THE ROYAL THAI GOVERNMENT

NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT BOARD

THE SUB-REGIONAL DEVELOPMENT STUDY OF THE UPPER-SOUTHERN PART OF THAILAND

FINAL REPORT

March 1985

VOLUME 4

surat thani-phuket zone

INDUSTRY

JAPAN INTERNATIONAL COOPERATION AGENCY

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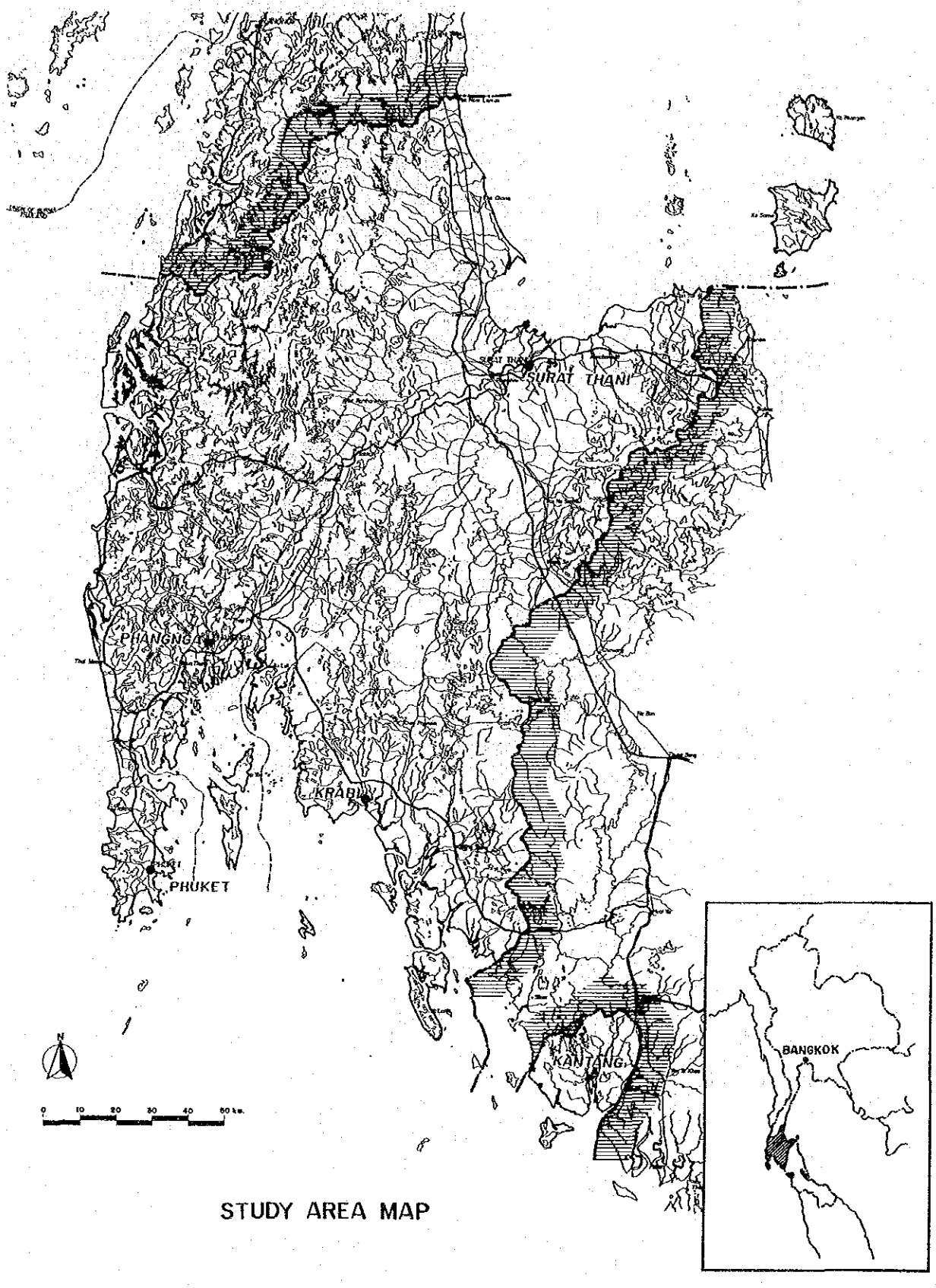
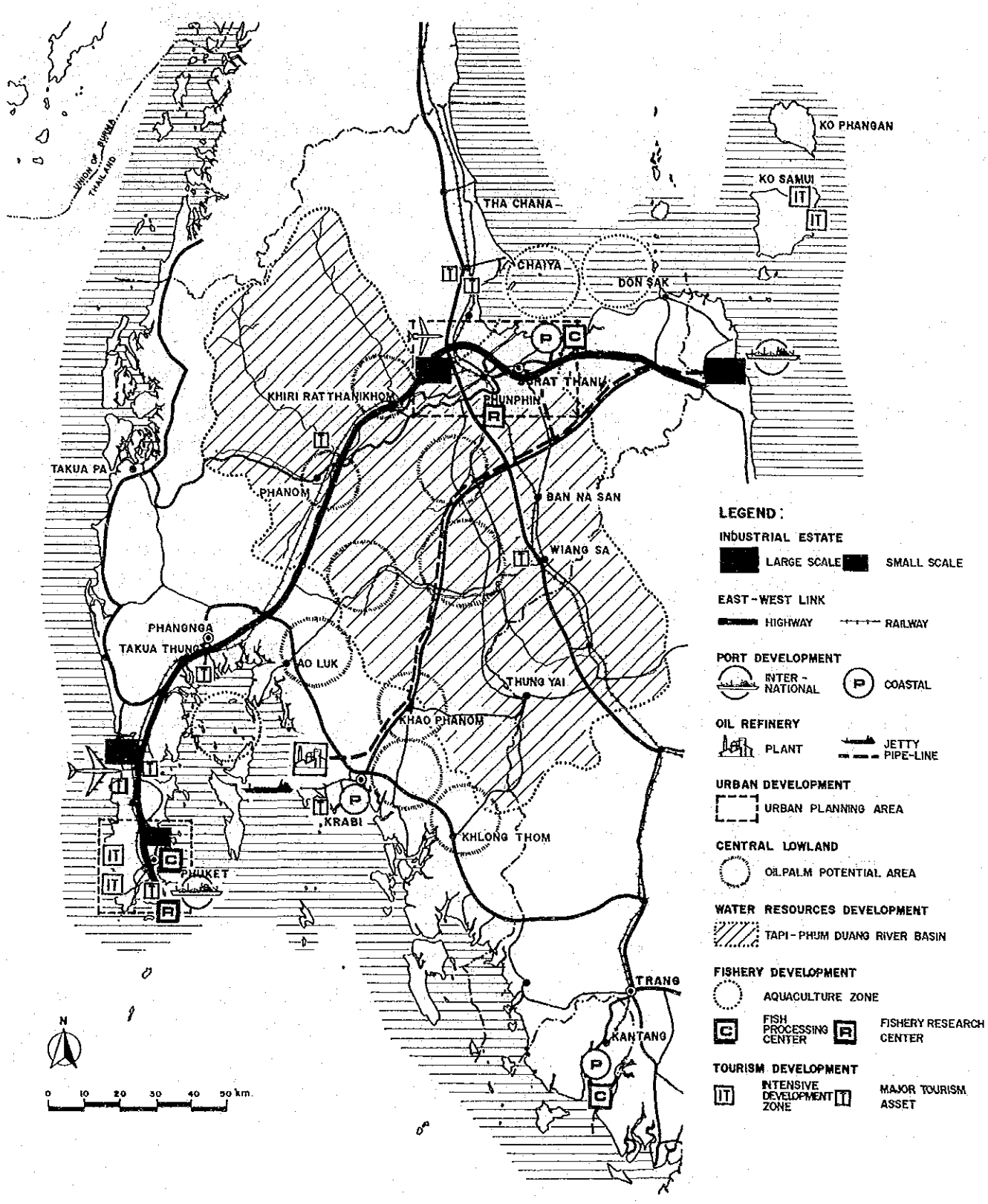


STUDY AREA MAP



PROJECT LOCATION MAP FOR PRE-FEASIBILITY STUDY

LETTER OF TRANSMITTAL

March 20, 1985

His Excellency Mr. Keisuke Arita
President
The Japan International Cooperation Agency
Shinjuku Mitsui Building
Nishi Shinjuku 2-1
Shinjuku-ku, Tokyo
Japan

Dear Mr. President:

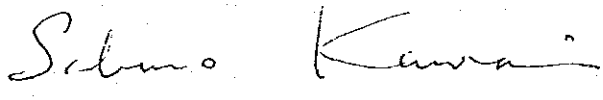
We have honor to submit to you our final report on the Subregional Study of the Upper Southern Part of Thailand. It is our great pleasure to note that this assignment has been completed through the close cooperation between two governments of Japan and Thailand.

The report was prepared during the past two years by the study team organized by the consortium of the International Development Center of Japan and the Pacific Consultants International Co. Ltd., and headed by Dr. Masahiko Honjo, the Team Leader. It comprises seven volumes, i.e. Vol.1 Master Plan; Vol.2 Transportation; Vol.3 Urban Development; Vol.4 Industry; Vol.5 Energy; Vol.6 Primary Resources ; and Vol.7 Tourism.

In preparing this report, our team benefited a great deal from cooperation extended by officials and experts of JICA and other authorities concerned of the government of Japan. Equally important, our team was supported by the staff from NESDB and other ministries of the Royal Thai Government throughout the stay of our team in Thailand for nearly 17 months. We also wish to put on record our sincere gratitude to the wide ranging discussions over the proposals contained in the draft final report at the National Seminar of the Upper South Development Policies and Programs held in Thailand on January 25 and 26, 1985.

We wish to add that we sincerely hope this report will provide an important basis for planning and implementing the development of the Upper Southern Part of Thailand.

Yours truly,



Saburo Kawai
President
International Development Center of Japan

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1. SUMMARY

Toward the year 2000, a limit in agricultural expansion in terms of both land and yield vis-a-vis the need to creat a huge number of job opportunities will make industrialization an inevitable trend in Thailand as many industrialized and newly industrializing countries have been experiencing. Thai industrialization which have been based on a piecemeal expansion of resource processing, consumer goods import substituting and labor intensive export industries is now at the transitional stage toward integration of these industries. The integration will involve the import substitution of more diversified goods, the increased degree of domestic resource processing, the diversification of industrial linkages and the strengthening of export competitiveness. The integration will call for expansion of:

1) Resource processing particularly of rubber, foodstuff, wood and minerals;

2) Import substitution industries of basic intermediate goods, being a key to industrial diversification, including steel and iron, paper and pulp, and basic chemicals;

3) Export industries not only of traditional agro-processing and textile goods but of many electric appliances and parts, and other miscellaneous assembly goods such as footwear, handbags, watches, toys and so on.

At present, almost 90 percent of the national industrial output is generated in the Central Region, Bangkok Metropolitan Region, in particular, because of its better established infrastructure, large market, availability of educated manpower, good urban services and accessibility to both other regions and abroad. The industrial concentration in the Central Region will be further accelerated, if Eastern Seaboard Development comes in its full operations. Although disadvantage of agglomeration will appear sooner or later in the form or rise in land price, wages, transportation cost and environment maintenance cost, individual industrialists can not go out of the metropolitan area because investment environment is extremely inferior in the nonmetropolitan regions, with lands but not ready for industrial use, little skilled manpower, inconvenient transportation, poor urban services on top of limited local market size. Industrial development in the nonmetropolitan regions could not be achieved without government support.

Industrial activities are still very marginal in the Upper South with about 1,500 industrial establishments, which are mostly the processing of local products such as food, wood, rubber and fish, the tin smelting and tin-excavation-based metal or

machinery industries. 80 percent of their products are absorbed in the southern market. Since more than half of them have willingness to invest, the government must meet with these willingness as an outset of industrialization of the Upper South.

In view of inducing external industrial investments on top of expanding and diversifying the existing local industries, the Upper South can offer the following comparative advantages.

For the resouce-based industries, the Upper South is endowed with a variety of agricultural and mineral resouces. For the import substituting industries, the Upper South, Surat Thani in particular, is endowed with the strategic position to be the gateway to the whole southern regional market, a plenty of the water and land necessary for some intermediate goods industries and the possible industrial linkages with Eastern Seaboard through coastal shipping network. For the export industries, the Upper South, Phuket in particular, is endowed with the direct access to foreign market of the western-situated and surrounding countries, the accumulations of international business experiences in tin, rubber and other trade and tourism and the decent urban amenity and natural environment attractive to the foreign technologies and investments. At the same time, the Upper South is suffering from particular disadvantages including a relatively long distance to Bangkok, limited size of local market, exhaustion of traditional resouce materials, relatively high level of minimum wage and low confidence by investors on the social stability in addition to the disadvantages common to many other nonmetropolitan regions, including inadequate infrastructures, lack of diversity in local industrial structure and insufficient quality control over local materials.

Having these advantages and disadvantages of the Upper South in mind, both bottom-up and top-down strategies are proposed for its industrialization. The bottom-up strategy consists of the promotion of local consumer market oriented industries, resource-based industries and industries allied to major local industries, while the top-down strategy consists of the inducement of the industries which would move out from Bangkok Metropolitan Region with improved infrastructures, financial incentives and various industrial services prepared on the part of nonmetropolitan regions and the export-oriented industries by making use of the potential access to the western situated countries via Phuket and East-West Link. Targets for these strategies are the increase in manufacturing GDP from 2,213 million baht to 25,511 million baht of which about 60 percent are to be induced and in manufacturing employment from 23,000 persons to 140,000 persons during the period 1980 to 2000. In parallel with changes in the national industrial structure, the Upper South will change its industrial

structure; the output of resource based industries to decline from 75 to 40 percent during the period 1¥980 to 2000, being nearly the same propotion attained at the national level at present.

Industrial expansion will take place mainly in Phuket and Surat Thani. In Phuket, industries will expand on the basis of local resource processing in the 1980s. In the early 1990s, new assembly industries will emerge based on the needs and technologies of the local resource processing activities while industries which make use of Phuket Airport for collecting materials and export products will possibly be developed. In the late 1990s and beyond, closer link between Phuket and Surat Thani will encourage export industries to be further diversified on the basis of increased opportunities of market and material import. In Surat Thani also, industries will expand on the basis of local resource processing in the 1980s. In the early 1990s, some intermediate goods industries will emerge based partly on the industrial linkage with Eastern Seaboard and partly on the southern regional market. In the late 1990s and beyond, closer link between Surat Thani and Phuket will encourage intermediate goods industries such as electric furnace to grow and diversify their source of materials and industrial linkages within Upper South.

For the proposed industrial development, the Upper South will require a total industrial area of about 1,200 hectares of which 400 hectares are assumed to scatter in rural areas while 800 hectares are assumed to be allocated to industrial zones and industrial estates. Four industrial estates are proposed at the Surat Thani-Phun Phin Highway junction, immediate next to the Phuket Airport, the immediate north of Phuket City and the proposed Khanom Deep Seaport Port at Khanom, covering the areas of 65, 125, 30 and 130 hectares, respectively. Of these, Surat Thani Industrial Estate and Phuket Airport Industrial Estate containing an export processing zone are proposed as high priority projects.

Outline of the two major industrial estates are as follows:

Processing	Surat Thani Industrial Estate	Phuket Airport Industrial Estate and Export Processing Zone
Location	Phun Phin Highway Junction	Immediate North of of Phuket Airport
Gross Land Area (ha)	190	100
Net Factory Area (ha)	125	65
Number of Employees (persons)	9,900	8,900
Value of Annual Output (million baht)	8,600	5,000
Candidate Types of Industries	Resource-based Palm oil refinery Rubber processing Other processing Regional market-based Food processing Construction materials Furniture & Fixture Machinery, tool Other goods Domestic/foreign market-based Electric machines, appliences and equipment Garments Other goods	Electric appliences and components Electronics appliences Industries allied to tourism
Preliminary Cost Estimates (thousand baht)		
Total	331,144	453,760
Basic Component	272,287	177,160
Sewerage	58,857	43,000
Access Road		11,200
Standard Factory		56,000
Office Building		166,400

Together with these industrial estates, industrial promotion measures are very important. Present industrial offices are active but they are seriously understaffed to take positive role especially in promoting existing local resource-based industries. They are proposed to be upgraded as Industrial Promotion Center at subregional or regional level offering various industrial services, including introduction and diffusion of technical and managerial know-hows, diffusion of market information consultation in proceeding various procedures for getting incentives, licensing and permissions and conducting research and development. Another proposal is the Industrial Development Corporation to be organized jointly by private and public at subregional or regional level. It should be stressed that IDC assumes the functions of both financing investors like Industrial Financing Corporation of Thailand (IFCT) and securing lands for industrial estate like Industrial Estate Authority of Thailand. The IFCT might as well take part in such local organization. Industrial promotion zone of Board of Investments is desired to be applied in Surat Thani and Phuket. In addition, it is recommended to give special incentives for those industries relocating from Bangkok to these industrial promotion zones.

2. INDUSTRIALIZATION OF THAI ECONOMY

2.1 CLOSE RELATION BETWEEN NATIONAL ECONOMY AND INDUSTRIAL DEVELOPMENT

A cross-country analysis suggests that there is a close relation between the national economy and development stage of industrial activity as shown on Figure 2.1. The Royal Thai Government (RTG) has a definite target to achieve an economic development at the level of the Newly Industrializing Countries (NICs), including those known as "Four Tigers" of Singapore, Hong Kong, Taiwan and Korea. In order to achieve that target, the adjustment of economic structure directing toward industrialization should be accerelated especially by the promotion of export-oriented industries.

Besides the general course of economic development, Thailand has its own reasons to accelerate industrialization, export industries in particular.

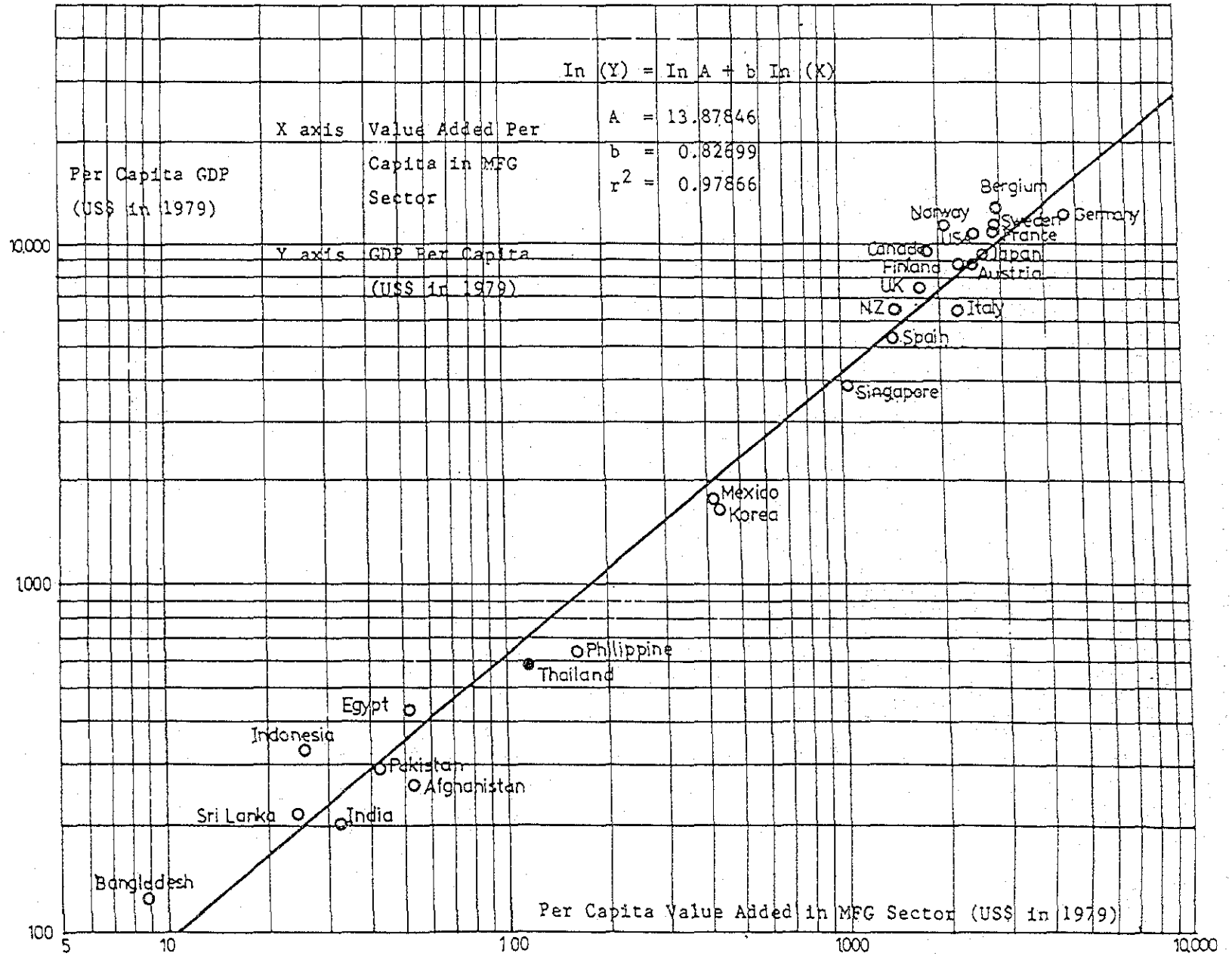
The national population is estimated at 64 million in the year 2000 and its age structure will require a huge number of job opportunities outside the traditional economic sectors such as agriculture, which has so far been able to absorb the increase of labour supply. More than 70 percent of economically active population have been absorbed in the agricultural sector. However, the country will be constrained seriously by limitation of available land on one hand, and the awkwardness to improve yield and productivity on the other hand.

