4. SPATIAL OUTLOOK

4.1 PRESENT SITUATION

4.1.1 Landuse (see Figure 4.1)

Broadly speaking, the Upper South comprises the forest area mainly in its the western half, the crop area mainly around Surat Thani, Phangnga and Krabi, and the low intensity landuse area mainly in the eastern half of the Upper South. The forest area covers about 53 percent of the total area, including primary forest, secondary forest and mangrove forest accounting for 60, 33 and seven percent of the total forest area, respectively. The crop area covers 23 percent of the total area, including tree crop area and paddy area accounting for 82 and 18 percent of the total crop area, respectively. Rubber plantations occupy 78 percent of the tree crop area. The low intensity landuse area overlaps partly with the forest area in that it contains the secondary forest, the secondary forest mixed with crops, the idle land and the mining and other area. It covers 41 percent of the total area. Major land development potential exists in this low intensity landuse area. 75 percent of this area or about 6,900 square kilometers is suitable for cultivation while the rest being 25 percent needs to be either reforestated or rehabilitated. During the period 1973 to 1982, about 1,000 square kilometers of primary forest is cut down for lumber production and changed into the low intensity landuse area and about 1,000 square kilometers of new rubber and oil plam plantation emerged mostly out of the low intensity landuse area.

4.1.2 Water Resourses (see Figure 4.2)

In terms of water resource, the Upper South comprises the Tapi-Phum Duang River Basin being the biggest in the South and the rest of about 50 small river basins. While river water is ample not only for agriculture but urban and industrial activies in the Tapi-Phum Duang River Basin, other small river basins particularly those facing Andaman Sea can provide the water of no more than 50,000 cubic meters per day per basin.

4.1.3 Primary Products (see Figure 4.3)

On these physical setup, various primary products are produced in the Upper South. Figure 4.3 shows three major products in each amphoe. In the most part of the Upper South, rubber is a predominant product. Rice production spreads in the Tapi-Phum Duang River Basin and its surroundings. Oil plam production concentrates on Krabi,

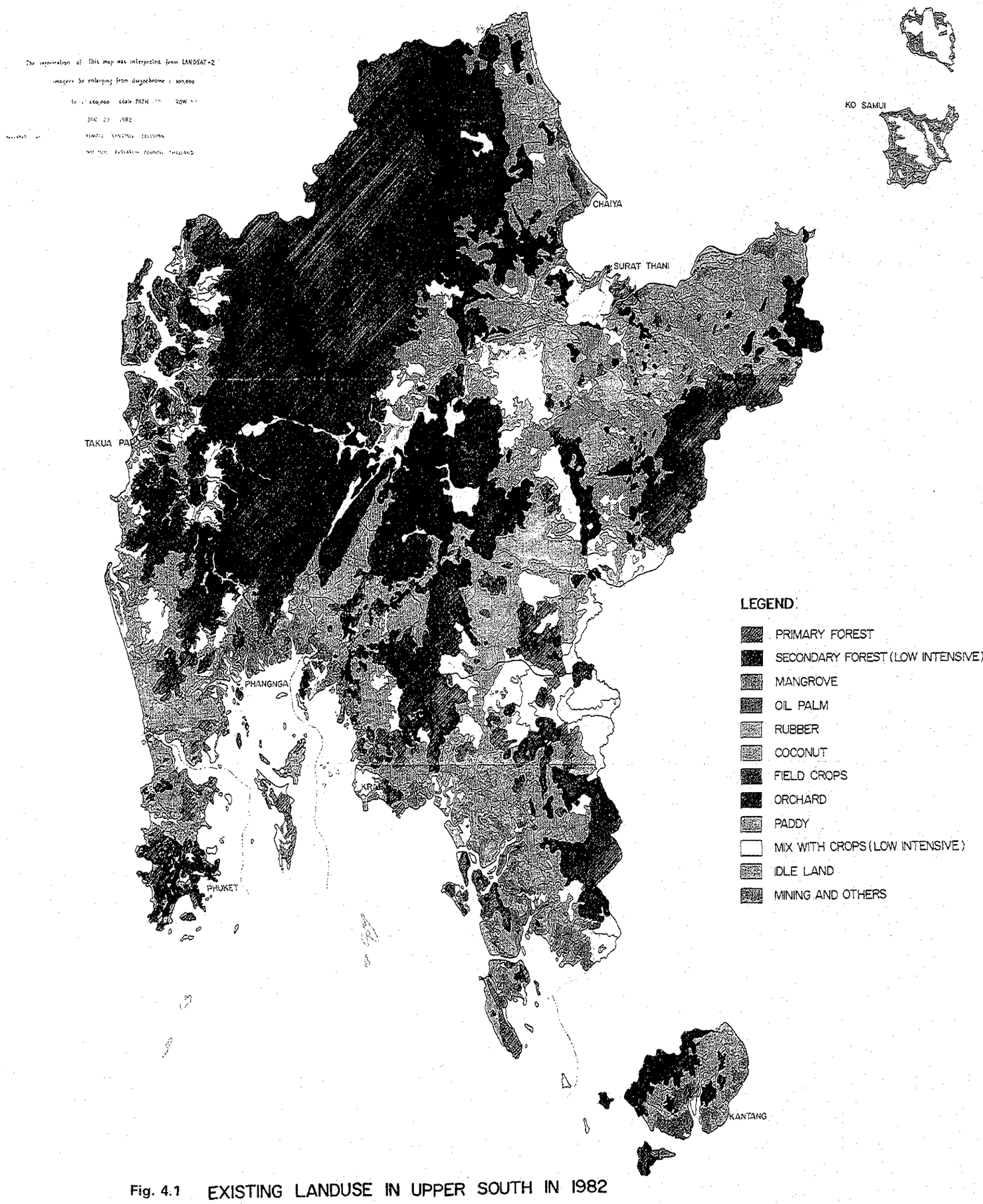
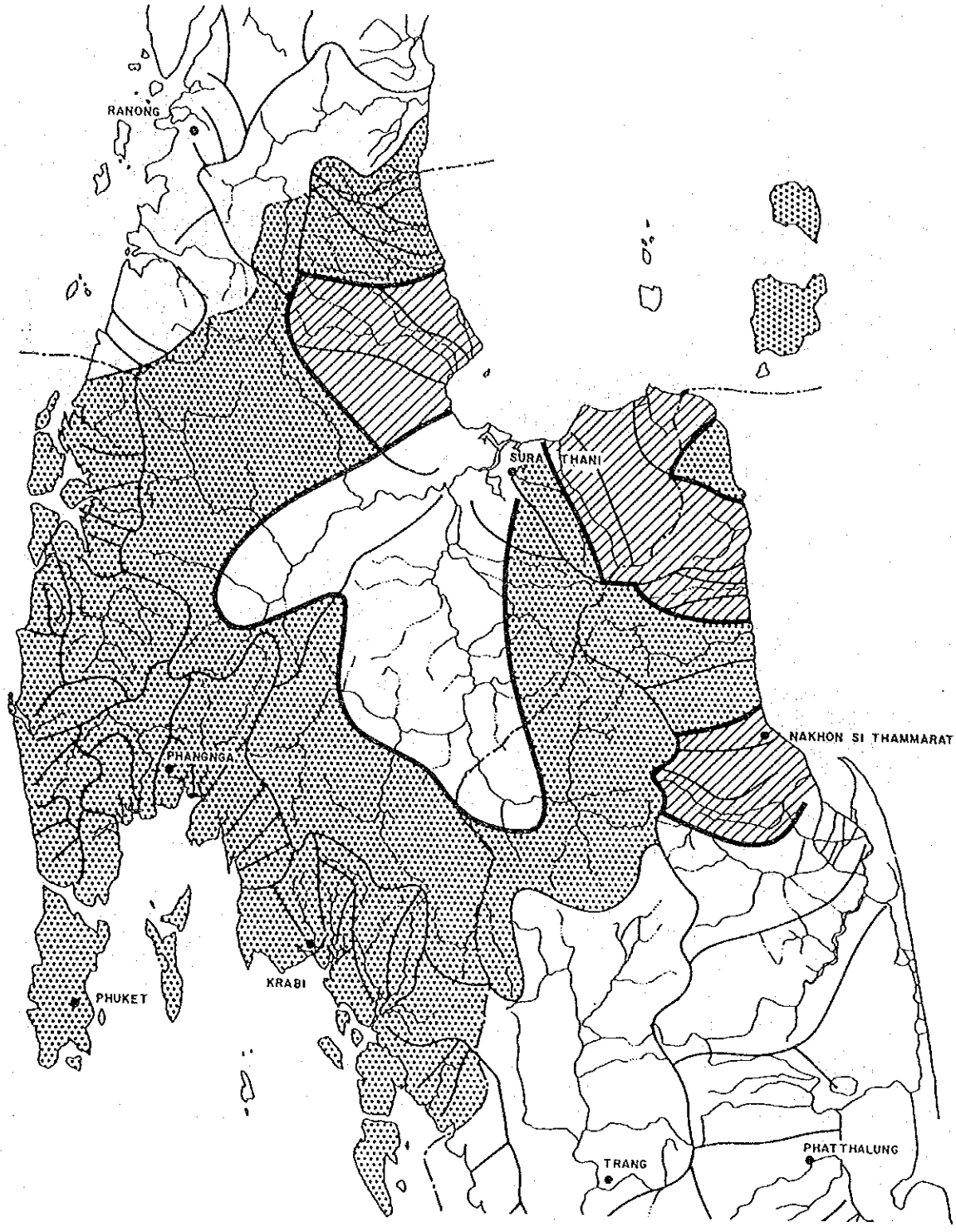


Fig. 4.1 EXISTING LANDUSE IN UPPER SOUTH IN 1982



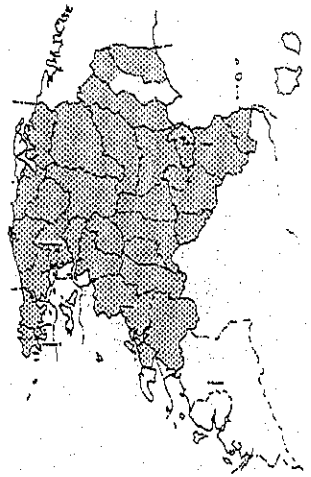
LEGEND

- High Potential Zone
- Limited Potential Zone
- No Potential Zone

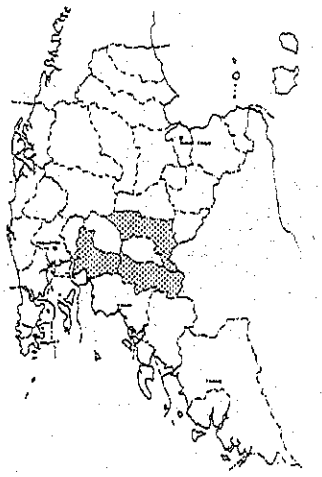
NOTE

1) Water usage of over 5,000 m3/day is considered in this map.
2) The basin where water is used by irrigation more than the mean discharge is considered to have no surplus.
3) Chiew Larn Dam will offer the available water without changing the minimum flow in downstream.
4) The minimum downstream flow in dry season is considered necessary as maintenance flow.
5) Available site is considered to be within 15 km from river.

