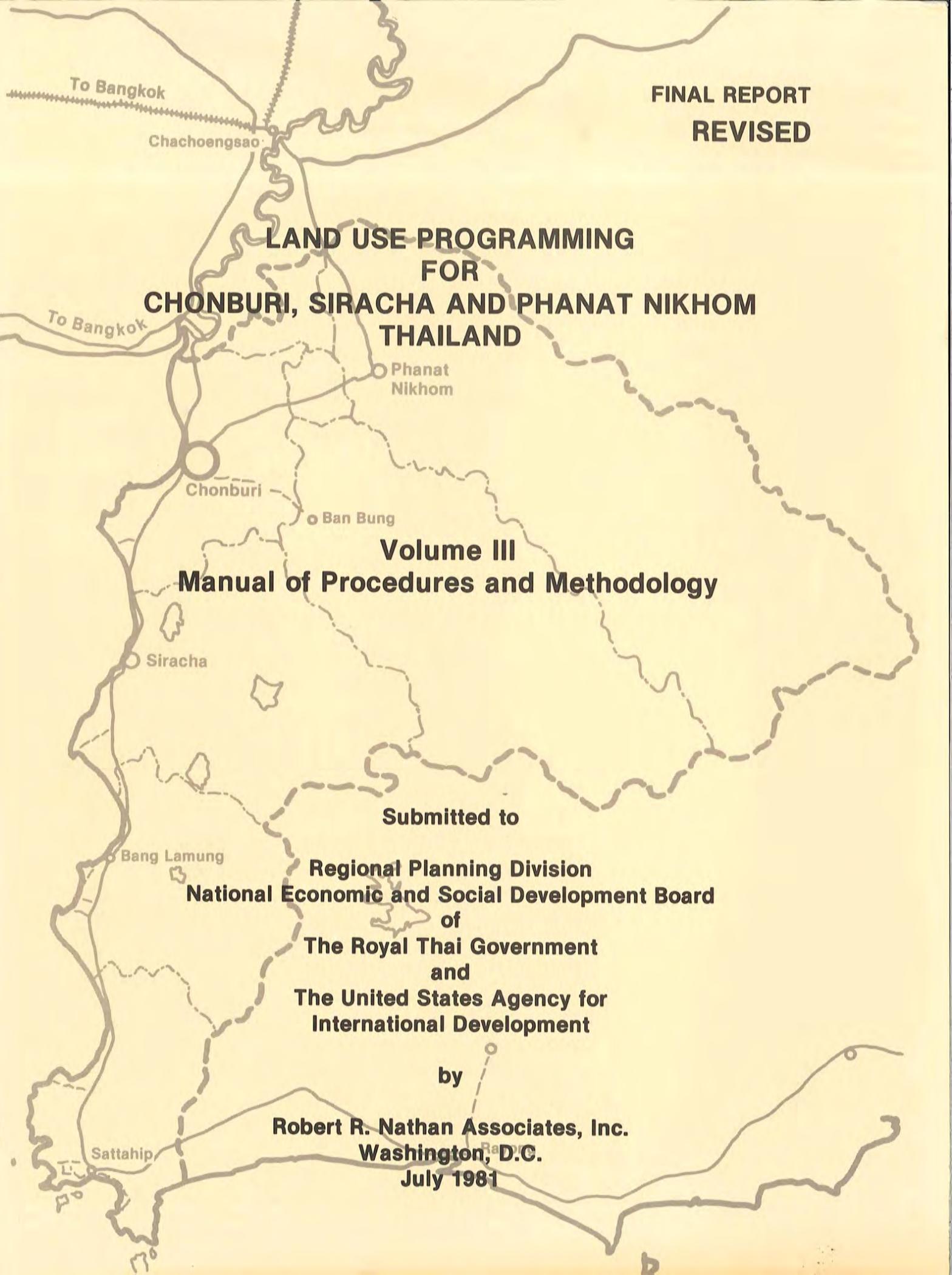
**Volume III  
Manual of Procedures and Methodology**

**Submitted to**

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

**by**

**Robert R. Nathan Associates, Inc.  
Washington, D.C.  
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## I. INTRODUCTION

The nature of the planning process has undergone a marked transformation in recent years. Traditionally, planning has been regarded as physical planning -- that is, as the task of devising land use plans and policies for the development of city or regional infrastructure. Today, governments are broadening this concept to include:

- . population planning;
- . economic planning;
- . land use planning;
- . physical (infrastructure) planning;
- . social (community facility) planning; and
- . administrative arrangements for organization and management.

The tendency, at least until recently, has been to view these different types of plans as being largely independent of one another and to assign the responsibilities for developing them to various government agencies on a functional basis. In doing so, it has been implicitly assumed that the several agencies of government are all headed in the same direction; that is, that the plans and policies of these

agencies are being developed and implemented in accordance with a common set of objectives and that the results of these plans are compatible. Experience has shown that this assumption is often not justified and that the independently determined plans and policies of the various government agencies are neither meeting the objectives of the government nor fulfilling the need of the community at large.

The importance of appropriate analyses to successful development efforts cannot be overemphasized since most failures result from incomplete or inappropriate analysis. Only from careful analysis can an understanding of the development context and the anticipated impacts of development efforts be acquired.

Analysis can be very simple, or it can be very complex and sophisticated, requiring millions of computations. Analyses frequently are quantitative. Some kinds of analysis, however, may be carried out with nonquantitative (verbal) data. One form of nonquantitative analysis may consist of an ordered set of questions or topics to be considered.

This report is intended to provide a guide in urban planning in which analyses with varying degrees of complexity are designed to assist local level officials in programming urban projects. In the initial stages the analyses can be used both to identify and conceptualize projects. They can assist in project formulation and justification as well as in detailed project design. The type and level of analysis to be implemented depends on numerous factors, including national policy, provincial policy, and anticipated future projects -- as well as manpower and other resources available to carry out the analysis.

This guide will emphasize verbal analysis and, consequently, will not require the use of sophisticated planning techniques or data gathering methods. To facilitate this approach, the guide will be presented in three sections: the presentation of a model for guide planning; analytical and data gathering techniques based on a case study approach; and a summary of the lecture notes from the training program from which the guide has been developed.

The discussion on guide planning will describe the procedure used during the Chonburi Land Use Programming Project and demonstrate, in a logical manner, the relationships of each component to the overall process.

The analytical and data gathering section will include socioeconomic characteristics of the population under study; the spatial distribution of development (urban and rural) and underdevelopment (including an analysis of central place service centers, key rural-urban linkages, urban functions and social services). Case studies, in the form of working papers, developed in the course of the Chonburi Land Use Programming Project provide examples of the data gathering and analytical process. A listing of these working papers is presented below.

#### A Brief Description of Case Study Papers

The methodology followed in the preparation of Working Papers (WP 1 to 23), and their intended use in the planning process are described briefly in the following section.

- WP 1 to 7: These papers presented a general analysis of activities at the Changwat level with specific attention given to the defined study area.
- WP 8: This paper specifically discussed development activities within the defined study area.
- WP 9 & 9A: These papers discussed the methodology used in determining the growth potential/capacity within the study area.
- WP 10 to 13:  
and 23: These papers presented an analysis of the existing conditions within the three municipalities and defined study area and generally sought to determine deficiencies in public services -- specifically infrastructure -- and identified possible alternative directions of growth.
- WP 16: This paper discussed specific projects/programs to alleviate those weaknesses previously identified.
- WP 17: A set of standards for determining the future land area needs within the study area is presented in this paper.
- WP 18-20: Description of the future land area needs.
- WP 21: Contains a preliminary analysis of the capacity of the municipalities to finance future capital projects.
- WP 22: This paper contains a discussion of several techniques for guiding orderly development within the municipality.

To provide the political, administrative, technical and organizational inputs needed for development requires locating proper services and facilities in central places that link cities with rural hinterlands. These inputs can be explained as: Role, Influencing Factors and Need, as related to determining the size and rank of places in a spatial hierarchy and their growth potentials. These terms are defined to provide a basis for future discussion.

#### Definition

- . Role: used to determine the relationship of the municipalities to the growth factors in terms of past and future trends.
- . Influencing Factors: identify the factors that have or will influence the future direction of growth.
- . Need: relates to the actual demand in terms of future projections vis-a-vis the developers' attitudes toward speculation.
- . Constraints: identify the factors that currently constrain development.
- . Growth Potential: the capability of a specific area to accommodate increased population and economic activity.

Role: WPs 1 to 7 and 10 to 15 define the existing role that the municipalities play and their linkage with their rural hinterlands.

Influencing Factors: WPs 8 and 17 present information on the factors that are, and could in the future, influence the direction of growth.

Needs: WPs 18 to 20 discussed, in general, the land area needed to meet the future population requirements.

Constraints: WP 21 contains a discussion of one of the prime constraints inhibiting public development within the municipalities. In WPs 10 to 15, there are identified various constraints, in terms of physical needs, that have affected the development process within the municipalities.

## II. A MODEL OF AN INTEGRATED AREA DEVELOPMENT PLANNING APPROACH

Realization of benefits of a multisectoral approach has led to development of systems or integrated planning in which population, economic activity, land use, infrastructure, and community facility plans can be effectively related and coordinated. This chapter contains a description of a simple framework, or system, for formulating an area development plan which links the various sub-plans, and ensures that they are mutually supportive.

In developing this system, some broad objectives of the planning process are discussed briefly.

### Population Factors

When planners talk about area development, they are invariably talking about where and how much of a particular government's financial resources will be allocated to the development of an area. A fundamental basis for determining where and how much of a government's financial resources will be allocated to an area is the demographic makeup of the existing and expected population of the area.

For example, information about the nature of the population in an area is needed in order to make decisions about:

- . the amount of land which needs to be developed for housing;
- . the quantity of water pipes which should be laid, the number and capacity of reservoirs and sewerage treatment works which need to be built; and
- . the number of schools, hospitals, cultural and recreational facilities which will be needed in an area.

Information about the demographic makeup of the population is also needed to ensure that the right mix of public services is provided. An area which has an older population, for instance, will need more health facilities and less schools than an area with a predominantly younger population.

These considerations indicate that the starting point for the preparation of any area development plan should be an analysis of the population of the area -- we must know for whom we are planning.

#### Efficiency in Resource Use

Since planners are ultimately concerned with meeting the needs of and improving the welfare of people, it is imperative to ensure that the resources allocated to area

development achieve the maximum benefit for the community involved. The process of area development planning and management must therefore be concerned with the efficiency or effectiveness of public sector resources in an area. Governments have limited amounts of capital to spend on area development, so it is crucial that those funds made available bring the greatest amount of "good" to the greatest amount of people.

This indicates the need for having a step built into the planning system which enables planners to identify both the effects which the various projects within a plan are likely to have on an area (project appraisal) and the effects which projects actually have on an area after their implementation (project evaluation).

It is obvious that trade-offs will have to be made in the preparation of area development plans since a government will never have the resource capacity to implement all of the proposed area spending proposals. Trade-offs are involved in:

- . allocating public finances for area development versus allocating those funds to other activities (e.g., defense); and
- . allocating funds to a particular area development project versus some other area development project (e.g., school versus a hospital).

In other words, trade-offs will have to be made both between a list of area development projects and other projects for public expenditure, and within the list of area development projects.

One of the principal functions of the planner should be to identify exactly what these trade-offs are and what are the likely consequences of proceeding with one project at the expense of another. The final decision about the course of action to adopt must rest with the government, however, and not with the planner. The planner can provide an objective assessment of the trade-offs involved in an area development plan, but should avoid situations where he is imposing his own value judgments on the decisions undertaken.

The systems approach to area development planning outlined in this paper assumes that government provides the normative framework for answering questions about what actions should be taken. Furthermore, recommendations on social projects or policies which are based solely on normative grounds are made through the political process (local, provincial or national government) or through community groups, not by the planner.

#### Dynamic Nature of Planning

Planners operate in a world of uncertainty. In formulating area development plans, they can consider the various factors relating to population and economic conditions as they exist and can also make projections about how these factors can be expected to change over time. But, planners will never know in advance exactly how these different factors will operate in the future or which factors will continue to be important.

The demographic makeup of a population can change over time as a result of a large in-migration or out-migration of

people from an area. Consequently, the community needs of a given population can change accordingly. Various economic conditions in an area may also change as a direct result of implementing different development projects.

For these reasons, the preparation of area development plans needs to be an ongoing process in which the assumptions built into the plans are continually modified as new information becomes available. The systems approach to planning avoids the trap of having government locked into a fixed (or static) plan; it instead ensures that area development plans are rolling plans with a built-in review and revision process. The danger with the more traditional static plan for area development, as evidenced by past experiences, is that the bureaucracy becomes so committed to The Plan it does not necessarily meet the needs of the community. It becomes oriented, in other words, to implementing the plan for the plan's sake.

#### Land Use Programming

Land use programming involves the availability of information on land for urban uses, existing utilization and prospective future requirements consistent with the "guide plan." The establishment of realistic goals and the formulation of the guide plan itself are conducted after the assembly of basic information on:

1. Existing availability and patterns of land use, to be compiled in the form of a cadastral survey.
2. The demographic, social and economic structures of urban centers.

3. The regional framework -- economic, demographic and social -- as it affects the role of urban centers. (In this connection, prospective infrastructure projects and the regional development policies set forth in the Fourth Five-Year National Economic and Social Development Plan will receive special attention); and
4. The institutional framework within which land use plans are formulated and implemented will be analyzed to provide guidelines for land use planning and project implementation.

The relationship of each of these components of the land use programming process are described briefly in the following paragraphs, and shown diagrammatically in Figure 1.

#### Cadastral Survey

The maps produced from the cadastral survey would identify all plots in the municipal boundaries, the ownership of each plot, the type and estimated value of structures (if any) on each plot, the estimated value of land and type and density of use.

The information is essential in identifying idle and underutilized areas; the information will also be critical in the development of a land assembly program, if means can be developed to surmount the financial and institutional constraints to municipal transactions in land. Finally, ownership and value of urban lands and structures provide useful information for an improved property tax system to augment the revenues of municipal government. The data will also be relevant if "betterment levies" are imposed to pay

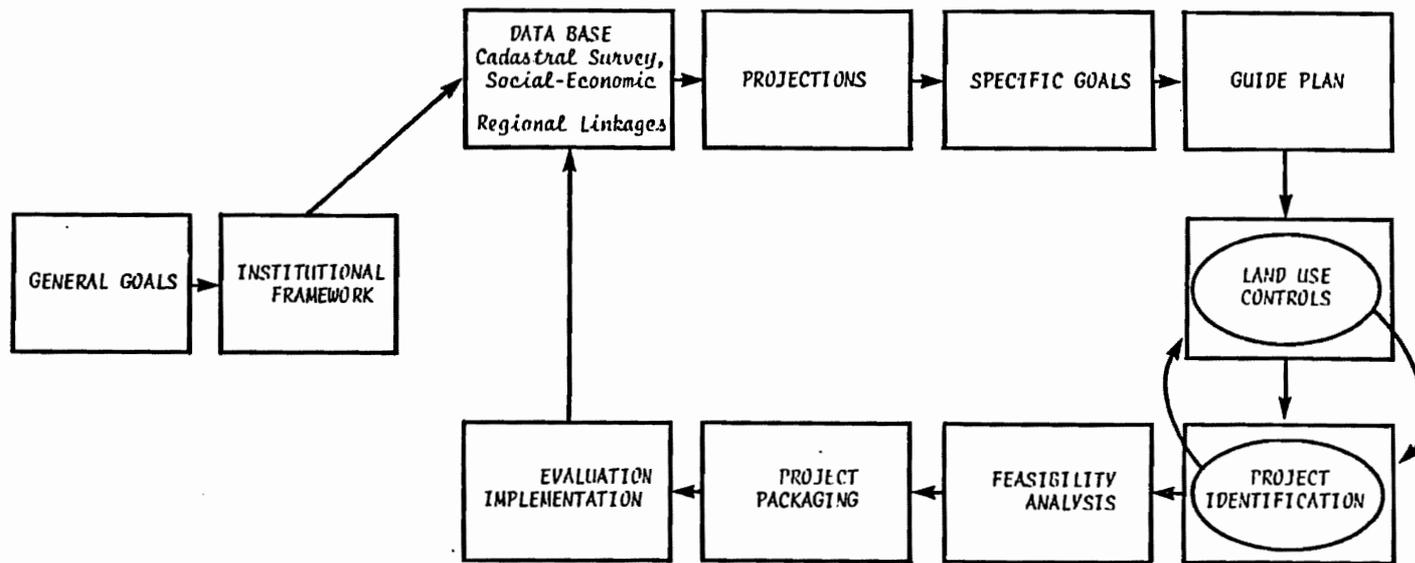


Figure 1.Component Flow Diagram

all or part of the costs of infrastructure projects benefiting properties.

### Socioeconomic Data Base

The primary purpose of the assembly of socioeconomic data for the three municipalities is to provide a baseline for projections and evaluation of the results of land use programming.

The structure of employment and income is an important variable in the design of goals and the alleviation of urban poverty. If the policies announced in the current Five-Year Plan are implemented, it is anticipated that both the total and composition of employment in Chonburi will undergo significant changes affecting land requirements for residential, commercial, industrial and infrastructure uses, and for facilities to supply services such as education and health.

Because of the comparatively rapid growth of population in Changwat Chonburi, it may be necessary to update some of the socioeconomic data from local sources. However, most of the desired socioeconomic data base can be developed from published sources.

### Regional Framework

The "region" is defined as Changwat Chonburi. While the focus of land use programming is on urban centers and the subregion in the triangle rather than the region, it is recognized that the functional role of urban centers is

directly affected by the nature of the hinterlands they serve and the linkages (economic, social and physical) between such centers and their hinterlands. Therefore, a broad survey of the region's existing economic characteristics, transport linkages and functional roles of its urban centers becomes necessary.

### Projections

While a number of deficiencies exist in the physical, economic and social aspects of the three urban centers, the essence of planning is the development of programmed policy measures and projects to meet anticipated future requirements for organized growth. For this reason, projections of certain demographic and economic parameters, utilizing regional and municipal data bases, are considered essential inputs in the formulation of the guide plan and in the identification and prefeasibility analysis of specific projects. The principal variables are:

1. Population: based on natural increase rates and net migration;
2. Employment: total and by broadly defined sectors, reflecting past trends, planned projects in the region and the announced policy of decentralization of future industrial and commercial growth;
3. Infrastructure and Social Service Facilities and Manpower: (e.g., health, education, fire protection, public safety) required to meet the needs of anticipated growth in population, employment and the changes in urban economic structure;

4. Land: required to overcome current deficiencies and future requirements for urban growth, based on density standards appropriate for middle-sized municipalities in Thailand; and
5. The Environmental Impact of population growth, economic development and specific projects.

#### Establishment of Goals

With the results of the cadastral survey, the regional framework and the socioeconomic data base, a tentative set of realistic goals can be established by representatives of national, provincial and municipal governmental agencies and private sector representatives. At this stage, there would be feedback from discussions of goals to the projections.

The physical constraints of the municipalities and the current limited success in generation of local revenues will make the formulation of goals by municipalities difficult. Goals (fiscal, social, and physical) are rooted in vague development issues. The establishment of goals will have to be preceded by data gathering and diagnostic analysis of the accelerating development in Changwat Chonburi. As an understanding of the situation unfolds, a series of tentative goals can be developed by the municipal and project staffs.

#### Guide Plans

The principal features of the guide plan will be developed in conjunction with the establishment of goals and the adjustment of projections of population, employment,

economic growth and infrastructure and land requirements.

Although the establishment of goals and guide plans are meant to serve as a framework for land use programming and project identification and evaluation, they will be re-examined periodically to reflect feedback from implementation of the short-term projects and any unanticipated changes in variables that may have a significant impact on the establishment of project priorities. This will facilitate flexibility in urban development programs so that goal setting and guide planning can be viewed as a continuing process rather than discrete activities undertaken at periodic intervals.

Prior to the actual preparation of a guide plan, a thorough knowledge of current public agency planning for the municipalities is essential. The sources of information are the officials of the various relevant government agencies and known private developers. This investigation is very vital, for while the land area requirements have identified certain needs based on application of standard land absorption ratios, the relevant government agencies may have their own priorities. Thus, the results of this investigation should be closely scrutinized for obvious duplications, omissions or overlapping recommendations. Having accomplished this exercise, the next step is to prepare the guide plans.

This approach is one that can be conducted, without significant technical assistance, by municipal officials. It is a method under which gross areas are selected as suitable for various kinds of land uses; then sites are identified for major roads, schools, and other public improvements. It is a flexible approach and well-suited to

situations of imperfect information and rapid change and at the same time provides a direction for policymakers. The preparation of such plans involves:

- . preparation of a statement as to goals and objectives for land use and facilities;
- . preparation of population forecasts and development trends and assessment of physical needs;
- . preparation of a generalized land use and transportation guide;
- . preparation of functional plans and programs that identify sites and capacity of open space, schools, roads, water and other utilities;
- . a sketch definition of phasing, timing and linkages of investments;
- . an implementation program discussing necessary legislation, potential financial sources, responsible agencies and private action.

Concurrent with the development of the guide plan is the identification of projects necessary for development as indicated in the plan. These projects can take the form of open space/recreation facilities; new roads; improved water or electricity supply and other government-supported facilities. The plan will also identify future requirements for housing and commercial facilities that the municipality can help to implement. If the fiscal resources are available to the municipality, the municipality may choose to become the sole developer or participate in a joint venture with the private sector. In general, project identification as related to the guide plan will identify two levels of projects: one which identifies the deficiencies of existing infrastructure or services, and one which identifies projects required to meet the future needs of the population.

### Project Identification and Evaluation

Within the general framework of the guide plan and the established goals, specific projects will be identified and evaluated. "Identified projects" may come from a multiplicity of sources: mayors and the provincial government, line agencies of the central government, representatives of the private sector and community leaders.

However, all project proposals should be subject to an evaluation process employing conventional criteria (benefit/cost ratios, internal rates of return and pro forma cash-flow projections), as well as a critical analysis of the distributive impact on the incomes of the urban poor, and on job opportunities for less-skilled members of the labor force. The environmental impact of projects should also be evaluated.

### Land Use Controls

The cadastral survey, proposed as one component of the "data base," serves as a point of departure for the development of land use controls -- as well as an example of the patterns of land use that occur in the absence of effective controls.

The principal thrust of the land use programming approach is the timely provision of basic infrastructure (urban roads, water, sewerage, health and educational facilities, electric service, etc.) as inducements for private investment in housing, commercial and industrial projects in planned areas. This approach, coupled with tax incentives,

provision of serviced sites on publicly owned lands and subsidies, comprise positive forms of control.

A variety of ineffective control devices has been applied to control land use. The Town Planning Act, 1975, provides authorization for zoning as a form of negative control. Other types of negative control include restrictive provisions in construction permits and licenses for commercial establishment, removal of squatters, minimum size of lots, price freezes on undeveloped lands and heavy taxation on uses contrary to planned usages.

### Project Packaging

A portfolio of implementable projects supported by national and local levels of government is viewed as an important end-product of the land use programming process. The action-oriented focus of the land use programming approach constitutes one of the principal differences between this approach and the preparation of conventional Master Plans for urban centers.

While identification of potential projects may come from a number of sources, e.g., provincial and municipal officials, business and community spokesmen, all identified projects should be evaluated in terms of the goals and guide plan to determine their compatibility with the desired pattern of urban development.

"Project packaging" includes concrete measures covering the following elements:

1. Specification of scale and phasing of project(s);
2. Coordination with other projects, both public and private, with which the subject project will interface; for example, a site and service project for residential plots would be coordinated with private (or public) housing projects to avoid premature investment in infrastructure, or delays in the housing construction and occupancy;
3. Identification of feasible location and site selection and appropriate transport (circulation) design;
4. Identification of potential financial resources required to implement the project, and a feasible schedule for repayment of loans based on a projected cash-flow analysis;
5. Identification of the agency or agencies responsible for implementation of the project and establishment of proposed organization for project management; and
6. Establishment of monitoring and evaluation procedures. Although not indicated in Figure 1, there will be a systematic and continuing review of goals and the guide plans through the feedback from the monitoring and evaluation procedures to be established as an integral part of the project package.

The process of project identification, evaluation through conventional feasibility analyses and project packaging will be initiated on completion of the basic data compilation, projections, establishment of goals and formulation of the guide plan. It should continue throughout the land use programming project.

The effectiveness of the land use programming approach will depend on the financial and administrative resources available to implement the project packages and on the private development that the projects are expected to encourage. While the project studied ways to strengthen local financial capabilities, it is not likely that local resources can be developed adequately to meet the requirements of large-scale projects in the early stages. As a result, project packages will require documentation in the form of detailed descriptions of the anticipated impacts on the pattern of development, estimated costs and benefits, identification of sources of financing, environmental impact analyses, and evaluations of the distributive effects of the proposed projects.

#### Area Development Planning System

A simple representation of a systems approach to area development planning is contained in Figure 2. The approach employs five main steps:

##### STEP 1

The starting point for the formulation of any area development plan should be an analysis of the size and composition of the population. The latter part of the analysis evaluates the human resource (education or skill) attributes of the population. Information on the occupational status of the population should also be examined to obtain an estimate of the size and composition of the labor force in the area: The population projection can be adjusted to take account of any actions by the government or the private sector likely to affect the size or composition of the population (see Figure 3).