Although the growth of industrial activities also created a lot of jobs during these two decades, the most rapidly growing one was import substitutive industries, which are now facing excessive competition among them because of limited size of domestic market. They have to find their market abroad.

2.2 GENERAL PATHS OF INDUSTRIALIZATION AND THEIR IMPLICATION TO THAI ECONOMY

As shown on Figure 2.2, there are general types of industrial development strategies and some typical paths of industrialization could be found. Thailand seems to be on the "development stage" and the NICs are now entering into the "mature stage". On the "developing stage", several types of strategies should be combined to break into the next stage following after the NICs. These are as follows:

Fig. 2.1 RELATION BETWEEN GDP AND VALUE ADDED PER CAPITA IN THE MFG INDUSTRY BY COUNTRY



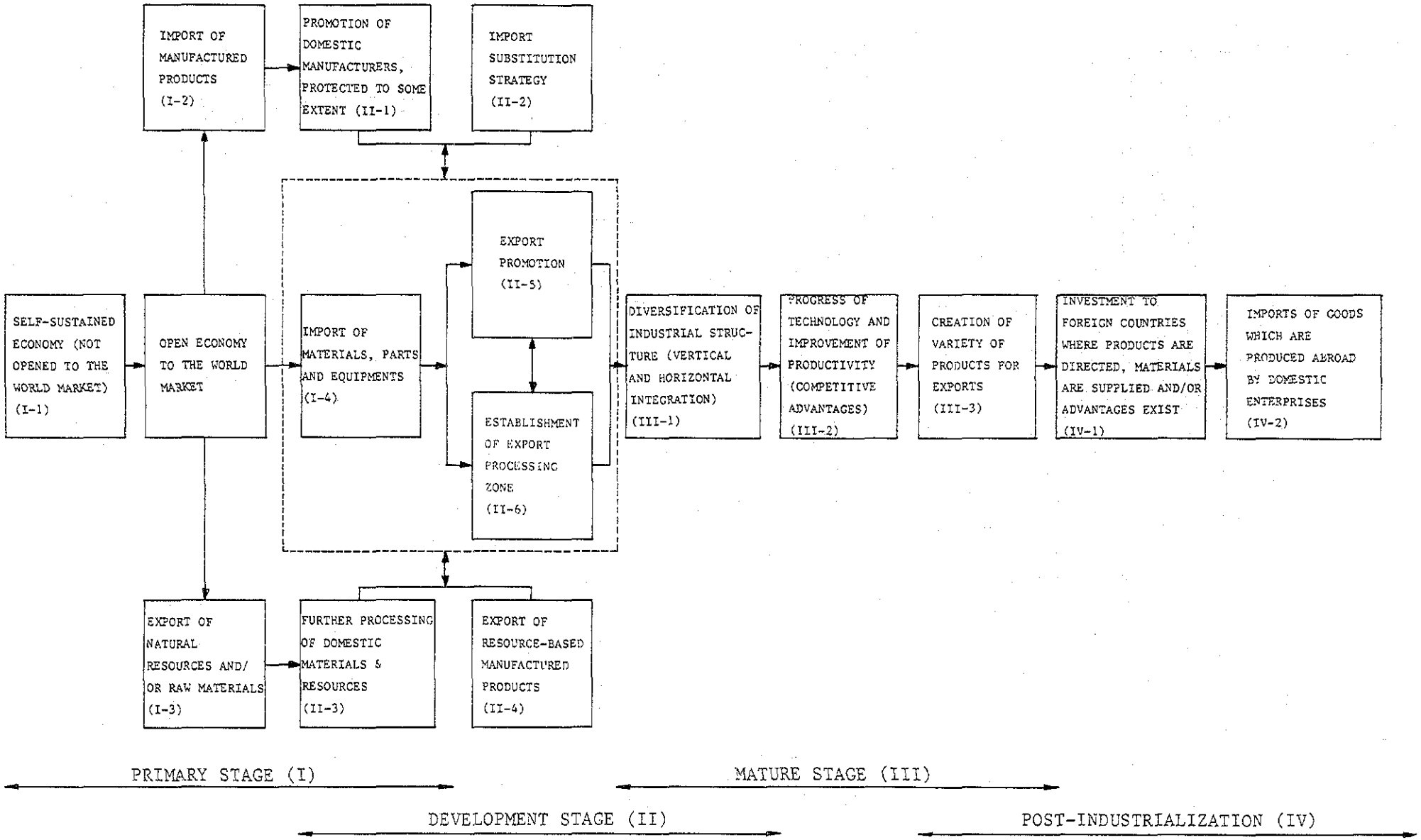


Fig. 2.2 GENERAL TYPES OF INDUSTRIAL DEVELOPMENT STRATEGIES

1) Improvement of Import Substitution Strategy

The most of import substituting industries have been heavily protected by government policies. In order to compete in domestic and/or foreign market, these industries have to improve both price and quality of their products by introducing advanced technologies and management know-hows. In the forthcoming future, various products will have to be produced for domestic market, because Thai people will have willingness to buy better quality products as their income will increase.

2) Further Processing of Domestic Resources and Materials

The most of domestic resources and materials have been exported in primarily processed form. There are great potentials to make them into further processed products, many of which are now imported from industrialized countries. Further processing of domestic resources and materials will contribute not only to import substitution but also to the export expansion.

3) Diversification of Industrial Structure Integration of Various Industries

Thailand has experienced the increasing import of capital goods, intermediate inputs and materials in spite of the expansion of import substitutive industries so far. A wide variety of established industries will provide allied industries with potential markets, and they should be integrated through interindustrial linkages.

4) Promotion of Manufactured Exports

Export has been expanding to account for nearly 30 percent of GDP in the manufacturing sector. It was only three to five percent in the early 1970s. Expansion of manufacturing production in Thailand will be increasingly dependent on foreign markets in future. Therefore the promotion of manufactured exports will be given the highest priority in the industrial development strategies. But the export promotion will require great efforts such as innovative technologies, quality improvement of products, introduction of management and technical know-hows, and price competitiveness. These efforts should be made not only for the export industries themselves but also for the whole range of their related industries.

Several strategies as shown on Figure 2.3 have to be implemented and maintained toward the coming century, to climb up economic development stages leading to an industrialized country.

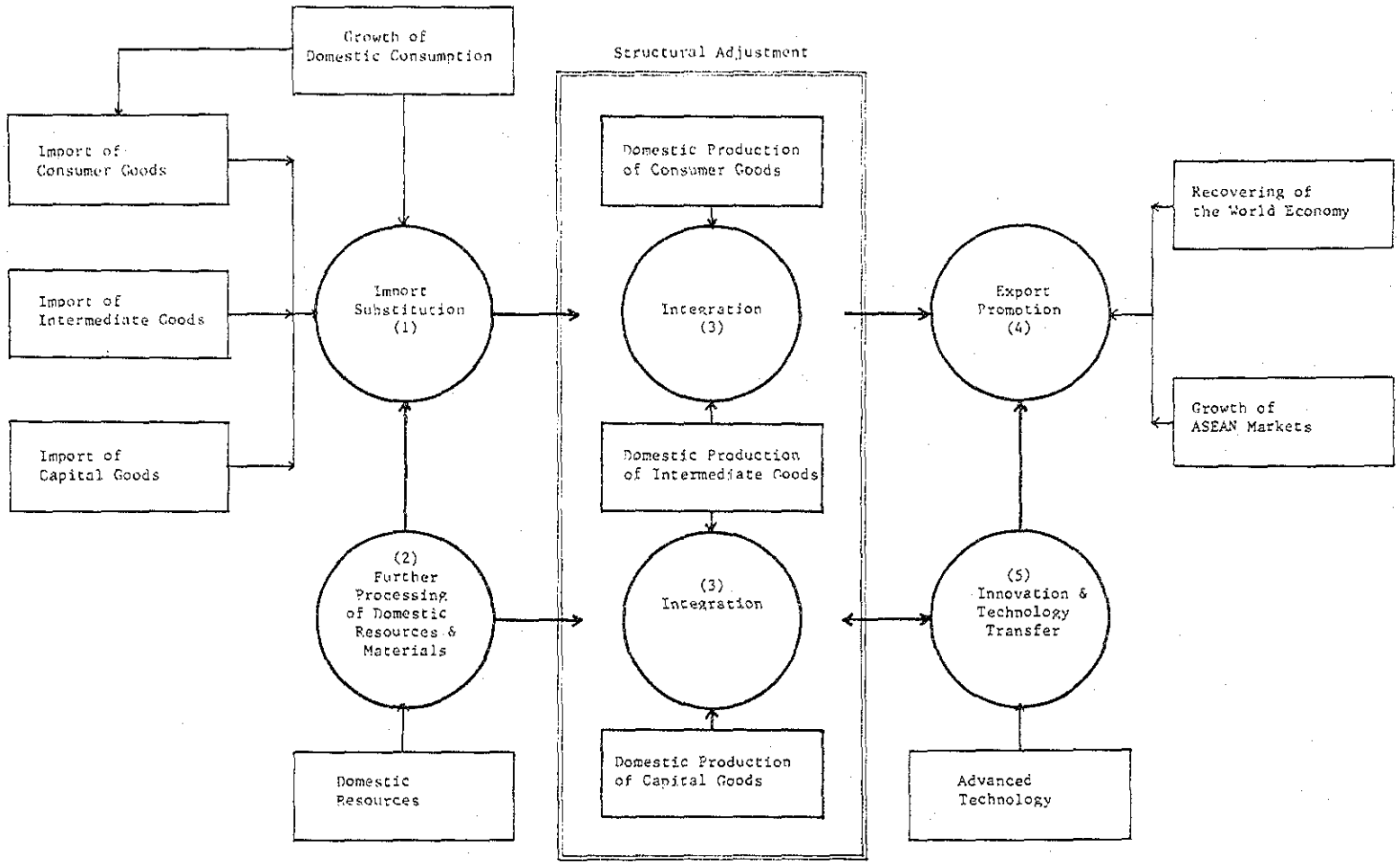


Fig. 2.3 BASIC CONDITIONS FOR INDUSTRIALIZATION AND GENERAL STRATEGIES

2.3 CANDIDATE INDUSTRIES TO BE PROMOTED IN THAILAND

Candidate industries could be found out from several view points as follows:

- Further processing of local resources and materials (Promotion of resource-based industries or export substitution);
- Import substitution; and
- Export promotion.

1) The most of resources and materials being produced in Thailand are exported in raw materials or primarily processed products, and these are imported to Thailand again after manufactured into more sophisticated products. Huge potentials are found in processing these resources and materials, including rubber, foodstuffs (fish, meat, fruits, vegetables, etc.), wood and lumber, and minerals (metallic and nonmetallic including concentrates) in Thailand.

2) Import Substitution

This area has been comparatively better managed than other areas of industrialization in Thailand. Three points should, however, be emphasized in proceeding to further import substitution. The first one is that there are a number of commodities remained for further import substitution. The second is that more and more new items will appear to be targets of import substitution in future. The third one is that established industries have to improve competitiveness of their products against imported products in both quality and price because many items have been protected by government support.

Industries supplying products to domestic market have potentials to export their products to less developed neighbouring countries such as Bangladesh, Burma, Kampucia and Laos. But they have to compete with products from other countries including NICs and developed countries. Improvement in quality and price through competition with these countries will at the same time stengthen the capability of industries to meet with growing and changing domestic market in future. Table 2.1 shows the industries which are expected to substitute the current imports substantially. The amount of imports are large and increasing in the listed industries and high potential for those industries to expand more is expected.

Table 2.1 POTENTIAL IMPORT SUBSTITUTING INDUSTRIES

Largest Potential Industries 1/

- Base Metal Products
- Petroleum Products
- Chemical Products
- Machinery and Mechanical Appliance

Large Potential Industries 2/

- Electric Apparatus for making electrical circuit
- Fertilizers
- Vehicle Part and Accessories
- Spinning
- Paper & Paperboard
- Electric Appliances
- Measuring, Checking and Precision Instrument
- Other Textile Products
- Pharmaceutical Products
- Dairy Products
- Precious Stones
- Photographic & Cinematographic Instrument and Apparatus

Potential Industries 3/

- Rubber Products
- Medical and Surgical Instruments
- Plastic Products
- Glass and Glassware
- Clocks and Watches
- Paper Products
- Vegetable Oil & Fats
- Toys, Games and Sport Requisites
- Preparation of Cereals, Flour & Starch
- Synthetic Precious Stones
- Optical Appliances and Instruments

1/ Import amount exceeded ten billion baht in 1982
2/ Import amount was between one to ten billion baht in 1982
3/ Import amount was between hundred million to one billion baht in 1982, except for those whose import amount declined during the period 1978-82.

3) Integration of Industrial Structure

The progress of industrialization makes it possible to produce more sophisticated and variety of products, which require versatile inputs. Wide variety of intermediate products must be supplied in conformity with the industrial standards which are consistent from basic material to final goods.

In the process of import substitution, Thailand has experienced a large increase in the import of intermediate goods, capital goods and raw materials. Industrial structure has to be integrated through the reinforcement of forward and backward linkages of industries. Basic material industries such as steel and iron, paper and pulp, and basic chemicals play very important role in this integration process. Some of them might be supplied domestically. Relatively large-scale industries should be established in some future period.

4) Export Promotion

For Thailand, the industrialization at the coming stage will be export-oriented one. The most promising products for export will be labour intensive products. Because NICs have been losing competitiveness in these products which have made it possible for NICs to expand their economy rapidly in the last decade. Labour intensive industries will, however, move to less developed countries, which have an advantage in labour cost. Recent booming exports of textiles and garments from Thailand seems to be an example of this opportunity.

Candidate products for exports are shown on Table 2.2. The world trade of these commodities are growing, particularly from LDC's to developed countries. Among these commodities Thailand will be able to find items for export promotion.

The way to a NIC or a semi-industrialized country, however, is not easy. Much efforts to promote export industries will be required. Above all quality and price of products are essential, and they depend not only on the diversification of industrial structure and the improvement of efficiency of manufacturing process but also on the ability of marketing and managment. In order to expand exports integrated policy-mix for export promotion is needed.

Table 2.2 LIST OF POTENTIAL EXPORT INDUSTRIES FOR ASIAN DEVELOPING COUNTRIES

Export SITC	Relatively Growing Export Industries with the Asian LDC's 1/ Share of: 10% and above		5 to 10%		Relatively Non-Growing Export Industries with the Asian LDC's Share of 10% and above	
0000-0999 Food & Live Animals	0341	Fish (fresh, chilled)	0112	Bovine meat (Fresh, frozen)	0422	Rice
	0342	Fish (frozen)			0542	Leguminous vegetables(dry)
	03503	Fish (dried, salted)			0741	Tea
	0372	Shell fish (prepared, preserved)				
1000-1999 Beverages&Tabacco	1212	Tabacco (stripped or part)				
2000-2999 Crude Metals excld. Fuels	23201	Natural rubber (latex)	28821	Copper waste and scrap	2871	Copper ore
	2472	Logs for saw and veneer			28792	Tungsten ore
	2483	Lumber (sawn, conifer)				
3000-3999 Mineral Fuels etc.	3341	Gasoline and other light oils	3342	Sprit for motor and aviation	3344	Fuel oils
	3414	Petroleum gases (gaseous)			3345	Lubs, petroleum oils
					3413	Petroleum gases (liquified)
4000-4999 Animal Vegetable Oil Fat	4243	Coconut oil			4242	Palm oil
5000-5999 Chemicals	5621	Chemical nitrogenous fertilizers	5231	Metal compounds of inorganic acid		
			5629	Other fertilizers		
6000-6999 Basic Manufactures	6123	Prepared parts for footwear	6514	Synthetic fibre yarn	6353	Builders woodworks
	6342	Plywood of wood sheets	6613	Worked stone for building	6513	Cotton yarn
	6516	Yarn of discontinuous systhetic	6744	Heavy plates and sheets of iron and steel	6535	Continuous region weaves (nonpile)
	6531	Weaves of continuous synthetic				
	6584	Linens	6953	Other hand tools	6992	Chain & parts of steel and iron
	6666	Ceramic ornaments	6991	Lacksmiths wares, etc.		
	6673	Precious and semi-precious stones				
	6871	Tin and alloys (unwrought)				

1/ excluding the Middle East countries

Export SITC	Relatively Growing Eaport Industries with the Asian LDC's Share of : 10% and above		5 to 10%		Relatively Non-Growing Export Industries with the Asian LDC's Share of 10% and above	
7000-7999 Machines, transport Equipment	7512	Calculating, accounting machines	72341	Self-propelled dozers	7243	Sewing machine
	75121	Calculating machines	7611	Color TV receivers	7938	Tugs and special vessels
	7612	Monochrome TV receivers	7638	Other sound apparatus		
	7621	Radio receivers for motor vehicles	7711	Transformers (electrical)		
	7622	Portable radio receivers	7781	Batteries, accumulators		
	7628	Other radio receivers	7782	Electric lamps and bulbs		
	76388	Dictating machines	77884	Electric condensers		
	7642	Microphone, loudspeaker and amplifers	7861	Trailers and transportation containers		
	7763	Diodes, transistors	7924	Aircraft		
	7764	Electronic microcircuits				
8000-8999 Miscellaneous Manufactured Goods	8124	Lighting equipment	8931	Plastic packing containers	8481	Leather clothes
	83101	Handbags	8973	Precious jewelry (made of gold, silver and platinum)	85102	Footwear (of rubber and plastic)
	8433	Dresses	8983	Sound recording tapes	8842	Spectacles and frames
	8435	Blouses			8993	Combustible products
	84394	Suits of man-made fibres				
	8462	Underwear of cotton				
	8483	Fur clothes and products				
	8851	Watches, movements and cases				
	8942	Toys, indoor games				
	8997	Basket works, brooms				

(Continued)

Source: UN Statistics of Trade

5) Promotion and Encouragement of Modern Technologies

Exports of labour intensive products will never spontaneously move to LDCs. It will be impossible to follow after NICs in the same way as they run, because almost every commodity will be equipped with high technology. For instance, popular toys in the world market are equipped with electronics. Then possible export products from Thailand have to install some hightechnology in materials, process, mechanism and design. New materials such as ceramics, carbon fibres, new metals, basic chemicals and LSI being generated from recent innovation will have to be used more and more for industrial products. The ability to absorb these technology will be one of the key factors to expand export.

3. INDUSTRIALIZATION AND REGIONAL DEVELOPMENT

3.1 HEAVY CONCENTRATION OF INDUSTRIES IN THE METROPOLITAN REGION

In fact more than 88 percent of the Value Added in the Manufacturing sector (VAM) was originated from the Central including Bangkok, while the share of the Central in terms of GDP was 61.9 percent in 1980. The share of the Metropolitan Region was 85 percent in VAM and 56.2 percent in GDP in 1970. It means that the concentration of industrial activities in the metropolis and its vicinity is greater than that of economic activities as a whole, and also increasing.

If the development of the Eastern Seaboard (ESB) is taken into account in the late 1980s and early 1990s, the share of the Central will increase enormously. Toward industrialization some growth poles should be developed similarly with Jurong Town in Singapore, Kaoshun in Taiwan and Masan in Korea. And income difference among regions is inevitably widened in a short term. But these difference in a long term will cause a serious social conflict and sometimes external diseconomy. One of major objectives of the National Economic and Social Development Plan is to restrict concentration of population and economy on the Metropolitan Region and to encourage the economic development in other regions.

Following after the ESB development, some growth poles in other regions should be developed to narrow income difference between metropolitan and other country regions.

3.2 AGGLOMERATION ECONOMY: ADVANTAGES OF THE METROPOLIS FOR INVESTORS

Agglomeration economy attracts investors to the Bangkok and its vicinity. It includes several advantages for investors as follows:

- Better established infrastructure than other regions in the country;
- Large markets for manufactured goods and services;
- Availability of workers in a wide variety of occupations particularly in highly educated workers;

- Availability of urban services as banking, financing, administrative services, information services and conveniences for business operation;

- Availability of allied industries; and

- Accessibility to both other regions in the country and abroad.