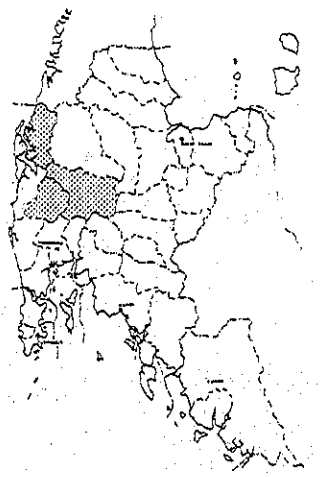
Fig. 4.2 AVAILABLE VOLUME OF RIVER WATER



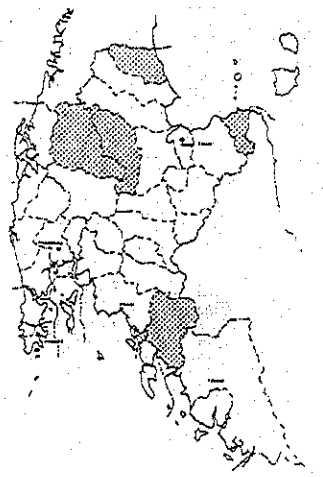
RUBBER



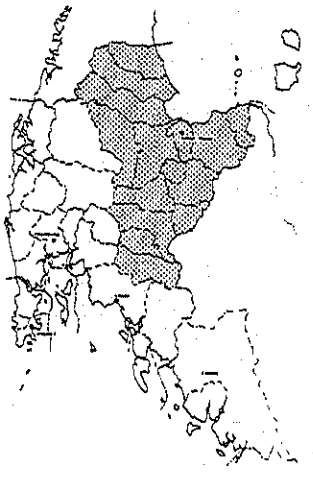
OIL PALM



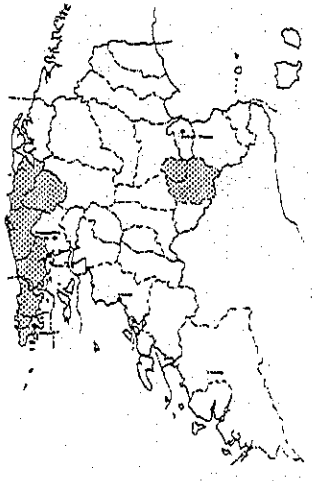
WOOD PRODUCT



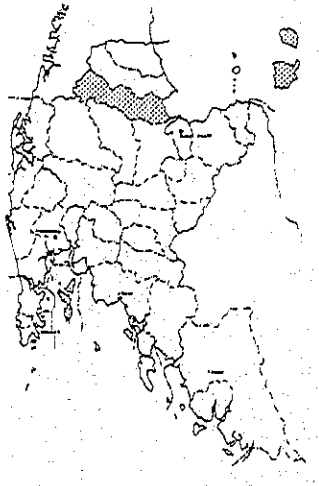
COFFEE



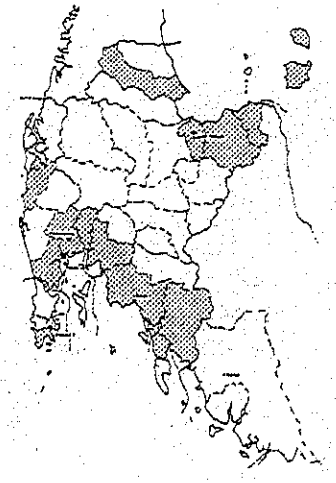
RICE



TIN MINING



COCONUT



FISH PRODUCT

Note: Those within one of top three products in each amphoe

Fig. 4.3 DISTRIBUTION OF MAJOR PRODUCTS

Amphoe Ao Luk, Khao Phanom and Phrasaeng. Coffee is produced mainly on some mountain slopes in Surat Thani and Krabi. Coconut production concentrates on Ko Samui and Thachang in Surat Thani. After rapid forest cuting, major forest production concentrates only in the hill range along Highway Route 401 between Takua Pa and Surat Thani. Fish production spreads over the most part of coastal lines both on eastern and western sides. Tin, being another major primary product, is produced mostly in the coastal area extending from Takua Pa to Phuket. Figures 4.4, 4.5 and 4.6 show deposits of various minerals in the Upper South. In addition to the Takua Pa-Phuket Area where tin deposits are concentrated, Ban Na San-Wiang Sa Area has sizable deposits of various minerals including gypsum, tin, fluorite and barite. Lignite deposit in Krabi and Khao Phanom is another major concentration.

4.1.4 Transport Network (see Figure 4.7)

During the past 20 year period, highways were vigorously constructed and steadily improved to provide all changwat centers with national highways and most of amphoe centers with either national or provincial highways. National Highway Route 4 along the Andaman Sea Coast and 41 in the central part penetrate the Upper South on north-south direction. Connecting two these trunk routes is an east-west link between Surat Thani and Takua Pa.

Railway which was the only means of interregional transportation for the Upper South in the beginning of the 1960s is used and still carries 35 percent of the inland-bound cargo to and from the South, although its share has been declining. Andaman Sea Coast, including Phuket, is completely left out of railway service at present.

The Upper South has one Port at Surat Thani on the east coast and three ports at Kantang, Phuket, and Krabi. Their service areas are confined virtually to the changwat areas they belong to, except that Kantang Port collects and distributes export/import commodites for the area outside the Changwat Trang, especially Thung Song of Nakhon Si Thammarat. These are all riverine ports with severe draft restrictions at the entrance of the channel and cannot accommodate the vessels on international shipping route directly, since they were developed under private initiative to serve the local fishing activities and the domestic trade between isolated settlements at a time when land transportation was difficult or impossible.

Regarding aviation, the Upper South has an international airport in Phuket and a domestic airport in Surat Thani. These airports play important roles in transporting tourists and business people.