**Figure 2**  
**Summary Chart: A Systems Approach to Area Development Planning**

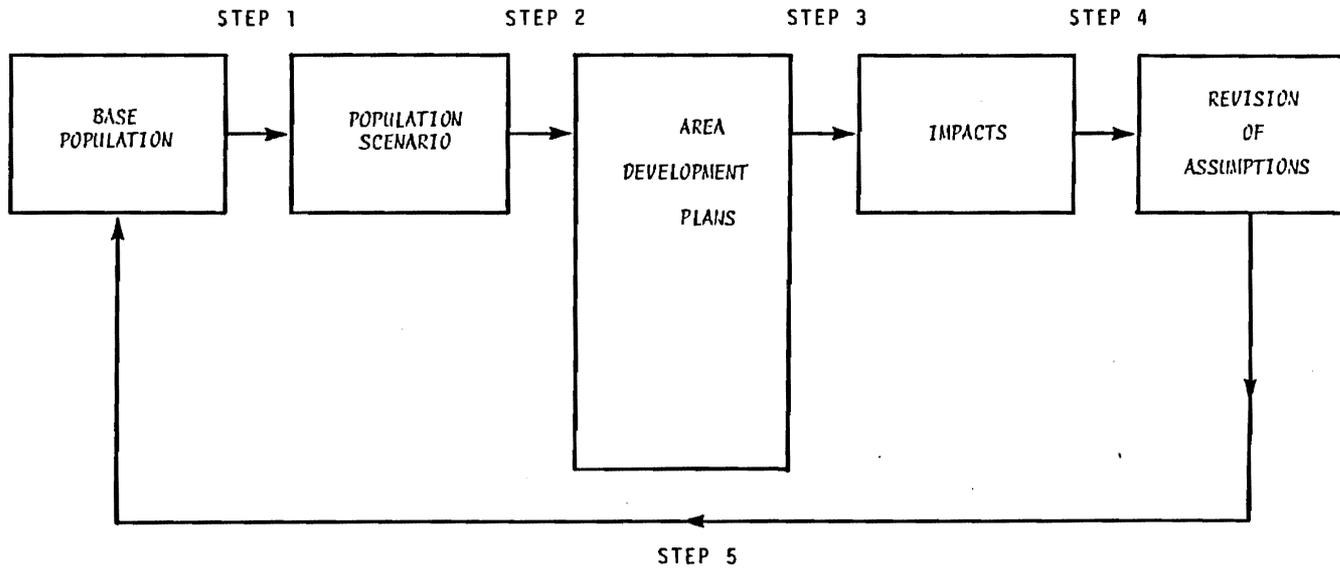
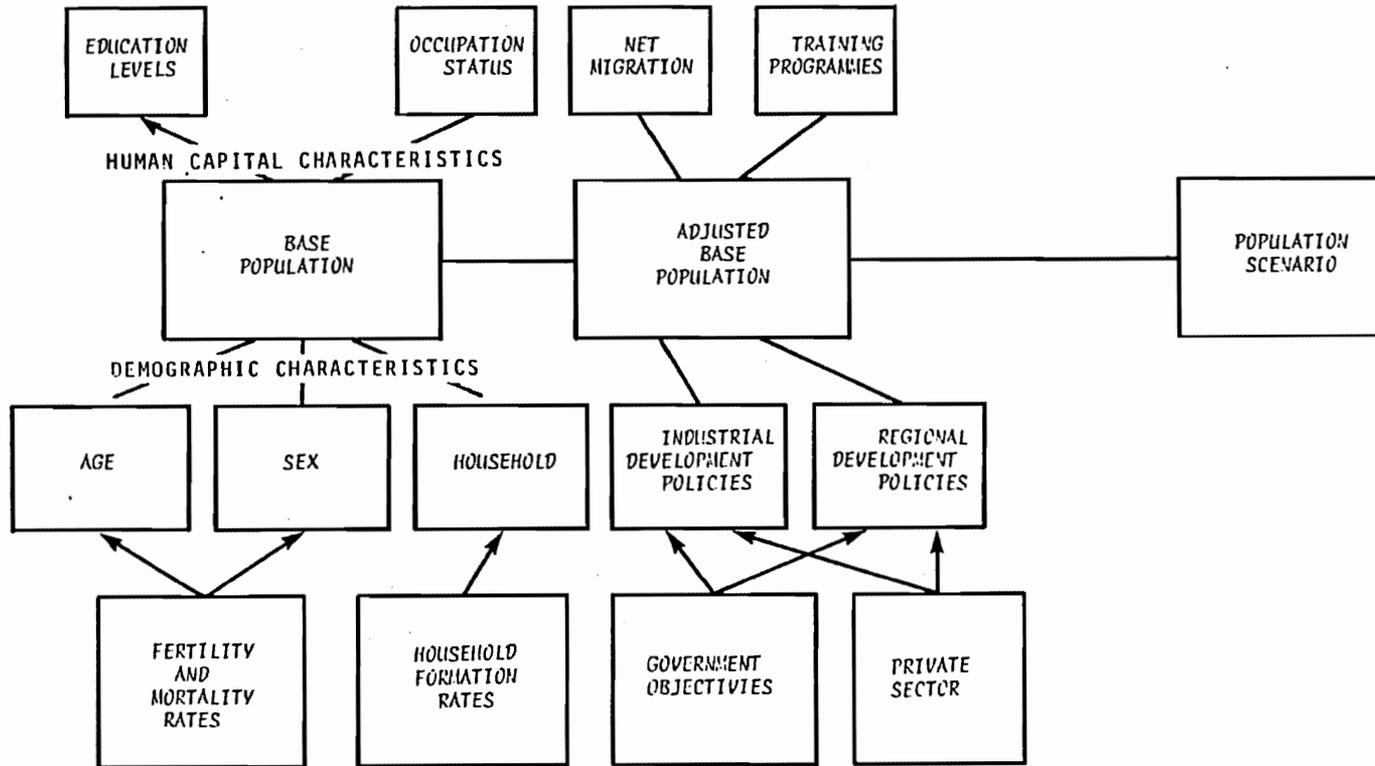


Figure 3: Population Analysis



The result of adjusting the base population for the effects of the various factors is a population scenario or projection. It is not necessary to have only one scenario; a common procedure is to develop three scenarios choosing the most likely one to formulate area development plans. The time frame selected for the population scenario depends largely upon the reliability of the data being used, although it is probably of doubtful value beyond thirty years. A five-year incremental period is more meaningful in terms of capital budgeting plans.

## STEP 2

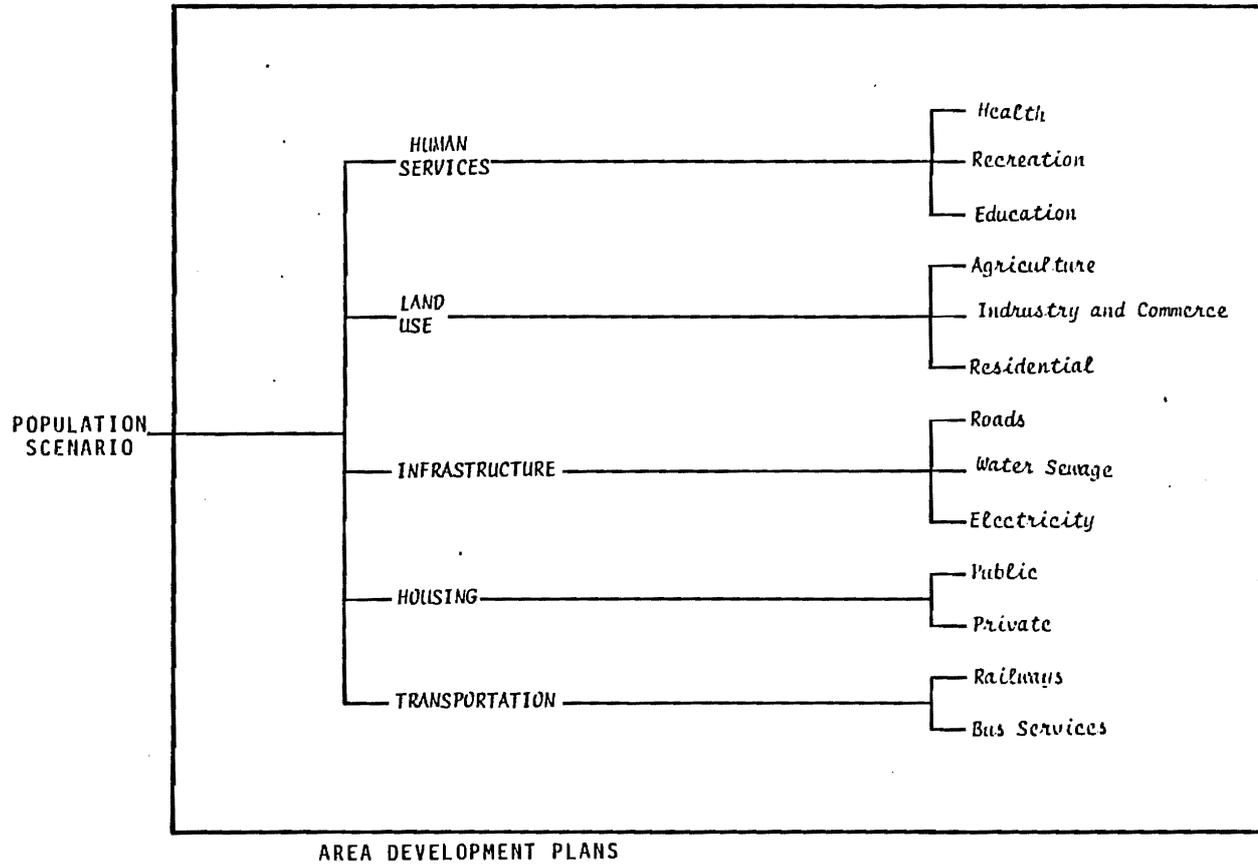
The next step is to translate the population scenario into an area development plan (Figure 4). There are many analytical tools useful for this purpose. Housing demand, for example, can be estimated using a technique known as the Headship Rate or Household Information Model. The technique makes use of household headship rates to obtain an estimate of the number of households likely within the population in a given year.<sup>1</sup>

Transport plans can be developed using various analytical techniques, such as "trip-generation models" which attempt to approximate the transport behaviour of families or households. Infrastructure and Human Service (community facility) plans can also be developed from the information generated on the

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1. A detailed description of this technique can be found in United Nations, Department of Economics and Social Affairs, "Methods of Projecting Households and Families," Manual III, Manuals on Methods of Estimating Population, New York, 1973.

**Figure 4: Formulation of Area Development Plans**



demographic makeup and number of households expected in an area at a given point in time. Land use plans should be geared to the other sub-plans to ensure that sufficient quantities and types of land (residential, commercial, industrial, etc.) are developed.

### STEP 3

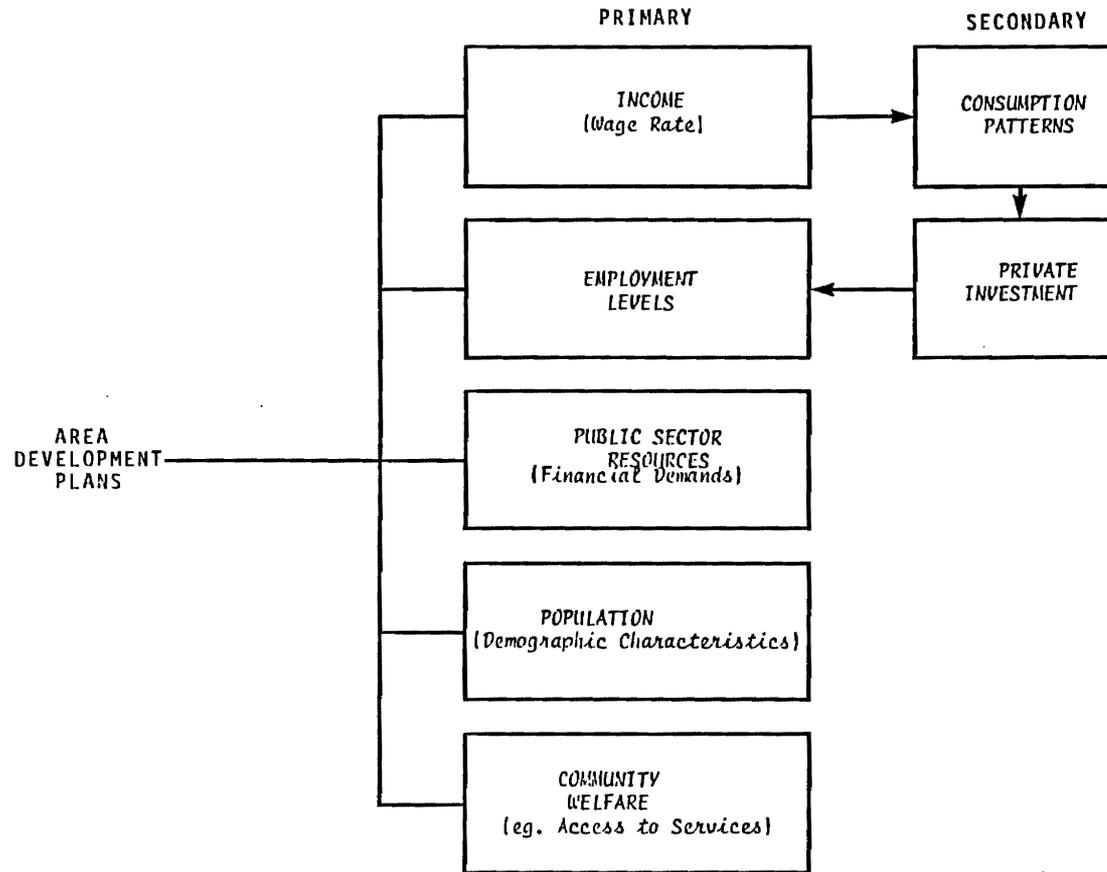
The third step is to attempt to identify and evaluate the likely impacts of the area development plan (and its component sub-plans) on the population and economy of an area (see Figure 5). The analysis in this step should attempt to answer specific questions:

- . How many new jobs (and what types of jobs) will be generated in an area?
- . What will be the effects of the plan on wage rates in the area?
- . How will community welfare be enhanced (e.g., to what extent will access to public services be improved)?
- . How is the demographic composition of the population likely to change as a result of these plans?

Particular emphasis should be given to determining:

- . What will be the cost of the plan to the government?
- . Can (or should) funds be taken from some other area of public spending?

Figure 5: Identification of Impacts



It may prove very difficult to get answers to the latter questions, but the planner should at least formulate the questions so the political decisionmaking body involved (i.e., the local, provincial or national government) is aware of the issues and can take decisions accordingly.

An integral part of the plan impact evaluation step should be an appraisal of the administrative framework of the government area development plan. Founded on a systems approach, the plan is of little value unless the administrative machinery is capable of effectively implementing and co-ordinating the various parts of the plan.

#### STEP 4

After examining the immediate and possible long-term impacts of the area development plan, the fourth step is to review the initial assumptions made in developing the population scenario in Step 1, Figure 2.

The necessity for this review step has been discussed earlier. If the age distribution of the population in an area has become more skewed towards the younger age groups, as a result of immigration to the area since Step 1 was undertaken, for instance, the various housing, health care and schooling projects drawn up on the basis of earlier information may prove inappropriate to the needs of the community. The development plan should be adjusted for such changes so that resources can be redirected to those areas where there is greater demand.

## STEP 5

The final step, as depicted in Figure 2, is a process by which the planner (or planning organization) reassesses the population scenario developed in Step 1 to take account of any changes in the critical variables identified in Step 4.

### Summary

The systems approach plan attempts to identify the optimum sequence of development within an area with regard to available resources, constraints and opportunities. Critical points in the development sequence have been highlighted to ensure that government agencies are aware of their responsibilities and can take steps to ensure that their separate activities are consistent with the overall sequence of the plan.

The systems approach to area development has many advantages:

- . It allows all agencies of government to plan their activities with consistent information and avoids duplicating the efforts of other agencies;
- . It facilitates coordination of the activities of the individual government agencies and thereby helps to minimize the public sector costs associated with area development;
- . It avoids the situation of having a government make unwarranted or premature commitments to particular area development projects; and

- . It enables the government to more easily determine the merits of individual projects by reviewing them within a comprehensive framework and to assigning priorities to the various development proposals.

The environment in which planners or planning agencies work is constantly changing. The systems approach to area development planning provides a mechanism by which planners can adapt to these changes.

### III. GUIDELINES FOR SELECTION OF SUITABLE AREAS FOR LAND-USE PROGRAMMING

#### Urban Structure in Thailand

The hierarchical structure of Thailand's urban centers is highly distorted by the overwhelming primacy of Bangkok. In 1979, Metropolitan Bangkok is estimated to have had a population about 40 times that of the next largest city, Chiang Mai.<sup>1</sup> Sixty-nine percent of Thailand's total urban population resided in Bangkok in 1980, as compared with 65 percent 20 years earlier.<sup>2</sup>

Although Metropolitan Bangkok demonstrates an extreme case of primacy in urban hierarchies, it is not among the larger or more rapidly growing cities in the developing world. However, only three "middle income countries" in the developing world have a higher concentration of the total urban population of their respective countries in a single primate city -- leaving aside Hong Kong and Singapore.

Nationally, Thailand's urban population accounted for only 14 percent of total population in 1980, as compared with 13 percent in 1960 -- with over 9.5 of the 14 percent of the urban population residing in Bangkok. Viewed from a broader perspective, Thailand is one of the least urbanized countries in the world. Of the 52 "middle income countries" -- as classified by the World Bank -- only one, the Yemen Arab Republic, has a smaller percentage of its population classified as urban. And the percentage of population classified as "urban" has increased at a lower rate in Thailand, 1960 to

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1. World Bank, "Economic Motivation Versus City Lights: Testing Hypotheses About Inter-Changwat Migration in Thailand," Staff Working Paper No. 416, Washington, D.C., 1980, p.1.

2. World Bank, World Development Report, August 1980, Annex Table 20.

than 100,000 population). This constraint should be given very careful attention in selection of municipalities for future applications of the land-use programming techniques.

The constraints to balanced development imposed by incomplete and/or distorted patterns of urban development are succinctly described by Rondinelli and Ruddle in their recent study of the relation of urbanization and rural development. Although the following quotation is based on their studies in several developing countries, including Thailand, their observations are consistent with the Consultant's findings in Chonburi Changwat, particularly in the eastern part of the Changwat:

In brief, developing nations exhibit a wide variety of spatial patterns with settlements that perform highly differentiated sets of functions and services. The problem is that in many countries essential components of the spatial hierarchy, especially in the middle levels, are missing, underdeveloped, or poorly distributed and that the linkages and interactions among settlements are absent or not well-developed. The majority of the population, especially the rural poor, live in scattered villages too small to support basic services and facilities and too isolated to benefit from the growth of large urban places. Thus, the dynamics of trade that stimulated commercialization of agriculture and industrialization in economically advanced nations and that spread the benefits of growth widely throughout the nation do not easily occur in developing countries with unbalanced spatial systems.<sup>1</sup>

In the typical functional hierarchy of urban places, the types and extent of services follow a somewhat regular progression in the number and complexity of services from

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1. Dennis A. Rondinelli and Kenneth Ruddle, Urbanization and Rural Development (New York: Praeger Publishers, 1978), p. 76.

the smallest urban centers to the largest. Because of the wide gap between the primate city and other urban centers in Thailand, the symmetry of this pyramid of cities/functions is distorted.

While the functional hierarchy is not a normal one in Thailand, it does, in general, exhibit some patterns found in other, more typical countries, as observed in the study by Professors Dennis A. Rondinelli and Kenneth Ruddle.<sup>1</sup> Provincial administrative centers such as Chonburi Municipality provide a wide range of urban services, including government services, as well as financial, marketing, and other services. In the special case of Chonburi Municipality, a large role is played by the sanitary district which adjoins the municipality to the east and southeast. In fact, the Provincial Hospital, a major medical facility, and many commercial and service establishments are located in the contiguous sanitary district rather than within the municipal boundaries.

Considering the municipal area of Chonburi and the sanitary district as the primary functional urban center, a second category of centers is to be found in the amphoe or district centers. The range of services and facilities in the district centers is reasonably broad, although heavily concentrated toward consumers' goods, agricultural inputs, and assembly functions for raw materials produced in the district. A third level is the tambon or local market, which has a narrower range of commercial and service facilities, although, again, with some medical facilities, usually in the form of a clinic.

Finally, at the village market level, the functions are reduced to a much smaller number of establishments serving a

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1. Rondinelli and Ruddle, pp. 67ff.

highly localized population through general stores, hardware stores, and repair shops.

However, a noticeable sprinkling of larger-scale manufacturing and processing establishments exist along Sukhumvit Road south of Bangkok and at a few other points still further south, even below Chonburi Municipality. As the planned industrial development on the Eastern Seaboard is realized, there is almost certain to be a further spread of industry in the region based in part on deepwater ports, extension of the rail line, an excellent North-South highway, and the siting of industries using natural gas and its byproducts.

Somewhere along the Eastern Seaboard, one or more urban centers will almost certainly develop, which, because of size and a sufficiently rapid rate of growth, will justify and provide a reasonable opportunity for successful application of the land-use programming technique.

Some Suggested Considerations for  
Future Application of Land-Use  
Programming in Thailand

Introduction

The techniques used in land-use programming are described elsewhere in Volume III, particularly in Chapter IV. In this section, attention is directed to selected institutional, administrative, financial, and demographic factors that will inevitably affect the success of land-use programming in Thailand.

Demography

Although since 1960 urban growth in Thailand has been relatively modest compared with urbanization rates in other

middle income countries, this relatively low rate of growth in the urban cohort of the Thai population is not likely to continue beyond the early 1980s. During the 1960s and 1970s, rural migration was undertaken primarily to exploit new areas for cultivation, accompanied by introduction and expansion of new export crops, cassava and maize. These crops permitted expansion of cultivation on lands that were not suitable for rice, and thus served as an alternative to migration to urban areas. This alternative may be nearing exhaustion; the environmental damages of deforestation have appeared in the form of soil erosion, flooding, and siltation of streams.

Inter alia, the pattern of increased urban growth will be affected by government policies designed to bring about more rapid growth in designated provincial or regional growth centers. Therefore, demographic trends and projections should be included in the criteria for selecting urban centers in which land-use programming might be applied. These projections will, in turn, reflect planned job-creating projects and programs.

### Institutional

Land-use programming is properly viewed as an ongoing, iterative process covering a broad range of activities from data collection through the monitoring of project implementation, and design of operational responsibility. As a continuing process, rather than a periodic exercise, land-use programming requires a "home."

Experience in the Chonburi, Siracha, and Phanat Nikhom project indicates that the resources of the typical "intermediate size" municipality in Thailand are too limited to provide an adequate institutional base for the minimal professional and supporting staff. The resource constraint is

closely related to the limited areas over which some of the municipalities have administrative authority over land use, as well as the limited areas of land suitable for additional urban uses.

Together with the absence of "intermediate size" municipalities in the range of 100,000-500,000 population, the practical obstacles to enlarging municipal boundaries to include areas for planned growth, including the areas already experiencing substantial population growth, a realistic institutional base for land-use planning should be sought along one or more of the following lines:

1. The Changwat Planning Offices should have their planning capabilities strengthened and given authority to carry out land-use programming activities in areas in which rapid population growth is expected, or being experienced. This would include areas within municipalities, in sanitary districts, or in ribbon developments along major thoroughfares such as Sukhumvit Road.
2. Consideration should be given to the establishment of metropolitan planning districts which, for example, would include established municipalities and heavily populated and rapidly growing contiguous areas adjoining the municipality whether or not these are now included in sanitary districts.
3. Where, as in the case of the Eastern Seaboard, there is likely to be rapid urbanization in coastal portions of both Chonburi and Rayong Changwats, consideration should be given to the feasibility of establishing special planning districts that would include, among their other responsibilities, land-use programming, conventional planning, and land-use controls.
4. Finally, if as has been suggested by one feasibility study, a large industrial estate/port complex projected to have an ultimate population of about 300,000 persons develops in the Laem Chabang area, such a city might provide adequate resources for land-use programming as well as an opportunity to apply this technique without many of the constraints imposed by existing land uses.

### Jurisdiction

In selecting urban centers for application of land-use programming, as has been indicated earlier, care should be exercised to select not only areas with prospective or prevailing rapid population increases but also areas having jurisdiction over areas with unused but usable land to accommodate urban population growth. The problem, particularly in Chonburi, as has been noted, is that the municipality, which was the agency with responsibility for land-use programming, was growing at a very slow rate, while it was being used as a service center by a very rapidly growing and larger population outside the municipal boundaries, over which it had no planning jurisdiction. With the finding of nonfeasibility for the reclamation project, the land-use programming approach provided little potential assistance in this municipality.

### Financial

Finance, as well as many other government functions, has long been highly centralized in Thailand. Both the current Fourth National Economic and Social Development Plan and the upcoming Fifth Plan place emphasis on achieving decentralization in administration as well as a spatially improved distribution of population growth and economic activity.

Although it is not absolutely necessary that financial resources for municipal governments be obtained from local tax and non-tax sources, it is necessary, if municipalities throughout the Kingdom are to have some control over their own fiscal affairs, that the amount of funds transferred from centrally collected revenues be allocated in some predictable fashion, be it on the basis of population,

revenues originating in the area, or priority projects. So long as local finance remains largely dependent upon ad hoc decisions to finance development projects, it will be very difficult for the land-use programming procedure to lead to orderly growth.

## Linkages

### Introduction

From a functional viewpoint, Thailand's urban hierarchy is not well-developed, as evidenced by the overwhelming primacy of Bangkok and the absence of intermediate size cities. The importance of agriculture, the high percentage of the labor force engaged in agriculture (77 percent in 1978), and the nature of the major agricultural products (rice, sugar cane, maize, and cassava) do not give rise to extensive processing that would promote urbanization. For the most part, these products are consumed and/or exported following single stage processing in rural areas.

### Economic Linkages

The major agricultural products noted above do not provide extensive opportunities for economic linkages in the form of processing in urbanized areas. Thus, an "economic linkage" between different stages of production and between nonurban sources and urban processing centers has not developed on a large scale in the case of the former group of rural products, i.e., rice, cassava, maize, and sugar cane.

However, Thailand produces a number of other primary raw materials that require more extensive processing: e.g., rubber, tin, kenaf and jute, precious stones, and marine

products. Varying amounts of these primary materials are fabricated into products for use in Thailand and for export, including sales to tourists -- mostly in Bangkok and one or two other tourist destinations in Thailand.

Production of textiles and -- more recently -- finished garments for export and the tourist trade have increased rapidly, providing urban type employment opportunities, some of which may be located outside the primate city. For example, employment in textile establishments in Chonburi Changwat with five or more workers rose from 61 in 1969 to 225 in 1976. However, the source of inputs for production of textiles in the Changwat is not identified.

Economic linkages based on manufacturing or processing of local (regional) raw materials and/or intermediate products are particularly important in the growth of viable intermediate size cities in Thailand, if these cities are to have a functional role in general rural development --as well as providing a more balanced spatial pattern of urbanization and economic development. In short, "economic linkages" constitute a mutually supportive association in which economic growth in one area stimulates similar expansion in the "linked area."

#### Physical Linkages

In addition to economic linkages, the development of viable intermediate or secondary urban centers will require transport linkages for the movement of goods and people. Although provision of infrastructure is one of the planning components of land-use programming, total development cost can be minimized by choosing areas that have a general transport network in place, if other characteristics, including projected population growth, are conducive to successful application of land-use programming.

For much of the central portions of Thailand, the transport network is fairly well-developed. With the addition of the rail extension from Chachoengsao to the Sattahip port area, there will be excellent north-south road and rail connections along the Eastern Seaboard. The rail line also extends along the southern portion of the peninsula through Malaysia and to Singapore. Transport linkages with Burma are largely undeveloped, while those with Laos and Kampuchea have been rendered largely unusable in recent years by political instability.

In fact, almost any area experiencing rapid growth of the type in which land-use programming would be appropriate is likely to have inter-urban basic transport infrastructure in place. Thus, these physical linkages, alone, will not generally be a determining factor in selection of areas.

#### Other Forms of Linkage

In their study of urbanization and rural development, Rondinelli and Ruddle mention several other types of linkages, that merit consideration in selecting areas for use of the land-use programming technique. Among the other types of linkages noted are the following:<sup>1</sup>

- . Political, Administrative, and Organizational Linkages. These include the linkage of provincial governments with the central government and of the various subprovincial divisions with the Changwat government headquarters. These linkages may include not only traditional government controls but also such matters as public health, education, and welfare services.
- . Service Delivery Linkages. Linkages of this type resemble economic linkages in the delivery of credit and financial transactions, health delivery, and provision of technical and commercial services.

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1. Rondinelli and Ruddle, Table 3, p.162.

- . Demographic Linkages. Where good physical linkages exist, a part of the labor force in urban centers may commute to and from nearby rural areas, mixing non-agricultural employment with part-time farming activities. In other instances, urban centers may have attracted, over the years, migrants from nearby rural areas and thus the urban centers have taken on special demographic characteristics of the areas from which they came, and with which they will continue to maintain close family and, perhaps, economic ties of the type characterized by Rondinelli and Ruddle as "social inter-action" linkages.

#### IV. TECHNIQUES

In this chapter, each of the following techniques is described:

Compilation and Analysis of Demographic Data

Manpower Forecasting

Industrial Location Analysis

Economic Structure Analysis

Cadastral Survey Techniques

Forecasting Future Land Area Needs

Establishing Objectives

Project Preparation

Social Cultural Factors Influencing Urban Land Use

Economic Impact Evaluation

Social Impact Evaluation

Environmental Impact Evaluation

### Compilation and Analysis of Demographic Data

There are various techniques for projecting the populations of small areas. The choice of method will depend largely on the data and time available, purpose for which the projection is required and, most importantly, the assumptions upon which the projection is to be based. None of the techniques is ideal. Only an analysis of conditions will indicate which technique would be the most suitable.