However, disadvantages appear and grow along with the increasing agglomeration. Rise in land price, wages, transportation cost (because of traffic congestion), and social cost for environmental protection reduce the agglomeration effects. Those industries are dependent on heavy cargo transportation, requiring additional land area for expansion, employing many workers (labour intensive industries), and causing heavy environmental problems in the metropolis and to its vicinity and sometimes even to outside the Metropolitan Region.

So far agglomeration economy in the Metropolitan Region has overwhelmingly affected industrial location. But disadvantages in other regions have gradually been overcome by development of transportation facilities, electrification, increasing purchasing power in rural households, promotion of education, and urban development. More enterpreneurs begin to seek investment opportunities in these regions. At present advantages in the Metropolitan Region are effective to the maximum extent. Therefore more efforts to reduce disadvantages for investors in other regions should be made in order to develop rural economy. In the process of industrialization of the national economy, therefore, the decentralization of industrial investments will have to be a major issue for RTG.

3.3 INDUSTRIAL DEVELOPMENT IN NONMETROPOLITAN REGIONS

Industrial investments in the nonmetropolitan regions are made mainly based on the resources, material and consumer markets in localities. In these localities most of investors are not satisfied with industrial environment, and have been suffered from insufficient and unreliable services such as fresh water, electricity, telecommunication, and urban amenities. Industrial development in the nonmetropolitan regions could not be achieved without great efforts by RTG in two areas: one in investments for improvement of infrastructure and the other in institutional, organizational and legal arrangements for investment promotion.

4. ADVANTAGES AND DISADVANTAGES OF UPPER SOUTH FROM THE VIEWPOINT OF INDUSTRIAL DEVELOPMENT

4.1 INDUSTRIAL STRUCTURE OF UPPER SOUTH

1) General Profile

There are 1,521 industrial establishments registered in the Upper South as of 1980. Half of them are rice milling industries while other major industries include manufacturing in food and beverage, metal products mostly related to mining activities, wood products and nonmetallic products being mostly building materials. Degree of diversification is very low. Scale of industrial activities is still only small as the industrial sector shares no more than 9.7 percent of GDP and 4.5 percent of employment. Compared with national industrial-mix, the Upper South is specialized in the manufacturing of foods, wood products, rubber processing, concrete and ceramic products, nonferrous metals virtually comprising tin, machines and transport equipment consisting mostly repairing and shipbuilding. These industries are mostly related to the processing of resources available in the Upper South. On the other hand, development in the Upper South is very limited in some industries which are fast developing in the country including textile, chemicals, metalworking, and electric appliances (see Table 4.1).

Information on scale of manufacturing entities is obtainable only for the whole South in the Industrial Census 1975. According to this data, the South has 20 industrial establishments with more than 100 employees while the Central has 227 of such establishments. Our field questionnaire survey conducted in 1983, however, finds, in the Upper South alone, 12 establishments with more than 100 employees out of 150 total samples which are 10 percent of the total number of establishments. We can, therefore, see a rapid increase in medium sized industrial establishments in the Upper South.

The spatial distribution of factories in the Upper South is shown on Figure 4.1 and 4.2.

2) Results of the Questionnaire Survey

We conducted a factory survey in view of obtaining the information on performance and investment willingness/preference of existing industries in the Upper South. Industries selected by random sampling are 150 and effective samples are 139, com-

Table 4.1 OUTPUT OF MANUFACTURING INDUSTRY IN UPPER SOUTH, 1980

Type	Million ฿ Whole Kingdom	Million ฿ Study Area	% Whole Kingdom	% Study Area	Major Production Activities in the Study Area
Food Stuff	100,465	1,552.3	19.1	31.2	Ricemill, fish-canning
Textiles	82,065	64.3	15.6	1.3	
Apparel	1,348		0.3		
Leather Foot Wear	1,214		0.2		
Wood, Lumber	12,898	310.2	2.5	6.2	Lumber
Furniture	1,034	87.8	0.2	1.8	
Paper	6.035	9.4	1.2	0.2	
Printing	5,980	13.1	1.1	0.3	
Chemicals	79,503	71.6	15.2	1.4	
Petroleum	106,142		20.2		
Rubber Product	7,631	518.8	1.5	10.4	Rubbermaking
China Clay	18,913	348.6	3.6	7.0	Concrete, brick
Iron, Steel	717		0.1		
Non-ferrous Metal		280.2		5.6	Tin-smelting
Manufacture of Fabricated Metal	21,647	63.4	4.1	1.3	
Machinery	6,914	488.4	1.3	9.8	
Electrical Industry	35,032	43.1	6.7	0.9	
Transport Industry	27,989	1,071.6	5.3	21.6	Car repair, ship building, bus-body
Precision Instrument	170		0.0		
Plastic, others	4,996	49.7	1.0	1.0	
TOTAL	524,769	4,972.5	100.0	100.0	

Source: The Team

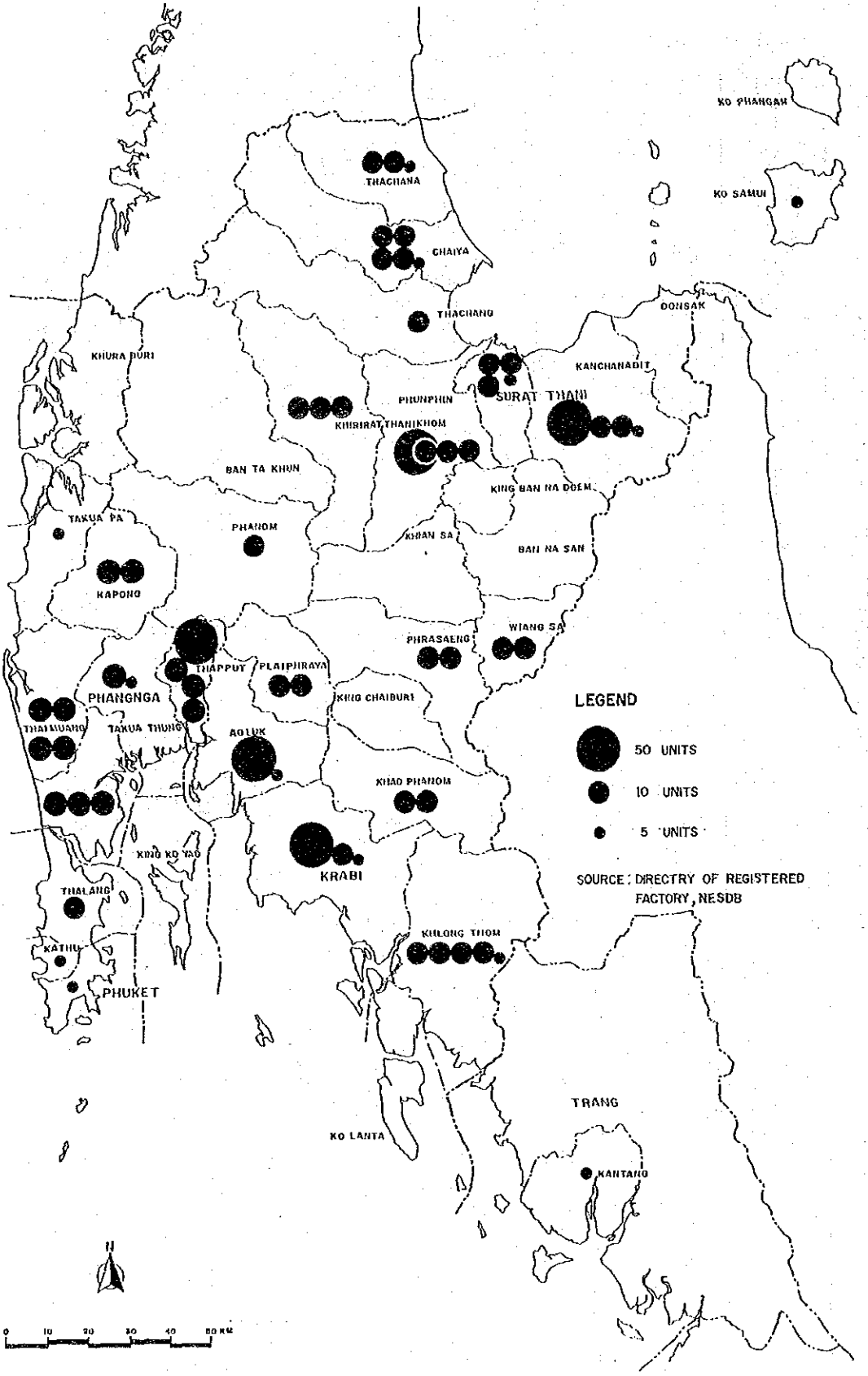


Fig. 4.1 SPATIAL DISTRIBUTION OF RICE MILLS

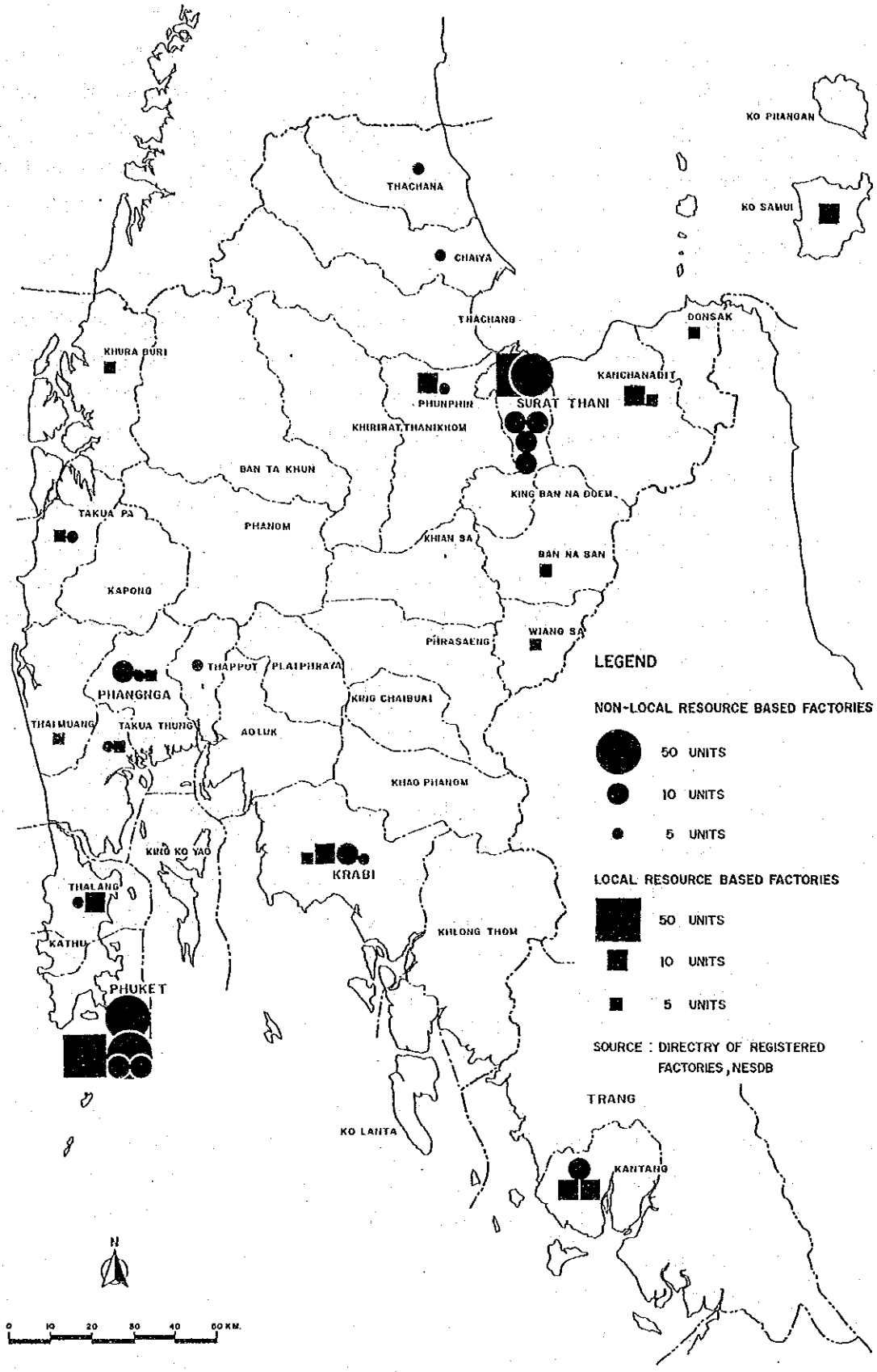


Fig. 4.2 SPATIAL DISTRIBUTION OF FACTORIES EXCEPT RICE MILLS

prising 54 in Phuket, 45 in Surat Thani, 20 in Phangnga and Krabi, respectively. 55 samples are those less than nine employees, 72 are those between 10 and 99 employees and 12 are those with the employees of 100 and above. Composition of type is shown in Table 4.2. On average one factory employs 31 workers, occupies 29 rai of land, sells 11,350 thousand baht worth in a year and uses 4,517 cubic meters of water per month (A tin industry is exempted).

According to the average share of market weighted by number of factories, 79 percent of products are directed to the South, 11 percent to Bangkok, three percent to other domestic market and seven percent to foreign market. Those dependent more than 74 percent of their products on the southern regional market include ceramics (100 percent) metal fabrication (100 percent), printing (100 percent), electric machinery (100 percent), furniture (99 percent) and machinery (90 percent). Those being dependent more than 14 percent of their products on Bangkok and other domestic market include wood and lumber (29 percent), food and beverage (27 percent), rubber products (17 percent), chemicals (100 percent), nonferrous metal (98 percent), and rubber products (64 percent).

More or less 70 percent of factories answer that market condition is "excellent" or "good" both in domestic and foreign. However, more or less 60 percent of factories answer "excellent" or "good" for the question regarding availability of funds and interest rate. The serious problems which those factories are facing at present are found to be relatively serious in inadequate utility supply (17 samples) and shortage of space (13 samples), suggesting the usefulness of establishing industrial estates for local entrepreneurs as well. 47 sample factories express the other unidentified problems. It is presumed that financial and security problems constitute a substantial part of the "other problems".

Having these in mind, 52 percent of entrepreneurs have willingness to invest further in the South. The investment willingness is judged to be considerably high. 56 percent of those with investment willingness want to expand their factories and 31 percent of those want to diversify their activities. The government must meet with these willingness as an outset of industrialization of the Upper South.

3) Investment Promotion by Board of Investments

Willingness of local industries to invest is large as has been observed in our field questionnaire survey. Board of Investments (BOI) has been providing investment privileges to a wide range of economic undertakings including agriculture, foresty,

Table 4.2 TYPE OF SAMPLE INDUSTRIES IN UPPER SOUTH

	Local market oriented		Nonlocal market oriented	
Local resource based	Food and beverage	43	Rubber products	11
	Wood/Lumber	8	Non ferrous metal	1
	Furniture	18		
	Ceramics	20		
	Total	89 (64%)	Total	12 (9%)
Non local resource based	Printing	7	Chemicals	1
	Chemicals	1		
	Metal fabrication	14		
	Machinery	4		
	Electric machinery	1		
	Transport equipment	9		
	Total	17 (26%)	Total	1 (1%)

Source: The Team

fishery, mining, manufacturing of chemicals, electric appliances and other industrial products and the service activities including hotels, transportation and warehouses. The undertakings approved by BOI can be exempted either fully or partly from the business tax and import duty on machinery, the tax and duty on raw materials and the corporate income tax. The export industries can be exempted from, on top of the above, the import duty and business tax on the raw and essential materials, imported goods for re-export and the export duty and business tax on exports.

In the Upper South, however, BOI has approved only 23 industries which account for only two percent of the total number of BOI approved industries amounting to 1,119 in the country. Moreover, out of the 23 approved industries only three industries are manufacturing industries whereas, at the national level, the manufacturing industries accout for 43 percent of the total BOI approved industries. It is necessary for the investment promotion effort to meet the strong investment willingness of local entrepreneurs in the Upper South through a package of incentives including, for example, industrial estate development, designation of special investment promotion area and area specific local tax exemption with matching subsidy from the central to local governments.

The three manufacturing industries approved by BOI in the Upper South include two industries at Phangnga to supply machines and parts for tin and related industries and one ice making industry. Two industries of the former can be an example to present the possibility to evolve diversified engineering industries starting from tin-related metal working industries through firm machineries, construction machineries and so on.

Recently new investments of two types appear in the Upper South. One is the market oriented industries as seen in the case of the whisky factory in Surat Thani. The other one is the resource based industries such as palm oil extraction factories, seafood manufactures, and metal smelting factories.

4.2 COMPARATIVE ADVANTAGES AND DISADVANTAGES OF UPPER SOUTH

Although there is no stated overall guideline for national industrial location, we understand the present policy aims at (1) attaining import substitution of basic industries and attracting every possible export industry in the Eastern Seaboard thereby establishing the center of interindustrial link within the country, (2) promoting agro-based and other resource-based industries in regional urban centers, (3) developing high technology and urban type industries in Bangkok Metropolitan Region and (4) Decentralization of industries from the metropolitan area. As this policy will be implemented, Eastern Seaboard will expand and diversify its industrial linkage with other viable industrial areas to form a network of seaboard industrial development based on the improved coastal and inland transport system. Resource-based industries will grow not only in major regional/urban centers but in smaller urban centers as urbanization proceeds in line with the increased scale of economy of each urban center and the improved transport network to stimulate more diversified integration in local materials and nonlocal materials/technologies.

It is in this context that comparative advantage of the Upper South draws attention in terms of industrialization and decentralization.

(1) Regarding the resource-based industries, the Upper South is endowed with a variety of agricultural and mineral resources for which the rest of the country can not respond better. There are the mineral resources such as tin, zircon, tantalite, tantalum, lignite, gypsum, low grade fluorite, the agricultural products such as rubber, oilpalm, coffee, coconut, cashew nut and fruits, including rambutan, lancet, durian, jack fruits and tangerine. Fishery and forest products have been major resources but they

are in danger of depletion. Livestocks are another potential resources although production level is limited at present.

(2) Regarding the import substituting industries, the Upper South has comparative advantages in four points. First, it has plenty of water and land resources necessary for intermediate goods industries of high priority in the national import substitution such as iron, paper, and chemicals. Second, it is situated at the gateway to the Sourth. The South with a population of 4.5 million in 1980 and with expected 7.7 million population in the year 2000, is relatively far and isolated from the mainstay of the national economy and will form an independent market from the rest of the country. This is a potential for the Upper South to become a production and distribution center of intermediate goods for the South. Third, at the same time, the Upper South could have close industrial linkages with Eastern Seaboard through coastal shipping network. Industrial materials supplied from Eastern Seaboard can partly be processed/assembled for the use in the South or combined with the resources to which the Upper South has better access, including those available in local and those which can be imported from the western situated countries through the deep seaport of Phuket. Fourth, it should not be overlooked that effect of concentration of materials, both external and local, stimulates the transportation and distribution industries and creates various industrial investment opportunities as having been observed in various places.

(3) Regarding export industries, the Upper South, Phuket in particular, has comparative advantages in following points. First, it has a direct access to foreign market of the western situated countries not only by the deep seaport but also by the airport. Second, Phuket has accumulated international business experiences in tin, rubber, and other trade and tourism. This outward looking enterpreneurship is another important potential to develop export industries. Third, the international access together with decent urban amenity and good natural environment of Phuket is hardly found elsewhere in the South. This can possibly attract the foreign technologies and investments to be combined with local resource/materials and manpower.

On the other hand, there are also disadvantages for industrialization in the Upper South. They are as follows:

(1) Lack of diversified industrial structure

Modern industries require many inputs of materials, parts and services from other industries. The diversification of industrial structure will take a long time, and Bangkok Metropolitan Area and the Central Region has a great advantage in this condition.

The Upper South does not seem to possess an advantageous position in this regard.

(2) Long distance away from the market and scarce population

These conditions will form a great disadvantage for the mass production industries to invest in the Upper South. This has been one of the reasons why the Upper South remains just to supply materials for the industries elsewhere.

(3) Shortage of such infrastructure as telecommunication, transportation, the supply of electricity in quality, and water supply

Among the above, the inconvenience of communication with major markets both domestic and abroad has constrained the industrial activities in the Upper South. In order to promote export industries, the well-managed communication system should be installed.

(4) Exhaustion of traditional materials

Such traditional materials as logs, fishery, tin ore, and coconuts have been in the process of exhaustion and the possibility to raise production levels for such materials is rather limited. Industries dependent on these materials have to face with the conversion of their products or further processing of those materials.

(5) Lack of quality control over local materials

Many of industrialists who use locally processed materials as their inputs are suffering from the low quality of supplied materials. In view of penetration into various markets and materialization of industrial opportunities, processing in local materials requires the better control of quality.