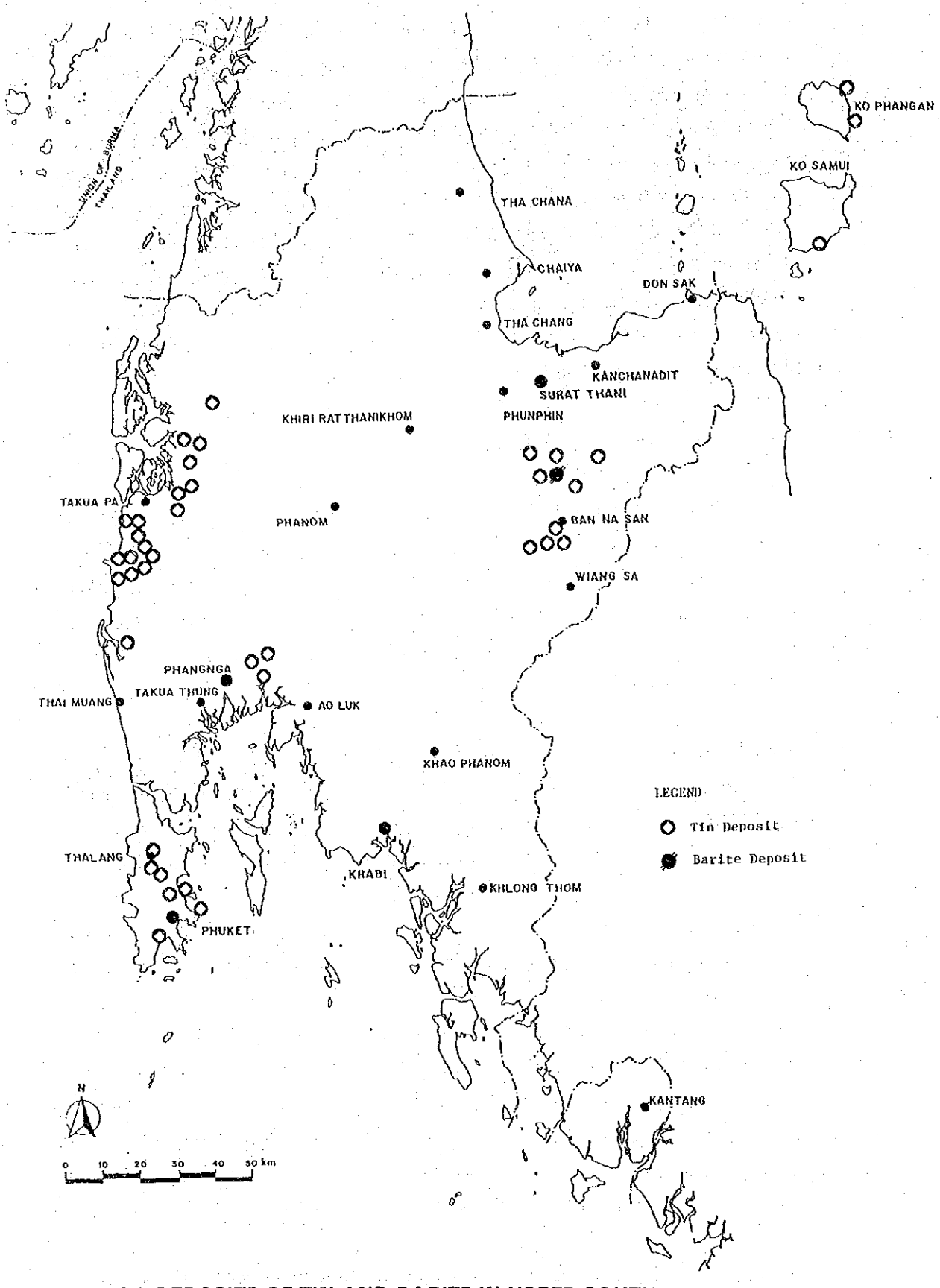


Fig. 4.4 DEPOSITS OF TIN AND BARITE IN UPPER SOUTH

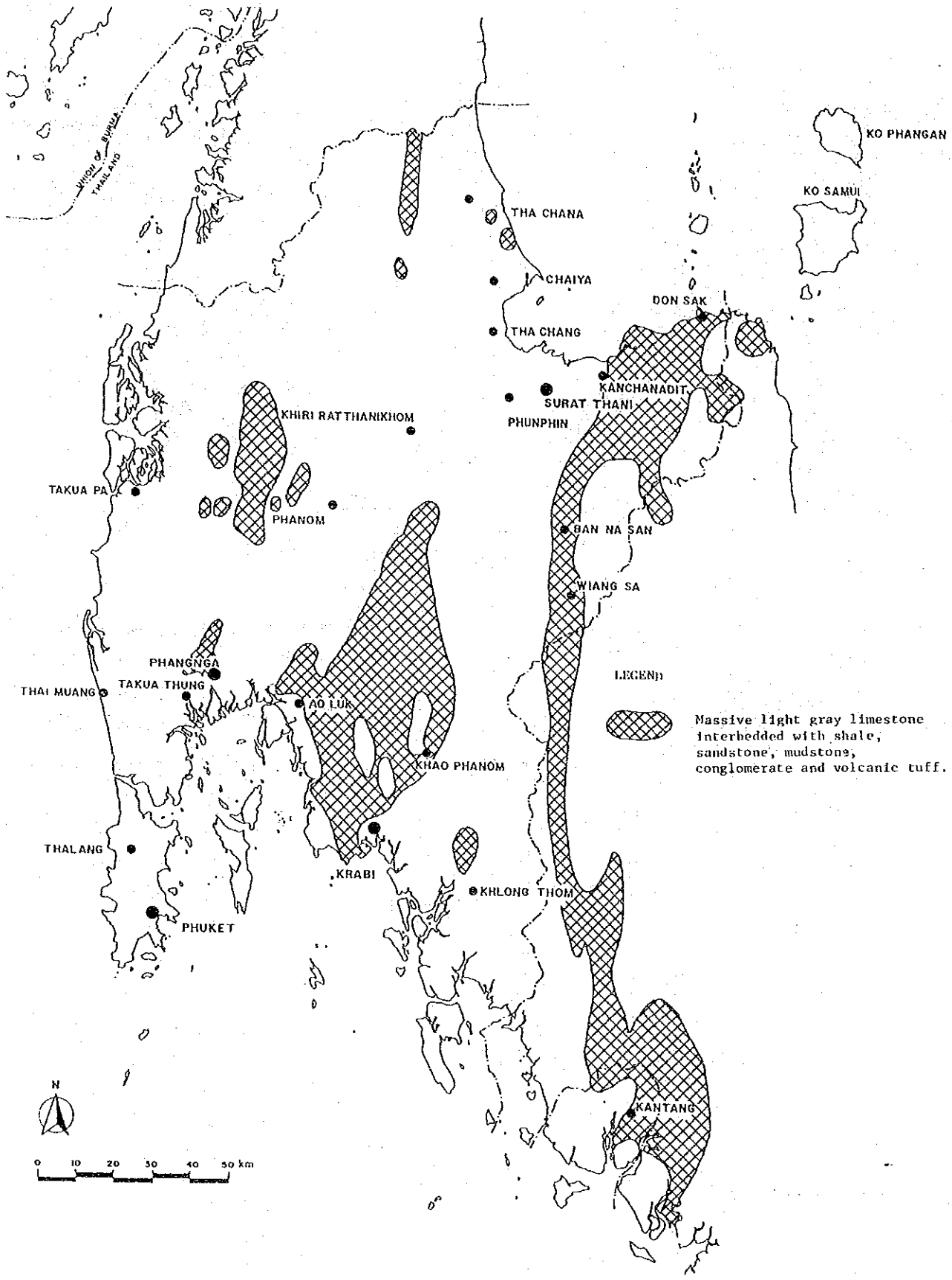


Fig. 4.5 DEPOSITS OF LIMESTONE IN UPPER SOUTH

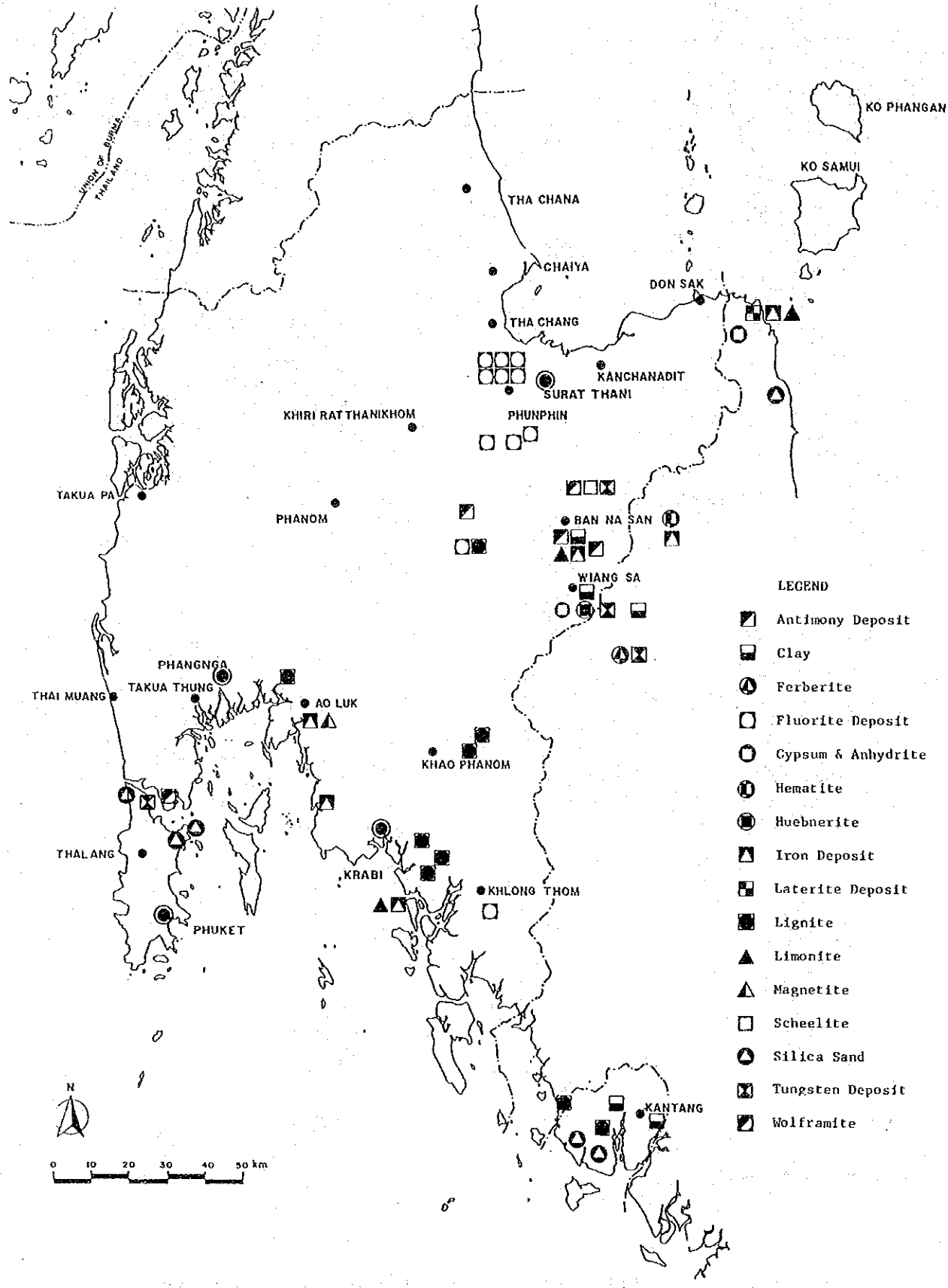


Fig. 4.6 DEPOSITS OF OTHER MINERALS IN UPPER SOUTH

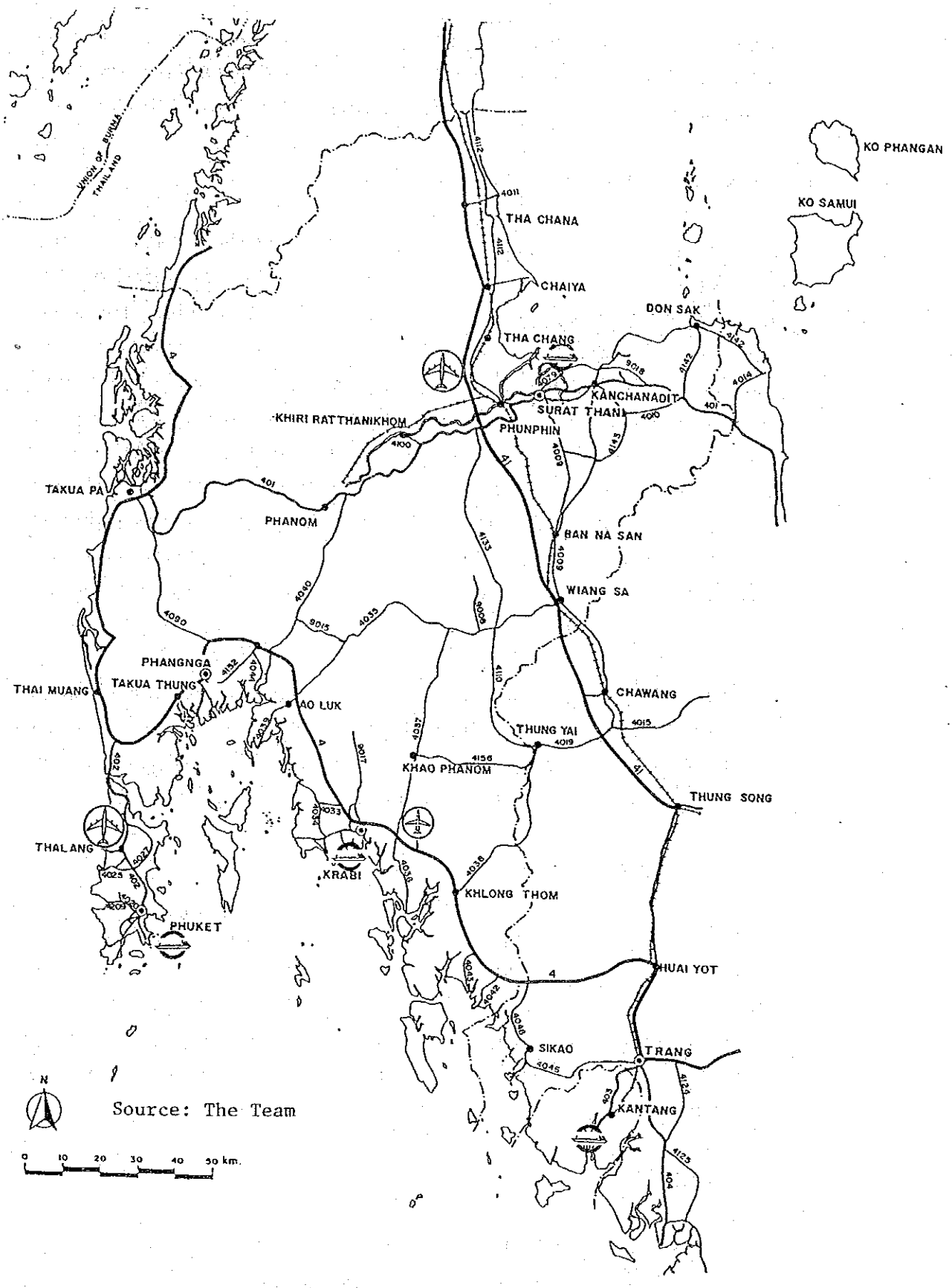


Fig. 4.7 EXISTING TRANSPORTATION NETWORK OF UPPER SOUTH

With all these means of transport, Surat Thani is now a center of both inter and intraregional flows of goods and passengers, while Phuket situating at the dead-end of the Upper South is rather isolated under the existing transport network.

4.1.5 Industrial Location (see Figures 4.8 and 4.9)

Industries are located mostly in the two centers of Phuket and Surat Thani where they are resource or nonresource based, except that rice mills are scattered over the subregion. As for resource-based industries, Phuket is specialized into various consumption goods such as food, beverage and furnitures because of its market isolation and urban/tourism consumption market, while Surat Thani is specialized into various intermediate goods such as lumber, coconut fiber, marble, concrete and other construction materials because of its transport access to various directions. Both have, of course, a number of rubber and fish processing industries. As for nonresource based industries, Phuket is specialized into the industries related to tin mining activities such as machines, mining equipment repairing, boat equipment and chemicals while Surat Thani is specialized into transport based industries including car reparing and assemblying.

Reflecting their growing urban activities, both cities have number of printing shops. However, no other major industries are located yet to ship out products to the national and international market except tin smelting, rubber processing, oil palm extraction, lumber processing and fish processing.