In dealing with demographic data, there is a temptation to assume that the forces operating on the population in the past will continue in the future. This misleading assumption is the principal cause of inaccurate population forecasts.

#### Past and Present Population (Data Source)

All information regarding births, deaths and population movements are recorded in the "Monthly Registration Summary Forms" for each Muban. These forms are completed each month at every Amphoe office for all Mubans within the Amphoe.

In addition, a summary form is completed each month for each Amphoe, Tesabahn and for the Changwat as a whole. Three copies are made: one is kept at the Amphoe or tesabahn office, one at the Changwat office, and one at the Central Registration Office in Bangkok.

#### Definitions:

- . Rate of population growth = Rate of net natural growth + Rate of net migration.

- . Rate of net natural growth =  $\frac{\text{births-deaths} \times 100}{\text{mid-year population}}$
- . Rate of net migration =  $\frac{\text{net migration} \times 100}{\text{mid-year population}}$
- . Net migration = immigration - Emigration

Migration for Chonburi Province comprises movement to and from other provinces in the Kingdom, including a negligible amount of emigration and immigration, and does not include movement within the Province.

Migration for districts and municipalities comprises movement to and from other districts and municipalities within the province, and to and from other provinces in the Kingdom.

Migration for village comprises movement to and from other villages within the surrounding district, to and from other districts within the province and to and from other provinces in the Kingdom.

### Forecasting Techniques and Case Study

#### Graphic Techniques

Population may be projected using graphic techniques comprised of three main steps:

- a. Plotting population against time for past census years.
- b. Sketching a line which fits this past data, and

Table 3. Population Characteristics  
Of Changwat, Amphoe, Tesbahn and Muban

Area	Population Dec. 1977 (in 000s)	Population Density Km <sup>2</sup>	Sex Ratio Dec. 1977 Male to 100 Female	Growth Rate 1977 (Percent)		
				Total	Natural Increase	Net Migration
<u>Changwat</u>	681.2	151	110	1.8	2.1	-0.3
<u>Amphoe</u>						
Chonburi	110.7	492	110	2.8	1.5	1.3
Phanat Nikom	126.4	84	104	2.8	2.2	0.6
Phanthong	26.9	145	97	0.6	1.6	-1.0
Bang Bung	76.3	128	111	0.3	1.9	-1.6
Siracha	78.6	160	118	0.7	1.2	-0.5
Bang Lamung	70.7	97	110	0.7	1.4	-0.7
Sattahip	80.9	232	145	0.9	1.6	-0.7
Koh Sichang	2.8	155	101	3.4	1.7	1.7
Nong Yai	16.7	50	129	3.0	2.7	0.3
<u>Municipality</u>						
Chonburi	49.5	10,862	106	1.0	0.8	0.2
Phanat Nikom	13.1	4,757	97	0.7	0.9	-0.2
Siracha	18.6	4,593	100	6.6	18.4	-11.8

Note: The exceptionally high rate of population growth in Siracha Municipality appears to reflect the underregistration of the out-migration of infants born in Siracha Hospital. As a result, an erroneous picture of the size and character of the resident population is produced. The unnatural "natural increase" in Siracha Municipality may be attributed to the presence of a highly reputable hospital to which come an unusually high number of parturient women. Many of the infants born in this hospital, and registered there, are not subsequently de-registered when returning home with their mothers. The fact that a large number of infants were de-registered accounts for the unusually high net rate of out-migration for the municipality; in fact, this rate should be much higher.

- c. Projecting the line to estimate the population in future years.

Graphic techniques may be classified as either linear or non-linear curves.

### Linear Projections

Linear curves follow the steps outlined above but, in this case, only two past dates are used. These points are joined by a straight line which is then extended to the horizon year.

Variations arise in the choice of points to be used: to use the most recent census points implicitly assumes that conditions in the future will essentially be the same as those in the immediate past. Similarly, to use the last census count with an earlier census suggests that the immediate past reflects some conditions which are not expected to reoccur in the future.

A somewhat more reliable method is a free-hand straight line drawn representing a "best fit," i.e., that coming closest to the points representing a number of census enumerations. In census years in which non-recurring factors are known to have affected the size of the population enumerated, the point representing the population in that year might be disregarded. This assumes that the future population will be in some degree a result of varying factors similar to those which caused the historical population changes.

### Non-Linear Projections

While each of the linear techniques assumes constant absolute growth increments for each time period, non-linear projection techniques recognize that the changing population will grow by different absolute increments.

Non-linear projections are difficult to derive by free-hand methods, and are best derived by mathematical techniques.

Extrapolation by Mathematical Function: For several of the projection techniques there exist formal mathematical functions. These relationships take the following generalized form:

$$P_{t+n} = P_t + f(n) \text{ where}$$

- $P_{t+n}$  is the population at any year  $t+n$
- $P_t$  is the population at the base year  $t$
- $n$  is the number of years from the base  $t$  to the forecast year  $t+n$
- $f$  is the mathematically derived function reflecting the assumptions being made.

The simplest function is the first degree polynomial or straight line and takes the form:

$$P_{t+n} = P_t + c(n) \text{ where}$$

- $P_t$  is the actual population at base year  $t$
- $n$  is the number of years from the base year, and

c is the annual average absolute increment derived from past data over a relevant period.

### Higher Order Polynomials

When sufficient data are available, polynomial equations higher than the first order may be used in population projections. Only one will be discussed here -- the exponential represented by the compound interest formula.

### Compound Interest Growth Rate

The formula expressing this curve takes the form:

$$P_{t+n} = P_t + \frac{1+r^n}{100}$$

$P_{t+n}$  is the population at the horizon year  $t+n$   
 $P_t$  is population in the base year  
 $r$  is the annual rate of increase  
 $n$  is the number of years from the base to the year for which projections are to be made.

The value of "r" is mathematically derived from historical data. In the following illustration this "r" will be based on 1970-1976 trends. Alternatively, when this rate has been established, one may decide to vary it on the basis of anticipated events (e.g., major industrial expansion or recession).

As a rough approximation, and when the historical population data describe roughly a straight line when plotted on a logarithmic scale, the annual (percentage) growth rate may be calculated as follows, using data for Siracha as an illustration:

- (1) Divide the population in the latest year for which data are available by the population in an earlier year. The time interval between the two selected years should cover a period in which the socioeconomic factors affecting population growth have remained relatively stable.

Example: Siracha Municipality

- |     |   |        |
|-----|---|--------|
| (a) | Population, 1976  | 17,386 |
| (b) | Population, 1970  | 16,116 |
| (c) | (a)/(b) = 1.0788  |        |
| (d) | From a compound interest table, the multiple of 1.0788 for a period of six years is found as equivalent to an <u>annual</u> rate of growth of between 1.2 percent and 1.3 percent per annum, interpolated as 1.272 percent. |        |
| (e) | Apply this rate, cumulatively, to the base year, 1970 ( $16,116 \times 1.01272^6$ ) which gives a population of 17,386 for 1976 as a check.   |        |

- (2) Using the compound interest table, population may be projected to any desired year by:
- (a) Locating the column at 1.2 percent and 1.3 percent
  - (b) Reading down to the line indicating the number of periods (years) for which the projection is to be made. For example, for Siracha:

<u>Year of Projection</u>	<u>I</u> <u>1.2%</u>	<u>II</u> <u>1.3%</u>	<u>III</u> <u>1.272%</u>
1980	18,158	18,338	18,228
1985	19,273	19,562	19,481
1990	20,458	20,867	20,752

- (c) The projections in Column III are interpolated from Columns I and II, as follows: Column I +  $\frac{.72}{.1}$  (Column II - Column I), e.g., for 1990:  $20,458 + .72 (409) = 20,752$ .

- (3) This method of projection does not generally produce projections that are realistic for more than a few years beyond the latest actual population.

As the rate of growth derived will be affected by the selection of only two years' data -- the early and recent years -- in a time series that may extend over two or more decades -- it is subject to significant errors. The method could be substantially improved by fitting a least squares regression equation to the logarithms of population for each year of what is considered to be a period of "normal" population growth, in which the forces affecting growth are expected to continue over the period for which the projection is to be made.

In addition to reducing the distortions that may result from the use of only two years, the fitting of a regression equation will provide measures of the degree to which year-to-year changes in population conform to the pattern described by a compound interest curve. This may be helpful in deciding on the reliability of projections, at least over short periods of time during which the basic determinants of population growth remain reasonably constant.

### Comparative Forecasting

This method is relatively simple in practice, but has complex implications. The future growth of the study area is assumed to follow the pattern of another older area whose earlier growth has exhibited characteristics similar to those anticipated for the study area.

By selecting as a "pattern of growth area" in which growth has stabilized following growth-inducing intervention, the course of growth of the study area may be defined. Once such a pattern area has been selected, the desired forecast is obtained by extending the growth curve of the study area into the future, according to the past growth curve of the pattern area.

An example of the comparative forecasting technique is found in the Laem Chabang Deep Sea Port Study (p. 116-153, Chapter 9) prepared by NEDECO. In this discussion, on new town settlements related to port development, NEDECO presented the following scenario based on a similar project in Ghana.

#### Occupation

Employment directly related to port	6,000 pers.
Resulting Employment from port	6,000 pers.
Industrial Area (1,100 ha/30-40 per/ha)	<u>38,500</u> pers.
	50,500 pers.
Spread Employment in Industry	9,500 pers.
Employment in Services	<u>60,000</u> pers.
	120,000 pers.

### Family Structure

Size	6.5 pers/fam
50% in labour force	3.25 pers/fam
10% partially employed	.35 pers/fam
20% without employment	.65 pers/fam
Active employees	2.25 pers/fam
Projected Population	
(120,000/2.25) x 6.5 = <u>350,000 people</u>	

### Problems

The main problem arises in the prior selection of the pattern area. First it is necessary to find an older area where the initial growth (social, economic and political determinants) is comparable to those anticipated for the development of the study area.

The second problem is that if there is an identified pattern area whose initial growth characteristics do compare with the present stage of development of the study area, will the future growth of the study area parallel what is actually past growth of the pattern area, not only in general character but also the same span of time?

Furthermore, comparability of social, economic and political conditions must be established. Such comparability implies not only that forces of population growth which operated in the past will operate in the future, and potentially across different political and cultural systems, but also that they will do so with the same intensity and timing.

### Cohort Survival Method

This method is modeled generally after the analytical approach used in developing estimates for the nation as a whole.

Briefly, this method adjusts figures from the last census forward by age and sex groups year by year to the date of forecast, with separate adjustments made for each of the three major components of population change: death, births, and net migration.

A variation on this approach records the change in population by five-year intervals, using a fertility ratio to fill in data for new persons appearing in each new 0-4 age group. (The fertility ratio is the number of children aged 0-4, inclusive, per 1,000 females of child bearing age at the end of this five-year period.)

Each variable is estimated separately and adjustments are made to establish what the next year's population (or that of the next five-year interval) is expected to be.

Separate tables are developed for males and females, and additional separate tables can be developed for different races.

Death rates (age and sex-specific or by five-year intervals) are determined from standard life tables.

Age-specific birth rates or, alternatively, fertility ratios for five-year intervals, are estimated by reference

to special studies of long-range trends in local birth rates.

Net migration rates (age-specific or by five-year intervals) are estimated by reference to studies of past trends in migration and future employment prospects.

The table illustrates the mechanics of the process used for carrying estimates forward to the date of the forecast. It illustrates the variation on this method that makes the analysis by five-year intervals and employs fertility ratios.

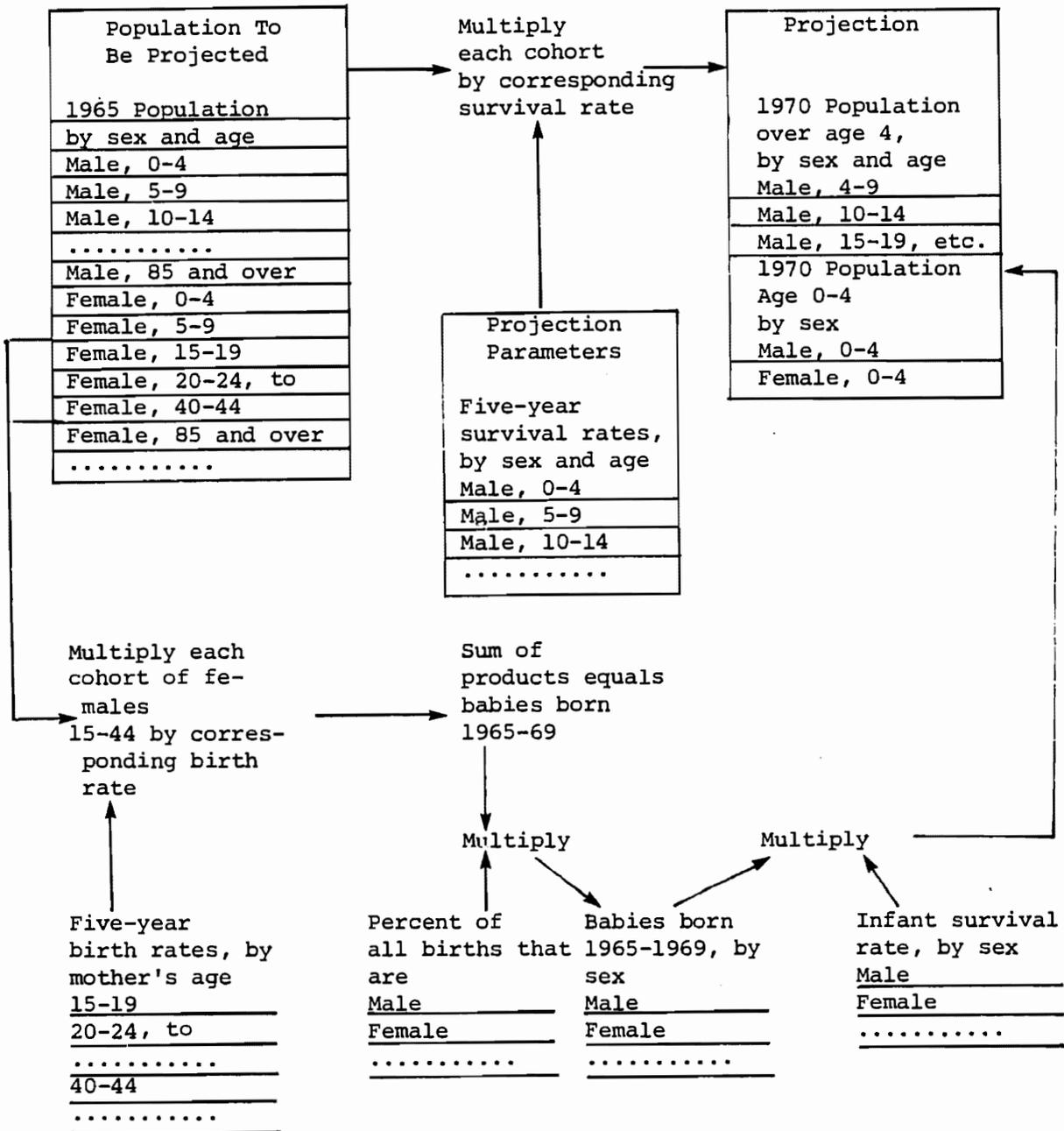
The arrows indicate how each chart is carried forward from the base date to the forecast date. The first succession of steps derives from abridged life tables for the appropriate age groups, death rates which are used in computing the number of survivors from each age group to be carried forward to the next age bracket at the beginning of the next five-year period.

In the next succession of steps, the net in- or out-migration is estimated by age groups for the same intervals of time and entered as the second adjustment shown in the figure.

The sum of the survivors and the in- or out-migrants from the original age group furnishes the estimate for the next highest age group at the beginning of the next five-year period.

The new 0-4 age group is obtained by applying the approximate fertility ratio to the number of females of child bearing age (usually 15-44) at the beginning of the last period.

Table 4. Cohort Survival Method



### Summary

In a very real sense, the use of mathematically determined values (or graphically approximated trend lines) based on historical rates of change in population in comparatively small areas to project population changes expected to result from government interventions designed to effect changes in the spatial distribution of economic activity and, hence, employment and population, is a logical contradiction. If such projections are to have any real value in the preparation of guide plans, and the programming of land use in space and time, there is no short-cut to the time-consuming tasks of estimating the direct and secondary impacts of each intervention on employment; and on the size of population required to meet the newly generated demand for workers, and, through this method derive land requirements for residential, commercial, industrial and public uses.

Of the methods described above, the cohort survival approach, when employed with careful estimates of employment and population induced to the area by intervention of the government, or other exogeneous factors (e.g., discovery of gas, petroleum or some other valuable resource), is probably the most reliable technique for population projections.

At best, long-term (over 5-year) projections of population should be avoided. In fact, the concept of land use programming has as one of its principal virtues the development of a process of continuous review and modification of the planning horizon -- preferably on an annual schedule

that will maintain a five-year horizon. This enables planners to maintain flexibility, while at the same time, remaining a few years ahead of requirements for land, infrastructure and services to meet the needs of growth in population.

### Manpower Forecasting

The rate of economic growth of any regional economy depends on two elements: first, the rate of growth in employment; and, second, the rate of growth of output per worker. An essential part of development planning, therefore, is to forecast the future supply and demand of labor.

Forecasting the supply and demand for labor involves two essential steps: first, the demand for labor forecasts may be prepared, and second, they may be matched with the supply of labor forecasts.

#### Demand for Labor

Of the two elements of manpower forecasting, the demand for labor is the most difficult to determine. There are two basic complementary approaches best suited for forecasting labor demand -- the "inquiry" method and the "statistical" method.

The inquiry method assumes that future manpower requirements are already known to, or can best be estimated by, the employers themselves. In the short run, this method has proven to be reliable, but in the long run few employers forecast more than three to five years ahead.

The second category of methods for forecasting the demand for labor is statistical, in which the future evaluation of manpower demand is deduced by the forecaster from recorded past and present trends.

Compared with the inquiry methods, statistical methods have the advantage of producing figures by a single consistent method. The primary disadvantage is that they cannot directly take into account information of a qualitative nature, information that is available at the plant or industrial level.

While statistical methods can be applied to forecast the demand for labor, the conditions promoting an economy's growth in the past may not necessarily reflect its rate of growth in the future. This is especially the case when large-scale interventions by government are involved.

Perhaps, then, the method of approach most suitable to determine labor demand is a combination of both the inquiry and statistical method.

### Supply of Labor

The problem of forecasting labor supply is in identifying and assessing the component elements of the availability of labor. In general terms, the future work force may be forecast by applying projected activity or participation rates to the working population as predicated by the population forecast. The limitation of this method lies in the reliability of the population projections and on the accuracy

of the activity rates used. In forecasting labor supply, the following elements need to be measured.

### The Unemployed

Where the rate of unemployment is high and/or underemployment is pervasive, there exist labor resources either directly available or available after training, and where the employment rate is high, labor shortages exist. A low rate of unemployment, however, may actually represent a large number of unemployed; yet these people may not constitute a labor resource. A low rate of unemployment could indicate that any potential labor is utilized.

The significance of the unemployed as a potential labor resource for industry depends upon the extent to which they can be regarded as capable of work. The pertinent information is not only the number of unemployed, but their characteristics of age, mobility, desire to work, training, etc., as well.

### Labor Activity Rates

The unemployed can be considered part of the labor force that is temporarily out of work, or as large numbers of people of working age who do not participate at all in the labor force. An activity rate, then, is defined as the proportion of the population of working age that works, or is actively seeking work. Estimates of labor supply can often be made by calculating activity rates and then matching them with figures of the population of working age.

**Example:**

given - population 15 years and over 150,000  
          participation rate = 75 percent  
then - labor force = 112,500  
      - inactive persons = 37,500

In preparing forecasts of labor supply, the participation rate is crucial; however, the participation rate -- and the size of the labor force -- is affected by employment opportunities and a variety of cultural and other factors.

**Migration**

An increase in the supply of labor in an area may result if the area receives a net migration gain of working population. The potential gain will depend upon both the size of the net flow and the socioeconomic characteristics of the immigrants.

**Young Persons**

An important contribution to the supply of labor is made by persons entering the labor force for the first time.

**Forecasting Labor Supply**

Labor market studies provide information to forecast participation rates, which can then be matched with population projections to give labor supply forecasts. A crucial issue arises over the assumptions used in preparing the participation rate projections. The assumptions will cover many aspects of human behaviour, including raising the

minimum school graduation age, the increase in numbers of young people going on to full-time education, the demand for jobs by married women, together with some statement on overall demand for labor. The actual supply of forthcoming labor will depend upon the level of the demand for labor at any particular time. As participation rates are affected by the demand for labor, it must be emphasized that the supply of labor cannot be calculated independently from the demand for labor: both aspects of manpower forecasting must be integrated.

#### Industrial Location Analysis

Industrial growth is the key to economic development. While economic growth at the national level is a central issue, the problem also arises as to how it can be achieved at a regional or sub-regional level. In the development areas, for example, to realize the future objectives in terms of lower emigration, lower unemployment, higher participation rates, better employment opportunities and higher incomes, achieving high growth rates may be the most appropriate policy. Below the regional level there may be no figures of output available on which to base forecasts or projections. Consequently, all analysis below regional level must be based largely on statistics of employment. Even at the regional level, the availability or reliability of data may be poor. While a forecast may show no increase in employment, it need not be interpreted as implying that no increase in output is expected, for output could increase as a direct result of an increase in output per worker (productivity).

Industrial location analysis may be used to answer important questions related to a regional industrial structure. These questions may include: is the industrial structure specialized or diversified? If the structure is highly specialized, is this a weakness or a strength? What are the reasons for a region achieving certain rates of economic growth?

A useful task in an analysis of the industrial structure of a regional economy is to compare its growth against the growth of the national economy; in a sub-region study, a comparison with the entire region. Disparities in rates of growth of employment are often indications of differences in the employment structure of different areas.

When analyzing employment growth, it is important to remember two aspects of the choice of time scale. First, the time scale should be consistent with any changes in the Standard Industrial Classification, and, second, the time period adopted should conform to a complete trade cycle.

One of the techniques of regional analysis of industrial structure is the location quotient, developed to demonstrate the region's share of employment in particular industries. The location quotient has sometimes been used as a self-sufficiency ratio. In computing the location quotient, the base used depends upon the problem and region under study. In terms of employment, a necessary first step is to divide industry into four major sub-divisions: primary, manufacturing, construction and service industries. The location quotient can then be calculated in two ways:

1. Numerator: the region's percentage share of total national employment in a specific industry.

Denominator: the region's percentage share of total national employment in primary/manufacturing/construction/service industry.

Dividing the numerator by the denominator gives the location quotient. Where the value of the quotient is less than one, the region has less than a proportionate share of a particular industry; where the quotient is greater than one, the region has more than a proportionate share.

2. Numerator: the percentage of the region's total primary/manufacturing/construction/service employment accounted for by a specific industry.

Denominator: the percentage of nation's total primary/manufacturing/construction/service employment accounted for by the specific industry.

Dividing the numerator by the denominator gives the location quotient. This method yields the same results as the first method and the same interpretation can be applied to the values of the quotient.

The location quotient illustrates a region's dominance in a particular industry. While it does have a limited use on its own, the location quotient is useful when used in conjunction with related techniques on industrial location and structure. It may also have a useful role in economic base analysis in distinguishing between local and export markets. If a given region is highly specialized in the production of a particular commodity, the product is presumed to be a regional export item. And because regional

growth is seen to be dependent on the demand for goods external to the region, this distinction becomes important.

Coefficient of Specialization. This coefficient measures the extent to which distribution of employment by industry groups in a region deviates from the national distribution (or sub-region from a regional distribution). The method of calculation of the coefficient of specialization is:

Numerator: ratio of employment in industry  $y$  in the region to employment in primary/manufacturing/construction/service industry in the region.

Denominator: ratio of employment in industry  $y$  nationally to employment in primary/manufacturing/construction/service industry in the nation.

To calculate a coefficient of specialization, the numerator is subtracted from the denominator, without regard for sign, yielding values between 0 and 1. If the region had a mix of industry identical to that nation (or sub-region or region), the coefficient would be 0. Alternatively, if all the employment in a region is concentrated in a single industry, the value of the coefficient of specialization would approach 1.

Having calculated coefficients of specialization, the next task is to assess whether or not the degree of specialization should cause concern. A technique which can be adopted to answer this type of question is the shift ratio. While the coefficient of specialization provides information on the degree of specialization in an industrial structure, the shift ratio is a tool which assesses whether or not the degree of specialization is harmful or beneficial to the region.

This technique applies to the employment structure of a region the changes which have taken place over a period of time in the employment structure of the national economy. The employment estimates for the region thus obtained are compared with the actual growth which has taken place in the region; i.e., national growth rates are applied to a region's industrial structure. If the actual growth has been greater than the estimated growth, the regional economy may be said to have performed better than the national economy of which it is a part.

The shift ratio technique is particularly suitable for analysis of industrial structure at the regional level. However, for small regions, it must be recognized that a detailed application of the technique may be subject to what appear to be small changes but one that actually leads to substantial effects. This may be especially true where employment growth may be strongly influenced by the fortunes of a single firm. For small areas it is desirable to supplement these mechanical methods with analysis of non-statistical data. Unless the mechanical techniques are related to sound local knowledge, the results may not be very significant. As with all techniques, it is necessary to relate the sophistication of the method to the subject under study.

In using the shift ratio technique, one further qualification should be made. It is possible that the faster (or slower) rate of employment growth in a region is in direct relation to a faster (or slower) rate of population growth.

### Economic Base Analysis

Economic base analysis rests on the hypothesis that the existence and growth of a region depends on the goods and services it produces locally and sells, or exports. The economic base theory is applicable to the analysis of cities or regions, and while economic base analysis may be used to estimate regional multipliers, many urban and regional economic base studies have been used in a descriptive function to improve understanding of how a community earns its living.

Regional economic base analysis distinguishes two types of activity within the regional economy: first, "basic" activities which export goods and services, and, secondly, "service" activities which are consumed locally. The economic base of a region consists of those activities which provide the basic employment and income for the area and provides an understanding of the source and level of all employment and income in that region. Therefore, the economic base study is able to develop information which will help a community solve its local problems.

Economic base analysis has been linked with regional multiplier theory in the form of the regional "export base" theory -- the growth of a region depends upon the growth of its export industries. This theory suggests that expansion in demand external to the region is crucial in determining growth within the region.

Economic base analysis has been related to the idea of a "basic service" ratio, which is calculated in one of two ways:

- . The proportion between total employment in a region's basic or export activities and total employment in its service or local activities.
- . The proportion between the increase in employment in basic activities and the increase in employment in service activities.

From either of these basic service ratios, a regional multiplier can be easily calculated.

Formula:

The multiplier = total (or increased) employment in both basic and service activities as a multiple of total (or increased) basic employment.

A number of criticisms have been made of economic base analysis. First, there are serious difficulties involved in measuring the economic base. Economic base studies have used employment as the unit of measurement mainly because data on employment are more readily available than data related to other possible units of measurement, such as income or net output. However, data on jobs do not take into account different wage levels in different industries; for example, the same increases in employment in two industries paying significantly different wages will lead to different secondary (i.e., multiplier) effects.

Secondly, there are problems involved in distinguishing between basic and service activities. Many industries are mixed in that they cannot easily be wholly allocated to either of the two activities. One solution to this problem has been the application of location quotients to determine

the basic service division. For example, ratios greater than unity may be taken to indicate an export or basic industry, and the amount by which the ratio exceeds unity may be an indication of the extent to which employment is basic, i.e., serving markets outside the region.

Thirdly, there are substantial methodological problems involved in economic base theory which pose questions regarding its validity. The theory overemphasizes the role of exports, suggesting that a large weighting of basic industry will necessarily result in growth; the theory consequently underestimates the significance of imports. The existence of imports as a leakage from the circular flow of income raises questions concerning the usefulness of distinguishing between basic and service activities.