(6) Political instability or perceived image of political instability by the investors in the Upper South

Although the security in the South has substantially been improved recently, investors still do feel uneasiness in their commitment.

(7) Adjustment of the minimum wage

Local industrialists complain that the minimum wage regulation by the government

does not meet the actual labour market of the region. They say that there are abundant want-to-work people at lower rate of wage than the minimum wage. Higher minimum wage makes it hard for industrialists to employ more workers without increase in production cost. The distortion of actual condition of labor market constrains new investments. The goal of the minimum wage regulation is to improve the living standard of people. Industrialists can contribute toward the achievement of this goal with an effort in increasing their productivities, which strengthen their competitive edges. However, distorted wage rates work as a disincentive to such effort and lead to further dispersion between rural and the metropolitan economy. Minimum wage regulation by itself is a highly effective measures to fill the rural/urban gap in view of welfare, however, at the same time presents a major issue from the point of view of industrial promotion. Thus alternation of minimum wage regulation in conformity with local labor market is in view.

(8) Small-size of local market

One of constraints to industrial development in the nonmetroplitan regions including the Upper South is a small size of local market. Investors seeking the scale of economy, rarely base their activities in the local market in view of demerits associated with small size market.

5. STRATEGIES FOR INDUSTRIAL DEVELOPMENT IN UPPER SOUTH

5.1 STRATEGIES

1) Bottom-Up Strategies

(1) Promotion of Local Consumer Market Oriented Industries

Increase of income and purchasing ability of local people will bring opportunities for investors in manufactured products of durable and nondurable. Recently, factories producing such products as furniture, food and beverage, construction materials (cement, cement products, bricks, etc.) are growing in the Upper South and new investments in these are in boom now.

In future, more variety of products can be required locally in spite of rather small market of the subregion. So far the most of consumer goods have been supplied from factories in the Bangkok Metropolitan Region because the factories promoted by the government to encourage import substitution have located in that region.

The RTG should place emphasis on the promotion of local industries as an important policy for industrial development, and this will bring more opportunities for local enterpreneurs to enter new business or expand their operations. Improvement of infrastructure and some incentives covering the local industries in Thailand as a whole should be emphasized.

(2) Promotion of Resource-Based Industries (See Figure 5.1)

Another strategy exists in the promotion of resource-based industries because there are several unique resources to be processed into industrial finished products in the Upper South. These include rubber and rubber wood, palm oil, minerals, metallic and nonmetallic, marine fish, and wood and timber from forest.

The most of these local materials have been exported abroad as raw materials or as primary processed goods. The further processing of local materials to intermediate goods and final goods for the domestic market and possibly for the foreign markets is the most viable strategy not only from the regional but from the national economy point of view. Besides these traditional resources, the Upper South has a potential to produce new materials for manufacturing such as cattle breeding, fishculture, and

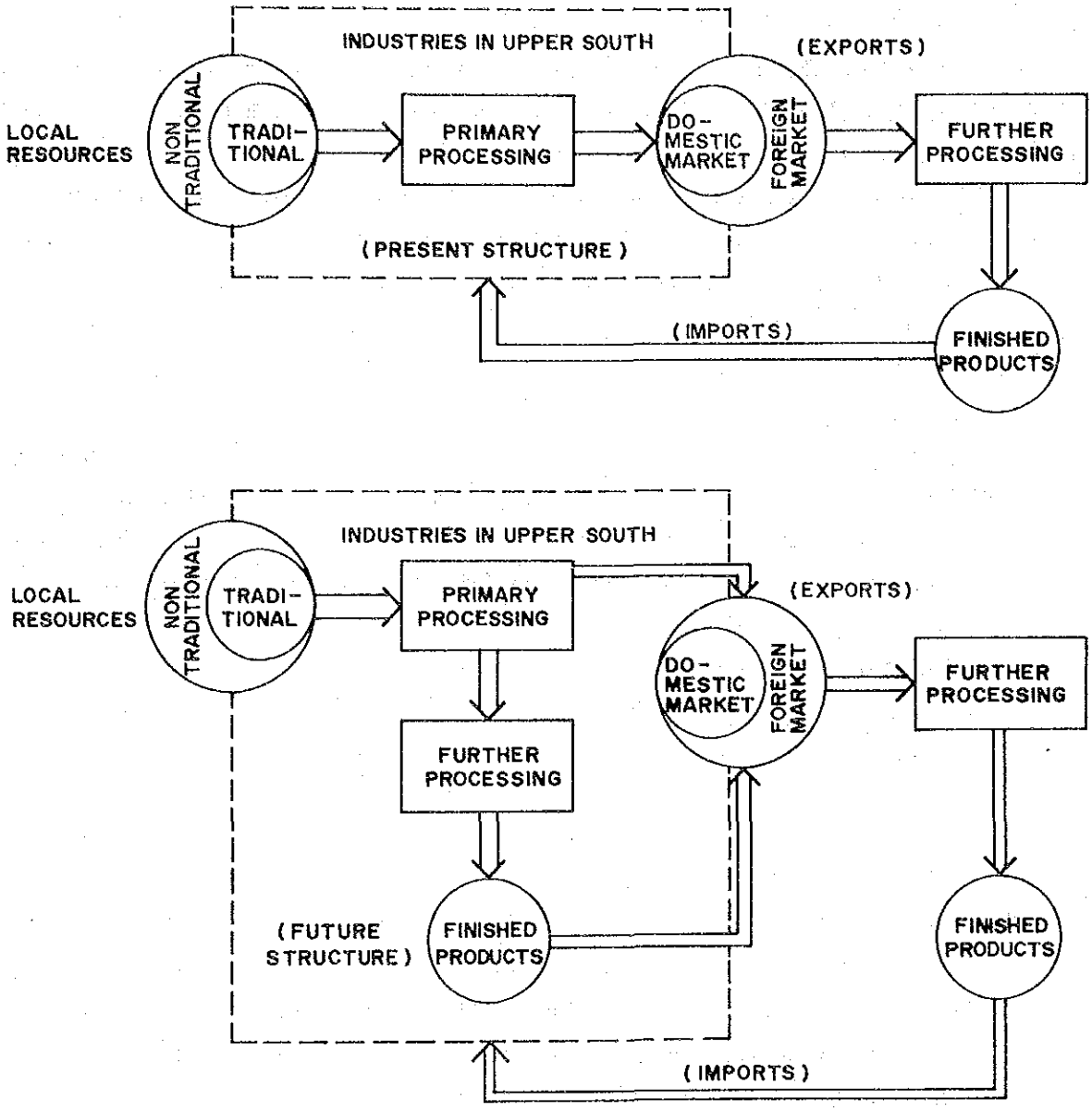


Fig. 5.1 SCENARIO FOR DEVELOPMENT OF RESOURCE-BASED INDUSTRIES

tropical crops (coffee, cacao, pepper, etc). These new materials will encourage the diversification of industrial base in the Upper South with possibility of expanding markets abroad for these products.

(3) Promotion of the Industries Related to Major Local Industries

The third point of view for the scenario of industrialization is to promote the industries related to such major local industries as mining, tin mining in particular, rubber and rubber products, fishery, and palm oil extraction. In fact, there are several such industries growing in the Upper South. These include metal works for tin mines, ship-repairing, auto-repairing, and shipbuilding for fishery. Promotion of these related industries does open a possibility to improve the efficiency of the major industries themselves, to diversify the industrial structure of the region and to produce new products.

Traditional industries will gradually tend to be capital intensive in order to improve their productivity in future, and they may use more industrial products in their operation. For instance, agricultural sector may use fertilizers, insecticides, feedstuff, and machines, many of which could be supplied locally.

2) Top-Down Strategies

(1) Needs of Incentives

Some additional incentives could be introduced to break the increasing external diseconomy in the metropolis, to provide the investors potentially moving out with alternative locations and to accelerate the development of regional economy. Among others, the improvement of infrastructure will come first, and promotional privileges, and tax incentives will complementarily follow. Urban services and so called soft infrastructure such as banking and financing services, information services and educational and training services will also be important.

(2) Locational Advantage of the Upper South

A concept of the East-West Link will have a great meaning in the industrial development strategies of Thailand. Efficient operation of the East-West Link will ensure better accessibility of investors to foreign markets at the both sides of the southern peninsula. In particular, the accessibility to the Western markets, Burma, Bangladesh, India, the Middle East, Africa, and Europe, will be enormously

improved.

(3) Establishment of Another Growth Pole after the Eastern Seaboard Development

Semi-industrialized countries have generally succeeded in establishing an industrial structure to integrate a full range of production from basic materials through final products. Present structure in Thailand shows smaller basic materials than industrialized and semi-industrialized countries. For instance, the annual consumption of steel and iron per capita is around 40 kilograms, that of paper and paper products is estimated at 10 kilograms. These per capita consumptions are 120 kilograms in Malaysia, 635 kilograms in Japan for steel and iron, and 47 kilograms in 1960 and 143 kilograms in 1981 for pulp and paper consumption in Japan.

Some of basic chemicals will be produced in the Eastern Seaboard and will contribute to the vertical integration of industrial structure of Thailand and also to the horizontal diversification of industries. The feasibility study on the establishment of integrated steel and iron plant has been done and possibility of establishing such basic and large scale industries is suggested by a study report on "Large Scale Industrial Investments in Thailand". The first growth pole of these industries will be at the Eastern Seaboard.

Depending on the speed of industrialization, another growth pole will become necessary in future. Because it will not be reasonable to concentrate too many basic and large scale industries on the Eastern Seaboard. If they are concentrated, the industrial corridor between Bangkok and the Eastern Seaboard will suffer from external diseconomy and the socio-economic disparity between the Central and other regions will increase. In the South including the Upper South, there are a number of areas suitable for major industrial growth poles. In particular, Surat Thani - Phun Phin Area and Khanom are promising for major industrial growth poles in the long-run.

In these instances, strategies set for the industrial development in the Upper South can be summarized as shown on Figure 5.2.

5.2 TARGETS

1) Target framework for regional industrial development is set based on the trend projection and the target projection under which development efforts induce additional industries and services.

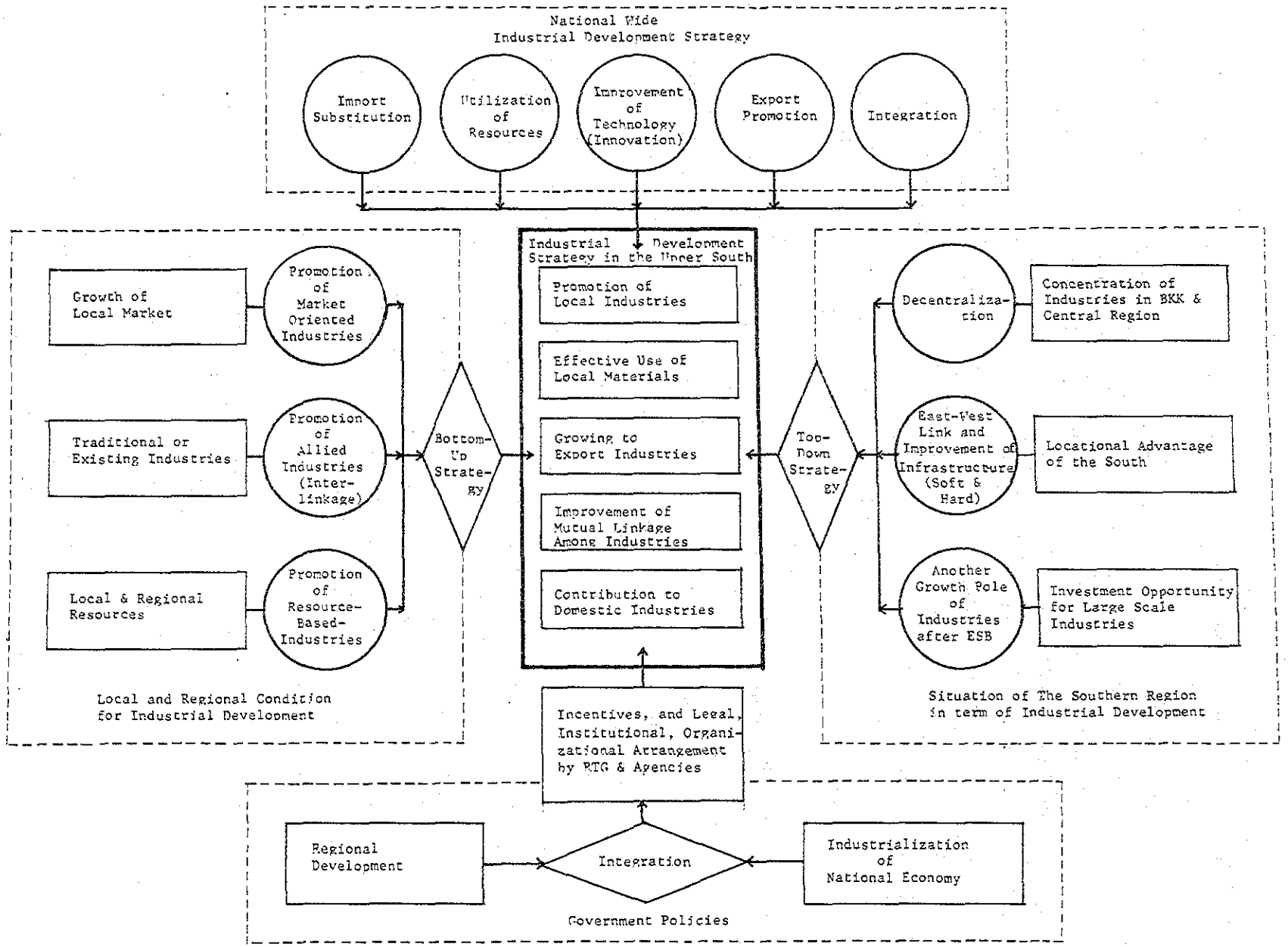


Fig. 5.2 STRATEGIC VIEWPOINTS OF INDUSTRIAL DEVELOPMENT IN UPPER SOUTH

Gross domestic products in the manufacturing sector ((in million baht at 1980 prices) are projected, as below:

1980	2,213
1991	9,421 (Induced Portion 1,154)
2000	25,511 (Induced Portion 15,642)

Employment in the manufacturing sector (thousand persons) are:

1980	23
1991	63 (Induced Portion 20)
2000	140 (Induced Portion 69)

These projections for industrial development are consistent with a regional economic target to achieve a moderate economic growth of 7.2 percent, eight percent per annum during 1980-1991 and 1991-2000 respectively, which are slightly higher than that of national average.

At least during the past two decades, the increase of industrial output has been generated mainly in the Central particularly in the Bangkok Metropolitan Region. In the coming period, the distribution of industries might be shifted into nonmetropolitan regions by increasing constraints of the over crowded metropolis, and it could be accelerated by the government efforts to encourage the industrial investments in the nonmetropolitan regions.

2) Industrial Groups for Target Setting

The industrial structure of the Upper South can be identified in two ways: one puts focus on the improvement of industrial structure in the country as a whole, and the other on local potentials for the industrial development. Keeping this in mind, the industrial subsectors can be classfied into the following six groups:

Resource Criteria \ Market Criteria	Local Market Oriented Products (Consumer Goods)	Intermediate Products (Intermediate Goods)	Basic Materials and Machinery & Equipment (Capital Goods)
Local Resource-Based	Group I (311-314) Foodstuff (332) Furniture	Group II (341) Paper & Products (355) Rubber & Products (361-369) Nometallic Mineral Products	Group III (331) Wood & Lumber (372) Nonferrous Metal
Non Local Resource-Based	Group IV (321) Textile (322) Apparel (323-324) Leather & Footwear (342) Printing	Group V (351-352) Chemicals (353-354) Petroleum (381) Fabricated Metal (356 & 359) Plastics other Products	Group VI (371) Iron & Steel (382-385) Machinery & Equipment

3) Changes in Industrial Structure in Thailand

The Gross Domestic Product (GDP) originated from manufacturing sector is utilized to analyse the changing industrial structure in Thailand. The result of analysis is seen on Table 5.1.

Major characteristics of structural change are as follows:

(1) The portion of consumer goods has been decreasing while that of intermediate and capital goods has been increasing.

(2) The percentage of local resource based products and that of nonlocal resource-based has been almost reversed during the past one decade.

(3) As a result of above two tendencies, the share of the consumer goods which are dependent on nonlocal resources (Group IV) has increased the most among six groups in spite of a declining share of consumer goods as a whole.

(4) The share of Group VI (nonlocal resource-based capital goods, including machine and equipment for consumers) has increased most next to the Group IV.

Table 5.1 INDUSTRIAL STRUCTURE OF THAILAND (IN TERMS OF SUBSECTORAL GDP)

in 1970
in 1980

Unit: %

Resource \ Kind of Goods	Consumer Goods	Intermediate Goods	Capital Goods	Total
Local Resource Based	43.6	9.2	4.1	56.9
	29.4	10.2	4.5	43.9
Non-local Resource Based	16.0	18.8	8.3	43.1
	21.9	22.2	12.0	56.1
Total	59.6	28.0	12.4	100.0
	51.3	32.2	16.5	100.0

Source: NESDB

4) Estimation of Industrial Structure in the Whole Country

It is difficult to estimate exactly what the industrial frame structure will be in future. Assumption, which embodies the directed target of industrial development, has to be introduced. The structure of highly industrialized countries can be used as a directed target. Table 5.2 shows the structural changes from 1960 to 1980 in Japan. The industrial structure of Thailand might be changed toward such structure.

A future structure would be as shown on the third column in Table 5.3, which could indicate one of the dimensions toward industrial development. With this structure, a targeted Value Added for Manufacturing Industry(VAM) and other economic indicators as shown on Table 5.4, can be estimated. In order to estimate the value of output, the ratios of value added to the outputs have been assumed. In assuming these ratio, Industrial Census of 1979 has been utilized and the adopted ratios are shown in Table 5.5. There exists the possibility that these ratios might be improved together with growth of production and structural reform. On the table the assumed ratios are indicated with those of Japan in 1980 for comparison.

Industrial value added and outputs are estimated and presented on Table 5.6.

Table 5.2 INDUSTRIAL STRUCTURE OF JAPAN IN TERMS OF VALUE ADDED BY SUBSECTORS

Unit: %

Industry Group	1960	1970	1980
Group I	9.6	9.6	10.9
Group II	10.0	9.1	9.1
Group III	6.4	5.5	5.0
Group IV	14.9	12.5	11.6
Group V	19.6	21.6	21.5
Group VI	39.5	41.7	41.9
TOTAL	100.0	100.0	100.0

Source: Statistical Yearbook of Japan

Table 5.3 A TARGETED INDUSTRIAL STRUCTURE OF THAILAND IN 2000 (IN TERMS OF VALUE ADDED)

Unit: %

	(A) Structure of Thailand in 1980	(B) Structure of Japan in 1980	(C) Structure of Thailand in 2000
Group I	29.4	10.9	25(20.15)1/
Group II	10.2	9.1	10(9.65)
Group III	4.5	5.0	5(4.75)
Group IV	21.9	11.6	17(16.75)
Group V	22.2	21.5	23(21.85)
Group VI	12.0	41.9	20(26.95)

Note : 1/ Figures in parenthesis are that the average of A and B.