4.1.6 Population Distribution (see Figure 4.10)

With all these resources, transport network and economic activities, the Upper South shows a rather scattered pattern of population distribution. Large population concentrations exist in Surat Thani-Wiang Sa Area, Phuket-Phangnga Area and the coastal area of Krabi. Relative concentration of population in these areas will be greater in response to urban/industrial development and stregthened urban-rural relations. In fact, population growth was faster in these than other areas during the 1970s.

4.2 FUTURE POTENTIAL

Spatial development potentials within the Upper South were assessed based on the natural conditions including topography, potentially available water resources and land capability/use and the existing infrastructure conditions. Procedure of the assessment is illustrated in Figure 4.11. In this step-wise procedure, results of land

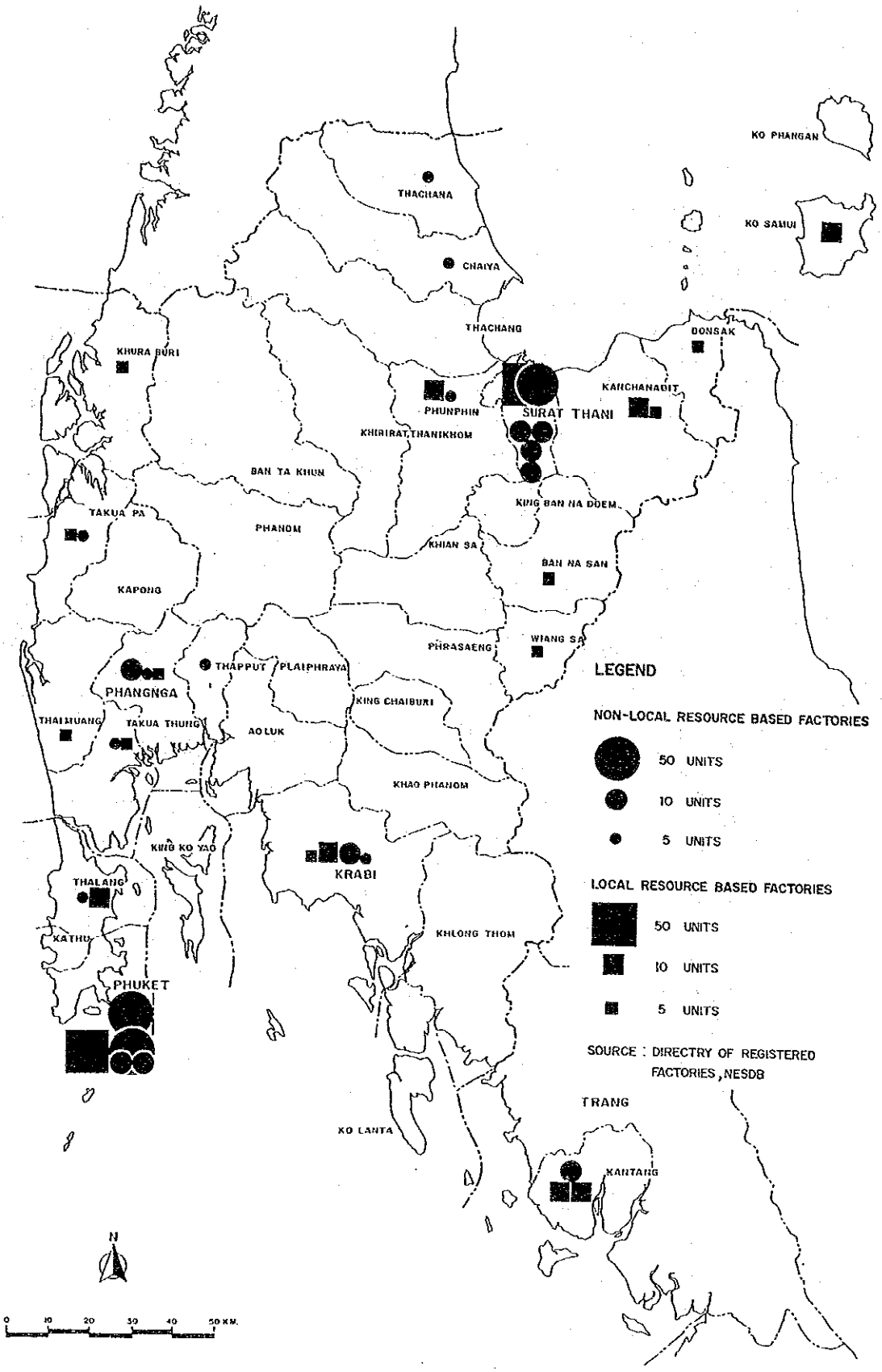


Fig. 4.8 LOCATION OF EXISTING FACTORIES IN UPPER SOUTH (EXCLUDING RICE MILL)