Fourthly, the economic basic analysis has been used as a planning technique to predict the growth of cities and regions. It might be expected that the ratio of basic to total activity will tend to fall as cities become larger, which will seriously weaken the base concept as an explanation of long-term growth.

While economic base analysis may be used as a technique to predict what type of employment/industrial structure is required in relation to specific population sizes, it must be recognized that the technique is constrained by a number of technical difficulties. However, the main advantage of the economic base concept is its simplicity, and it does provide a useful technique for purposes of both preliminary analysis and prediction. While the economic base method may

not be very accurate in making forecasts in the context of other forecasting techniques, this is not necessarily critical. The real value of an economic base study is its ability to pinpoint the problem areas of a region; it may, for example, reveal what sectors are in trouble and how the problems are related to other elements in the economy.

### Economic Structure Analysis

A knowledge of the structure and function of the urban or regional economy is fundamental to all land use planning. The density of an urban center is controlled by the extent and character of its production or income producing activity and by its general vitality. Thus, the economic base is the key to how the urban center developed and to its future prospects.

Viewed in these terms, the urban economy conditions the amount of land development that occurs. With a knowledge of the trends of growth (e.g., leveling off or decline in economic activity), the city planner is better able to develop yardsticks that assist in estimating the extent and character of changing land requirements that form the basis for a land development plan. For example, studies of employment are a key element in population forecasts and are used in determining land development needs. Estimates of future land requirements for industrial use are based on manufacturing employment and trends in wholesale, retail trade and services.

### Information to Consider

This discussion will present information on the economic generators at the Changwat and Amphoe level. Areas investigated were employment at the Changwat level, 1969 and 1976; employment at the Amphoe level, 1976; income distribution by industry, 1975; location of industries (major agro-industries and manufacturing); and worker density by industry.

### Existing Employment at the Changwat Level, 1969 and 1976

The Chonburi Changwat estimate of employment in 1976 was 19,532, distributed as shown in Table 5. However, the estimated employment levels do not include agricultural workers or government workers and establishments with less than five employees. This figure of 19,532 represents five or more employees per establishment employed in 532 establishments. In Table 5, there is another distinction that should be made, that is the difference between "number of workers" and "number of employees;" the former figure represents all workers, paid and unpaid family workers, whereas the latter figures represent only the paid employees. Table 5 thus shows that there are an estimated 18,024 employees engaged in active employment.

The major employment sectors with the highest number of employees, aside from manufacturing, are the commerce and the service sector. Within the manufacturing sector, the food/beverage and wood products industry engage the most employees. The food/beverage sector represents workers employed in rice mills, sugar factories and cassava industries. In the wood products sector, the employees are

Table 5. Employment Level in Establishments with Five or More Employees by Industry in Chonburi Changwat (Changwat Level)

Industry	1969			1976		
	No. of Est.	No. of Workers	No. of Employees	No. of Est.	No. of Workers	No. of Employees
All Industries	1,094	19,381	15,810	532	19,532	18,024
Mining & Quarrying	24	458	420	1	66	65
Manufacturing	334	8,704	7,779	200	8,993	8,622
Food and Beverages	227	4,585	3,963	107	5,124	4,946
Textile	1	61	60	1	225	224
Other Wearing Apparel, Except footweat	-	-	-	1	7	6
Leather, Leather and Fur Products	-	-	-	2	27	19
Wood and Cork Product, Except Furniture	18	2,108	2,067	13	1,212	1,178
Furniture and Fixtures	-	-	-	1	197	196
Chemical Products	2	384	383	3	385	382
Oil Refinery	1	221	221	3	535	532
Rubber and Rubber Products	-	-	-	2	31	24
Pottery and Earthenware	7	301	290	8	342	334
Non-Metallic Mineral Products	21	218	173	26	368	315
Iron & Basic Steel	-	-	-	1	64	60
Metal Products, Except Machinery and Transport Equipment	32	516	451	21	292	258
Machinery, Except Electrical Machinery	-	-	-	1	59	50
Transport Equipment	15	251	128	10	125	98
Stove Making	1	6	5	-	-	-
Manufacture of Thatch Roofing	1	6	5	-	-	-
Manufacture of Peanut Oil	3	29	20	-	-	-
Printing and Publishing	5	18	13	-	-	-
Electricuty & Water Supply	9	220	220	6	240	234
Construction	5	1,540	1,537	13	714	695
Commerce	321	2,817	1,408	137	2,126	1,948
Wholesale and Retail Trade	303	2,603	1,196	103	1,508	1,364
Banks and Financial Institutions	16	190	189	31	586	555
Insurance	2	24	23	3	32	29
Transport, Storage and Communication	52	1,1993	1,875	14	1,225	1,206
Services:	349	3,649	2,571	161	6,168	5,949
Educational Service	45	1,168	1,099	51	1,429	1,377
Medical and Health Service	3	26	18	1	6	5
Motion Pictures, Theatres and Related Service	4	55	48	10	182	166
Amusement & Recreation Service	-	-	-	2	185	183
Restaurants, Other Eating and Drinking Places	137	893	323	23	402	352
Hotel and Lodging Places	16	562	534	33	3,539	3,500
Repairing Service	62	485	319	37	341	287
Personal Service	82	460	230	4	84	79

from saw mills and wood processing plants. The service industry encompasses hotel and lodging categories and is reflected by the presence of the resort towns of Pattaya and Bang Saen. The commerce sector reflects the high number of wholesale and retail trade establishments.

The increase in employment and decrease in establishment levels in the food and beverage sector reflects a thinning out or combining of establishments and the introduction of several canning industries. The significant change in the wood products sector represents the depletion of local raw materials and the increased costs involved in transporting raw material from other locations.

Existing Employment at  
the Amphoe Level, 1976

The employment structure in Amphoe Muang follows closely that of the Changwat. Table 6 shows that the predominant employment sectors are, as in the Changwat, manufacturing, commerce and service, with 2,083, 1,418 and 1,241 employees, respectively. Within the manufacturing sector, food and beverage and the production of pottery and earthenware products employ the most people. In the commerce sector, the wholesale and retail category employ the highest number of people, and in the services sector, educational and repair services have the highest employment levels, followed by the hotel and lodging services.

Table 6 also shows the age structure by industrial sector. It indicates that most workers are between the ages

Table 6. Number of Establishments and Workers  
by Industry and Age in Amphoe Muang  
as of March 31, 1976

Industry	No. of Est.	Total	No. of Workers			Age				60 and over
			Em- ployee	Em- ployee	Unpaid Family	Under 12	<u>12</u> 14	<u>15</u> 17	<u>18</u> 59	
All Industries	300	5,503	333	4,945	225	1	136	306	5,006	29
Mining & Quarrying	1	66	1	65	-	-	-	-	66	-
Manufacturing	135	2,083	139	1,815	129	-	21	167	1,861	9
Manufacture of Food	83	899	86	778	35	-	1	17	852	4
Manufacture of Textiles	1	225	1	224	-	-	-	-	225	-
Manufacture of Leather and Leather and Fur Products Except Footwear and Other Wearing Apparel	2	27	3	19	5	-	2	7	18	-
Manufacture of Wood and Cork Products Except Furniture	4	41	6	31	4	-	-	1	40	-
Manufacture of Rubber Products	2	31	2	24	5	-	-	2	29	-
Manufacture of Pottery and Earthenware	8	342	8	334	-	-	-	70	271	1
Manufacture of Non-Metallic Mineral Products	8	113	8	62	43	-	-	24	89	-
Iron and Basic Steel Industries	1	64	1	60	3	-	3	-	61	-
Manufacture of Metal Products Except Machinery and Trans- port Equipment	19	262	19	233	11	-	10	36	212	4
Manufacture of Transport Equipment	6	79	6	50	23	-	5	10	64	-
Electricity, Gas and Water Supply	1	28	1	27	-	-	-	-	28	-
Construction	6	524	8	510	6	-	-	7	517	-
Commerce	79	1,418	87	1,302	29	-	43	23	1,349	3
Wholesale and Retail Trade	63	1,064	71	969	24	-	43	23	995	3
Banks and Financial Institutions	12	307	12	209	5	-	-	-	307	-
Insurance	4	47	4	43	-	-	-	-	47	-
Transport, Storage and Communication	6	143	6	132	5	-	-	3	140	-
Transport and Related Services	5	98	5	88	5	-	-	3	95	-
Communications	1	45	1	44	-	-	-	-	45	-
Service	72	1,241	91	1,094	56	1	72	106	1,045	17
Educational Services	17	376	29	317	30	-	-	3	373	-
Motion Picture Theatres and Related Services	7	144	7	134	3	-	-	6	137	1
Restaurant, Other Eating and Drinking Places	7	118	11	101	6	-	16	11	91	-
Hotel and Lodging Places	9	267	9	255	3	-	4	9	253	1
Repairing Services	29	272	31	228	13	1	51	77	132	11
Personal Services, n.e.c.	3	64	4	59	1	-	-	-	59	4

of 18 and 59. In terms of labor employment per establishment, Table 6 shows that the textile and pottery sectors have the largest number of employees per establishment. The hotel and lodging sector has a ratio of 1:30, and educational services a 1:22 ratio. In the commerce sector, banking and financial institutions have a ratio of 1:26, and wholesale and retail trade has a ratio of 1:17.

Income Distribution by Industry  
and Employee, 1975

The following information was collected in a survey on wages and income levels, undertaken by the Department of Labor (Changwat Level) in 1975. The investigation centered on the manufacturing sector with 10-99 employees. The results are based on information from 1,603 people.

Daily Wages: Of the 1,603 employees surveyed, 50 percent received a daily average wage of  $\text{฿}25$ . Of this 50 percent, 1 percent received an average of  $\text{฿}150$  for overtime work; 25 percent received a food allowance of  $\text{฿}267$  per month or  $\text{฿}9$  per day; 44 percent received an average housing allowance of  $\text{฿}175$  per month; 1 percent received a clothing allowance of  $\text{฿}360$  per year; and 7 percent received "other" forms of income.

Monthly Income: 611 employees (38 percent) received an average monthly wage of  $\text{฿}924$ . In addition to this monthly wage, 48 percent (294 employees) received an average food allowance of  $\text{฿}380$  per month; 54 percent received an average housing allowance of  $\text{฿}231$ ; 4 percent received a clothing allowance of  $\text{฿}43$  per month; and 12 percent received other allowances totalling an average of  $\text{฿}575$  per month.

Piece Work/Subcontract: This category represents 12 percent of the total surveyed. The average daily wage was reported at  $\text{฿}23$  or  $\text{฿}678$  per month; 28 percent received a food allowance at  $\text{฿}11$  per day or  $\text{฿}340$  per month; 35 percent received a housing allowance of  $\text{฿}5$  per day or  $\text{฿}152$  per month; and 2 percent received other allowances totalling  $\text{฿}89$  per month.

The daily wages ranged from a high average of  $\text{฿}41$  to a low average of  $\text{฿}16$ . The highest average monthly wage is shown to be  $\text{฿}1,687$ , and the lowest is reported to be  $\text{฿}500$ . The average wage for the subcontract work on a monthly basis was a high of  $\text{฿}2,683$  and a low of  $\text{฿}473$ .

#### Location of Agricultural Industries

Cassava: One of the most important agro-economic products in Changwat Chonburi is cassava, which is grown extensively in Amphoes Bang Bung, Bang Lamung, Siracha and Phanat Nikom. In 1976, there were 535 thousand rai planted with a production yield of 1,400,513 metric tons.

The processing factories, however, are not located close to the fields. Within Amphoe Muang, the processing factories are located in Tambons Ban Suan, Nongree, Huey Ka Pi and Samet. In Amphoe Siracha, the factories are located in the following Tambons: Nongkam, Tongsolka and Bang Phra. There is one processing facility in Amphoe Phanat Nikom located in Tambon Kutngong. Within Amphoe Bang Bung, there are processing factories in Tambon Nongsak, Klongkew, Nong-E-Roon and Ban Bung.

Sugarcane: Another important economic crop in Changwat Chonburi is sugarcane. In 1976 there were 347 thousand rai planted. Of this Amphoe Bang Bung had 148,660 rai under cultivation; Amphoe Phanat Nikom had 86,370 rai planted; in Amphoe Siracha, 76,320 rai were planted, and the remaining 35.6 thousand rai in other amphoes.

At present there are approximately seven sugar processing factories within the Changwat. These facilities are located mostly in Amphoe Bang Bung and Amphoe Siracha. Because sugarcane must be processed soon after harvesting, the factories are located near the fields.

Rice: In 1976 there were 377 thousand rai of rice planted in the Changwat. The main cultivation areas are Amphoe Phanat Nikom with 176,322 rai; Amphoe Phantong had 94,751 rai under cultivation. In Amphoe Muang there were 37,673 rai planted, and Amphoe Siracha cultivated 10,860 rai of rice. The remaining 57 thousand rai was in other amphoes. There are approximately 13 rice mills in Changwat Chonburi located in Phanat Nikom (four mills), Phantong (four mills), and the remaining five mills are distributed in Amphoe Bang Bung and Amphoe Bang Lamung.

Another agricultural product that is being promoted by the Ministry of Agriculture is the growing of peanuts. In 1976 there were 42 thousand rai planted. Most of the peanut cultivation is located in Amphoe Phanat Nikom.

In Table 7, the location of manufacturing and agro-processing industries with five or more employees is shown.

Table 7. Industrial Locations with Five or More Employees  
by Amphoe and Municipal Area

Industry	Muang			Siracha			Phanat Nikom			Phan Tong	Bang Bung	Bang La Mung	Sat- ta- hip	Ko Si Chang	Total
	Total Ind.	M.A.	Out of M.A.	Total Ind.	M.A.	Out of M.A.	Total Ind.	M.A.	Out of M.A.						
Rice Mill	-	-	-	-	-	-	4	-	4	4	4	1	-	-	13
Sugarcane (Sugar Mill)	-	-	-	3	-	3	1	-	1	-	3	-	-	-	7
Cassava	48	-	48	14	-	14	2	-	2	2	10	11	5	-	92
Fish Sauce	4	2	2	-	-	-	-	-	-	-	-	-	1	-	5
Clothing & Footwear	1	-	1	-	-	-	-	-	-	-	-	-	3	-	4
Sawmill	-	-	-	1	-	1	2	-	2	-	1	-	-	-	4
Wood Products & Furniture	3	2	1	2	1	1	4	1	3	2	-	1	5	-	17
Match	-	-	-	5	-	5	1	-	1	-	1	1	-	-	8
Food & Beverages	1	-	1	3	1	2	-	-	-	-	1	-	1	-	6
Ice	5	2	3	3	-	3	1	-	1	-	-	-	1	-	10
Type Retreading	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Oil Refinery	-	-	-	3	-	3	-	-	-	-	-	-	-	-	3
Pottery & Earthenware	3	-	3	-	-	-	-	-	-	-	-	-	1	-	4
Cement & Concrete Products	11	2	9	-	-	-	1	-	1	4	-	-	-	-	16
Engineering & Metal Products	18	9	9	2	-	2	-	-	-	-	1	-	1	-	22
Transport Equipment	37	7	30	3	1	2	2	-	2	-	-	-	-	-	42
Cold Storage	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Animal & Vegetable Oil	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Glucose	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1
Doll	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1
Asphalt	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1
Brick Making	-	-	-	-	-	-	-	-	-	17	-	-	-	-	17
Purification	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Total	135	27	108	42	3	39	18	1	17	29	21	15	18	-	278

M.A. = Municipal Area

### Cadastral Survey Techniques

In carrying out a cadastral survey, the approach should be twofold. First, existing data should be collected from available sources. Second, where data are not available, a field survey should be conducted in the study area. The purposes of the field survey are to fill in gaps of information and to serve to verify information obtained from other sources. The following outline presents the kinds of information that should be compiled for the cadastral survey. The data should be presented in the form of a map, when possible, or in the form of charts and tables when appropriate.

1. Types of Land Use:
  - 1.01 - Existing Land Use on Ground Level
  - 1.02 - Existing Land Use (showing mixed use, i.e., residential - commercial, residential - industrial, etc.)
  - 1.03 - Change in Land Use (availability by comparing past master plan reports)
  - 1.04 - Growth Pattern over a 15-year Period.
- 1a. Land Use Classification Breakdown:
  - Residential:
    - 1.05 - Population Density per square kilometer (low, medium, high)
    - 1.06 - Intensity of Use (floor area per rai)
  - Commercial:
    - 1.07 - Type of Commercial Activity (wholesale, retail, mixed)
    - 1.08 - Type of Goods and Services
    - 1.09 - Intensity of Use (floor area per rai)

Industrial:

- 1.10 - Type of Industry (cottage, light, medium, heavy)
- 1.11 - Type of Product
- 1.12 - Size of Factory (in terms of number of workers)
- 1.13 - Intensity of Use (floor area per rai)
2. Land Ownership and Parcel Size:
  - 2.01 - Type of Ownership (individual, central government, municipal, religious, crown property)
  - 2.02 - Existing Individual Ownership and Parcel Size
  - 2.03 - Property Currently Under Receivership or Bank Mortgage
3. Land Value:
  - 3.01 - Market Value
  - 3.02 - Land Value (as recorded by the Provincial Land Office)
  - 3.03 - Land Value (as recorded by the Municipal Finance Division for estate taxes)
  - 3.04 - Areas of Special Aesthetic, Cultural, or Historical Value
4. Building Condition:
  - 4.01 - Building Age
  - 4.02 - Physical Condition
  - 4.03 - Buildings Violating Health or Fire Regulations
5. Building Value:
  - 5.01 - Building Value (as calculated by bank estimates)
  - 5.02 - Cost of Demolition (as calculated by government estimation methods)

6. Type of Structure:
  - 6.01 - Type of construction: each building will be coded according to the materials used in three categories:
    - . structural material - reinforced concrete, wood, steel, or scrap wood
    - . wall material - wood, brick, scrap wood, or tin
    - . roof material - concrete, tile, or tin
7. Building Height:
  - 7.01 - Number of Floors per Building
  - 7.02 - Estimated Actual Height (in meters)
8. Soil Type:
  - 8.01 - Soil Profile
  - 8.02 - Soil Engineering Properties
9. Traffic Counts at Key Points:
  - 9.01 - Volume per Day, and Types and Numbers of Vehicles (cars, trucks, etc.)
  - 9.02 - Volume During Rush Hour, and Types and Number of Vehicles (cars, trucks, etc.)
10. Public Services and Utilities:
  - 10.01 - Types and Locations of Public Services and Utilities - including where applicable:
    - . Government Buildings:
      - provincial administration
      - provincial trade office
      - provincial land office
      - provincial labor office
      - provincial land transport office
      - provincial public health office
      - provincial public works office
      - provincial electrification office
      - provincial water supply office
      - provincial telephone office
      - provincial prison
      - police headquarters
      - provincial courts

- . District Administration
    - district courts
    - post office
    - fire station
  - . Municipal Administration
    - municipal educational office
    - police posts
  - . Educational Buildings:
    - nursery schools and kindergarten
    - elementary schools
    - junior high schools
    - senior high schools
    - vocational schools
  - . Health Facilities:
    - hospitals
    - clinics
    - nursing clinics
    - private facilities
  - . Parks and Open Space:
    - municipal parks
    - public open space in temple compounds
    - sports fields
- 10.02 - Roads and Pedestrian Paths (concrete and asphalt)
- 10.03 - Water Mains and Hydrants
- 10.04 - Electrical Mains
- 10.05 - Drainage System

### Methodology

The methodologies to be employed in the formulation of the cadastral report may be divided into three broad categories:

1. The Collection of Existing Data;
2. A Field Survey; and
3. Data Processing and Presentation.

Work in the first two areas should be carried out simultaneously. Thus, information collected in one area will be used as a check for information obtained in others.

1. The Collection of Existing Data

This component will consist of the compilation and organization of information obtained from various governmental, educational and private institutions.

The following sources of information should be used:

- . Comprehensive Planning Division, Department of Town & Country, Planning, Interior Ministry: maps showing infrastructure network, existing buildings, topography, and land use. These maps will be out of date but should be used for the construction of base maps and as an information check.
- . Cartography Division, Royal Thai Army Survey Department, Defense Ministry: maps showing built-up areas, natural features, types of land, etc.
- . Aerial Photography Division, Royal Thai Army Survey Department, Defense Ministry: aerial photographs at various scales, request for special reconnaissance session.
- . Urban & Regional Planning Department, Chulalongkorn University: infrastructural network, transportation network, educational locations, labor statistics.

- . Chonburi Provincial Land Office: deeds, statistics on ownership, estimated land values, maps showing parcel sizes.
- . Educational Administration Office for Changwat Chonburi: school locations, statistics on students and teachers.
- . Industrial Affairs Office for Changwat Chonburi: factory locations, statistics on labor and products.
- . Public Works Section of Chonburi Municipal Administration: map showing building location, statistics for building permits and code violations, boring logs, building age, locations of government buildings, parks, open space, roads, paths, sewage and drainage systems.
- . Finance Division of Chonburi Municipal Administration: statistics on land values, real estate taxes and land under receivership.
- . Public Health Division of Chonburi Municipal Administration: locations of health facilities, statistics on patients, doctors, nurses.
- . Provincial Water Supply Office
- . Provincial Electrification Office
- . Provincial Telephone Office

## 2. Field Survey

This component will consist of the collection and organization of data to be provided by field observation, interviews and field testing.

During the preparatory phase, the following data should be collected:

- . Road Network Base Map:  
For Chonburi, the road network map of the Town and Country Planning Department, Ministry of Interior, compiled in 1977 will be used.  
For Siracha, the base map will have to be drawn from aerial photographs.  
For Phanat Nikom, the base map will have to be drawn from data obtained from the municipality and from aerial photographs.
  
- . Existing Buildings Base Map:  
For Chonburi, the base map will be drawn from existing maps and aerial photographs (updating will be done during the field survey phase).  
For Siracha, the base map must be drawn from aerial photographs.  
For Phanat Nikom, the base map must be drawn from aerial photographs.
  
- . Topography Base Map:  
For Chonburi, existing data from the Town & Country Planning Department will be used (contours at interval of one meter).  
For Siracha, the only existing data are at contour intervals of 20 meters.

. Parcel Size Base Map:

For all three municipalities, existing maps from the Changwat Land Office will be used and updated by information provided by current deed records.

3. Data Processing and Presentation

This component will consist of the organization and final presentation of information already obtained from the two components. The concern of the present component is the arrangement of data into a meaningful and concise format. Generally, two types of format will be used: maps and tables. The maps should all be of the same scale (1:2,000) and should be of two kinds -- location maps and grid maps. Tables will be of two kinds -- tables with variable categories applied to the whole municipality and tables with variable categories applied to grid unit areas.

1.01 - Existing Land Use on Ground Level

- a. location map and table 1 (percent of municipality) and table 2 (percent per grid)
- b. direct plotting of raw data

1.02 - Existing Land Use:

- a. location map and table 1 (percent of municipality) and table 2 (percent per grid)
- b. direct plotting of raw data

1.03 - Population Density (Residential)

- a. grid map

1.04 - Intensity of Use (Residential)

- a. grid map plus table (total residential floor area per grid)

1.05 - Type of Commercial Activity

- a. location map and table (number of stores and percent per grid)

- b. direct plotting and raw data
- 1.06 - Type of Goods and Services
  - a. location map and table (percent per grid)
  - b. direct plotting of raw data
- 1.07 - Intensity of Use (Commercial)
  - a. grid map and table (total commercial floor area per grid)
- 1.08 - Type of Industry
  - a. location map and table 1 (percent of municipality) and table 2 (percent of type of industry)
  - b. use of Ministry of Industry criteria to obtain groups -- cottage, light, medium, heavy
- 1.09 - Type of Product
  - a. location map and table (percent of product)
  - b. direct plotting of raw data
- 1.10 - Size of Factory
  - a. table (size in terms of number of workers)
  - b. direct use of raw data
- 1.11 - Intensity of Use (Industrial)
  - a. grid map and table (total industrial floor area per grid)
- 1.12 - Changes in Land Use (for Chonburi only)
  - a. three small grid maps and table (percent of increase-decrease per category)
  - b. information derived from aerial photographs taken over a nine-year period

- 1.13 - Growth Pattern
  - a. three small maps for comparison
  - b. from built-up areas in aerial photographs taken over a 15-year period
- 2.01 - Type of Ownership
  - a. location map and table (area and percent of municipality)
  - b. direct plotting of raw data
- 2.02 - Existing Individual Land Ownership and Parcel Size
  - a. location map
  - b. direct plotting of raw data
- 3.01 - Market Value
  - a. location map
  - b. use of parcel map showing price ranges as estimated by commercial banks
- 3.02 - Land Value (Land Office)
  - a. location map
  - b. use of parcel map showing the Changwat Land Office's price ranges
- 3.03 - Land Value (Municipal Finance Division)
  - a. location map
  - b. use of parcel map showing the Municipal Finance Division's price ranges
- 3.04 - Areas of Special Aesthetic, Cultural or Historical Value
  - a. location map
  - b. direct plotting of raw data
- 4.01 - Building Age
  - a. location map
  - b. direct plotting of age groups: 0-5, 5-15; 15-25; 25-35; 35 plus years

- 4.02 - Physical Condition
  - a. location map
  - b. direct plotting of an architect's or engineer's site inspection categories: good, fair, poor
- 4.03 - Buildings Violating Health or Fire Regulations
  - a. location map
  - b. direct plotting of raw data provided by architect
- 5.01 - Building Value
  - a. location map
  - b. plotting of data provided by banks and a professional estimator (in terms of Baht per square meter)
- 5.02 - Cost of Demolition
  - a. location map
  - b. plotting of data provided by a professional estimator
- 6.01 - Type of Construction
  - a. location map
  - b. direct plotting of raw data groups: steel, concrete, wood, scrap wood
- 7.01 - Number of Floors Per Building
  - a. location map
  - b. direct plotting of raw data in color code
- 7.02 - Estimated Actual Heights
  - a. location map
  - b. direct plotting of raw data in color code
- 8.01 - Soil Profile
  - a. diagram
  - b. direct plotting of engineering data

- 8.02 - Soil Engineering Properties
  - a. location map
  - b. direct plotting of engineering data
- 9.01 - Traffic Counts: Volume Per Day
  - a. location map and table (total numbers and numbers by vehicle types)
  - b. direct plotting of raw data
- 9.02 - Traffic Counts: Volume During Rush Hour
  - a. location map and table (total numbers and numbers of vehicle types)
  - b. direct plotting of raw data
- 10.01 - Types and Locations of Public Services and Utilities
  - a. location map
  - b. direct plotting of raw data in a number code
- 10.02 - Roads and Pedestrian Paths
  - a. location map
  - b. direct plotting of data into five categories: concrete, asphalt, hardened dirt, dirt, wood
- 10.03 - Water Mains and Hydrants
  - a. location map
  - b. direct plotting
- 10.04 - Electrical Mains
  - a. location map
  - b. direct plotting
- 10.05 - Sewage - Drainage System
  - a. location map
  - b. direct plotting
- 10.06 - Telephone Lines
  - a. location map
  - b. direct plotting

### Projecting Future Urban Land Requirements

A systematic measurement of existing (circa 1977) and projected (1982 and 1990) land use, under varying assumptions as to location of new employment generating activities, migration, availability of land for urban uses, etc.

From information available and surveys to be carried out, estimates of land area currently used for each specific purpose should be obtained. The projection to 1982 can be made fairly safely by extrapolation of trends over the past five to ten years, with appropriate modifications to reflect the impact of known development projects to be implemented by 1982.