Source: The Team

Table 5.4 TARGETED FRAME WORK FOR THE INDUSTRIALIZING NATIONAL ECONOMY: AN ASSUMPTION

	1980	1990	2000
A. GDP(million US$)[1/]	30,000	56,000	128,000
B. POP(million)	50	56	64
C. A/B($ per capita)	600	1,000[2/]	2,000[2/]
D. VAM(million US$)[1/]	6,000	16,800	44,800
E. A/D x 100(percent)	20%	30%	35%
F. D/B ($ Per Capita)	120	300[3/]	700[3/]

Note : 1/- Values at 1980 price
Exchange rate ฿23/US Dollar

2/- Annual growth rate : 1980-1990 5.2%
1990-2000 7.2%

3/- Annual growth rate : 1980-1990 9.6%
1990-2000 8.8%

Source: The Team

Table 5.5 RATIO OF VALUE ADDED TO THE VALUE OF PRODUCTION

Unit: %

	Thailand in 1979	Japan in 1980	Thailand in 2000 (assumed)
Group I	29.8	30.4	30
Group II	30.4	36.3	33
Group III	34.9	26.2	30
Group IV	42.2	43.8	43
Group V	25.5	28.8	27
Group VI	31.6	34.1	33
Whole MFG	31.4	32.9	32

Source: Industrial Census, 1979 and Statistical Yearbook of Japan

Table 5.6 ESTIMATED VALUE ADDED AND VALUE OF OUTPUT BY INDUSTRIAL GROUP FOR THAILAND IN 2000

	(A) Value Added (million Baht)	(B) Value of Output	
		Value Added / Output	Value (million baht)
Group I	257,600	0.30	858,667(26.4%)
Group II	103,040	0.33	312,242(9.6%)
Group III	51,520	0.30	171,733(5.3%)
Group IV	175,168	0.43	407,367(12.5%)
Group V	236,992	0.27	877,748(27.0%)
Group VI	206,080	0.33	624,485(19.2%)
TOTAL	1,030,400	0.32	3,252,242(100.0%)

Note : Value in 1980 price

Source: The Team

Table 5.7 TARGETED INDUSTRIAL STRUCTURE OF THAILAND IN 2000

Unit: %

	Consumer Goods	Intermediate Goods	Capital Goods	Total of Left
Local Resource Based	25	10	5	40
Nonlocal Resource Based	17	23	20	60
Total of Above	42	33	25	100

Source: The Team

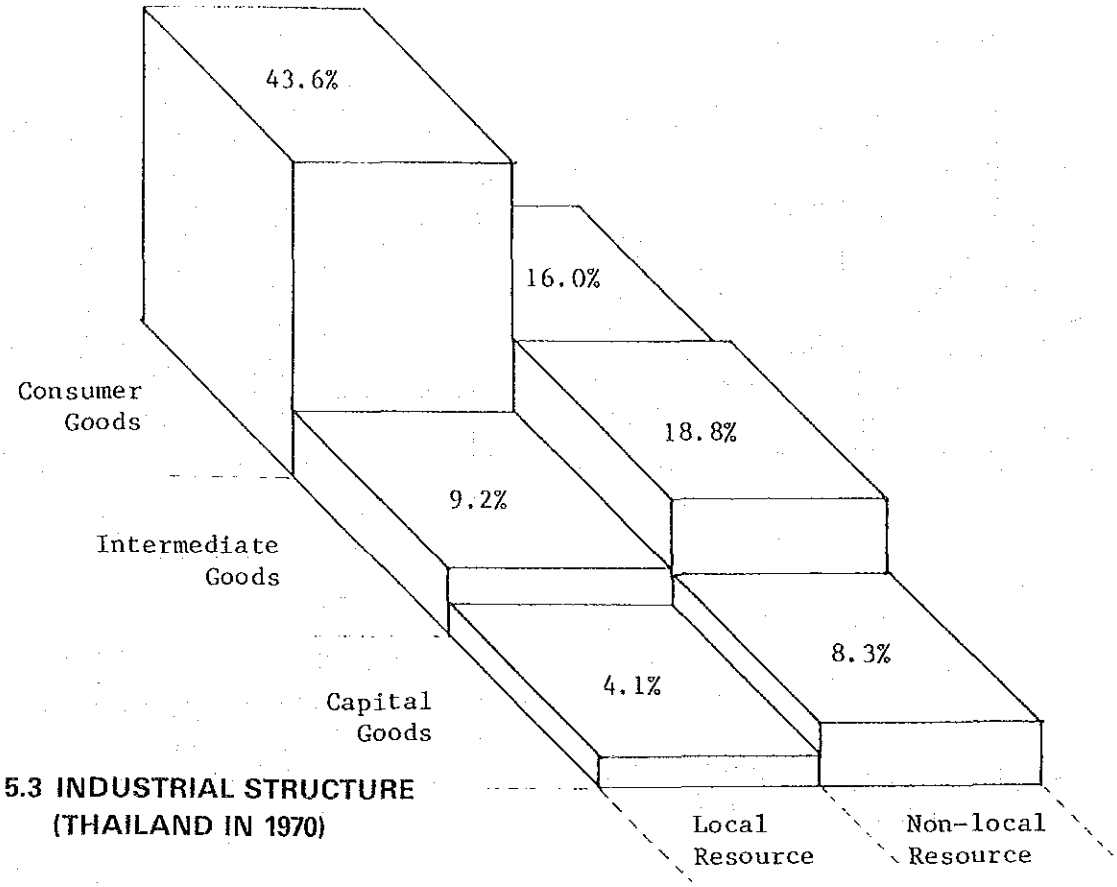


Fig. 5.3 INDUSTRIAL STRUCTURE (THAILAND IN 1970)

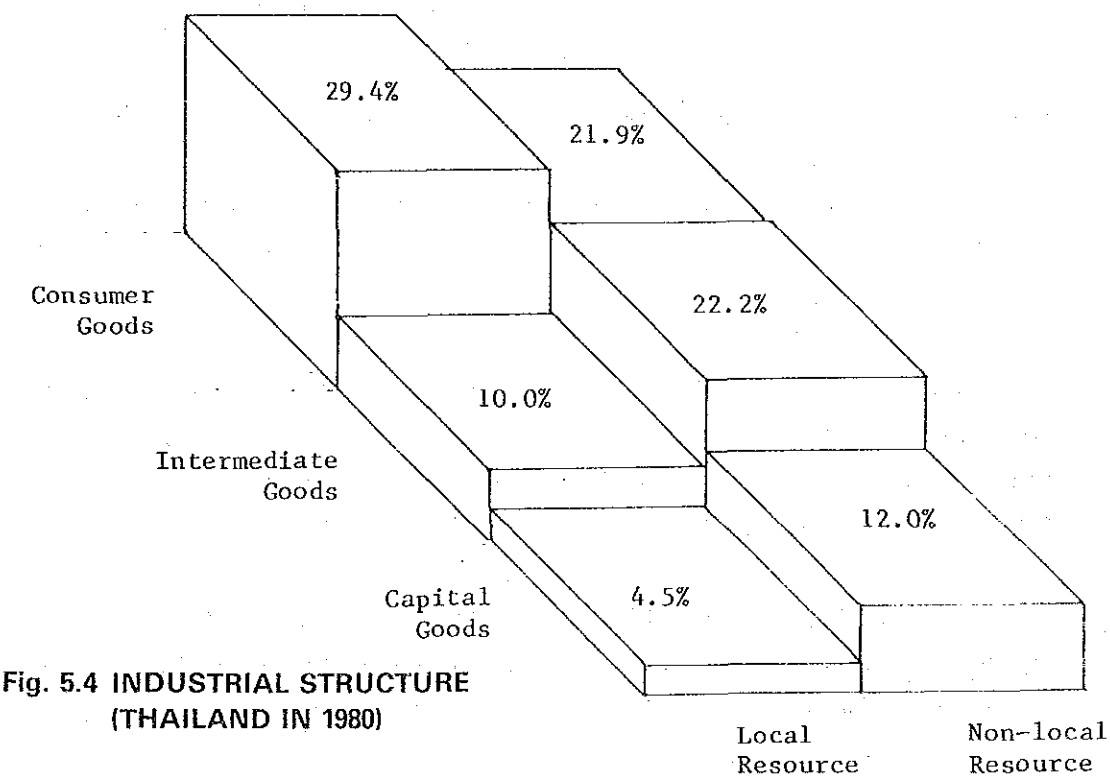


Fig. 5.4 INDUSTRIAL STRUCTURE (THAILAND IN 1980)

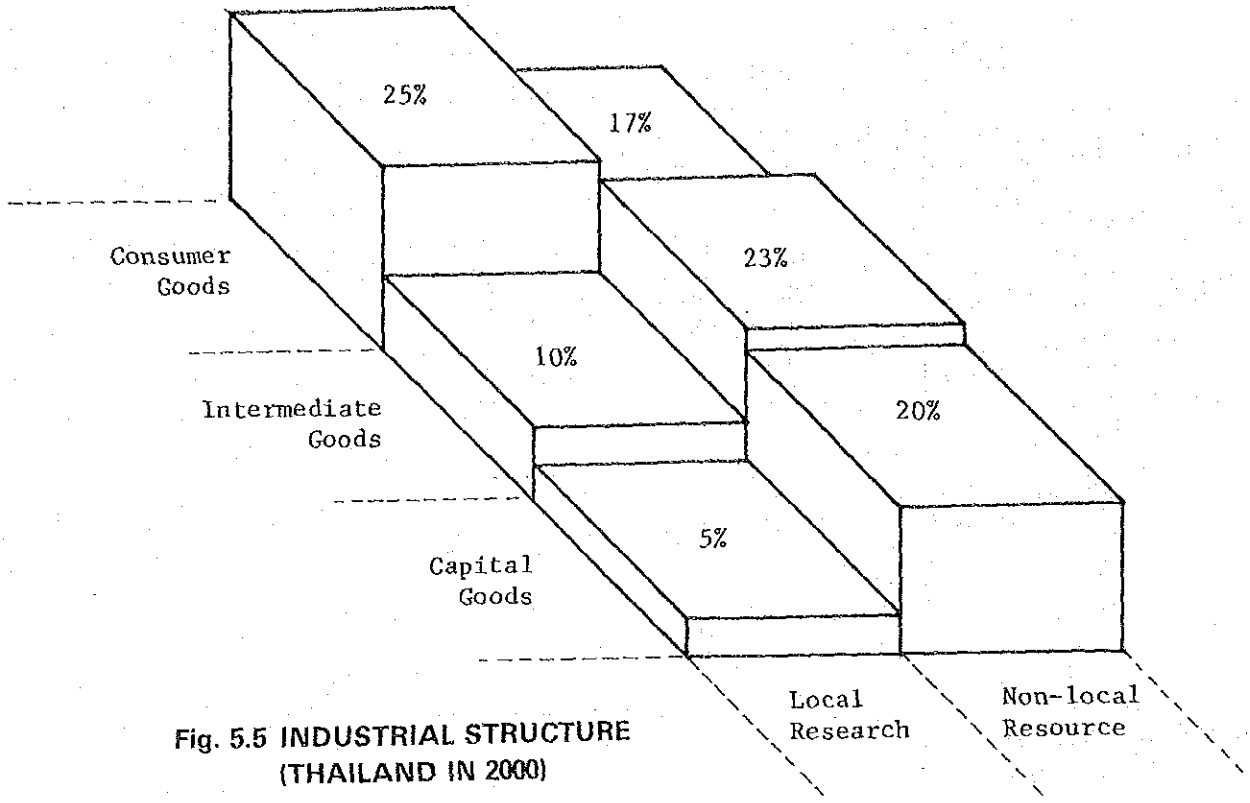


Fig. 5.5 INDUSTRIAL STRUCTURE (THAILAND IN 2000)

5) Industrial Structure of Upper South

Based on the proposed framework for the development of the Upper South as described at the beginning of this section, key indicators are summarized on Table 5.8.

The estimated GDP and VAM for the whole country in 2000 present a rather rapid growth, in reflection of target setting of 2,000 US dollars of per capita GDP at 1980 price. For this target to be achieved, the Eastern Seaboard will be required to be in full operation and also another growth pole will be required.

A projected Gross Regional Product (GRP) of 117,126 million baht as the framework for the Upper South will be equivalent to 3.98 percent of the estimated GDP. The growth rate is enormous, considering current status of manufacturing, however, the percentage remains almost the same as those in 1980.

In this rapid growth scenario, the manufacturing sector will have to play a greater role in the regional development than ever, because traditional economic sector alone can

Table 5.8 SUMMARY OF TARGETED FRAMEWORK

Unit: baht

	VAM/EPM in 1979	Relative Difference	VAM/EMP in 1980
Group I	131,379	1.11596	157,225
Group II	230,761	1.96014	276,158
Group III	80,884	0.68705	96,796
Group IV	75,025	0.63728	89,784
Group V	120,524	1.02376	144,234
Group VI	176,106	1.49588	210.750
TOTAL	117,727	1.00000	140,887

Source: The Team

Table 5.9 RELATIVE DIFFERENCE OF LABOR PRODUCTIVITY BY INDUSTRY GROUPS IN 1979 AND ESTIMATED LABOR PRODUCTIVITY IN 1980

	The Whole Country	South	Upper South
In 1980			
- POP (thousand)	46,455	5,754	1,106
- GDP, GRP (million baht)	684,930	81,647	27,273
- VAM (million baht)	134,500	4,931	2,213
In 2000			
- POP	64,000	-	1,840
- GDP, GRP	2,944,000 1/	-	117,126 2/
- VAM	1,030,400 1/	-	25,511 2/

Note : 1/ The per capita GDP is assumed as of $2000 at 1980 price, and per capita VAM, as of $700 at 1980 price.

2/ Proposed Macro Frame by Upper South.

Source: NESDB and The Team

not contribute to the rapid growth of the regional economy. A value added of 25,511 million baht possibly to be generated from the manufacturing sector will be equivalent to 2.5 percent to the country total which is 1,030 billion baht, in comparison to 1980 figure of 1.6 persent. It implies that the Upper South will have to be one of the growth poles for industrial development in Thailand after ESB. Otherwise the income disparity among regions must be widened in spite of the rapid growth of the national economy.

The industrial structure of the Upper South in terms of value added by industrial groups can be estimated by using the number of persons engaged in the manufacturing sector through obtaining estimated productivity of each group.

The estimated number of persons engaged in the manufacturing sector is 23,000, and this number can be distributed into six groups of industry by using the deducted distribution ratio from the reported number of persons engaged in registered factories. In terms of value added, the industrial structure of the Upper South can be illustrated as shown on Tables 5.10, 5.11 and 5.12 and Figure 5.6.

As compared to the industrial structure of the country as a whole, several features can be pointed out regarding the structure of the Upper South.

(1) Local resource based industries are dominant in the Upper South, particularly Group II and Group III, because of the existence of rubber & rubber products, and wood & lumber and nonferrous metal (tin smelting, etc.), respectively.

Table 5.10 ESTIMATED INDUSTRIAL STRUCTURE OF UPPER SOUTH IN TERMS OF VALUE ADDED AND VALUE OF PRODUCTION (1980)

	EMP (persons)	VAM/EMP (thousand baht)	VAM (million baht)	
Group I	7,889	84,294	665	(30.0%)
Group II	5,290	148,015	783	(35.4%)
Group III	4,255	51,704	220	(9.9%)
Group IV	851	48,179	41	(1.9%)
Group V	782	76,726	60	(2.7%)
Group VI	3,933	112,891	444	(20.1%)
Total	23,000	96,217	2,213	(100.0%)

Source: The Team

Table 5.11 INDUSTRIAL STRUCTURE OF UPPER SOUTH (1980)

	VAM (million baht at 1980 prices)	Value of Production (million baht at 1980 prices)	
Group I	665	2,218	(29.8%)
Group II	783	2,457	(34.4%)
Group III	220	888	(12.5%)
Group IV	41	92	(1.3%)
Group V	60	227	(3.2%)
Group VI	441	1,342	(18.8%)
Total	2,210	7,134	(100.0%)

Source: The Team

(2) These features above in turn bring the region a higher probability to proceed into intermediate and capital goods rather than consumer goods. This tends to be strengthened by the relative importance of industries in Group VI in the South, consisting of the machinery and equipment industry for tin mines.

(3) The very little share of nonlocal resource-based industries may be indirectly linked to the concentration of these industries in the Metropolitan Region or the Central.

(4) A large part of consumer goods for local market is also supplied from the Central. It reflects a minor percentage of consumer goods particularly nonlocal resource-based one.

Regarding industrial structure of the Upper South toward the year 2000, the following assumptions have been set.

(1) The growing local and regional market will widen the potential for local market-oriented manufacturers. In future, more products might be manufactured for local consumption than ever before. In this direction, it is envisaged that these products might be exported to other regions and foreign countries.

(2) Local resource based industries have been and will be a great opportunity for investment. The increased and improved supply of materials are assumed for this to be actualized.

Table 5.12 INDUSTRIAL STRUCTURE OF UPPER SOUTH IN 1980

Unit: Distribution (%) / VAM (million baht)

	Consumer Goods	Intermediate Goods	Capital Goods	Total
Local Resource Based	30.0%	35.4%	9.9%	75.3%
	665	783	220	1,668
Non-local Resource Based	1.9%	2.7%	20.1%	24.7%
	41	60	444	545
Total	31.9%	38.1	30.0	100.0%
	706	843	664	2,213

Source: The Team

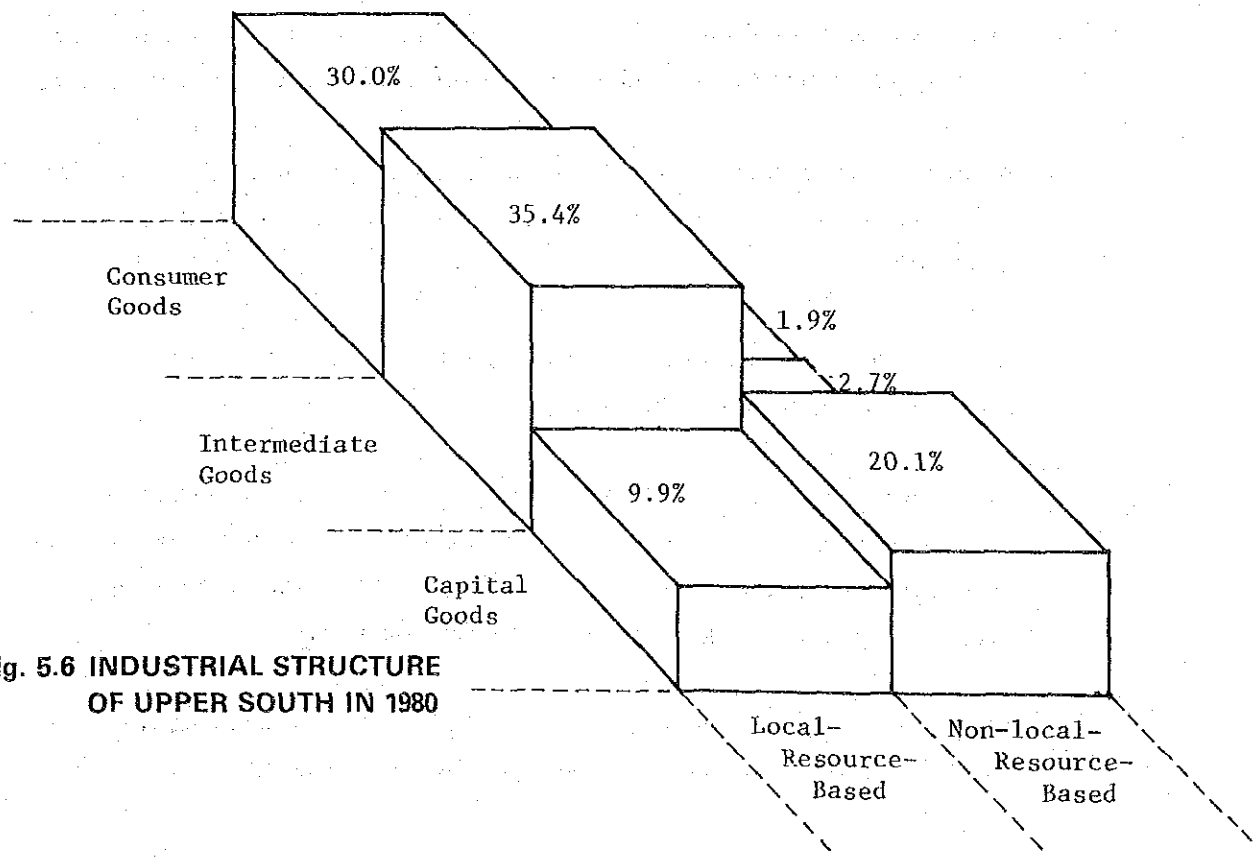


Fig. 5.6 INDUSTRIAL STRUCTURE OF UPPER SOUTH IN 1980

Projection I: Value Added of Production of Consumer Goods in the Upper South

In the whole country, the value added of consumer goods (Group I & Group IV) was 69.1 billion baht, and it was equivalent to 1,487 baht per capita. While that of the Upper South was 706 million baht, equivalent to 638 baht per capita or around 43 percent of the average of the country.

A target framework for the whole country in 2000 is estimated to produce 432,768 million baht of consumer goods, equivalent to 6,762 baht per capita. Based on this, if around 70 percent of consumer goods were to be supplied locally, the value added generated from the manufacturing of consumer goods in the Upper South would reach 8,676 million baht.

Projection II: Value Added of Local Resource-Based Industries

Future potential of local resource-based industries is necessarily limited by the growth of material production. Of course the price and quality in such materials will affect the possibility of processing industries.

GRP of material supplying sectors such as agriculture and mining are estimated as follows :

Unit: million baht

	(A) 1980	(B) 2000	(B) / (A)
GRP in Agriculture	7,934	25,880	3.26
GRP in Mining	5,800	13,911	2.40
Total	13,734	39,791	2.90

From the results of industrial census in 1979, a ratio of material cost to the gross output can be obtained for major industries as shown on Table 5.13. Although these ratios are quite different among industries, it is generally recognized that the ratios for products near the final product are lower than those of primarily processed ones. Average ratio for local resources-based industries is 47.1 percent. These rates can be improved by further processing to produce higher valued products. Then it is possible to assume the rate of 45 percent for such industries. At present local resources being the main product in the Upper South are shipped out of the subregion without being processed, including the leakage through smuggled outflow. In addition, an estimated value added of local resource-based industries of 1,668 million baht in 1980, has been applied as basic figure for the projection.