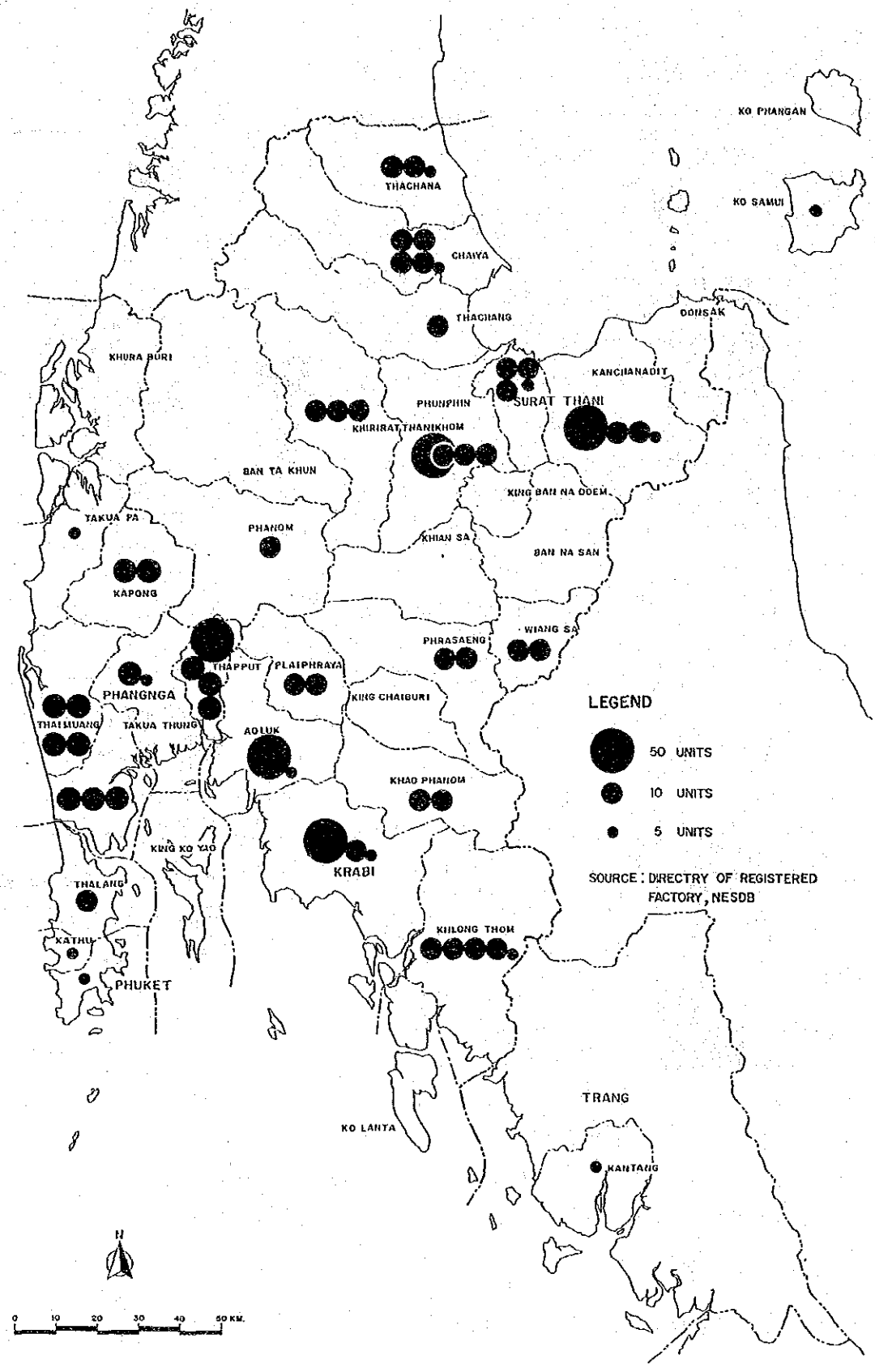


Fig. 4.9 LOCATION OF EXISTING RICE MILLS IN UPPER SOUTH

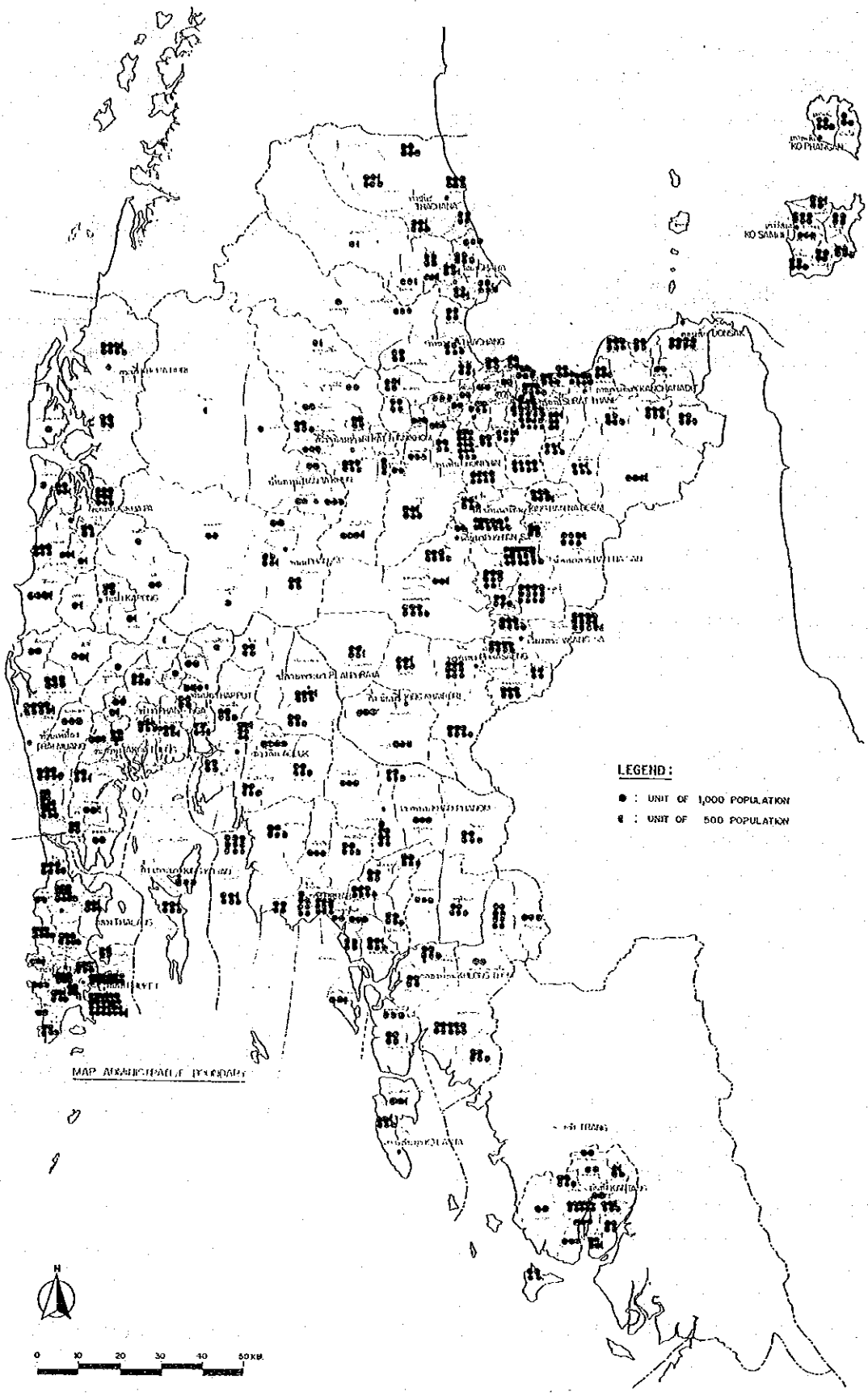


Fig. 4.10 DISTRIBUTION OF PRESENT POPULATION

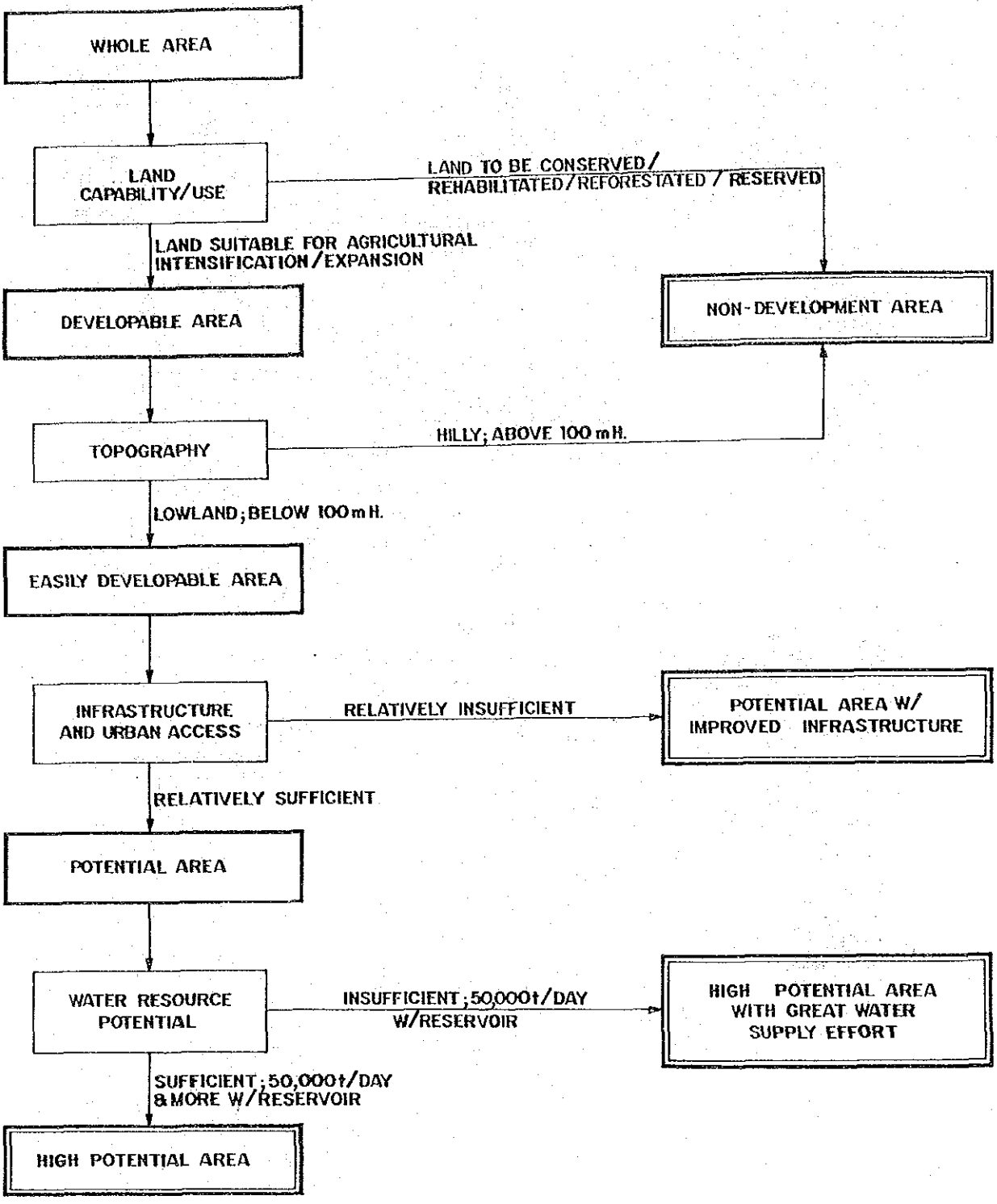


Fig. 4.11 PROCEDURE OF ASSESSING SPATIAL DEVELOPMENT POTENTIAL

capability/use assessment are shown on the map of land development potential in Figure 4.12. Results of topography and water resource assessement are shown in Figure 4.13. Results of infrastructure and urban access assessment are shown in Figure 4.14.

By overlaying these maps, the following zones have been identified (see Figure 4.15):

High Potential Area (Zone A-a) - In this zone, it will be possible to promote agricultural and/or urban developments in accelerated and intensive manner and a substantial benefit can be expected soon.

High Potential Area with Great Water Supply Effort (Zone B-a) - This zone is most likely to have the highest development potential next to Zone A-a, while development is limited by water resource constraint. If water is supplied sufficiently, potential of this zone such as Phuket will be as high as Zone A-a.

Potential Area with Improved Intrastructure (Zone AB-b) - In this zone it will be necessary to intensively develop the appropriate infrastructure in accordance with future needs not only for agricultural development but for industrial development in the area where suitable. Therefore, this area strongly requires a comprehensive planning to make best use of land in a proper manner.

Non-Development Area (Zone D-ab) - This zone should be preserved or reserved up to at least the year 2000 because of physical constraints. However, a partial development for settlement area will be possible if a proper program is established.

1) It is recommended that the area along the National Highway Route 41 and vicinities of Surat Thani/Phun Phin should be intensively developed for industrial and agricultural use soon because of the highest potential.

2) Phuket Island is not evaluated to have high potential partly due to this evaluation method which focuses on intraregional settings and partly due to insufficiency of water resource in the island. Phuket has to intensify its effort to utilize the existing resources and economic accumulations which have not only interregional but international importance, and in this mannner Phuket has a potential to shift the spatial patterns of potentials determined by existing conditions to those to be determined by new infrastructure input.