Projections for 1990 will require more elaborate techniques, as plans to intensify economic activity and accelerate population growth in the region will, if successful, invalidate historical trends as a basis for projection of future requirements for land. Most of the new port-oriented manufacturing will not be located within the present municipal boundaries (or in contiguous built-up areas) of Chonburi or Phanat Nikom. However, the area between the new port and Siracha will probably become increasingly industrialized as land in the industrial estate is taken up. The "ribbon" development along Sukhumvit Highway from Bangkok to the port and beyond will undoubtedly continue in the absence of effective controls to prevent it. Further development of manufacturing, including processing of agricultural products, along Sukhumvit (and probably the new railway link) will be substantial; this will not result, however, in a large increase in land required for industrial purposes in the three urban centers.

Future industrialization will be reflected in population growth in the urban centers, requiring additional land for housing (and/or more intensive use of available land), as well as for commercial and service establishments serving the larger populations in and near the centers. Siracha will probably be the first center to feel this impact because of its close proximity to the Laem Chabang site of the new port and industrial estate.

The following paragraphs contain explanations and suggested methodologies for preparation of Table 8.

For current land use, the areas should be estimated from the results of the cadastral survey, or from other available information. In the case of Chonburi, data should cover the contiguous built-up area, as well as the land area within the official municipal boundary, but excluding sea areas over which no structures are located. For Siracha and Phanat Nikom, estimates should be based on areas within municipal boundaries, excluding that part of Siracha's occupied area now in the sea.

#### 1. Residential Land

From the land area in residential housing and the estimated population residing thereon, a density ratio should be computed, e.g., hectares/1,000 persons.

The residential housing sector forecast involves estimates of expenditures on replacements as well as net additions to the housing stock. The factors affecting the forecast may be thought of as physical equipment and financial requirements.

Table 8. Urban Land Requirements 1979, 1982 and 1990  
(in hectares, or rais)

	Existing	Total Projected	Additional Required
1. Residential land			
2. Mixed residential/shops			
3. Commercial/Service			
4. Government			
5. Military			
6. Roads/Streets			
7. Hospitals			
8. Clinics			
9. Parks/Playgrounds			
10. Utilities (water, drainage, electricity, solid waste)			
11. Schools			
12. Manufacturing/Processing			
13. Churches, Wats, Temples			
14. Cemeteries			
15. Agriculture, Poultry			
16. Unused (idle, unoccupied)			

Physical. Determination of requirements in physical terms sets a range. Requirements are usually expressed in housing units, not expenditures. The obvious variables to be considered are demographic. The primary demographic variable is net household formation, which is influenced mostly by the age at which people marry and the percent of adults marrying. However, there may be feedback effects, since a shortage of housing may constrain household formation. Other variables to be considered are incomes, housing costs, rate of doubling (and undoubling, i.e., changes in multiple occupancy) and the number of single or non-family households.

Family size should be considered also; however, since families are flexible with respect to space, this variable is much less important than the number of families as a determinant of the required housing construction. Over a short period of time, average family size cannot change very much.

In addition to the demographic variables discussed above, housing market variables must be considered. The rate of vacancies, if far from "normal," may have a strong influence on building activity. The analyst must consider where the vacancies are located, how long they have existed, and the quality of the vacant units. Any trends in the ownership of second homes should be noted.

Finally, there is a certain amount of replacement demand. Some structures are destroyed by fire, flood, and wind and must be replaced. Others are demolished because of alternative demand, leaving the family to replace the structure

somewhere else. The alternative demand usually is from business operations and is aimed at the site rather than the structure.

Financial. After at least a range of required housing units to accommodate the projected number of households is determined, the financial-market conditions must be examined to estimate the housing units that are likely to be built. The market variable of income is of some importance in the short run (and more so in the long run), especially if income is expected to fluctuate widely from past levels.

The supply and cost of credit is an important factor affecting the demand -- as distinguished from the need -- for housing. The analyst should consider the amount of credit available, the required size of downpayment, and the size of monthly payments. These estimates must be conditioned by considerations of general credit availability and the lending regulations of government agencies. The demand side of the credit market is more difficult to analyze. The forecaster will want to examine, however, the liquidity of potential home buyers and their willingness to take on more debt.

The above analysis will need to be modified within the framework of price and capacity conditions in the construction industry. Shortages of labor and/or material will restrict construction. The analyst should consider whether there is an established trend in housing prices. It is also necessary to consider the spread between prices of old and new houses. In addition, new house prices vis-a-vis rent should be examined.

Preparing the Forecast. The above discussion lists the variables that the analyst should consider. The analyst then converts the unit forecast to a monetary forecast by multiplying the average price per unit. The average price is determined by dividing recent housing expenditures by the number of units and adjusting for inflation, upgrading of housing, or forecast housing-price changes. To obtain the final housing forecast, the estimate of construction expenditures must be added to the estimates of expenditures on additions, alterations, and non-housekeeping units.

Once the number of additional dwelling units has been projected to a specified target year, this datum must be converted to land requirements. The conversion should be based on two factors: (1) the projected population that will occupy the additional residential units, and (2) the ratio of population per rai (or hectare) of residential land adopted as the planning standard.

Care should be exercised to avoid double counting, as land for streets, utilities, parks, etc. to serve residential areas are calculated elsewhere in the projection of total land requirements.

2. Mixed Residential/Shop Land, and
3. Commercial/Service Establishments

As in other Asian cities, a significant share of the population lives above shops. There is no completely satisfactory method by which the land occupied by shophouses can be disaggregated into the "residential," and "commercial" requirements for urban land. For present purposes, it is

suggested that the estimated population residing above shops be subtracted from the total population, with the residual being the population giving rise to the demand for residential land. The land occupied by the shops with living quarters would then be combined with land used solely for commercial structures, including open markets, service establishments, etc.

The urban land required for the purposes described above will depend on the functional characteristics of the urban center and the nature, size, and economic characteristics of its hinterland. Ideally, the land required for commercial and service establishments should be calculated as a ratio of population in the centers "catchment" area. This can be approximated by including total population in the areas served by each of the centers, taking into account the functional roles of each center, distance, and transport facilities. In general, the larger the "service area" of a center, the larger its population and, hence, the land requirements for commercial/service use. The latter point is especially important for Chonburi Municipality, as most of the population increase that will utilize its commercial/service facilities will occur outside the present municipal boundaries.

When the existing land used for mixed and exclusively commercial and service purposes and total population in the center's catchment area have been ascertained, a planning parameter (ratio of land used to population) should be computed. Because the total population will be used in the computation, the result will not be affected by the somewhat arbitrary treatment of the shophouse residents.

#### 4. Government, Excluding Military, Schools, Hospitals

Urban land requirements for government administrative facilities are determined by the functional role of the center, i.e., whether it is a national, changwat, municipal or subsidiary headquarters.

Assuming that these variables are relatively unchanging, the planning parameter can be calculated as the ratio of land used for administrative functions to population. (From observation, it appears that land used for these purposes in Chonburi would be adequate to meet the requirements of a substantially larger population.)

#### 5. Military

Land occupied by the military comprises a significant share of the total land suitable for urban uses in the vicinity of Chonburi. Future requirements for land to be used for military installations are likely to be determined by policy decision of the RTG, rather than population and economic growth in the area. Thus, the present area should be taken as given for the purpose of the land use programming study. The personnel stationed at the installation constitute a part of the population served by commercial and service facilities in Chonburi.

#### 6. Roads/Streets

In most urban planning studies, the area to be used for streets is based on several factors, including population density, vehicle densities, availability of public transport, and physical configuration of the area. It is suggested

that as a data base (not necessarily a standard) the present land area occupied by major roads, streets and sois be determined and expressed as a percentage of total urban land. Quite clearly, Chonburi suffers from congestion at present. Completion of the new by-pass to the east of the city will relieve some of the congestion due to through traffic on Sukhumvit Highway within the municipality. The congestion may be shifted to the new by-pass if ribbon development is allowed to occur as it has along Sukhumvit Highway, north and south of Chonburi.

The provision of roads and streets is one of the more powerful inducements for urban development, a basic feature of the "Land Use Programming Concept." In the absence of control over land use along the new by-pass, and given the serious constraints on availability of land for urban use in the existing municipal boundaries of Chonburi Changwat, development may well occur along the by-pass to the east of the present center rather than in, or adjacent to, the present municipal boundaries.

#### 7. Hospitals, Clinics

Urban land requirements for health service facilities are generally determined on the basis of population to be served and standards adopted by the responsible national authorities. For the present study, it is suggested that the number of beds, and land utilized by the provincial hospital, be computed as a ratio of provincial population. Similar computations can be made for other health facilities in terms of the populations served by the respective facilities. It should be remembered that to be useful in the

programming of land use, the ratios must be reduced to land requirement/population. On the basis of population projections, computed ratios and standards (national ratios if available) can be used to estimate land requirements.

#### 8. Parks, Playgrounds

Although the pressure of population on land suitable for urban use will operate as a constraint on provision of parks and playgrounds, the relatively high population density indicates a critical need for such facilities. In any case, the existing lands in parks and playgrounds, as a ratio to population, should be computed and compared with national standards to indicate the need for such space as population increases in a spatially constricted area. If, later, the proposed reclamation is implemented, consideration should be given to the use of some part of the reclaimed land for public use as a playing field/park.

#### 9. Utilities

Urban land required for various types of utility services should be carefully measured. These services include electricity, piped water lines, sewers and drains, the klongs that also serve as channels for waterborne wastes (some of the reclaimed land would be required for the extension of klongs and other utilities), postal and telecommunication services, facilities for treatment of sewage, and collection and disposal areas for solid wastes. Reportedly, the three urban centers are inadequately served by these facilities at present. Any realistic program of land use studies to meet current and prospective growth in population should include provision of land required to meet minimum standards for these functions.

## 10. Educational Facilities

For land use planning, two sets of ratios are generally employed:

- . Number of classrooms per 1,000 school-age children, by level and type of school
- . Gross land area required per classroom, also by level and type of school. This ratio will vary depending on space required for playgrounds and the number of stories in construction of classroom space. Double shifts of classes also enable more students to be accommodated in each classroom; thus, the former ratio can also be considered as variable.

## 11. Manufacturing/Processing

Land use planning for industrial purposes is usually based on the number of employees per hectare. However, there is a wide range of variation among different types of industries in the number of workers per hectare. Electronic assembly, for example, can provide for large numbers of workers on a very small area; at the other extreme, petrochemical industries require large land areas for relatively small numbers of workers. Given the constraints in the form of limited availability of land suitable for urban use, it would not appear likely that industries requiring large amounts of land per 100 workers will be located in the immediate vicinity of the municipalities of Chonburi, or Siracha. Intensity of land use should be one criterion in terms of which sites for new industries are selected.

Land use and employment data should be compiled for major categories of industries operating in and near the three urban centers. From these data, "worker densities" can be calculated as rough guides in preparation of the guide plans.

#### 12. Wats, Mosques and Churches

The survey of this land use should identify and quantify land used for religious structures. In general, planning can probably be done on the basis of population, and the spatial distribution of future growth of population. In quantifying the land area used for religious ceremonies, lands owned by religious bodies but used for other purposes should be identified on the basis of use, not ownership.

#### 13. Burial Grounds

Land absorption by burial grounds is substantial in cultures in which cremation is not widely practiced. Future requirements, at least over the medium-term, can be projected from past trends, adjusted for changes in population during the trend period, and projected.

Although lands used for residential housing, for example, can and often are converted to other uses, such as commercial or industrial, land used as burial ground can seldom be converted to other uses.

#### 14. Agriculture, Livestock, Poultry

Although not generally regarded as "urban" land use, aerial photographs indicate some land in or adjacent to the

municipal boundaries of the three centers is used for agriculture. The location and extent of such lands should be identified, because these areas may be suitable for urban uses either within or outside of existing municipal boundaries.

#### 15. Idle (Unused Land)

One of the objectives of the cadastral survey should be to identify idle and/or underutilized land within municipal boundaries and in contiguous built-up areas. This might include "excessive" amounts of land surrounding residential houses, government buildings and other structures.

Excessive absorption of scarce land frequently held privately for speculative gain is encouraged by low levels of taxation. Changes in tax rates and administration can be effective in bringing about more intensive use. Although more intensive use is not a solution to Chonburi's land constraints, the existence of idle or underutilized land merits identification and quantification in the land use programming study.

#### Establishing Objectives

The establishment of objectives, or goals, is an essential component of any planning exercise, including Land Use Programming. The objectives established serve as a general framework for the formulation of the Guide Plan, and the identification of projects and programs by means of which such plans are to be implemented. Like other steps in the Land Use Programming technique, the establishment of objectives is regarded as a continuing process in which the

goals of development are modified to reflect unanticipated changes in the determinants of development, e.g., the location of a large (in terms of employment) industrial plant, or sharply increased rates of population growth in the planning area. In other instances, implementation of major projects in the Guide Plan may so alter the factors to be considered in establishing objectives that a review and reordering of priorities is appropriate.

The specific content of planning objectives will differ from country to country, among regions and urban centers in the same country and, as indicated earlier, through time, even in a given urban center. Nevertheless, all have one common feature: an explicit desire to influence the pattern of land use, economic activity, demographic characteristics, urban (regional) ambience and social structure in directions that would be different from those that would emerge in the absence of planning. In other words, plan objectives represent an expression of desired change, or a desire to influence future development patterns.

Establishment of plan objectives usually involves compromises, or trade-offs, between alternative objectives; moreover, various constraints operate to limit the range of realistic objectives. On the other hand, the probabilities that certain objectives can be achieved may be enhanced by the presence of underutilized natural or man-made resources, strategic location or a skilled but underutilized labor force.

The first step in the establishment of plan objectives is an inventory of the constraints and resources, and an

analysis of their impact on the range of alternative objectives.

### Constraints

Constraints frequently encountered in the establishment of plan objectives include:

1. Topography. Physical expansion of urban centers may be impaired by steep slopes, swamps and marshlands. While such lands can be used for urban purposes, the costs for leveling, or terracing of hills and filling and draining of lowlands renders the use of such lands more costly. Also, on filled lands, construction costs may also be higher.
2. Preemptive uses. Occasionally, urban expansion may be diverted or constrained by the existence of cemeteries, military installations, religious structures or historical/cultural sites. Where arable land is scarce, as in Korea, there are formidable obstacles to the use of irrigated rice land for any other purpose than cultivation of rice.

Many of the constraints arising from preemptive uses can be overcome, but often at considerable financial cost and, in some cases, at a considerable cost in the form of public opposition. Where alternative lands for urban use can be identified, they should be considered in the establishment of plan objectives.

3. Administrative constraints. The capabilities for planning and implementation of urban plans is of crucial importance in establishing objectives. The practical implication is that modest objectives, with effective planning and implementation of projects, are to be preferred to grandiose objectives, the attainment of which is beyond the administrative capabilities of the responsible agency.
4. Financial constraints. With few exceptions, all governments (and private sector developers, as well) are confronted with financial constraints. Under the existing fiscal structure of Thailand, sub-national units of government are seriously limited in their access to financial resources. For large projects, finance must be provided from central government sources, either from current revenues of the central government, or from international funding agency loans or grants to the central government.

In establishing objectives, therefore, it is necessary to bear in mind the potential sources of finance, and the priorities and/or criteria of the funding agencies if the size or nature of projects required to achieve the objectives are such as to require financial support beyond the capabilities of local government. At the same time, it is noted that carefully prepared and documented feasibility studies can frequently attract outside financing.

5. Other potential constraints. In addition to the specific factors noted above, the establishment of objectives should reflect consideration of the following elements that may affect the attainability of objectives:
- . Size, composition and skills of the labor force;
  - . Attitude of community leaders toward proposed objectives; and
  - . Legal/institutional constraints, e.g., the difficulty of extending municipal boundaries.

#### Positive Factors

1. Government policies. Central government policies, programs and financial support for strengthening local governments' administrative (including planning) capabilities provide an enhanced opportunity for establishment of expansionary objectives in selected "principal towns," of which Chonburi is one.
2. Regional focus. The designation of the Eastern Seaboard Region for accelerated development and population growth is by far the most significant "given" to be considered in establishing objectives for urban development in Changwat Chonburi. The availability of natural gas for use as fuel and feedstock, the proposed development of Sattahip as a commercial port, and, eventually, construction of a new port at Laem Chabang, the construction of

a rail link to the port(s) from Chachengsao and plans for industrial development in the Region will alter, quantitatively and structurally, the economy of the Changwat, as well as the size and occupational distribution of the labor force. These and the related national objective of minimizing future growth in economic activity and population in the Bangkok Metropolitan Area are the principal justifications for the selection of the three urban centers in Changwat Chonburi for application of the land use programming approach to the preparation of Guide Plans to meet anticipated requirements for land for urban uses.

Thus, in the formulation of objectives, proposed developments of the Eastern Seaboard must be viewed as an overall set of guidelines. In general, the establishment of urban planning objectives must complement and support the overall development strategies for the hinterlands of the urban centers.

Finally, it is noted that the Land Use Programming approach to urban planning implies participation by a broad spectrum of the public in the planning process. Representatives from the private as well as the public sector should be involved in free and open discussions of objectives; while such discussions will probably focus on specific projects -- rather than objectives -- it is the function of planning officials to place suggested projects in a context of overall development and, thus, to the nature of the objectives implied.

### Project Preparation/Evaluation

The Land Use Programming concept implies the existence of a number of potential projects, such as urban road construction and improvements, installation and/or extensions of electric, water and sewage lines, provision of schools, hospitals, parks and other facilities. Through the implementation of projects of this type, urban growth can be directed along channels compatible with guide plans for controlled urban growth.

Few local governments are financially able to carry out a large number of these projects at any one time. Moreover, such projects require phasing to meet existing or near-term projections of growth in the requirement for housing and urban uses. For this reason, it is necessary to identify projects that appear to offer opportunities for future implementation and to evaluate such projects in terms of their costs and benefits in order to establish priorities for implementation.

Although the foregoing discussion is focussed on infrastructure improvements that fall in the public sector, the same process of establishing priorities to identify worthwhile investments is necessary in the private sector, particularly where large-scale investments in manufacturing, agricultural processing, housing and mineral exploitation are being contemplated. In general, therefore, the early identification and evaluation of investment opportunities is a process which has broad application in all development planning.

### Elements of the Feasibility Study

Feasibility studies are used by analysts to provide decision makers with a basis for decisions as to the approval or the rejection of proposed projects. Therefore, feasibility studies should contain sufficient detail to enable those responsible for such decisions to assess the technical, economic and financial viability of proposed projects and to set priorities for implementation among those projects found to meet established, uniform standards. This requires that the standards, or selection criteria, be the same for all projects being evaluated.

1. Feasibility -- or opportunity -- studies require that prospective projects be described as precisely as possible. A project can be anything that requires the input of resources for a defined purpose, e.g., a factory, a school or a hospital. The project may form a part of a program.

2. The implementation of the project is expected if analysis indicates it to be viable. The compilation of data and the formulation of alternative solutions are done for practical purposes. The feasibility study is a means to decrease the risks of projects. Within the constraints of available resources in terms of money, information, time, expertise, and the predictive system, the feasibility study should contain all the relevant information for the decision maker.

3. A go or no-go decision is to be made. The feasibility study is a collection of information, but not the

decision. The administrative framework and its institutions involved in the decision making process will have to provide the final decision to go ahead or to drop the project.

### Check-List for the Collection of Data

Feasibility studies should start with a check-list of data sought. This list can be broken down into six sections: (1) materials and supplies, (2) market factors, (3) economic and technical factors, (4) personnel, (5) financial factors, and (6) social factors.<sup>1</sup>

#### Materials and Supplies

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Is satisfactory and prompt delivery of local materials assured at reasonable prices?
4. What materials and supplies must be imported?
5. Are they available in world markets at competitive prices?
6. Can prompt delivery of imported materials and supplies ensured so that large inventories will not be required?

#### Market Factors

1. Is there already a demand for the product? Who and where are the principal consumers or users? Who are possible new consumers?

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1. Feasibility Studies, Economic and Technical Soundness Analysis, Capital Projects. Department of State, Agency for International Development, Office of Engineering, Washington, D.C.: October 1964.

2. How is the demand for the product now satisfied? By local production? If so, what is the volume and value of annual production? What percentage of total consumption is supplied by local production? By imports? If by imports, what is the volume and value of annual imports? From what sources are imports obtained?
3. What is the estimated annual increase in local consumption over the next five years? How were estimates made? By reference to official figures on population growth, family budgets, imports, etc.? By consultation with trade or industry, ministries, associations, bankers, commercial houses, wholesalers, industrial consumers, etc.?
4. If the product is already being manufactured, can the existing and estimated future local market absorb production of the new plant without price cutting or other dislocations?
5. Would the estimated sales price and quality of the new product make it competitive with an imported equivalent? After adjusting cost of local conditions, is the estimated sales price of the product so high that tariff protection is necessary to protect it from imports?
6. Could the product compete in export markets on the basis of price, quality, and dependability of supply?
7. Can export markets for the product be developed? If so, in what areas and in what annual volume and value?
8. What procedures would be necessary to develop export markets? What would it cost?

9. In calculating costs of the product, has adequate allowance been made for the expense of a sales department, advertising, and promotion that might be required?
10. Do consumer prejudices against locally manufactured products exist? If so, why? Would they apply to the new product? If so, how could they be overcome and what would it cost to do so?
11. Do marketing and distribution facilities for the product exist? If not, can they be set up? What would it cost to do so?
12. Will the product be sold to wholesalers? Retailers? Direct to the consumer? Other industries? Government?

#### Economic and Technical Factors

1. How much foreign exchange (and in what currency) is required to import machinery, equipment, and supplies? For annual interest payments and amortization of any loans contracted to import machinery and equipment, or for payment of royalties and technical services? For annual import of raw materials?
2. What are estimated annual foreign exchange earnings and in what currencies?
3. Has careful consideration been given to the possibility of depreciation on the foreign exchange value of the local currency? To the possibility of import controls, or restrictions on availabilities of foreign exchange necessary to operate the business?

4. What benefits would the new business bring to the economy in the use of local raw materials, in employment, and in technology?
5. Do dependable facilities exist for transportation, power, fuel, water and sewerage? If not, can existing deficiencies be eliminated satisfactorily? What would be the cost to do so?
6. Do existing labor laws, government regulations, and taxes favor establishment of new business? If not, can existing obstacles be removed? If so, how and when?
7. In selecting the machinery and equipment for the new plant, have reputable and competent engineers and technicians been consulted? Have they been asked for advice on the most suitable types of machinery and equipment for the process and locality? Have they carefully compared costs of various suppliers? Credit terms offered to purchasers?

#### Personnel

1. Is there an adequate labor supply near the plant location? If not, how can the problem be solved?
2. Can the problem of training competent management and supervisory personnel be solved? Also, the training of skilled labor?
3. Is technical advice available in the locality? If not, where can it be obtained and what will it cost?

### Financial Factors

1. Has a definite plan to finance the project been worked out? Is sufficient capital available locally? If not, what is the plan to obtain the required capital?
2. In estimating the cost of the project, has careful consideration been given to the effect on costs of delays in construction schedules? In delivery and installation of machinery and equipment? In import of essential raw materials and supplies?
3. Has it been possible to make arrangements with local banks to finance short-term working capital requirements of the business?
4. In calculating cash flow and working capital requirements, has careful consideration been given to maintaining adequate inventories of raw materials? Supplies and spare parts? Seasonal fluctuations in the business? The time required to get the plant into production? Cash required to amortize its principal loans?
5. If the economy is in a period of inflation, has full allowance been made for the influence of rising prices and wages on the cost of the project and on working capital requirements?

### Social Factors

1. Is there a hospital or dispensary in the vicinity of the project?
2. Are there sufficient schools, including professional schools, in the vicinity of the project?

3. Are there already a sufficient number of houses and apartments available for the personnel of the new enterprise, or should they be constructed? In the latter case, are potable water, sewerage, electricity, and telephone services already available?
4. What are the total social and overhead costs of the project (dispensary, schools, in-service training, water, sewerage, power, telephone, transport, insurance, direct and indirect taxes, social security and pension fund, housing, and incentive such as bonuses, prizes, and profit sharing)?

#### The Planning and the Management of Conducting Feasibility Studies

The organization, the casting and the timing of the work concerned with the feasibility study is a complex task. Since the preparation of development projects is vital for later success, the following steps are crucial to the project management during the planning stages.

1. Define the responsibilities of the agencies in charge of the planning process for projects:
  - . project identification
  - . follow up project preparation
  - . plan of action
2. Clarification of the needs that have to be met by the project. The definition of the needs should be clear, operational and comprehensive. In relation to those defined specific needs, any feasibility study is unique for exactly that

purpose. The selection of criteria for the project appraisal can only be done if the needs are spelled out clearly.

3. Establish the purpose of the feasibility study, define the scope and set up a plan of operation: Define the steps to be taken.
  - A. Study Objective (prefeasibility study):
    - . Preliminary evaluation (opportunity study)
    - . Turn the project concept into a plan
    - . Project the requirements
    - . Project costs and benefits
    - . Identify necessary surveys
    - . Estimate the requirements of the feasibility study
    - . Identify anticipated problems, bottlenecks, difficulties
  - B. Scope of Work (to achieve more detailed analysis in the feasibility study).
    - . identify the particular problems of the project
    - . probe preliminary solutions
    - . set up preliminary criteria for appraisal
    - . design project
    - . set up proper limits for the investigation
  - C. Depth of Analysis:
    - . set time limits
    - . set terms for adequate project formulation
    - . specify details of project design

- . give priorities and levels of attention for the analysis of the various subject areas
  - . set up network for the complete study (surveys)
4. Project appraisals will be made by various agencies concerned with the decision making process. It is helpful to identify the specific requirements for information by these agencies for reference in the feasibility study, for example:
- . investors
  - . development banks
  - . foreign investors
  - . government
  - . planning boards
5. In setting up the detailed plans for the implementation of the study, one must realize the danger: either to work under time pressure (i.e., budget constraints and manpower shortages), which can result in a feasibility study with serious omissions of vital information or to face gestation lag by expanding the analysis for the fear of being incomplete.

The following are the most common surveys for industrial projects:

- . data gathering and formulation
- . economic analysis
- . field engineering surveys
- . survey of transport facilities
- . survey of the availability of raw materials
- . survey of technical alternatives
- . engineering design

- . market research
- . tests
- . other.

These surveys can be conducted by:

- . internal staff
- . internal staff and consultants
- . aid organizations
- . professional consulting firms

The common elements of the project include at least the following: objective, discreteness, coherent organized action, location, and scheduled beginning and terminal projects.

To plan a project, project planners have to look at the project both in the terms of its process and component. The project process or cycle consists of project:

- . identification and pre-investment study
- . development and preparation
- . appraisal and approval
- . execution
- . close-out.

The major components of the project include:

- . Economic analysis
- . Financial analysis
- . Technical analysis
- . Management analysis.

#### Measures of Feasibility

Since project appraisal requires a comparison among alternative projects of the benefits and costs over the economic life of the projects, the following three measures are widely used to make the comparisons noted above.

## 1. Net Present Value Method (NPV)

$$NPV = \sum_{t=1}^n \left( \frac{B_t - C_t}{(1 + i)^t} \right)$$

## 2. Internal Rate of Return (IRR)

IRR is the value of interest or discount rate ( $r$ ) such that the  $NPV = 0$ . IRR obtained by iteration of NPV calculation using alternative values for  $r$  until NPV approaches zero.

## 3. Benefit Cost Ratio (B/C ratio)

$$BC = \frac{\sum_{t=1}^n \left( \frac{B_t}{(1 + i)^t} \right)}{\sum_{t=1}^n \left( \frac{C_t}{(1 + i)^t} \right)}$$

where:

$B_t$  = benefits in year  $t$

$C_t$  = costs in year  $t$

$i$  = interest rate, or opportunity cost of capital

$r$  = discount rate, or rate of return

$t$  = year 1, 2, .... year  $n$

$n$  = number of years of project life.