Table 5.13 PERCENT METERIAL COMPONENT IN GROSS OUTPUT

Unit: million baht

Major Industries	(A) Gross Output	(B) Cost of Raw Materials	(B)/(A)
31119 Manufacturing of other meat products	65,005	55,164	84.9%
31123 Icecream	785,446	322,845	41.1%
31141 Fish Canning	743,667	449,144	60.4%
31149 Processing of fish, shellfish and other sea products	12,744,360	7,610,461	59.7%
31151 Oil and fats	6,396,191	3,266,516	51.1%
31169 MFG of grain mill products	3,189	1,460	45.8%
31171 Bakeries	236,991	101,794	43.0%
31172 Biscuits	10,935	4,196	38.4%
31220 Animal feed	17,266,207	11,599,806	67.1%
31161 Rice mills	1,396,191	3,266,516	51.1%
Sub-Total	44,648,182	26,657,902	59.7%
33111 Sawmill & planning	7,352,570	4,055,723	55.2%
33112 Veneer, plywood and veneered panel	4,299,240	2,526,338	58.8%
33113 Builders woodwork	320,744	133,521	41.6%
33120 Containers and small cane ware	3,651	2,060	56.4%
33190 Wood & Coke	113,542	54,670	48.1%
33201 Wood Furniture, fixture and flooring	1,050,337	572,366	54.5%
33202 Rattan furniture	46,063	17,248	37.4%
Sub-Total	13,186,147	7,361,926	55.8%

(Continued)

Major Industries	(A) Gross Output	(B) Cost of Raw Materials	(B)/(A)
34111 Pulp,paper and paper board	9,210,102	5,701,342	61.9%
34190 Paper Products	767,390	459,901	59.9%
Sub-Total	9,977,492	6,161,243	61.8%
35510 Tire & tube	6,981,561	3,526,326	50.5%
35591 Rubber sheets and block	11,024,709	8,414,396	76.3%
35599 Other rubber products	879,434	522,569	59.4%
Sub-Total	18,885,704	12,463,291	66.0%
36100 Pottery	338,797	97,611	28.8%
36910 Structural clay products	612,946	144,949	23.6%
36921 Cement	45,399,334	7,972,072	17.6%
36922 Line & plaster	306,515	43,413	14.2%
36991 Concrete products	6,284,610	4,181,520	66.5%
36999 Non metallic mineral products	583,828	83,306	14.3%
Sub-Total	53,526,030	12,522,871	23.4%
38191 Metal cans and shipping containers	3,114,291	1,606,800	51.6%
38192 Wire and wire products	1,691,883	1,089,870	64.4%
38199 Fabricated metal	1,972,983	1,409,508	71.4%
Sub-Total	6,779,157	4,106,178	60.5%
Grand Total	147,002,712	69,273,411	47.1%

Source : Industrial Census, 1979

This amount might be increased considering growing production of materials and further processing into more sophisticated and high-valued products. Then the value added of local-resource-based industries could be estimated by a rather simple method as illustrated below:

$$1{,}668 \text{ (million)} \times 2.90 \times \frac{1}{0.450} = 10{,}749 \text{ (million)}$$

Since the production of the Group I is dependent mainly on agricultural products, the share factor of 3.26 times of material increase can be applied.

Value added of Group I Industries

$$655 \text{ (million)} \times 3.26 \times \frac{1}{0.450} = 4{,}818 \text{ (million)}$$

Value added of Group II Industries

$$748 \text{ (million)} \times 2.90 \times \frac{1}{0.450} = 5{,}046 \text{ (million)}$$

Value added of Group III Industries

$$10{,}749 - (4{,}818 + 5{,}046) = 885 \text{ (million)}$$

Feature for New Industrial Growth Poles

To attain the target framework of regional development, several industries, which will be able to be established in Thailand toward the year 2000, could be induced in the subregion not only based on comparative advantages but also with the government efforts in the regional development. As candidate industries to promote growth poles of industrial development, the following projects could be proposed for consideration:

- Basic industries such as iron and steel, pulp and paper, and petroleum refinery;
- Supporting industries for agriculture and mining such as animal feed, fertilizer, insecticide and chemicals, machinery and equipment, fishing boat and suction boat;
- Shipbreaking and shipbuilding;
- Plastic processing;
- Textile and garments;
- Electronic machinery and equipment; and

- High-technology related chemicals from local materials.

Industrial Structure of the Upper South in the Year 2000

As a result, the industrial structure of the Upper South could be targeted as shown on Table 5.14 and Figure 5.7.

6) Projection of the Number of Employees Generated from Industrial Development

Possible number of employees to be generated is shown on Table 5.15. Number of employees of local resource-based industrial groups, Type I, Type II and Type III, is estimated at 17,434 or 75.8 percent of manufacturing employees in 1980. Increasing production of local resources and improvement of productivity will add 48,566 employees in these industrial group. Most of the increment will be generated through the industrial growth under the trend projection. Additional employees in the manufacturing sector will have to be generated through the induced industrial growth, particularly that of three non local resource-based industries, Type IV, Type V and Type VI, since the industrial development strategy in this study expects a great effort to accelerate the decentralization of industries and to establish some industrial growth poles in the Upper South toward the year 2000.

Table 5.14 TARGET STRUCTURE OF UPPER SOUTH, 2000

Unit: million baht

	Consumer Goods	Intermediate Goods	Capital Goods	Total
Local Resource Based	4,818 (18.8%)	5,046 (19.8%)	885 (3.5%)	10,749 (42.1%)
Non-local Resource Based	3,858 (15.1%)	10,904 (42.8%)		14,762 (57.9%)
Total	8,676 (34.0%)	16,835 (66.0%)		25,511 (100.0%)

Source: The Team

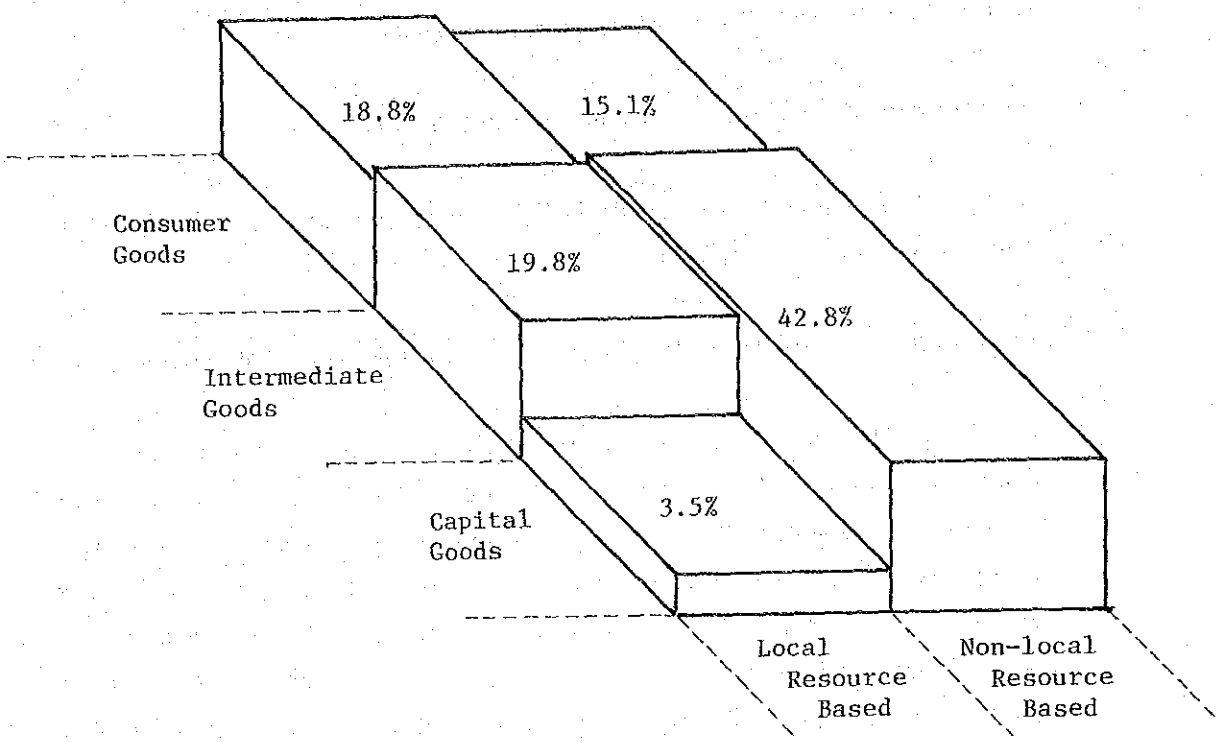


Fig. 5.7 TARGET STRUCTURE OF UPPER SOUTH, 2000

Table 5.15 ESTIMATED NUMBER OF EMPLOYEES BY INDUSTRIAL SECTOR IN UPPER SOUTH

Unit: persons

	1980	2000		
		A. Trend Portion	B. Induced Portion	C. TOTAL (A+B)
Type I	7,899	24,000	8,000	32,000
Type II	5,290	16,000	4,000	20,000
Type III	4,255	13,000	13,000	26,000
Type IV	851	3,000	27,000	30,000
Type V	782	15,000	30,000	45,000
Type VI	3,933			
Total	23,000	71,000	69,000	140,000

Source: The Team

6. POSSIBLE CANDIDATE INDUSTRIES IN UPPER SOUTH

Candidate industries will be proposed according to the following categories :

Bottom-up Approach:

Resource-based industries;
Local-regional market-oriented industries; and
Industries related with local industries (strengthening the backward and foward linkages of the existing local industries);

Top-down Approach:

Decentralization of industries;
Effects of East-West Link; and
Another growth point of industrial development necessary to support industrialization of Thailand;

Description for each category comprises of the following:

- present situation;
- problem structure;
- future potential;
- candidate projects; and
- policy implication.

6.1 RESOURCE BASED INDUSTRIES

The most promising industrial areas in the Upper South are the resource-based industries, because there are several kinds of unique resources to be processed into various products and to be supplied local, regional, domestic and foreign markets.

1) Processing of Agricultural, Fishery and Forestry Products

(1) Rubber and Rubber Products

Present Situation

Total area of rubber in the four provinces (Phangnga, Phuket, Krabi, and Surat Thani) was estimated at slightly less than 1,937 thousand rai, and 98 thousand tons of rubber were produced in 1980. Net exported volume of rubber through Phuket Port was only 29,000 tons in 1980 and 34,000 tons in 1981. The rest are transported through Songkhla, Pattani, Kantang, Narathiwat, Bangkok, and Southern border.

Problems

Almost all of the rubber has been transported out of the subregion in the form of primary products such as smoked sheet and rubber block without being processed into more sophisticated rubber products. Most of the rubber processing factories, including rubber tire factories, are located in the Bangkok Metropolitan Region. A little bit more than 94 percent of rubber are exported in 1980 and 1981 in smoked sheets and rubber blocks, and only a little protion of resources are domestically used in the country as a whole, while the value of net import of rubber articles is increasing at a rate of 19 percent per annum during 1975-1980, amounting to 631 million baht in 1980. Further processing of rubber will be able to reduce import of rubber products and possibly to contribute to the export promotion.

Future Potential

Although the planted area will not be expanded as being estimated at 1,940 thousand rai in 2000, the accelerated replanting and the increased yield per rai will bring the growth of rubber production up to 349,000 tons in 2000. Increasing supply of materials will provide the huge opportunity for inducing rubber processing industries, which are to be given the highest priority among export-oriented industries.

Candidate Industries

Some of the rubber products have already been produced in Thailand. According to customs statistics, such products as rubber threads, rubber tiles, solid tire flap, feeding goods for baby, medical rubber, rubber bands, erasers and other hardened products are even exported. But the products identified on the following three criteria should be promoted because these are imported:

First Criteria: Imports are exceeding exports and net imports are expanding.

- rubber belt;

- birth control products;

- rubber gloves (A plant got the licence to produce rubber gloves in the Lard Krabang Export Processing Zone);

- Packing and gaskets; and

- other unhardened rubber products.

Second Criteria : Imports are exceeding exports, though net imports are decreasing.

- rubber hoses;

- rubberized garments; and

- float for fishing.

Third Criteria : There are some room remained for import substitution.

- foam rubber;

- rubber tire;

- tube;

- air pillows, rubber boat and rubber balloon.

In future more variety of rubber products will be needed along with the diversification of industrial structure, particularly as parts and intermediate inputs to many kind of industries. The promotion of rubber processing industries will contribute not only to the balance of payments but also to diversification of industrial structure.

One of the indicators to show comparative advantage will be the ratio of natural rubber used in products against synthetic rubber. In an early stage of development, such products as containing natural rubber more than synthetic rubber are promising. The percentage of natural rubber content by products is as follows:

- Sanitary goods 83 percent,
- Tire and tube for vehicles except automobile and bicycle 57.1 percent,
- Sports goods 56.0 percent,
- Reclaimed rubber 49.1 percent,
- Tire & tube for bicycle 44.6 percent,
- Footwear 39.8 percent,
- Tire and tube for automobile 38.0 percent,
- Belts 36.2 percent, and
- Hoses 35.0 percent.

In a late stage of development, more variety of rubber products in Thailand will have enormous advantage in the world market, because synthetic rubber will be supplied by the industrial complex in the Eastern Seaboard, which could be combined with natural rubber into many kinds of rubber products.

Recommended rubber products :

In early stage:

- Footwear,
- Sanitary goods of rubber,
- Gloves,
- Sports goods,
- Tire and tube for vehicles except automobile,
- Birth control products,

- Reclaimed tire,
- Rubberized garments,
- Float for fishery,
- Foam rubber, and
- Air pillow, boat, and balloon.

In late stage:

- Tire and tube for automobile,
- Belts,
- Hoses,
- Packing and gaskets, and
- Parts and intermediate inputs for machines and tools.

Policy Implication

The most of rubber processing factories are concentrated in the Bangkok Metropolitan Region, accounting for more than 80 percent in the country. Besides three tire factories (Firestone, Goodyear and Bridgestone), almost all of them are small-scale industries. The promotion of rubber processing industries in the resource producing regions will contribute to the decentralization of industries and also to the regional development.

Local enterpreneurs are eager to start rubber processing business, and some are starting, for instance, rubber hose for tin mining. But they suffer from the lack of market and technical know-hows, the shortage of infrastructure, the heavy burden of tax and the insufficient financial support in long-term and low rate of interest.

Rubber products, at present, are exported at Bangkok. If a port and/or airport for exporting could be established in the resouce producing regions, more of natural-rubber-based industries can be located there.

(2) Palm Oil and Oil Products

Present Situation

In the South, oil palm planting has recently been expanding rapidly being licenced by BOI, because palm oil import is growing. There are plenty of land areas suitable for palm oil planting in the Central Lowland of the Upper South. Several oil extraction factories are starting operation or under construction. But more extraction factories are needed to meet the increasing supply of materials.

Problems

Suitable land for palm oil planting is 2,700 square kilometers. Only seven percent of it has been used for oil palm planting. For new investors, land acquisition is becoming a major constraint. In addition, feeder roads are not well maintained in the potential area.

Future Potential

According to our study on agricultural sector, palm oil production in the Upper South will reach 533 thousand tons per year by 2000. Given a standard capacity of extraction factory being 25,000 tons per year, around twenty factories altogether will be needed. Right now investment privilege for oil palm planting and oil extracting are limited to the projects which direct to domestic market, but not to export. But in future, Thailand will increase production of palm oil enough for export.

Candidate Projects

First of all, extraction factories have to be established close to oil palm planting area. They are typical resource-oriented industry, because fruits bunches should be transported to the extraction factories immediately after picking, at least within 24 hours. After extracted, palm oil and kernel oil in crude are used to be refined into cooking oil or to be put into processing plant of such products as margarine, shortening, soap, cosmetics and pharmaceutical.

A world famous enterprise, which has a half century history in Thailand, is starting a processing complex of palm oil in Lard Krabang Industrial Estate, producing more than 50 kinds of products. It has a large plantation in the Upper South through a joint venture with estate company. Crude palm oil is transported to the plant in tank

lorry to produce a variety of goods.

In the early stage of industrial development in the Upper South, more extraction factories will be established just for producing crude oil and it may be possible to establish some refining factories to produce cooking oil for local, regional and domestic market.

In late stage, investments for palm oil processing factories will be promising for export at the both sides of peninsula. It will be possible to produce the products, such as margarine, shortening, washing powder, soap, toothpaste, shampoo, perfume, and other fatty acid products.

Furthermore, there will be a potential for high technology industries related to palm oil business. Palm oil contains Vitamins A and E and ferments, which could be extracted to produce pharmaceuticals, including Vitamin A, Vitamin E, and digestive enzyme.

Policy Implication

Oil palm planting is rapidly expanding. To achieve high yield of fresh fruits bunch and to have competitiveness against other vegetable oil crops and against other producing countries will be fundamentally needed for the development of palm oil processing industries into export industry.

As regard to the location of processing industries, more effective incentives or privileges should be provided to the resource producing regions. Infrastructure should be improved immediately on a strategic lines for industrial development in the particular resource rich regions.

(3) Fish and Shellfish

Present Situation

One of the resources for industrial development in the Upper South is the marine fish and shellfish, because the subregion is facing both Gulf of Thailand and Andaman Sea. Fish catch in four provinces amounted to 286,000 tons and more in 1980, which is 17.4 percent of the national total production. A substantial part of the fishcatch in the Gulf are transported and unloaded at Samut Sakhorn and Samut Prakharn, which are close to the big market of Bangkok Metropolis. Thailand was exporting

300,000 tons of fish, amounting to 8,776 million baht in value, and importing 47,000 tons, or 550 million baht in 1981. Balance in value was 8,226 million baht plus which contributed to the balance of payments.

Traditional fish processing activities in the Upper South are fishmeal in Surat Thani, Phuket and Trang, shrimp paste in Phangnga, Phuket, Krabi and Trang, smoked fish in Krabi and Trang, and canning in Surat Thani and Trang.

Several new factories were recently established in the Upper South for materials. Another reason is that the expansion and new investment of canning factory in the Central cannot get promotional privileges any more by BOI. It brings an effect on decentralization of industrial investment. Improvement of political stability and transportation has given potential investors some confidence, too.

Problems

The volume of fish catch is said difficult to increase in future. The development of fish processing industries depends on the increase of material supply. If the increase of fish catch will be difficult, the potential area of further processing would be limited. The most important role of fishery industry has to be the stable supply of raw fish to the domestic food market. Surplus of material supply should be directed to processing and exports. Therefore, it will be a major problem to find measures to increase the material supply for fish processing industries.

Coastal area and marine space can be, and has been used for such various activities as ports, offshore mining, tourism promotion, recreation activities, navigation, and fishery. Sometimes some conflicts among activities will take place.

Improvement of resource managing system and introducing more efficient technologies may cause a social friction between modernized and artisanal small fishing. Artisanal fishermen have to move to other nonfishery job opportunities. They have to be participated into a more efficent system of fishing and fish processing integrating breeding, culture, primary processing, distribution, storage, and sales.

Future Potential

Material supply is a critical factor to the fish processing industries. The increase of fish catch is still possible more in the western than the eastern coast of the Upper South. The fish processing industries in the west coast potentially contribute to export

to the Middle East and European Countries.

At Kantang, there is a large scale fish market and cold storages, the number of which will increase, and 45 percent of marine fish catch in the Upper South will be landed at Kantang. If improvement and expansion of facilities at Kantang Fishing Port were to be realized, there will be a possibility to develop a fish processing complex at Kantang. In that case, processed products are transported to Phuket to load on ocean-going vessels for export.

In Phuket, medium-scale fish processing factories could be established, and they will have own fish landing facilities, cold storages and processing plants.

On the east coast, if a fish landing port with cold storage could be established and improved at Surat Thani, there will be a possibility to introduce more processing plants in future. They can process not only fish but also other materials such as meats, fruits and vegetables, sometimes including imported ones. They will form comprehensive food processing businesses.

Candidate industries would thus include, in early stage, cold storage, canning, chilling and freezing, and manufacturing of paste, powder and sauce of fish, and in late stage, combined or comprehensive food processing of fish, meats, fruits and vegetables, ham and sausage, animal feed, organic fertilizers, oil and fats from fish.

In the long-run, not only fish meat, and oil and fats but also viscera of fish, which are removed immediately after catch or landing, can be used as materials for various sophisticated industries such as producing stearates, fatty acids, vitamins and ferments. In preliminary stage these are used for producing animal feed and organic fertilizers. Once some sophisticated technologies are to be introduced, and once variety of local materials (palm oil, other tree crops, meats, fruits, vegetables and fish) are to be combined into such processing, there will be more potential to develop high value added products such as pharmaceuticals (vitamin, ferments) and organic basic chemicals (fatty acids, stearates) based on local materials. This is one kind of agglomeration economy.

Policy Implication

First of all stable and increased supply of fish should be attained by an integrated policies for fishery. Infrastructure should be improved to supply materials steadily and to reduce the investment and operation cost of industries. Incentives and

privileges should be provided to investors in resource rich regions. A research and development should be promoted for food processing industries. A kind of "food processing technology center" should be taken into consideration as an important measure of industrial development.