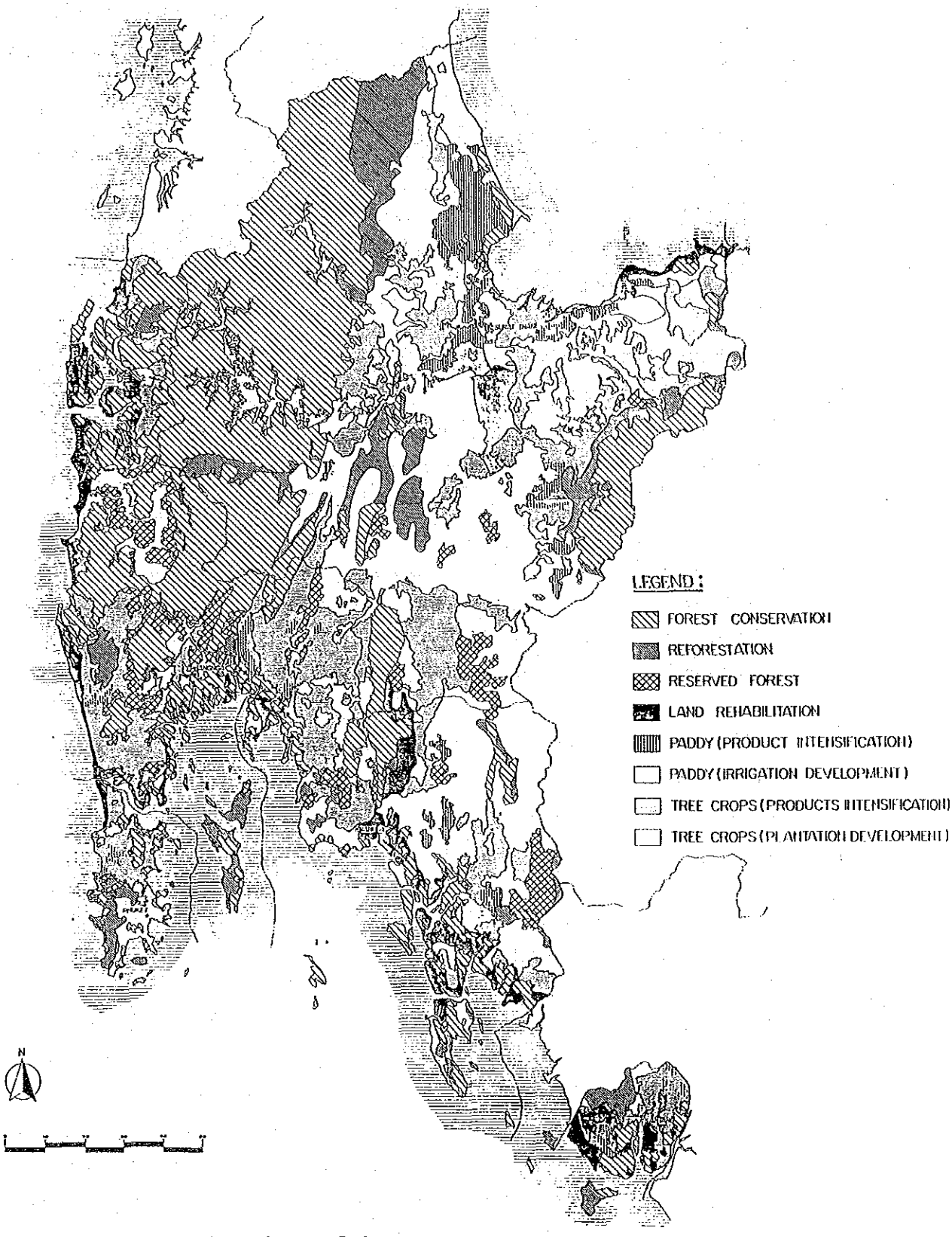


Fig. 4.12 EVALUATION MAP OF LAND DEVELOPMENT

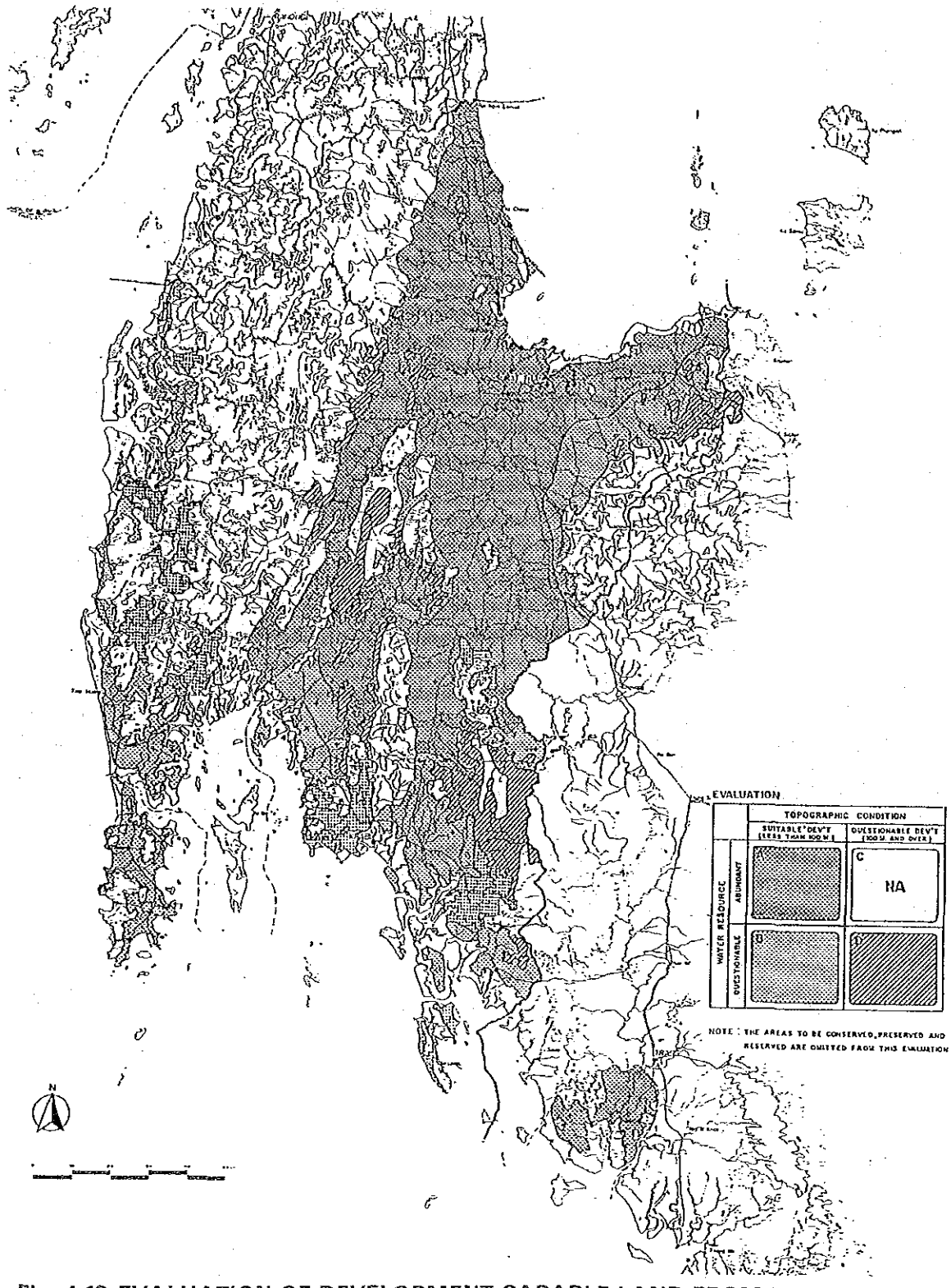


Fig. 4.13 EVALUATION OF DEVELOPMENT CAPABLE LAND FROM NATURAL FACTORS

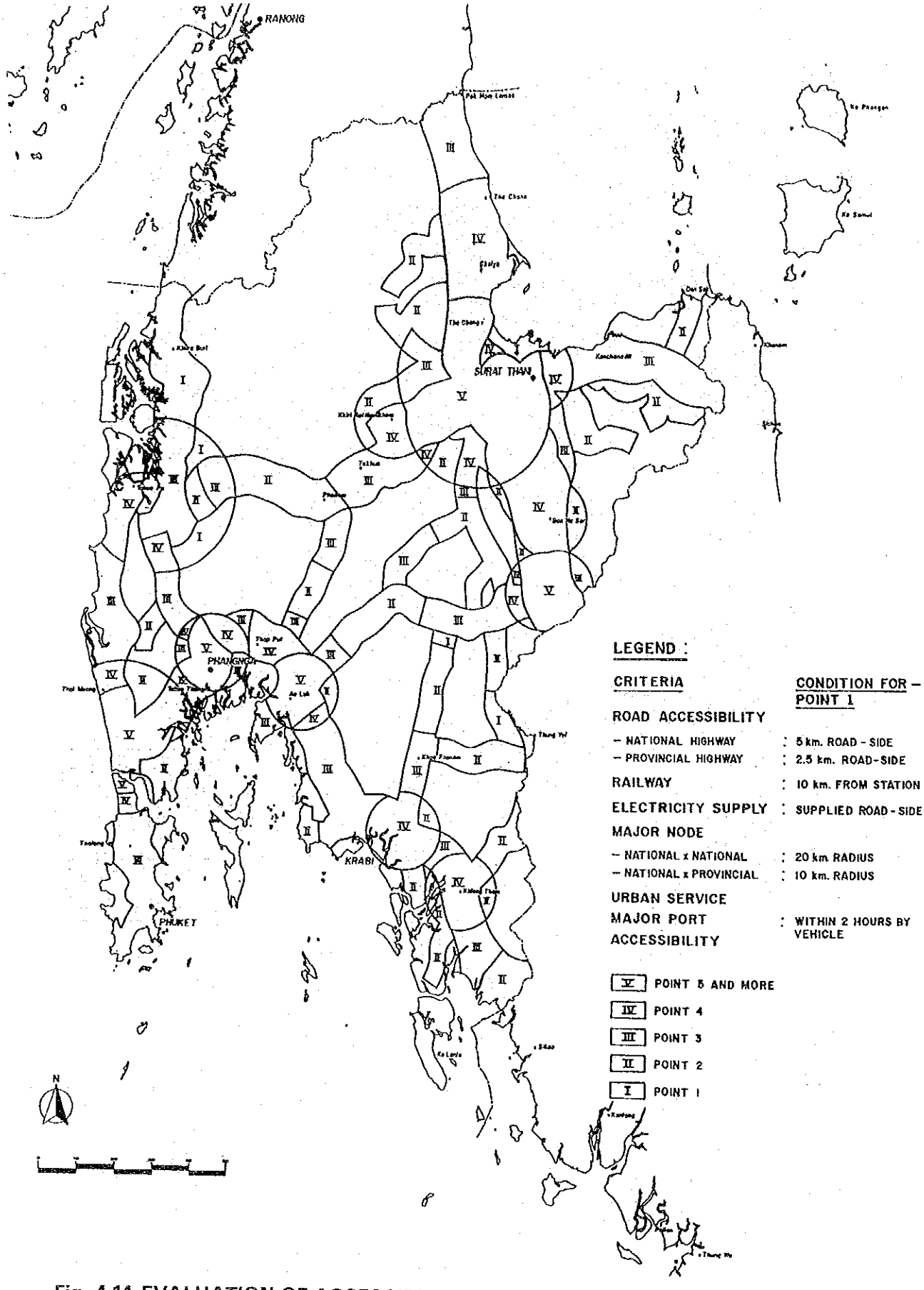


Fig. 4.14 EVALUATION OF ACCESSIBILITY AND INFRASTRUCTURE

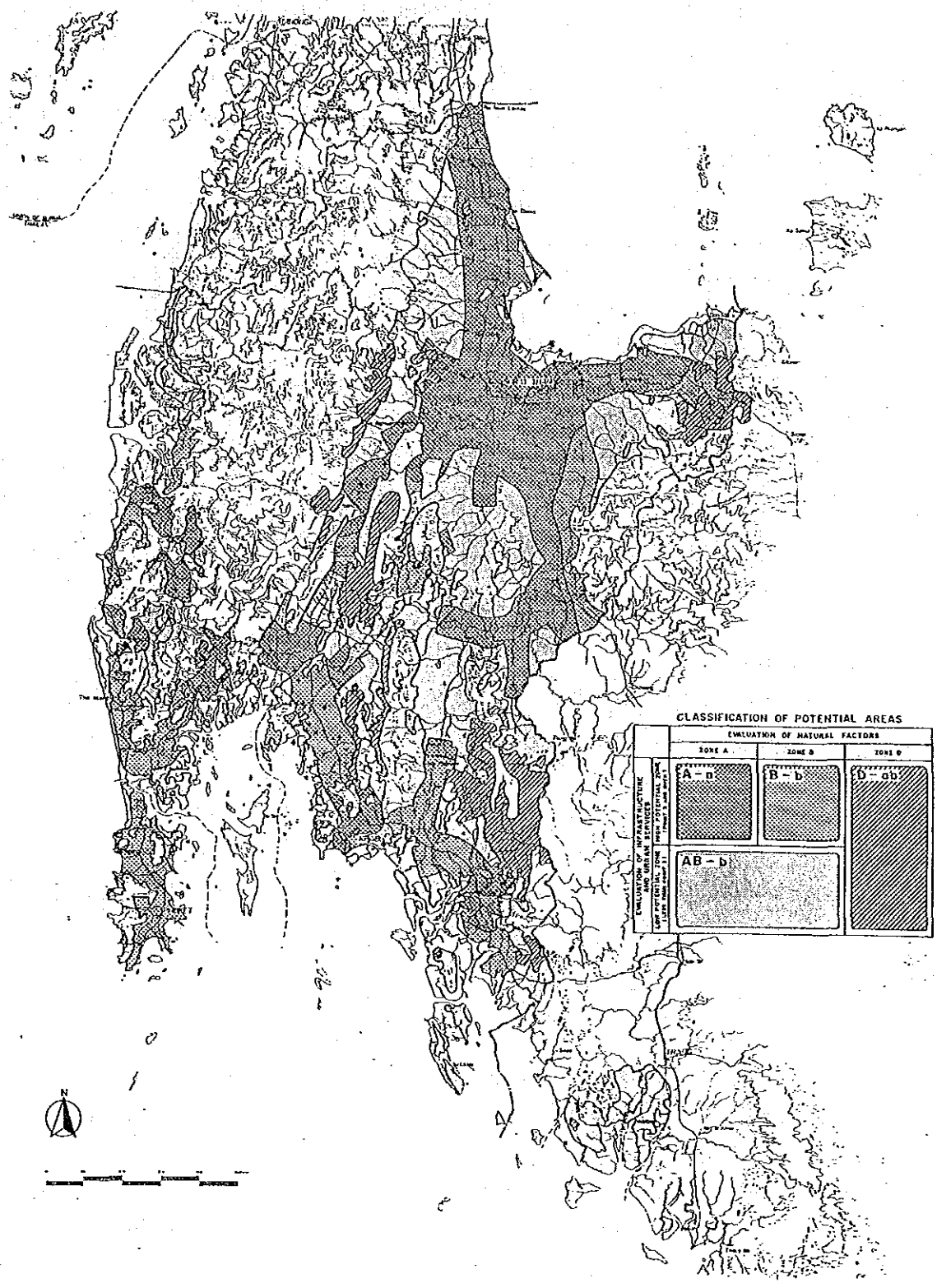


Fig. 4.15 OVERALL EVALUATION OF DEVELOPMENT POTENTIAL

3) In so called "Central Lowland" with high potential the problem of infrastruture weakness should be solved. Particular emphasis should be given to the development of Ao Luk, Krabi and Wiang Sa as the urban and commercial centers to support development of this zone as well as the development of infrastructures to link these centers each other. At the same time, mere infrastructure development is not sufficient but a consistent production system from land development to land management, from plantation to shipping and from research to extension should be established here in order to make best use of this highest and wide potential land.