Accordingly, three sets of estimates have to be prepared leading to project appraisal.

- . Estimates annual benefits over the life of the project.
- . Estimate of annual costs required to produce the estimated outputs.
- . Pricing of inputs and outputs by appropriate prices to obtain an estimate of annual costs and benefits. The appropriate prices include output and input:

Output

- (a) Land is priced at its market value in the case of private or financial point of view.
- (b) Land is priced at its shadow prices in case of economic/public point of view.

Input

- (a) Market prices (as mentioned above)
- (b) Shadow prices for (as mentioned above)
  - (1) Unskilled labor
  - (2) Opportunity cost of capital
  - (3) Foreign exchange rate

Since the timing of costs and benefits vary, a common denominator must also be applied. The next step thus involves discounting or finding the present value of costs and benefits by using the following formular:

$$PV_c = PV_t \frac{1}{(1 + i)^t}$$

Having completed the various steps mentioned, the comparison between costs and benefits can be made through NPV, IRR and B/C ratio as mentioned above. Although economic and financial analysis take the same form of calculation, they are somewhat different, especially the estimation of costs and benefits as well as pricing of projects. The easiest way to understand the social cost-benefit analysis is thus to examine the difference.

Finally, sensitivity analysis will be introduced, because as described previously, the valuations of future benefits, costs and prices that will affect the feasibility

of the project are estimates. Varying degrees of uncertainty attach to these estimates. It is, therefore, necessary to include an evaluation of the effects of divergence of values from the best estimates of benefits and costs on which the calculation of benefits and costs have been based.

At the prefeasibility level of project evaluation, sensitivity analyses are useful as a means of identifying those determinants that are of critical importance to the success of a project in order that more refined estimates can be made in the final feasibility studies. For example, limited budgets may have restricted soil borings where the costs of excavations/foundations are a major component of total costs. Before a "go-no go" decision is made, further borings are indicated if the project is otherwise viable.

#### Social and Cultural Factors Influencing Urban Land Use

The purposes of this section are to: (1) assist urban planning officers in gaining an appreciation of the social and cultural factors affecting land use, (2) familiarize officers with the use of human ecological concepts in land use planning, and (3) to suggest methods for collecting primary and secondary data on social and cultural factors influencing land use.

#### Human Ecological Theory

Three characteristics are involved in the transition of rural to urban communities: population size, population density, and heterogeneity of the population. Population

size refers to increases in the number of residents. Consequently, social relationships of individuals are likely to change from personal to impersonal. Because of the limitation of land in the urban area, increased population would result in a higher density of population, which in turn stimulates social differentiation in urban communities. These three factors contribute to the complexity and difficulty in understanding of urban social structure.

The ecological process contributes to an understanding of how spatial organization occurs in an urban area. There are five stages in the process: (1) centralization, the process whereby groups and institutions are clustered in the central area of the city; (2) concentration, the process of rural-urban migration which causes rapid increases in urban population; (3) segregation, a separation of the housing pattern among different classes (i.e., the wealthier classes usually reside in more desirable residential areas, while the poorer classes live in slum areas); (4) invasion, means an extension of the land area owned by powerful groups or institutions into another land area owned by the weaker groups or institutions; and (5) succession, a complete process of invasion in which the land (e.g., paddy land) is converted into residential or shopping center areas. This process, together with the concept of competitive cooperation, leads to the emergence of concentric zones, sector and multiple-nuclei patterns of urban development.

Land Use in Muang Chonburi,  
Phanat Nikom and Siracha

Chonburi Municipality is ranked thirteenth in size among the cities in Thailand. The highest population density is

found in Chonburi Municipality, followed by Phanat Nikom and Siracha.\* Therefore, the social structure of Chonburi is likely to be the most complicated, and Siracha's is likely to be the least. Competition for land ownership in the three urban areas conforms to the pattern of classical ecological theory. That is, the wealthiest and the most powerful groups or institutions own land in the central parts of the cities, where government buildings and business centers are located, and the poorer groups own land in less attractive residential areas.

Land use planning should reflect the influence of social and cultural factors in spatial organization. For example, traditions and values of urban groups are important variables in segregation. Consideration of traditions (e.g., Thai and Chinese holidays, Chinese New Year, folk activities) will assist planning officers in taking account of values and beliefs in relation to land use of urban people. Religious activity is one of the most influential factors to be included in land use planning. Land belonging to wats cannot be transferred to other uses, although high economic return could be obtained, because such invasion and succession are in conflict with cultural values of the people.

Sociocultural data in land use planning should include: (1) rural-urban migration; (2) ethnic groups, nationalities, language, religious, and educational level of the population;

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\*However, if the land in the sea is excluded from Siracha's municipal area, the density of the remainder is greater than in Phanat Nikom.

(3) customs, traditions, values, and folk activities of the population; (4) location of various ecological units; and (5) a map showing the transportation network and different service centers of the city. These data can be collected through field survey and various government records.

#### Economic Impact Evaluation

The main purpose of this section is to note the economic impacts of land use programs. Two categories of land use to be considered: urban land use and rural land use. With respect to urban land use, urban redevelopment will be discussed together with urban road improvement and construction. With respect to rural land use, the social costs of turning farmland into other uses will be discussed and then the question as to whether to leave the natural resources as they are, or to develop them for other uses, is addressed.

The costs of urban redevelopment are the resource costs to be used in the project, as well as the opportunity costs of land put into that project. Decrease in costs of fire, crime protection and health care as the result of slum clearance are regarded as benefits derived from urban redevelopment projects. Increases in income, taxes, property value and employment are considered to be quantifiable benefits of the project as well.

Urban road improvement and construction will mitigate city traffic congestion, and, therefore, decrease the vehicle operation costs of the road users. These are the benefits of the project that have to be weighed against the costs of the project.

The social costs of turning farmland into industrial land, shopping centers or residential areas are normally greater than the private costs. Decreases in agricultural outputs and deterioration of environmental amenities are cited to be social costs of using farmland for other purposes. Unless the private costs are equalized with social costs, the conversion to agricultural lands to other uses may represent a social loss.

However, the fact that a given area will provide greater employment, and accommodate industries yielding greater total income in urban/industrial use than in agricultural use, provides a powerful force for the conversion of land from agricultural to urban uses. At the same time, it is obvious that growth in world population and food requirements will place a limit on the conversion of agricultural land to urban uses.

From a practical standpoint, planning for urban growth should be directed toward minimizing encroachment on prime agricultural lands, even though expansion on steeper lands and filled areas may entail higher costs.

#### Social Impact Evaluation

Pre and post-implementation evaluation and monitoring are very important activities in planning. The evaluation process should be carried out at every step of the planning process to ensure the best final result. However, despite the fact that the evaluation of the social effects is one of the most important elements in planning, to evaluate this element alone as if it exists in a vacuum is insufficient. Social effects, economic effects and environmental impact must be taken into consideration as interdependent results.

As distinguished from economic evaluation, social impact analysis will be concerned more explicitly with the way in which a planned project or program will affect the determinants of the "quality of life" of individuals. These include:

- . The pattern of distribution of benefits;
- . Levels of nutrition;
- . Infant mortality and life expectancy;
- . Incidence of disease;
- . Adequacy of housing for lower income groups;
- . Increased literacy; and
- . General morale of the target population.

Social impact evaluation must be based on changes in the relevant social data, and the objectives of the project. Social data or information must be up to date, reliable and accurate and include the characteristics of the population, various relevant organizational structures, institutions, values, attitudes, customs and beliefs of those in the area specified in the project. Social data must be objective.

In general, land use planning is one of the various steps in the urban development process. More often than not, urbanization is regarded as producing socially negative effects. However, socially positive effects can be achieved, along with macroeconomic benefits by appropriate plans and efficient management.

Social impact analysis requires the establishment of "baseline" information, e.g., income distribution, nutrition levels, mortality rates, health statistics, school attendance,

housing conditions, etc., before implementation of the project or program. Insofar as possible, such information should be in a quantitative form. The evaluation involves, essentially, a comparison of the measures of social conditions at some future point(s) in time with the baseline values of the indices. It is noted that significant changes in the indicators of social impact may require several years.

The evaluation of the social effects is not an easy task. Some elements cannot be quantified into costs and benefits as clearly as they can be measured in economic and financial evaluations; therefore, it has to rely heavily upon the ability and skill accumulated from experienced analysts; and, most importantly of all, the evaluation has to be free from all bias. Also, care must be exercised to exclude from the net effects of the planned projects or programs those changes attributable to outside factors.

#### Environmental Impact Evaluation

Various types of development activities, especially construction, have significant environmental impacts. Each project has its own unique effects by virtue of location, topography, and the nature of the project. Therefore, careful evaluation of environmental impact is essential before any project is launched. The purpose of evaluation is to select the "best" project to achieve the established goals, as well as to mitigate adverse environmental effects. Many factors and their relationships have to be considered in the process of evaluation. However, because of the wide variety of factors and their relationships, there can be no literal "cookbook approach" to the evaluation process.

Generally, evaluators must first understand the ecology and the ecosystem of the area. Next, the scope of the evaluation should extend to both regional and local assessment, depending on the scope of the project undertaken. Every project, apart from having immediate on-site or primary impacts, can have effects over a widespread area, the so-called downstream or secondary effects. An ecosystem comprises highly interdependent components; a seriously adverse impact on one may bring about unanticipated system alteration.

The body of assessment should include the following:

- . A description of factors as they currently exist
- . A description of the feasible alternatives
- . Objectives of every project and alternatives
- . The result of superimposing the project and its alternatives on these factors
- . Suggestions to both minimize the adverse effects and where possible to even improve the environment as related to the proposed project.

Techniques used in the evaluation can utilize:

- . checklist
- . matrix
- . questionnaires
- . weighting system
- . cost-benefit analysis
- . modelling

It must be pointed out that any successful methods of environmental impact evaluation have to be varied to the

nature of the project concerned. The factors of cost, timing and the availability of skilled evaluators must be taken into account.

Checklist Of Activities Which May Cause  
Environmental Impact

1. Modification of Regime
  - a. Exotic flora and fauna introduction
  - b. Biological controls
  - c. Modification of habitat
  - d. Alteration of ground cover
  - e. Alteration of ground water hydrology
  - f. Alteration of drainage
  - g. River control and flow modification
  - h. Canalization
  - i. Irrigation
  - j. Weather modification
  - k. Burning
  - l. Surface or paving
  - m. Noise and vibration
  - n. Predator control
2. Land Transformation and Construction
  - a. Urbanization improvements (sidewalks, paving)
  - b. Industrial, commercial improvements (sites, buildings)
  - c. Airports
  - d. Highways and bridges
  - e. Roads and trails
  - f. Railroads
  - g. Cables and lifts
  - h. Transmission lines, pipelines and corridors
  - i. Barriers, including fences and signs
  - j. Channel dredging and straightening
  - k. Channel improvements

- l. Canals
  - m. Dams and impoundments
  - n. Piers, sea walls, marinas, and sea terminals
  - o. Offshore structures
  - p. Recreation structures, picnic sites, etc.
  - q. Blasting and drilling
  - r. Cut and fill (grading and excavation)
  - s. Tunnels and underground structures
3. Resource Extraction
- a. Blasting and drilling
  - b. Surface excavation
  - c. Subsurface excavation
  - d. Well drilling and fluid removal
  - e. Dredging
  - f. Clear cutting and other vegetation removal
  - g. Commercial fishing and hunting
4. Processing
- a. Farming
  - b. Ranching and grazing
  - c. Feed lots
  - d. Dairying
  - e. Energy generation
  - f. Mineral processing
  - g. Metallurgical industry
  - h. Chemical industry
  - i. Textile industry
  - j. Automobile and aircraft traffic
  - k. Oil refining
  - l. Food and feed processing
  - m. Lumbering
  - n. Pulp and paper
  - o. Product storage

5. Land Alteration
  - a. Erosion control and terracing
  - b. Mine sealing and waste control
  - c. Strip mining rehabilitation
  - d. Landscaping
  - e. Harbor dredging
  - f. Marsh fill and drainage
6. Resource Renewal
  - a. Reforestation
  - b. Wildlife stocking and management or preservation
  - c. Ground water recharge
  - d. Fertilization application
  - e. Waste recycling
7. Changes in Traffic
  - a. Railway
  - b. Automobile
  - c. Trucking
  - d. Shipping
  - e. Aircraft
  - f. River and canal traffic
  - g. Pleasure boating
  - h. Trail
  - i. Cables and lifts
  - j. Communication
  - k. Pipeline
8. Waste Replacement and Treatment
  - a. Ocean dumping
  - b. Landfill, solid waste disposal
  - c. Emplacement of tailings, spoil and overburden
  - d. Underground storage
  - e. Junk disposal

- f. Oil well flooding
  - g. Deep well emplacement
  - h. Cooling water discharge
  - i. Mineral waste discharge including spray irrigation
  - j. Liquid effluent discharge
  - k. Stabilization and oxidation ponds
  - l. Septic tanks, commercial and domestic
  - m. Stack and exhaust emission
  - n. Wastewater reclamation
9. Chemical Treatment
- a. Fertilization
  - b. Chemical de-icing of highways, etc.
  - c. Chemical stabilization of soil
  - d. Weed control
  - e. Insect control (pesticides)
10. Accidents
- a. Explosions
  - b. Spills and leaks
  - c. Operational failure

Impact Summary  
For High Density Residential Development  
Chonburi Land Reclamation

NATURAL IMPACTS	Beneficial	Adverse	Short-Term	Long-Term	Direct	Indirect	Mitigating Measures
1. Increase vegetative density, diversity and cover							
2. Increase fauna diversity, both wildlife and domestic		X	X	X			
3. Increase regional air pollution		X	X		X	X	
4. Increase local pollution along streets		X	X	X	X	X	X
5. Short-term introduction of sand particulates reduces air quality		X	X		X	X	X
6. Loss of some specific faunal species that will not adjust to the population density and cultural uses of area		X		X	X		
7. Alter local temperatures very slightly		X		X	X		
8. Winds will be altered locally, often decreasing comfort		X		X	X		
9. Minor alterations in precipitation received on site							
10. Alter water cycle		X		X	X		
11. Increase impervious surface and storm runoff		X		X	X	X	
12. Cyclic deterioration of water quality		X	X		X	X	
13. Increase nutrient levels in surrounding local water due to fertilization of soils							
14. Improve edaphic properties of the soil							
15. Sand fill may subside after development		X	X		X		X

SOCIOECONOMIC IMPACTS		Beneficial	Adverse	Short-Term	Long-Term	Direct	Indirect	Mitigating Measures
1.	Increase the population residing on the site and citywide		X		X	X	X	
2.	Increase average density per rai in the city		X		X	X	X	
3.	Increase noise levels on the site and along access roads		X		X	X	X	
4.	Increase traffic flow levels, and levels of service		X		X	X	X	
5.	Increase "usable" open space and recreation area	X			X	X	X	
6.	Increase employment for the city	X		X		X	X	
7.	Increase commercial activity within the city	X		X		X	X	
8.	Create a lagoon system to control run-off and serve as a recreation area	X	X		X	X		
9.	Increase the housing market opportunities in the city	X			X	X	X	
10.	Construction period will cause lengthy disruptions along access streets and on the island		X	X		X	X	
11.	Decrease street habitability along all roads undergoing traffic impact due to proposed project		X		X	X	X	
12.	Qualitative change in the city's social composition	X	X		X	X	X	
13.	Qualitative change in the city's values or character, i.e., identity or small town atmosphere	X	X		X	X	X	
14.	Impact to recreational facilities in the rest of the city	X	X		X		X	
15.	Construction impact due to the new sewage lines, and provision of other utilities, etc.		X		X	X	X	
16.	Increase tax revenue to the city and school districts	X			X	X	X	
17.	High building mass density per rai almost equivalent to an urban setting		X		X	X		

IMPACTS OF PUBLIC SERVICES SYSTEMS (Indirect Effects)	Beneficial	Adverse	Short-Term	Long-Term	Direct	Indirect	Mitigating Measures
1. Increase sewage load (Cumulative impact)		X		X		X	
2. Increase impact at treated sewage outfall (Cumulative impact)		X		X	X		X
3. Increase use of water and electricity with a concomitant decrease in future available capacity (Cumulative impact)		X		X	X		
4. Significantly increase solid waste production of the city. Reduce life of disposal site		X		X		X	
5. Increase demand for public safety and fire protection		X		X	X		

## Impact Summary - Private Development Project

	<u>Yes</u>	<u>No</u>
I. Characteristics of the natural Environment		
Does the project site involve a unique land form or biological area, such as beaches, marshes, tidelands?	_____	_____
A. Land topography, soils, geology		
Will the project involve construction on slopes?	_____	_____
Is the project to be located in an area of soil instability (subsidence or severe erosion)?	_____	_____
B. Water		
Is the proposed project located within a floodplain?	_____	_____
Does the proposed project involve a natural drainage channel or streambed?	_____	_____
C. Biodata		
Are there any rare or endangered species of plant life in the project area?	_____	_____
Will any mature trees be removed or relocated?	_____	_____
Is the project site adjacent to, or does it include, a habitat food source, water source, nesting place, or breeding place for a rare or endangered wildlife species?	_____	_____
Could the project significantly affect fish, wildlife, reptiles, or plant life?	_____	_____
Is the project located inside or within 200 feet of a fish or wildlife refuge or reserve?	_____	_____
D. Potential Alteration of Natural Features		
Will the proposed project result in the removal of a natural resource for commercial purposes (including rock, sand, gravel, oil, trees, or minerals)?	_____	_____
Will the project involve grading in excess of 300 cubic yards?	_____	_____
II. Pollution (air, water, noise, land)		
Will the project create dust, fumes, smoke, or odors?	_____	_____
Will the project involve the burning of any material, including brush, trees, and construction materials?	_____	_____

	<u>Yes</u>	<u>No</u>
Is the project expected to result in the generation of noise levels in excess of that currently existing in the area?	_____	_____
Will the project involve the application, use, or disposal of potentially hazardous materials, including pesticides, herbicides, other toxic substances?	_____	_____
III. Applicable Pollution Controls & Standards		
Will the proposed project require a permit or other approval from any of the following agencies?		
State Water Resources Control Board?	_____	_____
Regional Water Quality Control Board?	_____	_____
Department of Public Health?	_____	_____
Does the project require variance from established environmental standards (e.g., air quality, noise, water quality)?	_____	_____
IV. Impact on Infrastructure		
A. Circulation		
Is the project expected to cause noticeable increase in pedestrian traffic or a change in pedestrian patterns?	_____	_____
Will the project result in noticeable changes in vehicular traffic patterns or volumes (including bicycles)?	_____	_____
B. Water Supply and Sewage Disposal		
Will the project entail the acquisition of water from wells or surface sources for commercial and/or non-domestic use?	_____	_____
Will septic tanks be utilized for sewage disposal?	_____	_____
C. Demand for Service from Special Districts and/or Municipalities		
Will the project require the extension of existing public utility lines?	_____	_____
Will the proposed project require public services from an agency, district, or public utility that is currently operating at or near capacity?	_____	_____

	<u>Yes</u>	<u>No</u>
V. Social Effect		
Is the project apt to result in the congregating of more than fifty people on a regular basis?	—	—
Will the project result in the introduction of activities not currently found within the community?	—	—
VI. Miscellaneous		
Will the project employ equipment that could interfere with existing communication?	—	—
Is the project located within the flight path or noise impact area of an airport?	—	—
VII. Land Use		
Is the proposed project expected to result in other changes in land use, either on or off the project site?	—	—
Could the project serve to encourage development of presently underdeveloped areas, or increases, in development intensity of already developed areas (examples include the introduction of new or expanded public utilities, new industry, commercial facilities, or recreation activities)?	—	—
Does the project involve the construction of more than twenty dwelling units?	—	—
Is the project adjacent to or within 500 feet of an existing public facility or site for same?	—	—
Does the project require variance from adopted community plans, policies, or goals?	—	—
Does the project involve lands currently protected under an open space easement?	—	—
VIII. Visual Impact		
Is the site for the proposed project adjacent to a designated scenic corridor?	—	—
Will the project obstruct scenic views for existing residential areas, public lands, or public roads?	—	—

	<u>Yes</u>	<u>No</u>
Does the project involve the construction of buildings or structures in excess of three stories or thirty-six feet in height?	—	—
IX. Sociocultural Impact		
Will the project require the relocation of people or business in order to clear the construction site?	—	—
Does the project site involve a known historical or archeological site?	—	—

APPENDIX

English Summary of Lecture Notes

## Foreword

The summaries of lectures presented in Annex B are reproduced here to provide an indication of the scope of topics covered -- in varying depth -- during the formal training program for local government staff. The lectures were presented in the Thai language over a period of approximately three months.

Most of the lecturers were from universities and other training institutions located in Bangkok. However, some of the lectures were prepared and delivered by government officials and local counterparts.

Although individual lecturers were provided with an outline of the training program, and detailed guideline for their use in preparing their lectures and illustrative materials, the scope and content of the individual lectures varied widely, as may be noted from the summaries prepared by the lecturers, and edited only for grammatical clarity.

In general, most of the lectures tended to be rather academic for the participants; a greater use of case materials would have been more desirable, as observed by the participants. In some of the lectures, content did not focus clearly on the issues in the study area, or provide explicit guidance in how these issues were to be resolved in the context of the Land Use Programming project.

Despite some shortcomings in the training program as implemented, an overall assessment indicates it was worthwhile. The shortcomings are noted in order to provide guidance in the design of future programs.

The views expressed in the summaries of the lecture notes do not necessarily reflect the views, findings or recommendations of Robert R. Nathan Associate, Inc.

RHJ

LECTURER: Manu Sattayateva, NESDB  
LECTURE : Introductory Session

The Fourth National Economic and Social Development Plan formulated a definite decentralized urbanization strategy to accelerate development in agriculture and industry, as well as to increase employment in the Eastern Region. This strategy will increase the regional economic status and decrease disparities with Bangkok. The strategy proposes to develop regional urban centers outside of Bangkok. This will reduce the flow of migration into Bangkok and the congestion in the Bangkok metropolitan area. The Fourth National Plan specifies that Chonburi be the urban growth center for the Eastern Region. To meet this objective, the following strategies and measures will be undertaken:

1. Policy and measures relating to the control of urban land use will emphasize the formulation of a land use plan for the area surrounding Chonburi, an overall city plan, and plans for specific areas.

2. Policy and measures relating to the urban infra-structural development will emphasize the public utility services, health, and housing sectors.

3. To develop cities in regions outside of Bangkok into viable urban growth centers, economic activities are essential to provide jobs to urban dwellers. Consequently, it will be necessary to develop and decentralize industries in these regional urban centers. At the same time, other economic and commercial activities must be developed in the growth centers. To attain these objectives, the government will use fiscal and monetary incentives to attract industry,

commerce, and other services. In addition, the government will establish industrial estates and export-processing zones.

4. The government will accelerate regional and rural development planning concurrently to serve as sources of raw materials and marketing outlets for the urban products.

The Problems:  
Chonburi Growth Center

Currently, the urban growth center for the Eastern Region has problems that will have to be corrected to make it the center of the region. These problems include:

1. The shortage of infrastructure to support urban development, especially in the market centers, production centers, and housing service centers, such as:

1.1 The problem of communication in the subregion and the city when growth occurs.

1.2. The problem of education when population densities increase.

1.3. The shortage of public health services.

2. The shortage of water sources for urban consumption. As the city grows and progresses, more people will migrate, making development of additional water sources essential.

3. The environmental problem from the expansion of the growth pole and industrial zones and linked areas among Amphoe Muang, Phanat Nikom, Siracha, Laem Chabang, Pattaya.

4. The problem that land costs in the central area and in neighboring areas are very high, that agricultural areas will be destroyed by the expansion of industry, and that the peripheral forest area will be invaded to use the land for agriculture cultivation.

#### The Strategies for Solving the Problems

1. Government agencies should recognize the importance of land use programming of regional growth centers; support the project of land use programming for an intermediate-sized city (Chonburi), which will help directly in planning land use of Chonburi; and support the plan in effective implementation according to the plan's objective and the identified targets.

2. The government should support a study to delineate industrial areas, considering environmental problems that will arise and their effects on tourism.

3. The development of important water source areas should be accelerated as well as a project to impound water on a large scale to serve agriculture and industry, especially the Nong-Kaw, Mabprachan, Phanthong, and the Second Bangphra Projects.

4. The government should determine how to accelerate labor training to supply the requirement of the labor market in the future when the growth pole of the Eastern Region has been developed. The labor development should be supplied in the communities that surround the growth center as well, in order to depress labor migration from various points to the city of Chonburi.

5. A specific plan for the growth center and surrounding areas should be made a high priority.

LECTURER: Utis Kaothein, NESDB  
LECTURE : Land Use In Intermediate-Size Cities In  
Developing Countries

### The Intermediate-Size City

An intermediate-size city may range in population from 100,000 to 500,000, depending on the particular country (Kingsley Davis classification of Class II cities). These cities may be growth poles or growth centers backed up by the national development plans. Because their functions are not as complicated as that of the metropolises, their problems on administrative and land use control are manageable. They only come into competition with the metropolitan areas for the limited public funds and skilled manpower when they experience rapid growth.

Intermediate-size cities could help lessen in-migration to the primate cities and at the same time foster economic integration with their hinterlands.

In Thailand, the intermediate-size city is equivalent to the "principal town" identified in the Fourth National Development Plan under the decentralized urbanization strategy and income distribution, and regional development strategy. Chonburi is the principal town for the whole Eastern Region in the first project.

### Land Use Control

Land use control relates the use and availability of urban land in space and over time. Land use control becomes necessary in conditions such as rapid growth of population,

when equally desirable activities compete for the same space, and when the community's environmental ambience is under danger of destruction.

In Thailand, development at the national level is charged to NESDB (National Economic and Social Development Board) and to the Town and Country Planning Office. However, land use planning at the community level should be undertaken by the local government itself.

#### The Technique of Land Use Planning and Control

Land use planning involves preparation of some statement as to goals and objectives for land use and facilities; preparation of forecasts on population and economic trends and assessment of physical needs; preparation of generalized land use and programs that identify sites and capacity of open spaces, schools, health facilities, roads, sewer, and other utilities; some definition of staging, timing and linkages of investments; and an implementation program involving legislative, governmental, and private action.

In shaping a city lacking government action, there is probably no tool more powerful than capital budgeting. Improperly scheduled public investments and untimely opening of areas for growth before or without proper services and facilities are by far the most serious urban problems. Capital budgeting orders government action in scale and sequence to derive utmost benefit from whatever resources are available in the short run.

Although planning and capital budgeting provide a framework for public exercise of land use control, without supplementary public actions they cannot be considered control techniques. Publicly exercised land control techniques fall into three classifications: positive, negative, and a combination of both positive and negative elements.

1. Positive techniques include:
  - . infrastructure aimed at gradual development of an area after provision of basic services and facilities;
  - . land acquisition for public purposes;
  - . tax exemption for a definite period of time for those factories or business establishments willing to locate in an interior site.
2. Negative techniques are those that remove or prevent development countering public objectives. This includes:
  - . slum or squatter removal;
  - . zoning and subdivision control;
  - . withholding of permission (to build);
  - . value freezing as to allow public acquisition;
  - . taxation to prevent land speculation.
3. Techniques with both negative and positive elements include: the plan or the planning process as the control device, and public/ private development instruments. The former provides directions for land use activity and at the same time prevents violation of the adopted local public policy. Its success depends more on the capacity of the people in charge of the implementation, public funds available, and also political conditions. The latter calls for a close cooperation between public and private in as much as the fund is acquired by collecting a betterment tax from all property owners in this specific area. Its weakness is that property owners outside the area pay taxes at a low rate.