(4) Wood and Lumber

Present Situation

Local resources have been used for industrial products, including construction materials, fuel or materials for charcoal, and the materials for furniture, wooden boxes, wooden cases, matches and plywood.

Traditional industries have established some beautiful industrial linkages. For instance, old rubber trees have been used as costless fuels for fish meal factories and other many industries. As local demands for wood and lumber are rapidly increasing, wood processing industries are growing in the Upper South. But the intermediate industry, sawmills, are facing a problem of material shortage.

Problems

The cause of material shortage is resource exhaustion and outflow of resources, mainly to Bangkok. Royal Forestry Department provides private companies with concession for cutting down logs in the national forests. Recently concession area has been reduced to protect the forests. Still more, as the large portion of logs are transported to Bangkok, local saw mills cannot obtain sufficient materials to meet the local demand.

Minimum wages are set at higher level than the market price of labour, and local enterpreneurs complain the high cost of labour. Nonregistered small mills can use materials by illegal cutting and employ workers at lower wage than the minimum wage, which the registered factories are forced to follow.

Future Potential

Above all the reforestation is required in terms of long scope. The South has favourable natural condition to raise forest. It will take rather long period to recover the supply of foresty products which was once abundant. But the carefully planned reforestation will allow more production of logs to the local market. According to an

estimation by our study on agricultural sector, however, the annual growth rate of foresty production will be only 0.3 percent. Then an efficient use of resource will be required. In the Upper South, Surat Thani has the largest supply capacity of forestry products.

Mangrove forests are also said to be protected from the environmental viewpoint. Rubber wood may be the only promising material for industrial use. Around 155,000 cubic meters of rubber wood production are estimated in the Upper South based on rubber replanting programe.

Candidate Industries would thus include, in early stage, furniture and fixture (made of rubber wood, rattan, etc.), construction materials, wooden box, wooden case, matches, tiles, blocks, plywood, and charcoal for cooking and industrial fuels, and in late stage, system unit (kitchen unit, bedroom unit, dining unit, bathroom unit, office unit, etc.) and pulp and paper (kraft pulp, paper and its products).

Products in late stage, including system units, will require materials other than woods such as plastics, metals and ceramics. Basic chemicals will be supplied from the Eastern Seaboard and processed locally into particular products.

Policy Implicatrion

The improvement of resource management will be required for the stable supply of materials to processing industries. Incentives and promotional privileges should be strengthened for investors in resource rich regions. Right now a large part of local resources go to Bangkok and processed products come down to the resource producing region, even rubber wood for furnitures. Processing industries in Bangkok can offer higher purchasing price for materials than local users, because they are close to the market. Local demand for wooden products particularly for furniture and fixture has been expanding so fast that it will be enough to support processing industries initially for local market. But in late stage, they are possibly to be export industries supported by improvement of infrastructure and their own efforts.

(5) Other Agricultural Products

Present Situation

In the Upper South, there are plenty of other agricultural products, which have potentials for exporting or substituting import. They include coconuts and coconuts

products (oil, fibre, wood, etc.), coffee and cacao, black pepper, cashew nuts, pineapple, rambutan and other tropical fruits, and livestock. At present most of them are transported out of the subregion in the form of raw products for food or in primarily processed form while some of them are consumed locally. Among others, pineapple has been canned and exported.

Problems

Except for rubber, which is traditional and major agricultural product in the South, other products have not been well taken care of in terms of industrialization. Local farmers have limited know-hows as to farming, marketing, and management. Particularly the knowledges about market potentials and necessary conditions are required for competing in the market. If a market direction and technical know-how are to be provided, there are enormous opportunities to develop a variety of agricultural products for export industries.

Future Potential

Thailand will maintain the position to be a resource rich country particularly in terms of foodstuff. This position will be a strong bargaining power of the country. So far Thailand has exported raw materials or primary processed materials of foodstuffs. In future resources should be exported after processed.

In the Upper South, enormous potentials have not effectively been materialized largely because of the existence of major commercial products, being rubber. More variety of agricultural products will be possible in the Upper South. In particular, livestock and its products should be promoted for export.

Candidate Products thus include, in early stage, livestock, animal feed, dried, chilled, frozen meat (cattle, pig, etc.), and canned, dried, powdered, fruits and vegetables, and in late stage, ham and sausage, pharmaceuticals and organic chemicals of animal vescera and mushrooms cultured on rubber wood and its wastes.

Policy Implication

An integrated policy will be required to realize the effective use of potential resources. Particularly, the integrated promotion system covering from farming through markets of processed products will be needed.

2) Mineral Resources

Present Situation and Problems

The most valuable mineral resource has been tin ores in the Upper South. It has enormously contributed not only to regional economy but to the national economy. But the decline of world tin comsumption and cut-down of price of tin metal has recently caused serious effects on the regional economy. Miners do not like to sell tin ores to the monopolistic smelting factory, Thailand Smelting and Refining Company Ltd. (THAISARCO) at designated price by International Tin Council (ITC). The production of THAISARCO has declined from 36,000 tons in 1981 to 18,000 tons, and it has affected local economy seriously. Tin mines onshore have almost been exhausted and miners moved to offshores. However, it has caused problems of the environmental deterioration and negative effects on fish breeding.

Arguments are being made against the declining of tin production amount. One major point is that the world price of tin metal by ITC is rather high compared to other competing alternating metals. In this argument it will be favourable for Thailand to free the price control by ITC, because lower price will encourage the upward consumption of tin. Otherwise the tin consumption will not increase despite the recovering of the world economy.

The Upper South is rich in other mineral resources also. There are limestone, lignite, gypsum, barite, tungsten, flourite, monazite (wolfram), zircon antimony, tantalite, ball clay, columbium tantalum, kaolin, and silica sand.

Limestone is abundant in the subregion and used for cement production at Tung Song by Siam Cement Co., Ltd., mainly for local demand, which is estimated at 725,000 tons in the South in 1984. It is used also as a material of fibre cement. Lignite is used as fuel for thermal power plant at Krabi.

Recently gypsum mines have been opened and products are exported. A tantalum smelting factory is now under construction. Together with effective use of agricultural products, mineral resources in the subregion have to be utilized more effectively as materials for manufacturing industries directing toward both domestic and foreign markets.

Production and reserves of major minerals in the Upper South are shown on Table 6.1 and Figures 6.1 through 6.4.

Future Potential

Diversification of industrial structure will give rise to the expansion of local, regional and domestic markets for mineral resources. The development of oil fields in Thailand requires refined barite, which is imported from Singapore. Cement and its products will be consumed more in construction works of infrastructure, urban facilities and housing.

Demand for ceramics and their products, glass and wear, parts and equipment of mineral resources will grow also. Increasing domestic demand will make it possible for these mineral processing industries to grow into export industries.

As the Upper South is relatively rich in several kinds of mineral resources, promising areas of industrial development can be found in the processing of these resources.

Candidate Projects thus would include, in early stage, cement, pile, tube, board, plate, block sheet of cement, tantalum smelting, gypsum board, gypsum plaster board, and pewter of tin, and in late stage, barite refining, new ceramics, tin plate for canning, and parts and equipment by metal and ceramics.

Policy Implication

The most of potential resources should carefully be surveyed and evaluated as to whether they can offer necessary quality and enough reserves either for domestic use or export.

Regarding the possibility of tin processing, effective pricing and taxation policies should be considered from the viewpoint of promoting domestic use in spite of the stagnating export of raw metal. And the illegal outflow of tin ore should effectively be controlled.

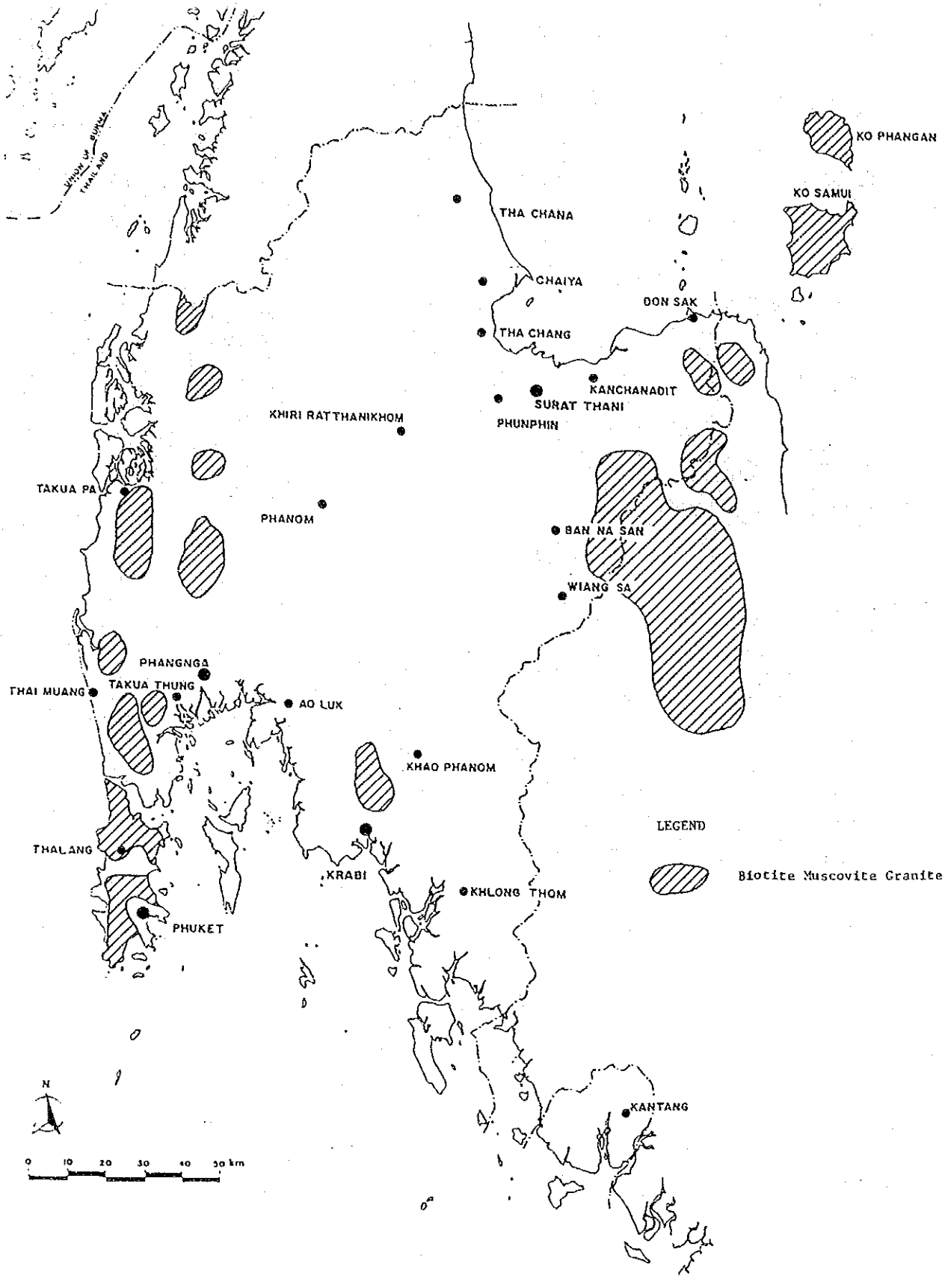


Fig. 6.1 SPATIAL DISTRIBUTION OF MINERAL RESOURCES
(1) GRANITE

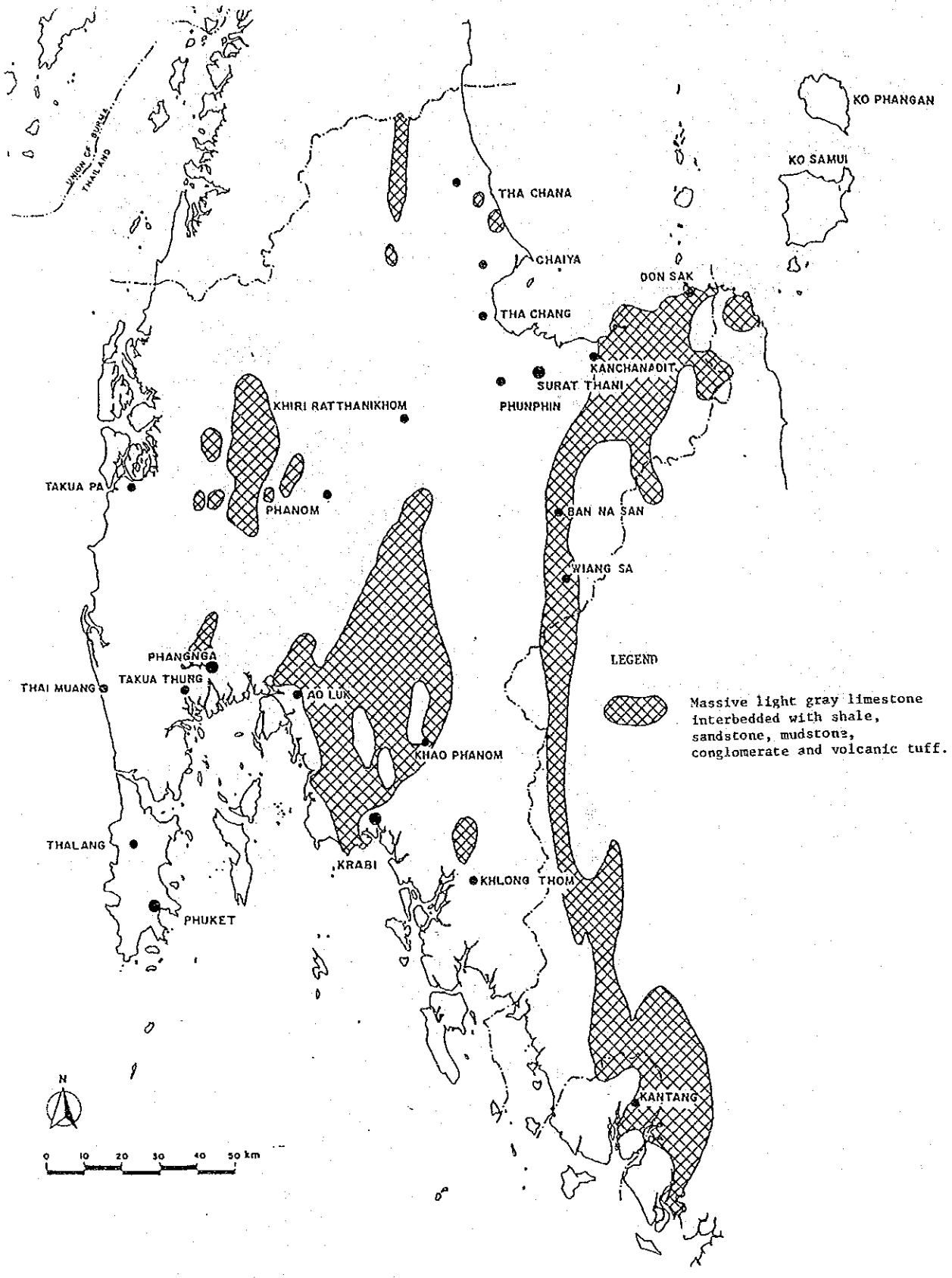


Fig. 6.2 SPATIAL DISTRIBUTION OF MINERAL RESOURCES (2) LIMESTONE

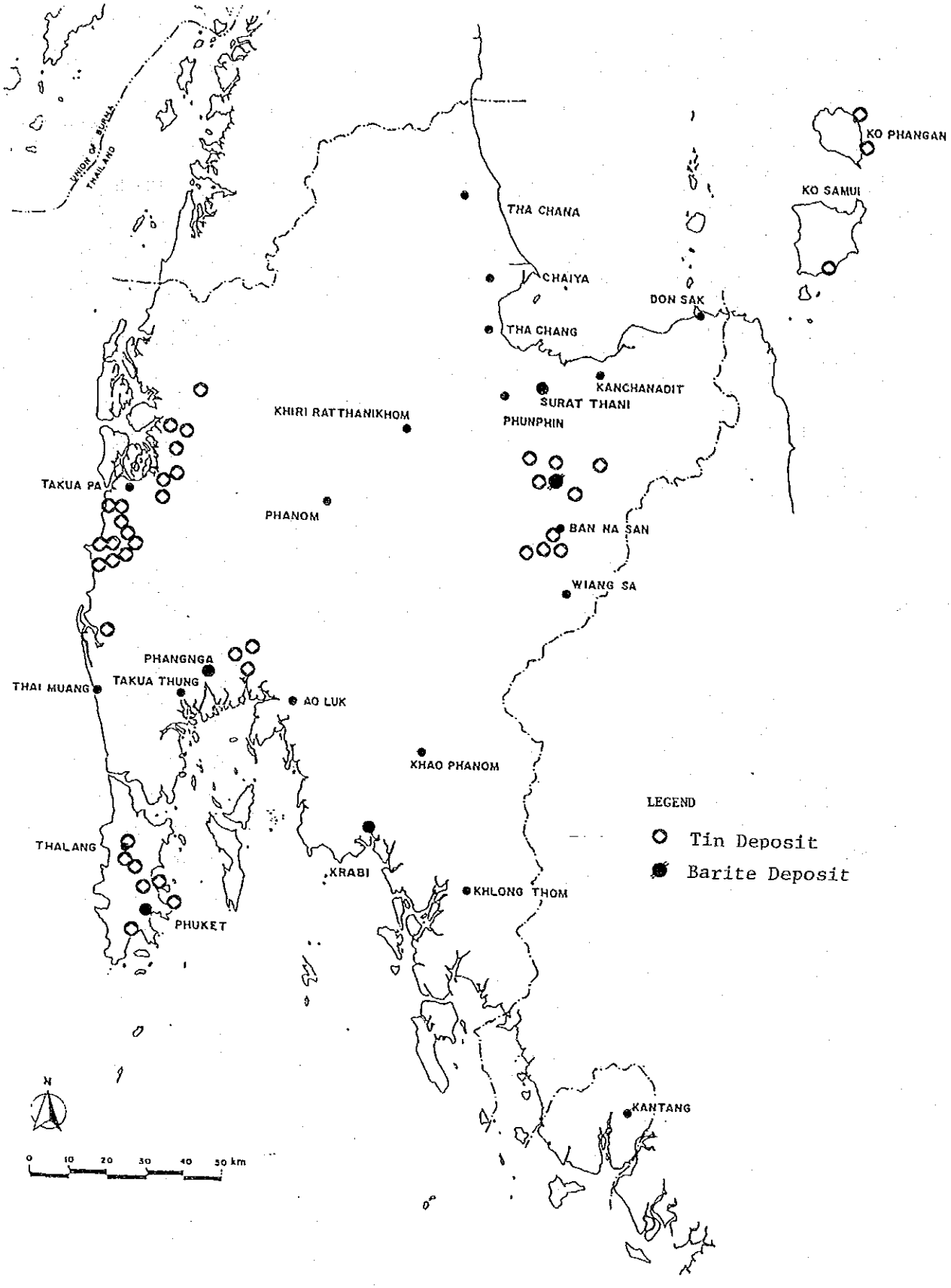


Fig. 6.3 SPATIAL DISTRIBUTION OF MINERAL RESOURCES
(3) TIN AND BARITE

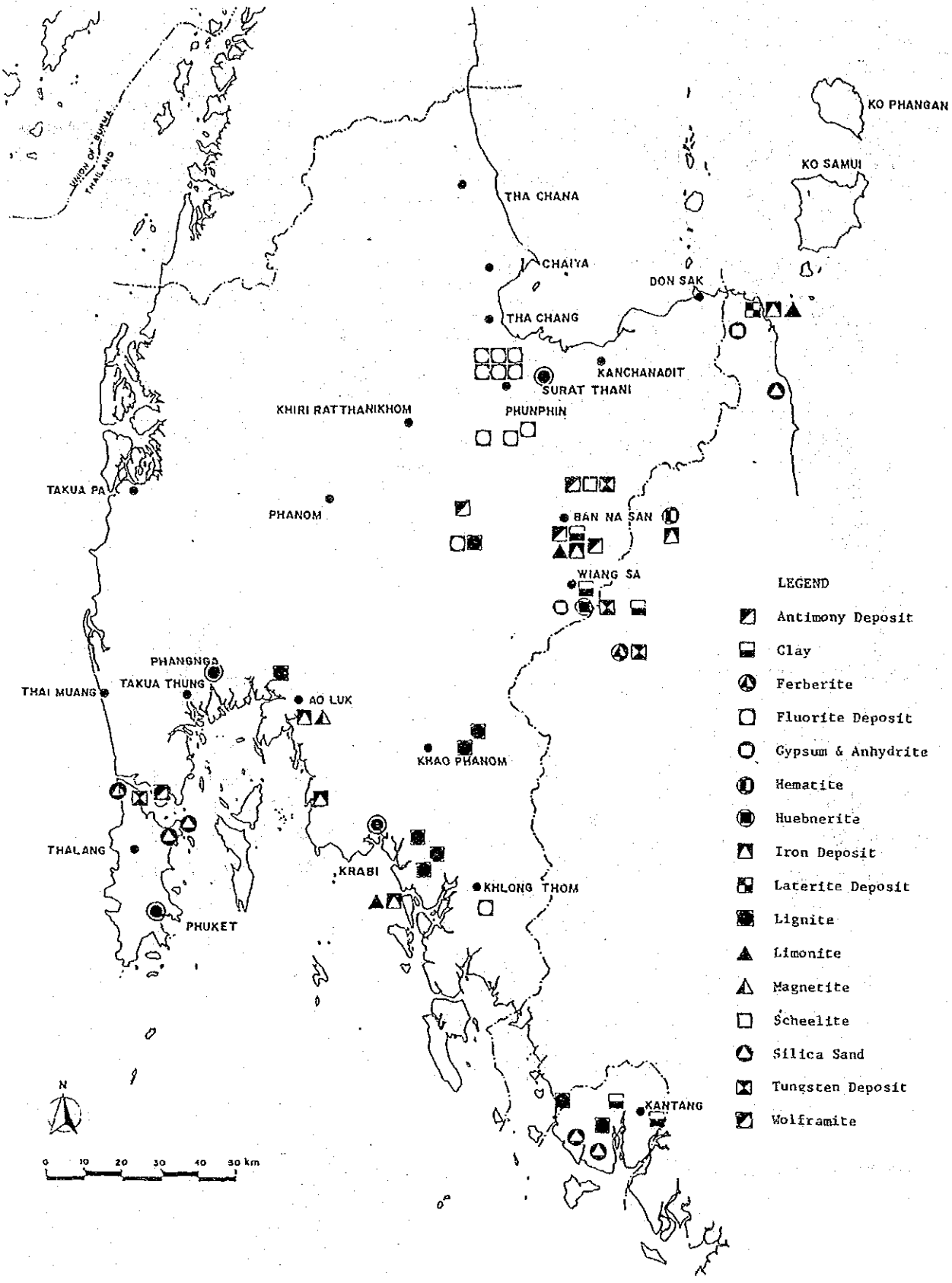


Fig. 6.4 SPATIAL DISTRIBUTION OF MINERAL RESOURCES
(4) OTHER MINERALS

Table 6.1 MINERAL PRODUCTS IN 1980 AND RESERVES IN UPPER SOUTH

Unit: t

Minerals	Province					
	Phuket	Surat Thani	Phangnga	Krabi	Nakorn Si-Thammarat	Trang
Antimony					203	
Barite		16,000			17,442	
Ball Clay						
Columbite	5					
Columbium Tantalum	80				4	92
Feldspar					61	
Fluorite				16,562		
Gypsum		147,236				
Kaolin		650				
Lignite				385,000		
Limestone					734,091	
Monazite	66					
Tantalite	120					
Tin Ore	3,771	1,065	27,369	14	1,571	834
Wolfram	4	9	36		727	
Scheelite					16	
Zircon			21			
Iron						
Tungsten						
Silica Sand						