4) Taking into account 2) and 3) above, the development of Tapi and Phum Duang Rivers Basin Area is desirable to be carried out as one package which includes both investment and noninvestment measures to develop the basin from upper stream to seashore at the river mouth in an integrated way; watershed protection, water management and control, effective land development, urban services and settlement encouragement, fishery activities promotion and so on.

5) A vast development with large projects centering on Phangnga seems to be difficult because of dispersed small potential areas. A careful development policy will be necessary. Diversification and challenge to new trials are required not only in the agricultural but also in land development sector.

6) The ravine between Phangnga and Phanom, which is located at the intermediate point between Takua-Pa and Surat Thani, is a comparatively high potential area. Agricultural development can be accelerated with the encouragement of infrastructure development.

In an attempt to integrate the potentials of Surat Thani with those in Phuket which is now rather isolated in spite of its national importance, we introduced an idea of strengthened link between these cities keeping in mind the potential role of the Upper South in national internationalization, industrialization and decentralization.

Particularly, reduced time distance between these cities will give a great impact not only on the area of influence of urban services but also on economic interactions between major urban centers. Figures 4.16 and 4.17 show the areas within two-hour time distance from major urban centers on the basis of existing and improved transport network, respectively. The most conspicuous change is that the areas within two-hour time distance from of Phuket and Surat Thani will be overlapped to a great extent with improved transport network although they are separated from each other at present. With improved transport network the entrance to Phuket Island is almost within

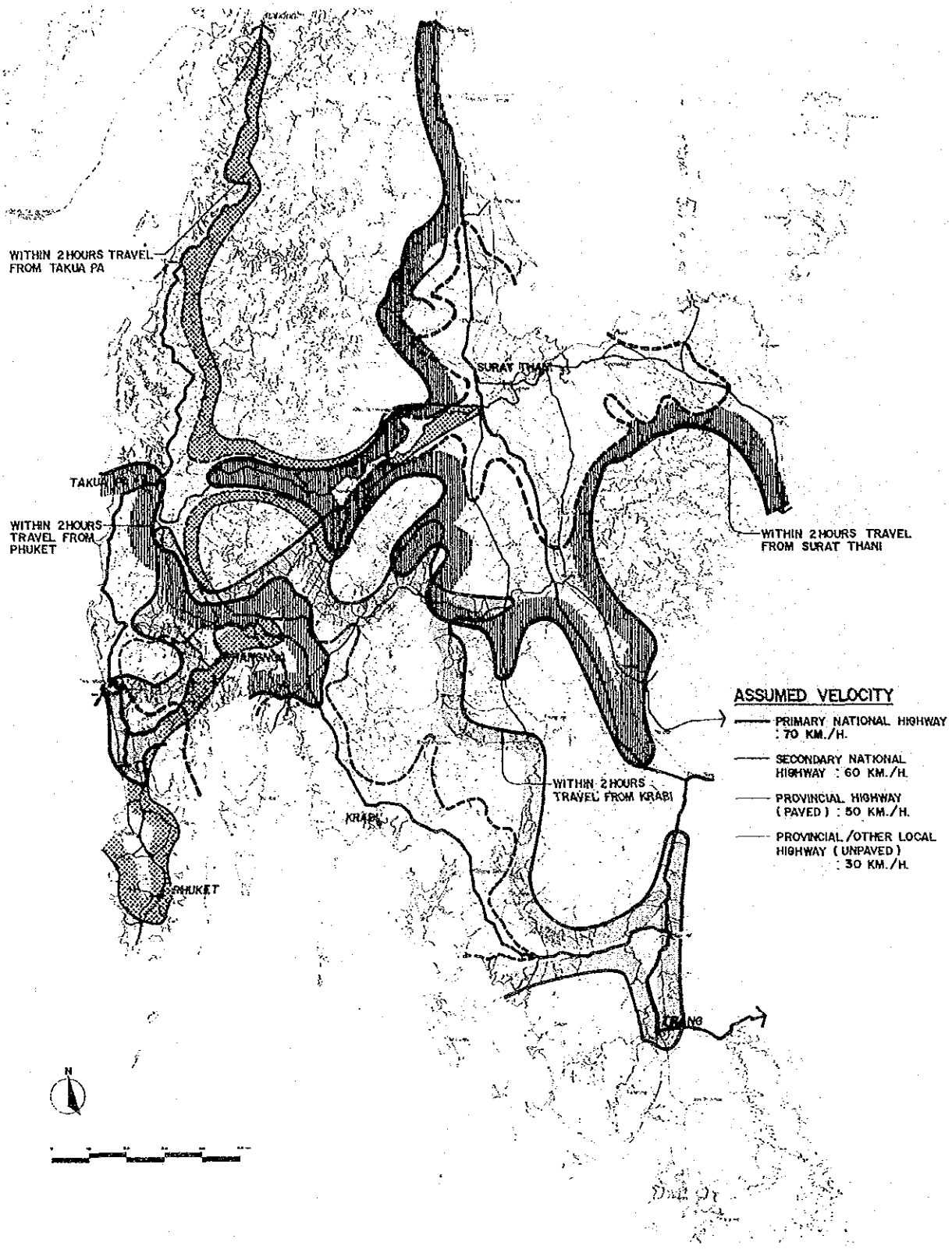


Fig. 4.16 TIME-DISTANCE ON EXISTING ROAD NETWORK

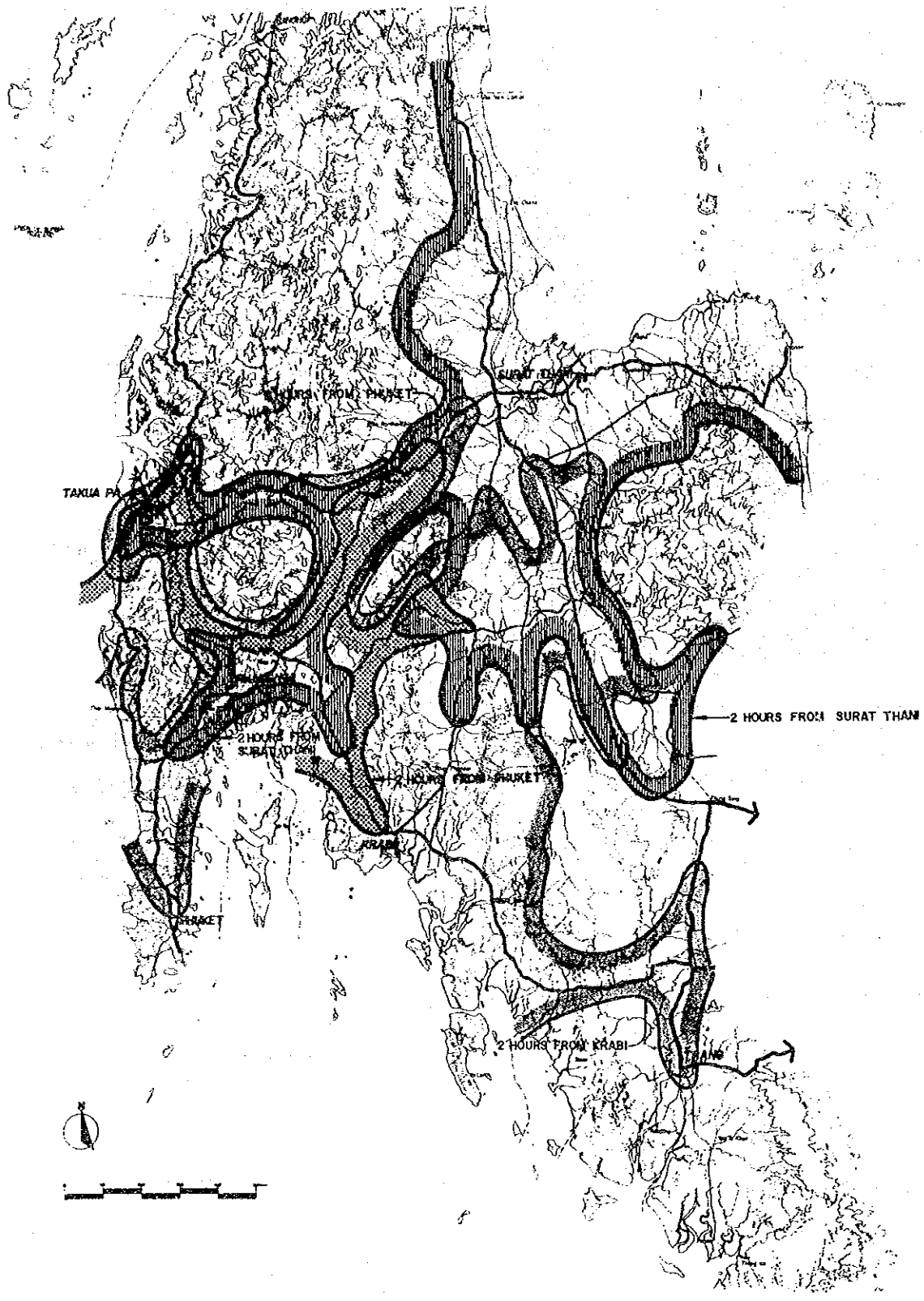


Fig. 4.17 TIME-DISTANCE ON FUTURE PROPOSED ROAD NETWORK

the reach of two hours by car from Phun Phin. A significant impact will be given on the relationship between Surat Thani and Phuket by the possibility that businessmen and transporters can easily make one day round trip between the two centers.

4.3 FUTURE SPATIAL SYSTEM

The development potentials assessed above are expected to be fully materialized by collective effects of the strategies to develop Phuket into a regional growth center as the country's western entrance, to reinforce the link between Phuket and Surat Thani, to develop Surat Thani into an industrial, distribution and urban center in the seaboard industrial development and to make full utilization of resources available in the hinterlands.

First, urban centers and transport infrastructure will increase their relative importance in materializing development potentials. Second, potential of the areas endowed with natural conditions such as land and water will be increasingly materialized not only for agricultural but for industrial development with new infrastructure.