LECTURER: Utis Kaothein, NESDB  
LECTURE : Constraints in the Application of Land  
Use Programming (Case Study - Chonburi)

The principal town strategy aims at creating a socio-economic base for every subregion which could assist in reducing income disparities and improving the distribution of development in the regions.

In terms of implementation, the NESDB is developing several "Action-Oriented Approach" programs in selected principal towns, especially Chonburi -- the selected principal town for the Eastern Region.

The land use programming concept is still incomplete. The basic theories of Rivkin for the land use programming in the intermediate-size cities of developing countries will have to be explored. During the implementation, sorting out the area in which the formal concept is not yet actually functional will be required. Within the case of the Chonburi land use programming project, a number of constraints have been noted which allow for pinpointing the areas for consideration.

#### I. Land Shortage and Physical Constraints

- (a) Topographical limitation -- Chonburi has a mountainous terrain, and is a shoreline area; some parts of the municipality are low-lying areas and consequently are susceptible to flooding during the rainy season. Therefore, its topography prevents physical extension of the town.

- (b) Inadequate infrastructure -- The existing road network, and other urban facilities and services (i.e., garbage collection) are below standard. Furthermore, water is in short supply.

## II. Fiscal Resource Limitation

Data show that the local government's expenditures are even higher than its actual income, that the government expenditure grows higher while the income remains low. For example, in 1971, the expenditure was ₦6 million, whereas the income was only ₦4 million. In 1978, the expected expenditures will be as high as ₦21 million, with only ₦14 million income.

## III. Legal Limitations

The biggest problem is the inability of the municipality to expand its boundaries to areas where urban functions and urban facilities are required. The reason is that the process tends to be complicated and time consuming with major political overtones (conflict of interest among other municipalities). Another legal problem is the taxation problem. The municipality is allowed to tax only certain activities that do not provide enough income to cover its own expenditures, whereas activities which earn more income are under the control of the central government.

## IV. Administration Constraint

The municipality follows the policies set by the

central government, and the officials are chosen and appointed by the central government rather than elected by the local residents. So in terms of budgeting, personnel and policies, the central government has a tight control over the local government. The system, is consequently more centralized than the advocated decentralization approach. In this way, the activities of the local government are being swayed by the dictates of the central government, thereby allowing for losses in terms of flexibility and creativity at the local level. It can also hamper the work of some agencies which have to collaborate with the municipality.

V. Business and Social Independence

As a result of the previously mentioned problems, the people lose interest and sense of participation, knowing that their wishes will be ignored. This can cause further problems to the land use concept, as positive measures for land use control require a great deal of cooperation from the local residents.

Recommendations:

1. If at all feasible, the land use programming concept should not limit its interest to the municipality itself, but should also take into consideration the surrounding areas outside its boundaries, which are also in desperate need of urban facilities and functions.

2. The local residents should be educated as to their rights and duties in obtaining mutual benefits.

LECTURER: Daranee Bunchorntavakul, Chulalongkorn  
University  
LECTURE : Planned National, Regional, and Local  
Projects

### Introduction

A development plan, whether at the national, regional or local level, requires several preliminary steps:

1. Existing conditions of the target area must be studied to identify the main problems. All aspects, of the existing conditions (i.e., physical, socioeconomic, and demographic) must be analyzed.
2. After determining the conditions and problems of the target area, planning begins by setting objectives and targets, forming policies and strategies, and identifying projects to attain the stated targets and policies.
3. The plan is then implemented through the programs and projects by the relevant government agencies. Cooperative action is necessary to avoid repetition. The budget for implementing a plan must be carefully considered.

Projects are identified after a plan has been developed. Projects may be identified by the needs of local people and by government policy. Projects should be consistent with the stated targets and policies at national and local levels.

### Characteristics of A Sound Project

In determining the soundness of any project, three criteria are used:

1. Consistency and comprehensiveness of the project
2. Feasibility of the project in
  - . Techniques
  - . Finance
  - . Administration
  - . Environment.
3. Economic and social appropriateness.

Identifying sound projects is important to the development of the country at all levels. Consistency from the national to local level, will ensure the same direction for national development through the cooperation from the concerned agencies.

### Economic and Social Framework Related to Identified Projects at National and Regional Level

#### A. Economic and Social Framework at National Level

Thailand primarily has an agricultural economy with major economic activity centered on the production, processing and distribution of a few agricultural products. Manufacturing is limited to agricultural processing and to producing some consumer goods for the domestic market.

After Thailand's First National Development Plan, the transportation and communications infrastructure, which is the basic requirement for economic development (such as dams, roads, etc.) had been widely constructed. The Government of Thailand set this sector as the first priority in allocating the budget. The First and Second National Plans devoted 40-45 percent of the development budget to the sector of transportation and communication and power. During this period, the development budget was from loans and aid from abroad. After World War II, the Thai economy was stimulated by three factors: government expenditure, aid from abroad, and the construction of infrastructure.

The consequence of infrastructure construction was the rapid growth in the tertiary sector. This sector became the leading sector instead of agriculture and industry in the changing Thai economy. The rapid growth of the tertiary sector made the personal income gap wider, because there is a low level of demand for labor in this sector. Meanwhile, Thailand has faced a population explosion that increased the population in the agricultural sector. Since the arable land was limited, the yields returned from the land were low. This brought about the widening income gap between people in urban and rural areas and among regions of Thailand.

The major factor that made the regional income increasingly unequal was the government policy to invest in infrastructure, especially in the Bangkok Metropolitan area. Moreover, Bangkok is the center of international trade, which is very attractive for investors. The result was a great deal of private investment in the Central Region, because the rate of return was very high. This caused

migration of rural people to the urban area to find better jobs in the tertiary sector. The consequences of this phenomenon are problems in public health, public utilities, transportation, and education in both urban and rural areas. It also created slums in the urban area.

The rural poverty caused further damage to the country in terms of natural resource exploitation, such as deforestation and destruction of watershed areas. The result was droughts in the dry season and floods in the rainy season, which caused damage to the overall economy.

Because the regional economic and social inequalities have increased and may affect national economic and political stability, the Fourth National Plan stated an important policy to distribute growth from Bangkok to other regions. The objectives stated in the Fourth Plan are "to decentralize the growth from the Bangkok Metropolitan area by developing urban centers in other regions outside Bangkok to help check the flow of migration into Bangkok Metropolitan area and as regional centers for generating growth to surrounding rural peripheries." At the same time, the congestion in the Bangkok Metropolitan area will also be alleviated. The government will accelerate the development of the regional centers and promote them to the intermediate-size cities. An urban land use plan, an overall city plan, and plans for specific areas will be prepared. In addition, the urban infrastructure and public utility services will be developed. The government will employ tax incentives to promote industry, commerce, and service to the regional centers to create employment in the city.

## B. Economic and Social Framework of the Eastern Region

There are seven provinces in the Eastern Region of Thailand: Nakorn-Nayok, Chachoengsao, Prachin Buri, Chonburi, Rayong, Chanthaburi, and Trat. The Eastern Region has made more progress in industry than other regions (except Bangkok). This is partially because of the infrastructural development that makes transportation to Bangkok easier. Chonburi is located not far from Bangkok, so it is influenced by the industrial growth of Bangkok. However, the rural Eastern Region is still underdeveloped and lagging, which is inconsistent with the urban and industrial growth of some areas in the region. This causes the wider income gap between urban and rural areas. Therefore, the development guidelines for the east were set up to accelerate the:

- . growth of industry in the Eastern Region to correspond with the expansion of the industry and the town, including the preparation of land for industrial zone;
- . development of land reform and irrigation system and solve the problems of lagging rural areas that have a very low level of economic and social services.

### Projects Concerning Chonburi

According to the Fourth National Plan, Chonburi is to be the growth center of the Eastern Region. Therefore, it is important to develop Chonburi to become the regional center for agricultural and industrial production, commerce, business, and the distribution of products at present and in the future.

The Chonburi Land Use Programming Project was identified to meet this need, and it was consistent with the targets and policies of developing growth centers in Thailand. This project has three components:

1. identifying the pattern of growth center development that will be included in the long-term plan;
2. helping the local municipality solve specific problems by conducting a feasibility study of investment projects; and
3. training the local officers to plan and prepare the development projects for the municipality.

The project site is the area composed of the municipalities of Muang Chonburi, Siracha and Phanat Nikom. This site should be provided with facilities for business and residential areas.

The preparation of short-term projects is the task of each municipality. The projects are identified after determining the problems of the area. For example, Phanat Nikom Municipality, which has an area of 2.76 square kilometers and a population of about 13,000, is the center for trading of agricultural products and other business for its hinterland. This municipality has two problems: canal water pollution in the dry season and flooding in the rainy season, which damage the inhabitants' property and halt earnings of the people. It is the task of the municipality to solve these problems and improve the municipal area. However, to solve these problems, it may need more money

than the municipality can provide from its own sources. The municipality can discuss this problem with the Chonburi Land Use Programming Project and discuss a feasibility study of the development projects. In this manner, the government can help solve the local problems by considering the economic, social, and political appropriateness.

### Conclusion

A project can be identified in two ways: first, from the policy level responsible for the national and regional planning. This kind of project is usually policy-oriented. The details about project site and characteristics are determined in the regional plan based on the resource endowment and the economic and social condition of the region. Second, "bottom-up" projects are identified based on the need of people and the existing problems in the area. This kind of project requires a feasibility study of the investment project before implementation in order to be sure that the project is worth investing in and that careful preparation has been taken to prevent the unfavorable impact of that investment. Some projects are identified because of political pressure and/or an emergency, such as disasters. However, projects at any level that are identified with the criteria will certainly join and correlate at a level of development such as the Chonburi Land Use Programming Project.

Planned Public Development Expenditures

(Billion Baht)

Sector	First Plan		Second Plan		Third Plan		Fourth Plan	
	Baht	%	Baht	%	Baht	%	Baht	%
Agriculture	4.6	14.8	10.5	17.0	13.7	13.6	39.1	15.5
Industry	2.6	8.4	1.1	1.8	2.4	2.4	3.6	1.4
Transportation and Communication	10.2	32.8	17.1	27.7	19.5	19.4	37.2	14.7
Power	4.3	13.3	5.0	8.1	7.9	7.9	16.0	6.3
<b>Economic</b>	<b>21.7</b>	<b>69.8</b>	<b>33.7</b>	<b>54.6</b>	<b>43.5</b>	<b>43.3</b>	<b>95.9</b>	<b>37.9</b>
Social Development	5.5	17.7	1.9	3.1	2.7	2.7	8.6	3.4
Urban and Rural	-	-	8.4	13.6	14.9	14.9	33.3	13.2
Health	1.4	4.5	3.6	5.8	6.3	6.3	19.4	7.7
Education	2.5	8.0	14.1	22.9	32.9	32.8	95.3	37.7
<b>Social</b>	<b>9.4</b>	<b>30.2</b>	<b>28.0</b>	<b>45.4</b>	<b>56.8</b>	<b>56.7</b>	<b>156.6</b>	<b>62.0</b>
<b>TOTAL</b>	<b>31.1</b>	<b>100.0</b>	<b>61.7</b>	<b>100.0</b>	<b>100.3</b>	<b>100.0</b>	<b>252.5</b>	<b>100.0</b>

Source: National Development Plans: 1, 2, 3 and 4  
National Economic and Social Development Board of Thailand.

LECTURER: Dr. Pahibul Changrien, NIDA  
LECTURE : Changwat Planning: Chonburi

Local administration in Thailand can be divided into two levels: local government (provincial administration), and local self-government (administrative bodies).

At the provincial administration level, changwat and amphoe (district office) are regarded as two administrative bodies. At the changwat level, the Governor is held responsible for all functions directed by the government. Some changwats have Deputy Governors. Every changwat has committee members comprised of heads of various departments and chaired by the Governor. The administration of functions and responsibilities are as follows:

1. Changwat Office is responsible for general administration.
2. Departmental Office has various departmental heads responsible for the work in their fields.

At the amphoe level, the Nai Amphoe, or district officer, is held responsible for the duties. Deputy district officers and heads of various departmental units in the amphoe level assist Nai Amphoe in performing the administrative functions.

At local self-government level, there are three local administrative units:

1. Changwat Administrative Organization, which is comprised of:

- (a) Changwat Council elected by the people for a five-year term.
- (b) Changwat executives comprised of Governor and district officers.

2. Municipalities. There are three types of municipalities:

- (a) Tambon
- (b) Muang
- (c) Nakorn.

The administrative functions are as follows:

- (a) Municipal Council elected by the people to represent them for five-year term
- (b) Mayor.

3. Sanitary Districts. The Department of Local Administration, Ministry of Interior, would be held responsible for the establishment of the sanitary districts. The sanitary district committee is comprised of a district officer, deputy district officer, police chief, chief of health officers, village headmen and deputy village headmen (four of them having been elected by the people for a four-year term).

Theory and Practice in  
Local Government

In democratic countries, local self-government maintains several purposes:

1. It aims to provide "School of Democracy" for general public;
2. It provides a decentralization system;
3. The local government body will represent the central government in giving services and administering them in the area.

The paper also deals with:

- . Major components of local government;
- . Local personnel; and
- . General characteristics of local government in Thailand.

Problems of Changwat Planning

There are several problems with Changwat planning. There are problems on general administration, coordination problems, understanding the plan, lack of data, and problems in development expenditures.

LECTURER: Paitoon Sayswang, Thammasat University  
LECTURE : Basic Economic Data on Eastern Seaboard  
Towns (Chonburi)

This lecture emphasizes the necessity of indepth knowledge of the economic and social base of the entire Chonburi area in order to establish a program of land use for any urban area. In so doing, stress is given to the basic role, function, and interrelationship between the town and the rural hinterland, and between the town and the larger metropolis. To understand the basic social and economic base of the area, four sets of data are identified and data on Chonburi is analyzed.

1. Delineation of study area involves identifying and measuring the intensity of the flow of goods and services between rural and urban areas. The urban centers in Chonburi roughly approximate the administrative boundary.

2. Basic data on land use, population, employment and income are given on all various zones, including the implication of land use programming.

3. The analysis of economic activity is considered. In Chonburi, the agricultural sector dominates the whole economy, with rice and cash crops comprising the major activity. Trade and agro-industry, and self-contained industry like oil refineries, are described. Future demand on urban activity and land use are inferred.

4. The role of state covers the flow of tax proceeds to the central government, and covers local and state expenditure in highway improvement and reservoir construction.

Having identified the basic data, certain patterns of land use can be projected by clarifying the role of the growth center and its physical pattern. Because of limitation in data itself, as well as the limitation of using pure economic data, the necessity of combining this data with physical and administrative information is necessary.

LECTURER: Kamthorn Kulachol, Silpakorn University  
LECTURE : Infrastructure Data

The infrastructure within Chonburi area taken into consideration:

1. Health Facilities;
2. Education Facilities;
3. Communication, Telecommunication and Transportation;
4. Public Safety and Police;
5. Public Utilities -- Water Supply and Electricity.

The electrical supply (which is managed by the Provincial Electricity Authority), and the communication and telecommunication systems appear to be well-established networks. Their facilities and systems are able to provide services to all communities. The transportation facilities, focusing on the road network, are also in a good condition. The new bypass highway under construction will help reduce congestion on the main roads in the urban area and the new railway line to Sattahip will contribute to the overall transportation system.

Other facilities and utilities, however, need to be considered and developed.

1. Police stations are established in all communities, but the ratio of policemen to the population is still below standard.

2. Provincial hospitals, amphoe hospitals, health centers, and midwifery centers are properly provided. But people from all parts of Chonburi, some from long distances, come directly to Chonburi and Siracha hospitals, creating overcrowding and sometimes inadequate care.

3. Schools are almost all public and there is still a classroom shortage in the secondary level.

4. The ten fire stations in the area provide proper services; only the existing equipment is quite limited.

5. Drainage systems are conventional, draining directly to the ocean. There are no sewage and treatment plant systems, however.

6. Water supply is limited to only densely populated areas along the ocean. The water for Chonburi and Siracha is from Bang Phra Reservoir.

Details are illustrated in the submitted tables, diagrams and maps.

LECTURER: Dr. Pramote Prasartkul, Mahidol University  
LECTURE : Sources of Basic Demographic Data in  
Thailand and Population Forecasts

This paper discusses existing sources of demographic data in Thailand primarily involving national censuses and registration systems. Both static and dynamic natures of population characteristics pertaining to these two sources of data are also discussed. A brief explanation of the census-taking process in Thailand is given, and various population characteristics existing in the census materials are illustrated. These population characteristics include demographic data such as age, sex, marital status, fertility and migration information. (Social and economic characteristics of the population given in the census are also reviewed.)

Furthermore, evaluation of the census underenumeration is discussed. For the registration system in Thailand, vital statistics and household registration are emphasized, the latter an important potential source of migration information in Thailand. The paper elaborates on birth and death statistics presented in various forms of tabulation in existing government publications. Evaluation of vital statistics by survey of population changes in 1974-67 and 1974-75 is undertaken. It is noted that data from these two sources are, however, not equally available in all administrative units, especially at the amphoe level. Cautious use of these demographic data is emphasized.

The paper also deals with various types of population estimates with a special emphasis on population projections for subnational units, i.e., Changwat. General principles

and procedures of local population projections are discussed, and three methods considered feasible in terms of available data are methodologically illustrated. These three methods are: (1) mathematical method, (2) ratio method using prior projected population as the base, and (3) cohort-component method. As an illustrative case, data from the 1960 Censuses and previously projected population for the central East Region are used to project the 1980 population of Chonburi. The paper also discusses the significance of different assumptions underlying each method.

LECTURER: Dr. Kiat Chitakul, Chulalongkorn University  
LECTURE : Land Use Inventory

From archeological evidence of the Ayudhya period, Chonburi Municipality, the present administrative center of Changwat Chonburi, can be dated as an older urban area than either Phanat Nikom or Siracha. (The two latter towns can be traced to the early Ratanakosindra period.) Chonburi and Siracha are located on the sea coast and have as their eastern boundary Sukumvit east regional highway. Phanat Nikom, however, is located far from the sea coast and has a less important road connecting it to Chonburi and Chachoengsao. Today the Chonburi Municipality population totals about 50,000 persons, which is more than the population of Siracha and Phanat Nikom by three and four times, respectively. Although Chonburi Municipality has an area of only 4.6 km.<sup>2</sup>, the urbanized area of Chonburi is greater. For example, about 10 km.<sup>2</sup> and its population, the 20,000 people of Tambon Bang Sai, Ban Suan and Samet, comprise part of the Chonburi urban area.

Chonburi's growth is limited, however, by various restrictions: the boundary formed by Sukumvit Highway to the east; and the problems of water shortages due to hilly terrain. Therefore, Chonburi's growth has always been in the southern direction. It can be said that today, from the aspect of urban structure, Chonburi has reached its growth potential, having a population density of more than 10,000 people/km.<sup>2</sup> Furthermore, Chonburi's rate of urbanization has been rapid, occurring mainly outside the legal municipal boundaries. At the same time, Phanat Nikom and Siracha have one-half the population density of Chonburi, and their growth has mainly occurred within their municipal areas.

Land use planning must be the first step of any planning process; understanding land function, land size and changes in land utilization is necessary for successful land use planning. Furthermore, in the formulation of a land use plan there must be criteria for parcels size, building and population density, site planning, open space and various models for urban growth. Equally important is the process of data collection and data analysis for problem identification and the projection of future trends.

In regard to the physioeconomic and service sectors of the three municipalities, the characteristics, functions, sizes and scope of the surrounding areas of the three municipalities have been identified. As a result of comparative analysis, it is then possible to place the three municipalities into an urban hierarchy.

In regard to the physical environment of the three municipalities, data should be analyzed in population density; building types, density and materials; and traffic flow and communication network.

In the area of economic analysis, the following topics should be studied:

- . Location and land utilization;
- . Land values;
- . Gross income from commercial and service activities;
- . Number of nonresident commuters.

As for the service and government sector, distribution of service and number of civil employees should be studied.

LECTURER: Dr. Salit Santimatanedol  
Ministry of Communication,  
Department of Transportation

LECTURE : Traffic and Transportation Data Collection

This paper is divided into two parts: the first explains the concept of traffic and transportation planning process (oral presentation); the second discusses several studies, including:

- . Traffic volume studies
- . Vehicle speed studies
- . Travel time and delay studies
- . Parking studies
- . Traffic accident studies
- . Origin and destination studies.

In each of the above studies, the following sub-categories will be explained:

- . Definitions
- . The importance of the study
- . Methods of conducting the study
- . Presentation of the study.

LECTURER: Dr. Apichat Wongkaew, United Nations,  
Asia Pacific Development Institute

LECTURE : Establishment of Objectives

This lecture reviews the current approaches and methodologies of planning necessary to meet the changing social and economic needs of the area. The process of planning and the issues involved in shaping urban policies and programs within the context of national and regional development are discussed. Several methodologies of planning, coined as "top down," "bottom up" and "irritation," are discussed.

A diagnosis of the existing data, including trends and future projections, is the key in formulating the "problem structure" of the development. The relationship among those problems at the local, regional, and national levels is taken into consideration to formulate the objectives of the development. The targets and strategies will then be identified, where the obstacles and constraints in reaching the objectives are identified and analyzed (physical environment, financing possibility, political influences and social acceptabilities, time dimension, popular participation in planning process, institutional capacity, etc.).

The overall development "scenario" can be designed after these factors are considered. The evaluation of the formulated programs and projects then become the feedback materials for reviewing the objectives of the plan again.

LECTURER: Jedkamchorn Phromyothi, Silpakorn University  
LECTURE : Guide Planning

In land use programming, a term employed by USAID/UP, from Malcolm D. Rivkin's concept<sup>1</sup> advocated for developing nations, the "Guide Plan" is the key to its success. It is a planning approach that is different from the conventional approaches to land use planning or planning for urban development. It illuminates the need for continual flow of information; alternative formulations; consultation among planners, decisionmakers and citizens; preparation of planning policies and programs; and periodic revision practiced in the contemporary "Planning Process." It is believed to be suitable for small communities in developing countries, thus Chonburi.

The end product of the process using Guide Planning should be a portfolio of implementable projects that are supported by government at the national as well as local level and also by the community at large. The end product should not be a traditional Master Plan report, although it may be necessary to document various aspects of the programming process.

In general, land use programming has two major objectives:

1. To provide a realistic and implementable action program that is of a scale and time frame needed to keep pace with population growth and other development.

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1. Malcolm D. Rivkin, Land Use and the Intermediate-Size City in Developing Countries, New York: Praeger Publishers, 1976.

2. To consolidate the known techniques for controlling the use of land to achieve a desired pattern of urban growth.

Thus, it is clearly seen from these objectives that the process of land use programming requires certain characteristics if development is to occur on the right scales, at the right time, and in the right place. Therefore:

1. The process must be receptive to the needs of implementing agencies, and of the type that will create financeable development projects.
2. The process must be flexible enough to respond to changes in policies and programs to differentiate between projected and actual needs.
3. The process must be a relatively fast one, so that cycles of programming and implementation can occur at a pace that will meet the needs of rapid population growth and other developments.

The elements that comprise the land use programming process are:

- . Goal Setting
- . Implementation Structure
- . Guide Planning
- . Land Assembly
- . Project Packaging
- . Control Mechanism
- . Evaluation and Feedback.

There is no established procedure for the formulation of the programming process, and the order in which these items are addressed must be determined by the local situation. Two or more items may be addressed at the same time. However, the process should seek "targets of opportunity" that will provide maximum payoff and further impetus to meeting overall urban development objectives.

Rivkin referred to Guide Planning as "... (a) rudimentary approach... that might be conducted, often without significant technical assistance, by the mayor or administrators of a small community... under which gross areas are selected as suitable for various kinds of land uses, and then basic site location is identified for major roads, schools, and other public improvements. It is a highly flexible approach and suited to situations of imperfect information and rapid change. The guide plan provides a gyroscope for policymakers and forces the thinking through of land use decisions. It can serve until more extensive technical skills are brought to bear and is far better than no planning at all."<sup>1</sup>

The guide plan then is generalized planning to establish a main framework for urban development. The framework should consist of major transportation corridors, major elements of water supply and sewerage, open space system and public land, existing employment centers, both industrial and commercial. Ultimately, individual residential projects will be fitted into the main framework, and other framework elements will be developed as needed. It involves the following components:

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1. Ibid., p. 29.

1. Preparation of projections of population and economic trends and assessment of physical needs.
2. Preparation of generalized land use transportation guides.
3. Preparation of functional plans and programs that identify sites and capacity of open spaces, schools, health facilities, roads, water, sewer and other utilities.
4. Some definition of staging, timing, and linkages of investment.
5. An implementation program involving legislation, government and private action.

The precise character and sequence of these steps, the level of detail employed, and the kinds of supplementary analyses prepared are all matters to be worked out in context of the specific country and specific city involved, which in this case is Chonburi, Thailand.

Although the establishment of goals and the development of the guide plans are to serve as a framework for land use programming and project identification and evaluation, the goals and guide plans should be reexamined periodically to reflect feedback from implementation of the short-term projects and unanticipated changes in variables that may have a significant impact on the establishment of priorities for projects. This will facilitate flexibility in urban development programs and offer the chance to use the "targets

of opportunity" that may become available. That is, goal setting and guide planning are to be viewed as a continuing process rather than discrete activities undertaken at periodic intervals.

As mentioned earlier, there is no established procedure for formulating a guide plan. However, key elements in the planning process which are interdependent in formulating a guide plan, and it is essential that the planner understand their fundamental roles in the process. Some thoughts on these elements are presented to serve as basis for class discussion.

Goal setting is an important element in the planning process. A goal is an abstract idea and is usually expressed in abstract terms. It is an idea to be sought, not an object to be achieved. Goals, then, are not expressed with regard to time or place.

For example, statements of goals include:

- . raise the standard of living
- . promote development
- . improve the quality of the built environment.

Such statements of goals are much too general to serve as the basis for drawing up specific planning proposals. Many plans fail because they are based upon loosely formulated goals. To overcome these difficulties, goals need to be translated into a set of compatible objectives to bridge the gap between ideals and action.

An objective must be capable of measurement and attainment. Objectives stem from strategy and, as such, should be specified with regard to time and place. For example, objectives could include:

- . eliminate unemployment in Chonburi by 1980.
- . ensure that everyone living in Chonburi is within 100 meters from public open space by 1982.

Plans can be drawn up to achieve objectives. Thus, planners should define a guide plan as proposals of concerted action to achieve objectives.

To achieve goals or objectives, a development plan, or in this case a guide plan, must have a clear policy as one of its elements. Guide plans should involve two levels of concern: the structural level and the development level. In this sense, structure implies the guidance of change through time in accordance with evolving policies, and development implies the design of definite schemes of local change for execution in the near future.

The guide plan is primarily statements of policy accompanied by a "structure map" designed to clarify the basic physical structure of the area and its generalized land use and transport system. The main structural components may consist of the road system, public park or open space system, and activity centers (e.g., the new fish market proposed by the Chonburi Municipality). However, no attempt should be made to prejudge detailed layout and the physical form of the city. Its form should depend as much on market forces as on the planner's predictions. In short, guide planning is an attempt to prepare for the future, not to predict it.

The most difficult problem in planning is one of implementation. In implementing any plan, the planner must recognize the existence of plural interests and the realities of functional interdependence. Often the goals are not attained because of events largely determined by decisions of private individuals, in other words, by market forces.