Source: DMR, Mineral Potential, Reserves and Production of Thailand, 1979, and Mineral Statistics of Thailand 1976-1980.

6.2 LOCAL AND REGIONAL MARKET-ORIENTED INDUSTRIES (DURABLE AND NONDURABLE CONSUMER GOODS)

Present Situation

Local markets are too small to compare with Bangkok Metropolitan Region. Then many consumer goods are produced in the Metropolitan Region and distributed to other regions.

Problems

Local enterpreneurs have not been able to compete with medium and large scale industries in the Metropolitan Region, because of small size of local market, lack of information, shortage of infrastructure and insufficient urban service. But the attitude and purchasing power of local people are changing and a wide variety of goods are increasingly required even in the nonmetropolitan regions. Some kinds of industries such as construction materials, food processing, and furniture manufacturing are rapidly growing there. Consumer goods for local and regional markets are better to be produced by local industries. To promote local industries will contribute to activating local economy and to decentralization of the national economy.

Future Potential

A whisky factory is now under construction at Phun Phin in Surat Thani Province. Beverage bottling factory is a typical type of local market-oriented industry. It implies that investments in these type of industries will be possible in the Upper South. Along with regional development and growing income, more products will be able to be produced locally.

Agglomeration of local market-oriented industries creates a diversified industrial structure in the nonmetropolitan regions and provide opportunities to related industries. Among these, some competitive enterprises can be established by achieving or developing unique technologies, unique commodities with extremely high competitiveness.

A confectionery has become very popular in Phuket, and established a new better equipped factory at the outskirt of downtown. The printing business is becoming one of the busiest businesses in the major urban centers such as Phuket and Surat Thani. More and more industries will find opportunities to grow in future.

Although local enterpreneurs have already started business being related to existing local major industries, too many small businesses are competing each other in established products and services. As these businesses are dependent on small capital, small profit and cheap labour, it seems rather difficult for modernized industry to enter these established market. In future these local small businesses have to improve their operation to meet expanding and changing local needs which will require more efficient and sophisticated operations. Promotional incentives and assistance will be required, because local enterpreneurs are now seeking investment opportunities.

However, they complain that they are lacking know-how to catch these opportunities and know-how to produce potential products. Also they are lacking enough capital to invest to medium scale manufacturing business. Promotional efforts have to include the long-term and low interest finance to the potential investors.

The most of profits have leaked to Bangkok for investment in the service businesses which provide short-term return to investors.

Candidate products will thus include, in early stage, food and beverages, garments, footwear, household equipment (including furniture & fixture), construction materials, and repairing services of machine & equipment, and in late stage, chemical and plastic products, machine and tools, and paper and paper products.

Policy Implication

Expansion and improvement of regional industrial promotion offices should be urgently carried out to promote local industries to meet the increase of local/regional demand for manufactured goods.

6.3 INDUSTRIES RELATED TO LOCAL INDUSTRIES

Present Situation

There are many industries having relations with major local resource-based industries, including tin mining, rubber and fishery in the Upper South. Major related industries include metal works for tin mines, suction boats, fish boats, automobile repairing and construction. Particularly in relation to tin mining, suction boats and fish boats should be noticed in the Upper South. These local industries require a wide range of supplies such as pumps, engines, pipes, tubes, metal sheets, other machine and equipment. This is why there are numbers of metal works found in the Upper South compared to other nonmetropolitan regions.

Future Potential

Improvement of traditional major industries in the subregion and development of new industries will open plenty of opportunities for existing industries to improve their operation and to start new businesses depending on their own particular experiences. In particular, such areas as metal works, tools and machinery, parts and equipment, plastics products, chemicals will be promising. For instance, some con-

centration of canning factories will bring an opportunity to produce tin plate and cans; the promotion of agriculture will require animal feed, fertilizer and insecticide; and the promotion of marine fishery will provide shipbuilding businesses with growing opportunities.

Candidate projects will thus include in early stage, parts and equipment of metal, shipbuilding in small and medium scale, and machine repairing, and in late stage, parts and equipment of metal, plastics and ceramics, shipbuilding in larger scale, machineries for agriculture, mining, households, fishery and other manufacturing, fertilizers, insecticide, animal feed and other chemicals, and ship breaking.

Policy Implication

Some integrated policy will be required, covering entire linkage among various industries from material through intermediate to final products. And some organizational arrangement to implement this policy has to be established. It is recommended to establish a branch of a Regional Industrial Promotion Center. In early stage of operation, local demand at present and in future for allied industries in specific areas should be studied to determine potential size of market. After that particular industry should be identified, and potential local investors will have to be consulted.

6.4 DECENTRALIZATION OF INDUSTRIES

Present Situation and Problems

Bangkok Metropolitan Region has been the only growing center of manufacturing industries. However, problems caused by over-concentration of industries and service businesses make it hard for factories to expand their land areas or to build new plants. Some of the factories complain the environmental costs and increasing operation cost, particularly labour cost. Recently, many investors are moving to outskirts of the Metropolis and established more efficient factories, maninly toward east and north directions. In the nonmetropolitan regions, major investments are limited to two types of industry. One is local market-oriented industries and the other is resource-based industries. This is true in the Upper South also.

Future Potential

At present, difference is apparent in the level of infrastructure and urban services for investors between metropolitan and other regions. However, more concentration of

industries into the Metropolitan Region will not be preferred any more by some investors and a necessity will be emphasized to control the concentration and to encourage investments in the nonmetropolitan regions. The effective efforts by RTG to accelerate dispersal of industries will and have to reduce the handicaps of the nonmetropolitan regions. So far a policy to encourage import substitution industries has been emphasized. This type of industries tend to locate close to the major domestic market, the Bangkok Metropolitan Region. But a shift of policy toward export promotion will provide more opportunities for decentralized investments.

Candidate Projects will thus include, in early stage, resource-based and export-oriented industries, local market oriented industries, and water consuming or energy intensive industries, and in late stage, industries related with existing and newly induced key industries, basic industries depending on bulk imported materials, and foot loose type industries such as electric machinery and appliances, electronic machinery and appliances.

Policy Implication

More effective incentives will be required in order to accelerate the decentralization of industries into the nonmetroplitan region. Infrastructure for industrial activities should be improved. Telecommunication, water supply, transportation urban services have to be improved. Since it will be difficult to provide infrastructure all over the region, particular zones or areas have to be designated as industrial development zones or estates as priority areas to be coordinated not only with financial incentives but with infrastructure development.

6.5 EFFECTS OF EAST-WEST LINK

Present Situation

As mentioned earlier, the Upper South has geographical advantage, because it is facing the Gulf and Ocean on both sides. Particularly, the accessibility to the western market through the west coast of the subregion has to be noted.

At present these coastal areas are used for local transportation, tourism, fishery, agriculture, tin mining and forestry. Rubber and tin are exported to Penang, Kuala Lumpur and Singapore through small ports on both sides. Two modern ports will be constructed on both sides of isthmus, Songkhla and Phuket. At the eastern coast of the Upper South, Tha Thong Port has been completed already. A new Krabi Port is

starting operation.

Problems

Exports of tin and rubber have long been suffering from the lack of deep seaport to ship their products for exports. These products are transported to Bangkok, Penang, Kuala Lumpur, and Singapore once by coastal vessels and are loaded on ocean-going vessels there. This has been a great disadvantage for the exporters in the subregion. Though several new ports have been constructed, under construction or decided to construct, these ports are too small for ocean liners to enter. The weekness of infrastructure impose high costs on investors. They have to be equipped with their own electric generators, water reservoirs and telecommunications.

Future Potential

The western coast of the Upper South has favorable accessibility to western markets, which include Western Asia (Burma, Bangladesh, India and Pakistan), Middle East, Africa and Europe. These will offer potential markets for Thai exports. The eastern coast will be able to enjoy a close relation with the Eastern Seaboard and natural gas field in the Gulf, and also will be a junction of north-south transportation and east-west transportation. These geographical potential makes it possible to develop a variety of industries.

Candidate Industries will thus include, in early stage, labour intensive export industries (garments, footwear, electric machinery and appliance, toys, accessories, etc.), resource based exports (rubber products, processed food, mineral products, and artificial flowers and precious stones and gems, and in the late stage, electronics products and its appliances, chemicals and pharmaceuticals.

6.6 ANOTHER GROWTH POLE OF INDUSTRIAL DEVELOPMENT : A WESTERN SEABOARD AFTER ESB

Present Situation and Problem Structure

Industrial development in an integrated manner has started at the Eastern Seaboard in Thailand. It includes two concepts, one is the development of a large-scale complex of basic industries mainly based on natural gas, and the other is the development of a industrial growth pole in general outside Bangkok mainly oriented to export. This project is given the highest priority for a coming decade.

Many modern investments will go toward the Eastern Seaboard, and it will help the industrial concentration in the Central. Usually, concentrated efforts to establish a growth pole leading the development or the restructuring of national economy are required on the way. However, RTG has to pay a careful attention to the regional differences of economic growth.

After the ESB, other growth pole has to be developed in the nonmetropolitan regions to maintain a balanced socio-economic structure among various regions.

Future Potential

According to the national development plan, the diversification and integration of industrial structure have to be realized. An industrialized economy does usually have a relatively wide range and comprehensive structure of industrial products, which are needed to generate high value added.

A study of "Large Scale Industrial Investments in Thailand" presented a short list of large scale industries which will be feasible in Thailand by the year of 2000. Proposed projects in that study are shown on Table 6.2.

Canditate Industries in the Upper South will be dependent partly on advantages in investment conditions for investors of those projects, but to a greater extent on the government efforts to develop new industrial nuclei outside of the metropolitan region and the Eastern Seaboard; possibly the western seaboard.

Among the possible industries on Table 6.2, there are several candidates for the western seaboard. In fact a consultant firm has carried out a feasibility study of the integrated iron and steel factory (1.6 million tons per year), in which several sites are surveyed along the west coast of the Gulf of Thailand including Khanom. On the criteria of cost minimum for investor, Leem Mae Ramphung in Prachuap Kiri Khan Province is selected as the most suitable site, although it is located very close to the border with Burma and the hinterland is very limited. This might not be appropriate from the viewpoint of fostering a nucleus industry to give spread effects on various regional industries. This means that every infrastructure as well as port facilities will be used for the iron and steel industry only. Indirect economic effect, which must be seen as important from the national and regional development point of view, may not be expected. Another project of iron and steel plant with an annual production capacity of six million tons has been proposed in the Eastern Seaboard Development. It is an iron and steel plant by the direct reducing method dependent on the natural gas.

Table 6.2 LARGE SCALE INDUSTRIAL INVESTMENTS: PROPOSED BY "STUDY ON LARGE SCALE INDUSTRIAL INVESTMENT IN THAILAND, DRAFT FINAL" MAY, 1984

1* Suphan Buri Sugar Mill (Expansion)

2 Synthetic Fibre Plants (in three units of 20,000 tons per year each

3 Spinning Mills (in three units of 100,000 spindless each)

4** Second Gas Separation Plant

5** LPG Production Plant

6** TORC III

7* Bangkok Military Refining (rehabilitation)

8* Bangkok Military Refining (expansion)

9** Polyplopylene Plant (70,000 tons per year)

10** Petrochemical Complex

11** Aromatic Complex

12** Methanol Plan

13** Fertilizer Plant

14** Ethanol Plant

15 Multipurpose Drug Synthesizing Plant

16** Rock Salt Soda Ash Project

17* Siam Cement Co., Ltd (Expansion at Tha Luan)

18* Siam City Cement Co., Ltd (Kaen Koi)

19* Jalaprathan Cement Co., ltd (Nakhon Sawan)

20 Union Thai Cement Industry Co., Ltd (cement for export)

21 Six Additional Cement Plants, 1994-1999

22* Flat Glass Plant

23 Bangkok Newsprint Complex (120,000 tons per year at Ayudhya)

24* Thai Pulp Co., Ltd (75,000 tons of bamboo pulp, Kanchanaburi)

25 Forest Industry Organization (FIO) pulp production

26 Pulp Plant (100,000 tons per year)

27 Integrated Pulp & Paper Mill (120,000 tons of printing and writing paper)

28 Integrated Pulp & Paper Mill (120,000 tons of industrial paper)

29* Newsprint Complex II

30 Integrated Steel Plant

31	Sponge Iron (400,000 tons per year)
32	Cold Rolling Mill (500,000 tons per year)
33	Mini-plant for Flat Products (400,000 tons per year)
34*	NMB, Computer keyboards, etc.
35*	AMD Inc., Semiconductors
36*	Siam-Nissan, (diesel engines)
37*	Isuzu (diesel engines)
38	Yontrakit Group "All-Thai" Cars
39	Yamaha (motorcycle engines)
40*	Thai Airways Int., aircraft maintenance center
41	Cha-am Pineapple Tinplate Co., (tinplate plant)

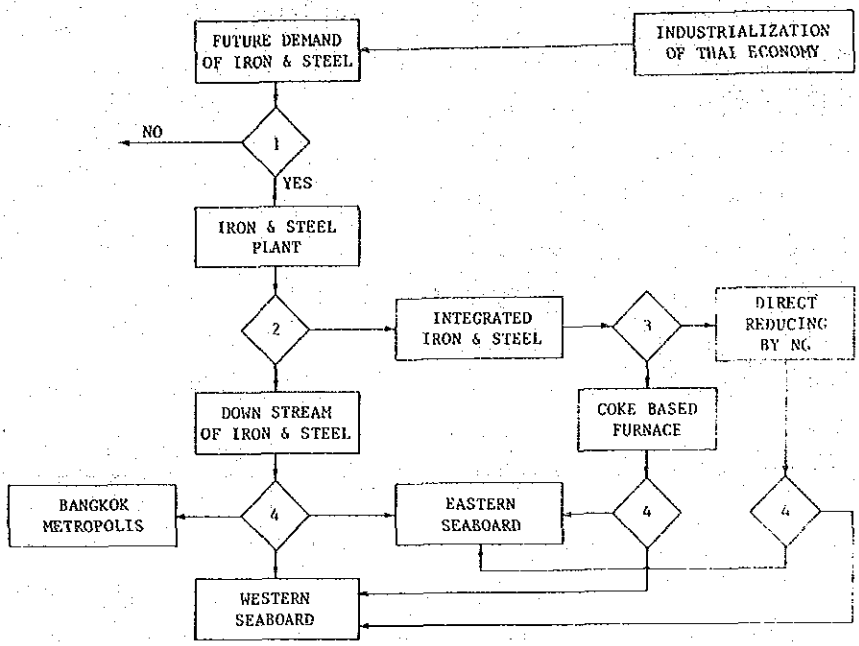
Note : * ongoing/decided/under planning

** Projects in the Eastern Seaboard Development

*** Besides listed projects, such projects as engineering industries (agricultural and textile machinery, turbines, equipment and components for telecommunications and electric distribution), electric and electronics industries including semiconductors and integrated circuits, shipyards & shipbreaking are recommended. But these are eliminated from the main list because these are out of large scale industries.

Despite many counter arguments, it will be necessary for the country to have iron and steel plants in addition to existing electric furnace plants on the way to industrialization. A per capita income level at 2,000 US dollars will require the deceptive steel consumption of 120 kilograms per capita according to a cross country analysis. Population of 60 million will require 7.2 million tons of deceptive consumption on the basis of 2,000 US dolalr economy. To have some ability to producc such a basic material, which will be used in various industries, is significant in keeping the economic security and independence. Furthermore, several commonly prevailing arguments could be considered: Which demand has to be directed to? Whether is it competitive with imported products or not? Which methods will be dominant, the direct reduction, coke based furnace or electric furnace? Where is the plant better to be located? What degree of economic effect will be expected?

It will be impossible to present a definite idea concerning all of these questions, however, it will be possible to deal with it as one of the optional subjects for the Upper South development. A procedure to explore its possibility is shown on Fig. 6.5.



Decision (1) : Whether is it necessary to develop the iron & steel plant or not ?

Decision (2) : Which will be preferable the integrated plant or the down stream plant ?

Decision (3) : Which processing method will be advantageous, direct reducing by Natural Gas or Coke Based Furnace ?

Decision (4) : Which site will be better for the location of iron & steel plant ?

- In the case of direct reducing, it will be depending on the availability of natural gas. It will be possible to land the natural gas to the Western Seaboard in late the 1990s.
- In the case of the coke-based furnace, a candidate site is proposed at Laem Mae Ramphung, however, it will be possible to find alternative site in Upper South as a candidate together with other industries which will heavily depend on the access to deep water.
- Paying attention to down stream activities, the site selection will be more complicated. Because there will be an alternative to expand and improve existing electric furnace plants in Samut Prakarn. Even in that case, the relocation with integration and with rebuilding of existing factories should be taken into consideration outside the metropolitan region because of their heavy affects on the environment.

Fig. 6.5 PROCEDURE TO EXPLORE POSSIBILITY OF IRON AND STEEL PLANT IN UPPER SOUTH

Along with the iron and steel plant, following projects can be candidates for the establishment of new industrial nuclei on both sides of the isthmus.

- Iron and steel plant;
- Pulp and paper plant, and paper processing complex;
- Shipbreaking and shipbuilding;
- Petroleum refinery;
- Integrated circuit and electronics products;
- Electronic machines, appliance, parts and equipment;
- Machines, tools and equipment for various industries including agriculture and mining;
- Chemical products (plastic products being a basic material from the ESB);
- Tin plate or tin-free steel plate and cannery; and
- Logistic base for natural gas fields.

Policy Implication

If the Thai economy will go forth toward a industrialized country, industrial growth poles besides the Eastern Seaboard will be required. The Upper South has an enormous capacity to develop industrial nuclei. This potential will have to be noted in the regional development policy of RTG. A great effort to develop industrial nuclei in the Upper South will bring more effective use of rich resources in the subregion, and will contribute to social and political stability of the country.