The best method of implementation is one of direct enforcement. In a totalitarian system, this can easily be done, but under a system of democratic capitalism, such as we have now in Thailand, direct enforcement is almost impossible. Planners must seek to channel private energies and initiatives in the direction of desired public ends.

To overcome these difficulties, the planner must develop strategies as a mechanism to control the dynamic and changing environment of the city. This control mechanism will help the planner to shape the background conditions required by the guide plan; that is, those general market orientations and locational preferences of certain infrastructure or community facilities that are consistent with the goals and necessary for their realization.

LECTURER: Dr. Prasit Tangyingsiri, NIDA  
LECTURE : Project Analysis and Appraisal

The purpose of this lecture is to discuss the modern techniques of economic and financial analysis of projects. The techniques outlined are not complicated, but they are effective. They are commonly used by NESDB, the central planning authority, for project analysis and appraisal of all development projects.

The main purpose of project analysis is to help decision-makers select those projects that will contribute most to development objectives. Therefore, all projects have to be evaluated in terms of benefits and costs and ranked in accordance with net contributions. By deciding to implement a particular project, others may have to be foregone because of limited resources.

The term "project," for our purposes, means any scheme, or part of a scheme, for investing resources that can reasonably be analyzed and evaluated as an independent unit. A project, however, could be broken down into parts for separate consideration. But it would not be sensible to consider various parts of a project separately if they were so closely linked that one could not be operated, or fulfill its purpose, without the others. In such a case, it is feasible to integrate all components under one single project.

Although there are many definitions of a project, the common elements of the project have to include at least the following matters: objective, discreteness, coherent organized action, location, and scheduled beginning and terminal

projects. The proposed project thus must include at least these five matters.

To plan a project, project planners have to look at the project both in terms of its process and components. The project process, or cycle, consists of the following stages:

1. Project identification and pre-investment study;
2. Project development and preparation;
3. Project appraisal and approval;
4. Project execution; and
5. Project close-out.

The major components of the project include:

1. Economic analysis;
2. Financial analysis;
3. Technical analysis; and
4. Management analysis.

Each cycle and each component will be discussed in detail during the lecture and in the research paper.

Since the technique of project appraisal requires a comparison of the benefits and costs over the economic life of the project, the following three measures are widely used to make the comparisons noted above:

1. Net Present Value Method (NPV)

$$NPV = \sum_{t=1}^n \left( \frac{B_t - C_t}{(1+i)^t} \right)$$

$$\text{or } = \sum_{t=1}^n \frac{B_t}{(1+i)^t} - \frac{C_t}{(1+i)^t}$$

2. Internal Rate of Return (IRR)

IRR is the value of interest or discount rate (r) such that

$$\sum_{t=1}^n \frac{B_t}{(1+r)^t} - \frac{C_t}{(1+r)^t} = 0$$

3. Benefit Cost Ratio (B/C ratio)

$$B/C = \frac{\sum_{t=1}^n \frac{B_t}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t}{(1+i)^t}}$$

where

$B_t$  = benefits in year t

$C_t$  = costs in year t

i = interest rate

r = discount rate

t = year 1, 2, ... year n

n = number of years of project life.

Accordingly, three sets of estimates have to be prepared leading to project appraisal:

1. Estimates of annual outputs or benefits over the life of the project. In the case of our project, the output may be counted as the annual rental value of land, or an estimate of the annual net product attributable to the land in its alternative uses.
2. Estimate of annual inputs or costs required to produce the estimated outputs.

3. Pricing of inputs and outputs by appropriate prices to obtain an estimate of annual costs and benefits. The appropriate prices are as follows:

Output

- (a) Land is priced at its market value in the case of private or financial point of view.
- (b) Land is priced at its shadow prices in the case of economic/public point of view.

Input

- (a) Market prices (as mentioned above);
- (b) Shadow prices for (as mentioned above)
  - (1) Unskilled labor
  - (2) Opportunity cost of capital
  - (3) Foreign exchange rate.

Since the timing of costs and benefits varies, a common denominator must also be applied. The next step thus involves discounting or finding the present value of costs and benefits by using the following formula:

$$PV_0 = PV_t \frac{1}{(1 + i)^t}$$

After completing the various steps mentioned, the comparison between costs and benefits can be made through NPV, IRR and B/C ratio. Although economic and financial analysis take the same form of calculation, they are different, especially the estimation of costs and benefits as well as pricing of projects. The easiest way to understand

the social cost-benefit analysis is thus to examine the difference.

Finally, sensitivity analysis will be introduced, because as described previously, it reflects the best estimate of future benefits, costs and prices that will affect the benefits expected from the project. But uncertainty may attach to these estimates. It is, therefore, necessary to include an evaluation of the effects of divergence of values from the best estimates of values of benefits and costs on which the calculation of benefits and costs have been based.

LECTURER: Paitoon Sayswang, Thammasat University  
LECTURE : "Method for Project Feasibility Study  
Case Study of Phuket Coastal Port"

The lecture describes the project preparation for a medium-size development project costing about 20 million Baht. The proposed project is located at Khlong Tha Chine near the township of Phuket and involves the construction of an 80 x 20 meter landing pier for the use of 250-300 ton lighters and coasters. The pier is designed for 24-hour operation. This project is selected for presentation here because it is of the scale that could be undertaken by the local authority. The lecture itself is divided into four sections:

- . Section I deals with steps in project preparation covering demand analysis, investment criteria, operation and financial plan, design and cost estimates, economic cost/benefit analysis, and a cost recovery scheme.
- . Section II describes the background of the Phuket Coastal Port, including its physical condition, port facilities, traffic forecast and the operation of its present port.
- . Section III deals with project evaluation covering project life determination, investment cost and other opportunity costs as well as the estimate of benefit in terms of reduction in overall transport costs and transaction costs. Using a discounted cashflow method, the internal rate of return is derived. Alternatively, for given rates of return, cost/benefit ratios are computed.

- . Section IV highlights findings and results of analysis to form the basis for investment recommendations.

Wherever appropriate, detailed discussion on technique for project preparation of other types of investment such as sewer improvement, market place development are provided.

LECTURER:           Preeda Chuntakul, Kassesart University  
LECTURE :           Economic Impact Studies

The main purpose of the report is to investigate the economic impact of land use programs. Two categories of land uses are considered: urban development (road improvement, redevelopment, construction), and rural development (redevelopment of farmlands, natural resources).

The costs of urban redevelopment are defined as the resource costs as well as the opportunity costs of land. Decreases in costs of fire and crime protection and health care, as the results of slum clearance, are regarded as some of the benefits derived from urban redevelopment projects. Increases in income, taxes, property value and employment are also considered benefit. Urban road improvement and construction will mitigate city traffic congestion, and as a result decrease vehicle operation costs. All of these benefits, of course, have to be weighed against project costs.

The social costs of turning farmland into industrial sites, shopping centers or residential areas are normally greater than the private costs. Decreases in agricultural outputs and amenity losses are cited as the social costs of using farmland for other purposes, and as long as private costs are less than social costs, the episode will continue unless the private costs are increased by the government.

To leave the natural resource in its original form is as beneficial to society as to develop it to produce the outputs. The decision whether or not to preserve or develop it will be settled by the size of these benefits.

A short discussion on the significance and method of post evaluation and ex-post evaluation must be performed to gauge its success or failure in assuring that the resources already committed into the project will have the largest return.

LECTURER: Ruchaniekorn Settho, Kassesart University  
LECTURE : Social Impact Evaluation

Evaluation is an essential concept in planning, so the actual evaluation process should be completed in every step of the policy plan. Yet to simply evaluate the plan is insufficient. Coupled with the social effects, the economic and environmental effects must also be taken into consideration.

The crux of social-effect evaluation consists of relevant social data and the objective of the social project. The social data must be current, reliable, and must cover the characteristics (statistical) of the population, various relevant organizational structures, institutions, values, attitudes, and customs. The social data must also be scientific. The objective of the social project includes analyzing the needs, wants, taste, prestige, and livability of the community.

In general, land use programming is one of the steps in the urban development planning process, and more often than not, urbanization is regarded as producing socially negative effects. In this report, however, both the socially positive and negative effects are studied in detail.

The report proceeds to cover three areas: data identification, prediction and evaluation. Evaluation is considered the analysis of social loss and gain that people receive. The practical side of the evaluation begins by putting the checklist, social impact statement and impact summary into the form of a summary matrix; or by explaining the social conditions thoroughly. Finally, the various proposals of

the project are analyzed carefully, taking into account both pros and cons.

The evaluation of social effects is not an easy task. It cannot be quantified into cost and benefits as measured in the economics. Therefore, it has to rely primarily upon the ability accumulated from actual working experience.

LECTURER: Suwattana Thadaniti, Kassesart University  
LECTURE : Environmental Impact Evaluation

Actions and constructions have certain environmental impacts, so careful evaluation of environmental and geographic conditions is essential before any project is launched. The purpose of evaluation is to select the best project to achieve the set goals and to mitigate the adverse effects. Because of the wide variety of factors and their relationships, however, there can be no literal "cookbook approach." The task of selecting a project should include both regional and local assessment, depending on the scope of the project undertaken. Every project, apart from having immediate on-site or primary impacts, could have effects over a widespread area, the so-called downstream or secondary effects. The latter often appear in socioeconomics, land usage, and pollution.

The body of any assessment must include:

1. A description of factors as they currently exist;
2. A description of the feasible alternatives;
3. An objective of every project and alternatives;
4. The result of superimposing the project and its alternatives on these factors;
5. Suggestions to both minimize the adverse effects and, where possible, to improve the environment.

The methodology of the evaluation itself could be in the form of:

- (a) Checklist
- (b) matrix
- (c) questionnaires

- (d) weighting system
- (e) cost-benefit analysis
- (f) others.

It should be noted that any successful method of environmental impact evaluation has to be varied to accommodate the nature of the project concerned. Finance, timing and the readiness of evaluators must be considered. New techniques have always been suggested; but evaluators have to depend on the public interest.

LECTURER: Dr. Apichat Wongkaew, United Nations,  
Asia Pacific Development Institute

LECTURE : Program Administration

The "Program Administration" lecture provides a general conceptual framework for the review and preparation of the projects before their implementation. Basic concepts and techniques are explained to the participants to encourage a better understanding of program administration.

Problems of personnel, manpower, and material resources are the main issues of the lecture. The program budgetting (PPBS: planning, programming and budgetting system) is one of the important elements toward strengthening the preparation of program administration. Program evaluation and review techniques for the monitoring instruments such as PERT, CPM, Gantt Charts, Square Network, are introduced.

LECTURER: Dr. Narong Srisawat, Kassesart University  
LECTURE : Social and Cultural Factors Influencing  
Urban Land Use

The purposes of this paper are to assist urban planning officers in understanding the social and cultural factors affecting land use; to enable officers to utilize human ecological concepts in land use planning; and to explain how to collect primary and secondary data on social and cultural factors influencing land use.

### Human Ecological Theory

Three characteristics are involved in the transition of rural to urban communities, i.e., population size, population density, and heterogeneity of the population. Population size refers to the increase of residents, e.g., from one thousand to several thousands or to millions. Consequently, social relationships of individuals are likely to change. Because of the limitation of land in the urban area, increased population results in high density population, which in turn stimulates social differentiation in urban communities. Population heterogeneity also results, so various social groups are likely to be found in the urban area. These factors contribute to complexity and difficulty in understanding urban social structure.

The ecological process, as evident in classical human ecology, helps planning officers understand how spatial organization occurs in an urban area. There are five stages in the process: (1) centralization -- the process whereby groups and institutions are clustered in the central area of the city; (2) concentration -- the process of rural-urban migration which causes rapid increases in urban population;

(3) segregation -- means a separation of the housing pattern among different classes (i.e., the upper class usually resides in the most appropriate residential area while the lower class lives in slum areas); (4) invasion -- an extension of the land area owned by powerful groups or institutions into another land area owned by the weaker groups or institutions; and (5) succession -- a complete process of invasion where the land (e.g., paddy land) is completely changed into residential or shopping center areas. This ecological process, with the concept of competitive cooperation, leads to the emergence of concentric zones, sector theory and multiple-nuclei theory.

Sociocultural ecology is the theory which uses social and cultural factors as the key explanatory variables of spatial organization. Sentiment and symbolism are considered to be the two essential factors in land use patterning.

Land Use in Muang Chonburi,  
Phanat Nikom and Siracha

Chonburi Municipality is ranked thirteenth in population among cities in Thailand. Population of the three municipalities, i.e., Chonburi, Phanat Nikom and Siracha, is increasing rapidly. The highest population density is in Chonburi Municipality, followed by Phanat Nikom and Siracha, respectively. Therefore, the social structure of Chonburi is likely to be the most complicated, while Siracha's is probably the least. Competition for land ownership in the three urban areas conforms to classical ecological theory; that is, the wealthiest and most powerful groups or institutions

own land in the central parts of the cities where government buildings and business centers are located, while the poorest groups own inappropriate residential areas.

Land use planners should consider the influence of social and cultural factors in spatial organization; traditions and values of the urbanites are important variables in segregation. Traditions (e.g., Thai and Chinese holidays, Chinese New Year, folk activities) will help the planning officers take account of values and beliefs in relation to land use of urban people. Together with ecological distance, the planning officers would find that small industries, such as the fish soy sauce factory and the bus body construction factory in Chonburi Province, are located in the Chonburi Municipality area and in Ban Suan community, respectively.

Religious activity is one of the most influential factors to be included in land use planning. Land belonging to temples cannot be transferred to other uses, although high economic return could be obtained, because such invasion and succession are in conflict with the inhabitants' cultural values.

Sociocultural data in land use planning should include: (1) rural-urban migration; (2) ethnic groups, nationalities, language, religious, and educational level of the population; (3) customs, traditions, values, and folk activities of the population; (4) location of various ecological units; and (5) a map showing the transportation network and different service centers of the city. These data can be collected through field survey and various government records.

LECTURER: Dr. Apichat Wongkaew, United Nations,  
Asian Pacific Development Institute

LECTURE : Land Use Control

This lecture contains a review and discussion of the current regulations and laws of Thailand on land use control and an identification of the positive measures to secure desirable patterns of land use.

The existing Thai legislation concerning "Land Use Control" will be explained. Their strong and weak points as well as their usefulness will be discussed at length. The first Thai Town Planning Act, amended in 1975, is the important source material. It is composed of 84 sections that are grouped into 11 chapters. The following sections are highlighted and discussed:

- Section 4: Terms that are used in the Act, such as general plan, specific plan, accessory space, etc.
- Section 17: Preparation and making of general plan.
- Section 26: Enforcement of general plan.
- Section 27: Ministerial regulation enforcement.
- Section 28: Preparation and making of specific plan.
- Section 41: Enforcement of specific plan.
- Section 70: Appeal.
- Section 83: Penalties.

The experiences of positive inducement in land use control from many countries are presented in the seminar.

The positive measures that ensure desirable patterns of land use with reference to Thai administration and financing system are discussed. Zoning as a technique of land use control is the main issue that the speaker will try to emphasize in preparing the land use plan for the municipalities.

### Land Use Controls

The capital budget forms a critical point between land use planning and other elements of urban administration and thus is one of the few essential components to a land use control effort. The capital budget is (can be) prepared by local administrators to provide a basis for rational public investment activity. One function is to order government action in scale (of importance) and sequence to make the most impact from limited resources in the short run. The implication of a short-run nature of the capital budget refers to very specific directives for use of public funds over a 1 to 5-year period.

In programming such a budget, the following steps are suggested:

1. The goals of the municipality are assessed, and the goals of each public agency responsible for public works are identified.
2. The specific projects that each agency wants to work on over the 5-year period are identified and priced.

3. All projects are identified on a map of the study area so that all complementarities and conflicts are revealed.
4. Decisions are made regarding projects that are critical for short-term development or improvement.
5. The budget authority defers the projects that are incompatible with land development objectives.
6. The chosen projects are scheduled in sequence over the time period, and provisions are made for the necessary funds for each agency.
7. The governing body approves or modifies the budget and it is enacted into law.

One of the most serious problems, universally, has been the ad hoc scheduling of public investment -- the early opening of areas for growth before or without adequate services. Thus, a careful capital budget or program can serve to direct public investment and related private activity to growth areas that are deemed desirable by the governing body -- areas where sufficient services can be provided.

Planning and capital budgeting provide a framework for public exercise of land area control. Alone, however, they are not control techniques. Publicly exercised land control techniques are discussed below.

## Positive Techniques

Positive techniques require positive action by government and use government power and financial resources.

### Provision of Infrastructure

The provision of infrastructure has become the most powerful tool for shaping the urban environment. Although a capital budget is a strong guide for growth, provision of roads and utilities can actually produce and direct growth. That is, once the basic services for new development are installed, a given area becomes very attractive for development. Provision of infrastructure can take two forms: basic transport and utility systems that lead growth and service facilities, such as schools, community centers, etc. However, one of the most frequently recurring problems is the coordination of such investment, so that land is made available and complementary services installed when needed.

### Government as the Financier and Developer

This particular technique is not new, even in Changwat Chonburi, or Thailand in general. Basically, it can involve the financing of low- and moderate-income housing, construction of low-cost housing, and government development of industrial land and related residential communities.

Theoretically, it is possible for such governmental land development activity to be ordered within the framework of an overall physical plan.

Of specific note is the local right of the municipality and changwat to enter into such related development practices. To this point, both the municipalities and the Changwat Chonburi have ventured into such activities such as the Chonburi Fish Market, the open markets in each municipality, the municipal pawnshops, and the large development project underway in Tambon Ban Suan (by the Changwat).

### Incentive Techniques

#### Tax

This concept is actively used by the Board of Investment as a means for encouraging special industries or developments to locate away from the metropolitan area through the provision of low tax assessments for a certain time period. These low tax assessments usually relate to customs assessments on imported equipment, various concessions on the taxation of income (profits) and building and land taxes.

A more specific description of this technique as related to urban development would involve retaining a low tax rate on a specific parcel of land for a short period of time, if the developer meets the development requirements of the municipality. An example would be the inclusion of "public" recreation space in a housing estate developed by the developer but maintained by the municipality, or the redevelopment of low-density structures to a higher density (i.e., two-story shop houses to four-five story units).

The purpose of this land use control is positive in that it encourages a higher level of development that meets the requirements of both the developer and municipality.

### A Higher Land Use Intensity

The purpose of this control device is also positive, since it encourages the developer to meet the specific requirements of the municipality which, in turn, permits the developer to construct his housing or commercial units at a higher density ratio than normally permitted.

The contribution that the developer can make could be in the form of provision of "public" recreation space, or the transfer of portions of land to the municipality that would assist in improving access or vehicular circulation to areas experiencing problems.

### Negative Techniques

Negative techniques are those that are applied to remove or prevent development that is counter to public objectives.

#### Slum or Squatter Removal

This is a universally known technique that involves the actual demolition of physically deficient housing and removal of squatter settlements on public lands. These actions are usually related to attempts to resettle the population elsewhere and to redevelop the cleared sites for new uses.

#### Withholding of Permission

Simply put, this category provides the "ultimate" technique in deterring development by denying permission to build.

### Land Value Freezing

The aim of this technique is to "freeze" the value on land, since it often is not possible for a public authority to acquire the needed land for public facilities or housing in a short period of time after a particular project need has been determined. Many countries have regulations that enable freezing of site values for stated periods of time, during which public acquisition can presumably take place.

### Taxation

This technique basically implies that a heavy tax is levied on land areas that are held out of development for speculative purposes and on the proceeds of previous sales that show excessive profits.

The details of zoning, land use classification, general plan, specific plan, land area ratio (urban, semi-urban and rural) are described and given to the participants as a guideline or tool for decisionmaking and design of the land use plan. The different size of towns and their required spaces for different kinds of activities and services which are suitable physically, environmentally and economically for implementation are given in the form of tables.

LECTURER: Phayab Phyormyong, NESDB  
LECTURE : Financial Capacity of Municipality

If local bodies are to carry out their functions responsibly and attain a satisfactory degree of self-government or state of autonomy, they must have access to adequate revenue, and, above all, have budgetary responsibility within their control. With respect to revenue, this means that a healthy local government system needs adequate revenue to finance local expenditures, so the local revenue system can operate in such a way that local fiscal independence is maintained.

In this report an investigation into the revenue system of Thai municipalities, with special emphasis on locally levied taxes, is made, providing information about various sources of revenue and revenue structure of each municipality. Evaluation of the municipal taxation system, with emphasis on locally levied tax revenue, is provided in Section 2, below.

## 1. Revenue Structure of Municipality

In Thailand every municipality is authorized by law to obtain funds from similar financial sources.

### 1.1. Tax Revenue

The municipality is authorized to collect building and land tax, land development tax, signboard tax, and animal slaughtering tax as income. Apart from this, the municipality can add a surcharge of up to 10 percent of the collections

of certain national taxes. These national taxes, which are levied by the Revenue Department and the Excise Department, are business tax, alcoholic beverage tax, non-alcoholic beverage tax, and entertainment tax. In addition, there are other taxes -- the so-called shared taxes -- which are levied by the government, but all, or a portion, of these taxes is distributed to local bodies. The municipalities share of taxes are rice premiums and road vehicle taxes.

### 1.2. License, Fee, and Fine

Theoretically, fee is the price of certain governmental services. License provision is designed to restrict particular enterprises to people who have a license, where the license is a tax receipt in payment for permission to carry on the activity. The purpose of this could either be revenue collection or regulation of certain activities. Thai local authorities have the right to charge licenses, fees and fines in their respective jurisdictions. However, the government intervenes in collections which are generally a matter concerning the localities. The government control is reflected in the determination of what kinds of activity and local government services are provided and what rates the local authorities can charge for license fees and fines. The rights of municipality to charge for license fees and fines are derived from the Public Health Act of 1950. For instance, according to the law, licenses are required from anyone who wishes to operate businesses which affect the health of the people, such as restaurants, barber shops, medical professions, etc., or which require certain governmental services as street cleaning. It is notable, however, that license fees for selling liquor and gambling permits

are charged by the central government, not the municipality. The latter could only add a surcharge of up to 10 percent to the amount collected by the government as its revenue. The fines are imposed as penalties for violation of municipal regulations and by-laws.

### 1.3. Income from Property

This is income derived from municipality-owned physical capital such as equipment or buildings which are leased, and monetary capital which earns interest, such as bank deposits.

### 1.4. Miscellaneous and Trading Income

Miscellaneous income includes donations from private persons, and other minor receipts, while trading income is derived from municipal commercial activities like electricity and water supply.

### 1.5. Government Grants and Loans

Grants and loans for municipalities are usually from the Department of Local Administration.

### 1.6. Other Income

This category is basically comprised of trust funds.

## 2. Municipal Taxation

Tax revenue of municipality is derived from tax collection which could be categorized into three major groups:

- (1) taxes which are locally levied; (2) surcharge taxes; and
- (3) shared taxes.

## 2.1. Locally Levied Taxes

Taxes levied by municipality consist of building and land tax, land development tax, signboard tax and animal slaughtering tax.

### A. Building and Land Tax

Building and land tax is levied on the owners of buildings and the land they developed. It is levied only in municipal jurisdictions.

The tax payment is based upon the annual assessed rental value of buildings and the land -- that is, the annual income derived from them when they are let or the estimated rental value when they are used wholly or partly for commercial purposes by the owners. The tax rate is 12.5 percent of the rental value. In practice, the rental is assessed by the actual rent of similar buildings in the same neighborhood. Once in every four years owners of houses and buildings who are to pay the tax must fill in the tax returns which contain certain information on rents or estimated income of the buildings. The amount of tax to be paid is then assessed by tax officers who can revise the declared rents upward if they rate too low; however, taxpayers are given the right to appeal.

Principally, the building and land tax should be an important tax revenue source of the municipality; on the contrary, they represent the smallest amount. It is noted that the prevailing building practice in Thailand of making lump sum rental payments whenever the lease agreements expire, and then entering into new agreements makes the actual rent to be eventually paid far below the rents that ought to be paid. Moreover, the tax assessors in most cases tend to accept the rents declared in the tax returns. In addition, the single tax rate of 12.5 percent is inappropriate on equity grounds since according to the rates, houses and buildings of higher annual rental value would pay the same proportion of their annual rental income as those with low rental value.

B. Land Development Tax

Land development tax is nothing more than a land tax; generally it is regarded as an agricultural tax paid by farmers since most land is utilized for agricultural cultivation, especially rice. Land development tax is the major and, in most cases, the only direct monetary demand the government makes on most agricultural households.

The tax base is the assessed value of land, determined every four years by a land assessment committee appointed by the provincial

governor. The land value assessment is based on the average of the prices of at least three pieces of land sold within the sub-district (tambon) during the year prior to the assessment. Once the land value is determined, it is effective for four years. The average of land is the so-called "medium value of land."

The tax payment is determined by the assessed price of land. The land development tax is then reduced in two ways: first, the farmer is allowed to exempt 5 rai of land used for residence and rearing livestock if the land is located in the changwat local government jurisdiction. In the case of tambon municipality or sanitary district, muang and nakorn municipality, the number of land exempted is 1 rai, 0.5 rai, and 0.25 rai, respectively. Secondly, the provincial governor has the power to reduce farmers' land tax if a natural catastrophe has caused a failure of crops. Furthermore, the tax rates could be altered by two significant factors: (1) the rates are cut in half if the land is for annual crop cultivation and if the landowner himself is also the farmer; the maximum rate cannot be more than 5 Baht per rai; (2) the rates are doubled if the land is vacant or not utilized in a manner benefitting the nature of land.

The calculated medium price of land practices may not reflect the potential value of land since the existing practice of land value assessment is not based on land mapping (soil classification from which the potential value of land could be determined). Further, the low productivity of the land development tax may be due to low tax rates and to generous tax exemption specified by law.

C. Signboard Tax

The yields from signboard tax are remarkably low compared to other locally levied taxes. Tax payments are calculated according to the signboard area and the number of Thai or foreign language characters in the signboard.

D. Animal Slaughtering Tax

For purposes of revenue collection, slaughtering of animals (i.e., cattle, buffaloes, swine, goats, sheep and poultry) beyond a certain number is not allowed unless the tax is paid. The Animal Slaughtering Act of 1959 fixes the tax rates between 4 Baht and 15 Baht per animal, depending on the kind of animal slaughtered. Slaughtering tax produces a small proportion of municipal tax revenue.

2.2. Surcharge Taxes

Municipalities are authorized to add a surcharge of up to 10 percent of certain national

tax collections to their tax revenue. These taxes are business tax, liquor tax, non-alcoholic beverage tax and entertainment tax; they are levied by the Revenue and the Excise Department. Municipalities are required to pass the by-law to collect surcharge taxes and to specify the rate of surcharge they are going to charge. Usually they add the full 10 percent allowed surcharge.

### 2.3. Shared Taxes

There are two taxes levied by the government on behalf of local authorities of which the proceeds, after being pooled in Bangkok, are distributed to various local bodies by a set formula.

#### A. Rice Export Tax

Export tax on rice is levied by the Custom Department according to specified tax rates. Apart from these tax payments, a rice exporter is required to pay additional local tax on rice and paddy exported. The rates of tax are one Baht per 100 kilograms of paddy, broken rice and rice bran. Such tax is also collected by the Custom Department, but all proceeds go to local government; they are then shared in equal amount by municipality and sanitary district. The municipal and sanitary district shares are redistributed to all municipalities on the basis of population in each jurisdiction.

B. Vehicle Tax

The tax is collected by the police department; all proceeds are divided among the three different local authorities as follows: 50 percent for municipalities, 25 percent for sanitary districts, and the rest for changwat local government. Tax collected in a province is pooled and sent back to the province after deduction for administrative cost in tax collection. If there is more than one municipality and sanitary district in the province, the provincial government is to divide municipal and sanitary tax shares among municipalities and sanitary districts.