In the year 2000, the Upper South is expected to form the spatial hierarchy as shown in Figures 4.18 and 4.19. The space of the Upper South will be organized as a whole to form a major east-west development axis of the South. This axis will comprise of centers and hinterlands. The centers are Phuket Urban Area and Surat Thani Urban Area consisting, respectively of expanded municipal areas and suburban areas for industrial and other related activities. Phuket and Surat Thani Urban Areas will be exactly on the interregional east-west link which will serve as the backbone of the east-west development access as well. The axis will be further reinforced by Krabi link and Takua Pa link as supporting links. The hinterlands will spread around either these centers or transportation links between these two centers. Hinterlands of the Phuket Urban Area will include (1) Phuket Metropolitan Area which covers Phuket Island and coastal areas of Phangnga and Krabi, (2) Takua Pa Area and (3) Central Lowland, potential agricultural area extending over northern part of Changwat Krabi and southern part of Changwat Surat Thani. The Phuket Metropolitan Area will be tied with Kantang through both land and marine transportation. Hinterlands of the Surat Thani Urban Area will include (1) Surat Thani Metropolitan Area which covers Ban Don Bay Coastal Area extending over Tha Chana and Don Sak as well as the area extending from Surat Thani Municipality to Ban Na San along the transport link toward Thung Song, (2) Tapi Phum Duang River Basin and (3) the Central Lowland which will thus be the hinterland of both Phuket and Surat Thani Urban Areas. The Surat Thani Metropolitan Area will be tied with Ko Samui through marine transportation.

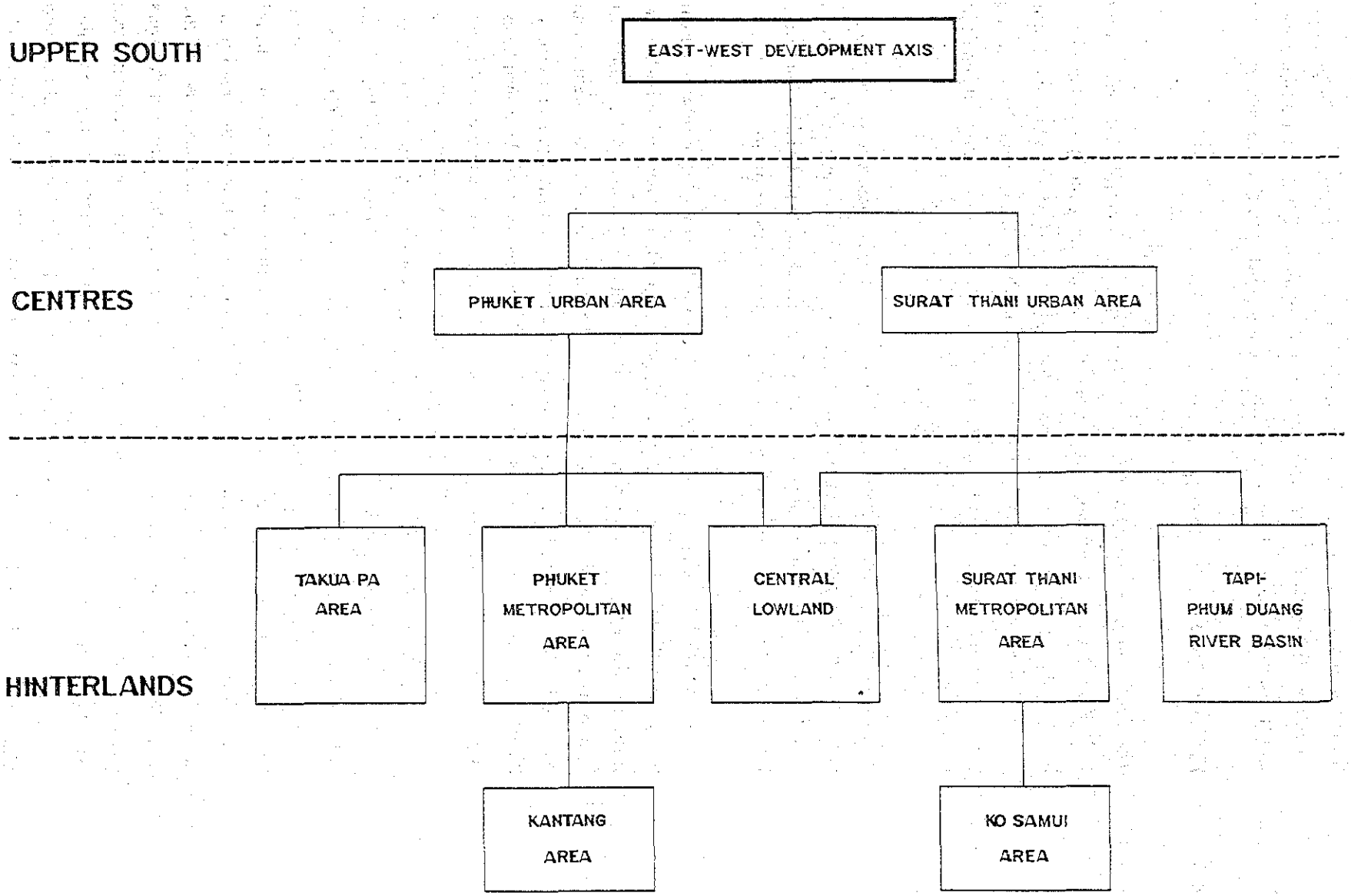


Fig. 4.18 SPATIAL HIERARCHY OF UPPER SOUTH, YEAR 2000

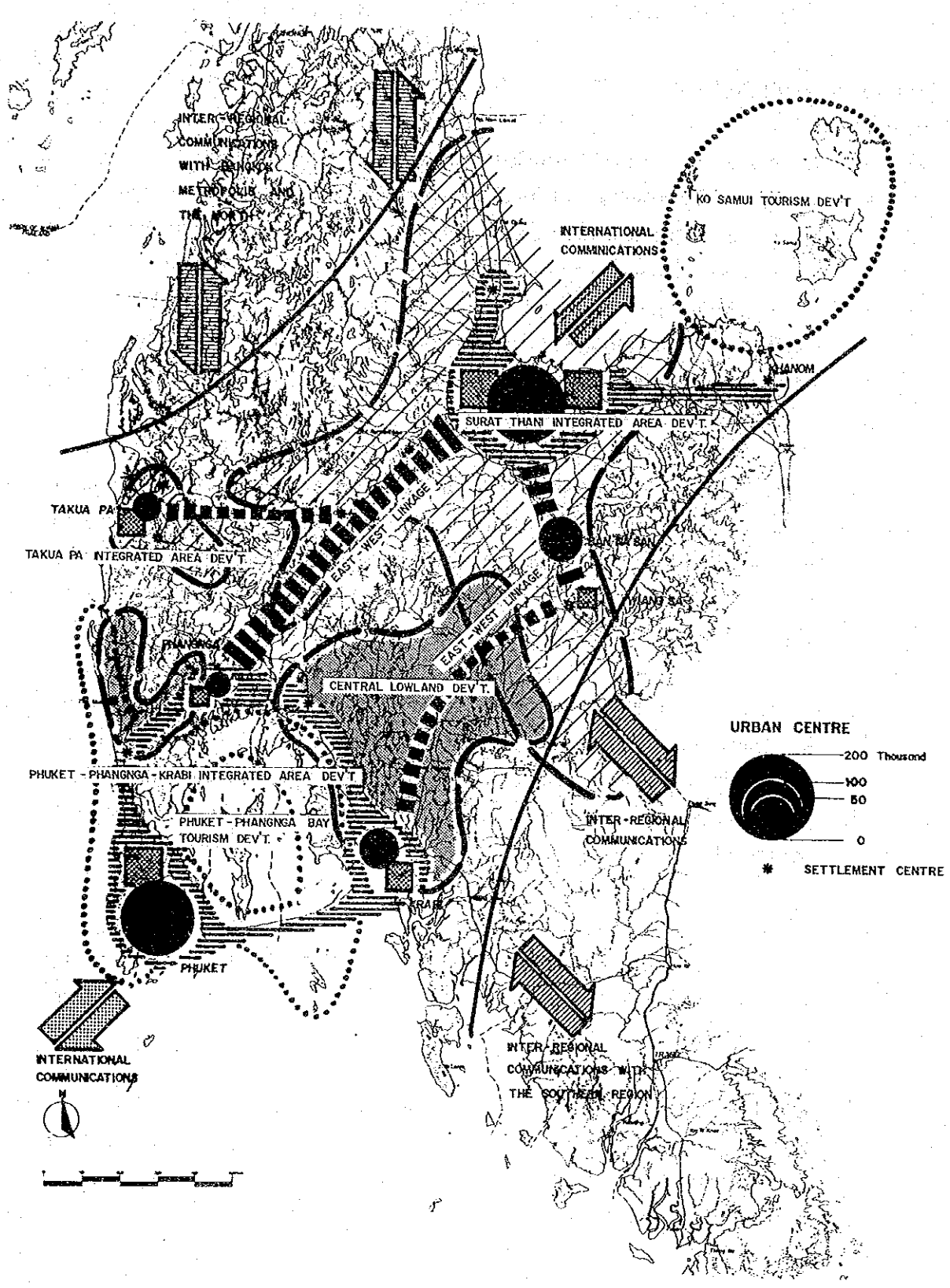


Fig. 4.19 CONCEPT OF REGIONAL DEVELOPMENT STRUCTURE

5. TRATEGIES AND PROJECTS

5.1 OVERALL STRATEGIES

In view of roles of the Upper South in national development and its economic and spatial outlook as well as potentials and constraints examined in the previous chapers, the Upper South as a subregion is proposed to be developed under the following strategies:

1) To develop Phuket into a regional growth center functioning as the country's gateway to the western-situated countries, the center to initiate the Upper South development and the service center for Andaman Coastal Area.

2) To reinforce the link between Phuket and Surat Thani to create a direct connection between the western-situated countries and various parts of the country, Bangkok in particular, to link Phuket and Andaman coastal economy more closely with the mainstay of the national economy being in Bangkok, and to unify economies of the Upper South at western and eastern sides.

3) To develop Surat Thani into an industrial, distribution and urban center in the emerging seaboard industrial development along the Gulf of Thailand, having potential industrial linkage with Eastern Seaboard, trade and business linkage with Phuket and market linkage with the whole South as well as based on its large resource-rich hinterland.

4) To make full utilization of resources available in the hinterlands of Phuket and Surat Thani to support the strategies for fostering and linking the two growth centers. Environmental rehabilitation is another urgent task to be carried out especially in tin excavated areas.

Based on these strategies, the Upper South will be able to contribute to the nationwide regional development challenges of national economic expansion/internationalization, industrialization and decentralization of Bangkok through reintegration of the national space, seaboard industrial development and local resource management.

These strategies will also bring about changes in the spatial structure of the South. In the South particularly, location and hierarchy of urban centers have been determined strongly by evolving transport network. In the first place, most of present provincial

capitals emerged as centers of coastal trade at river mouths already during the period back to the sixteenth to the nineteenth century. Introduction of railways to the South in the early twentieth century changed substantially the old settlement pattern. New urban centers emerged along railways just like the counterpoles to old coastal centers, i.e., Phun Phin to Surat Thani, Thung Song to Nakhon Si Thammarat, Hat Yai to Songkhla and Yala to Pattani. The National Highway Route 4 completed in 1967 gave a great impact on the settlement pattern especially in the western coast. It is at this time when western coastal urban centers were strongly linked each other and with Bangkok and Hat Yai. In 1978, the National Highway Route 41 was completed and stimulate the growth of urban centers in the central corridor and the eastern coast, Surat Thani-Phun Phin, and Hat Yai-Songkhla in particular (See Figures 5.1 to 5.4).

This changing pattern will evolve into a pattern constituted by the dual development axis on east and west coasts with ladder structure in between (See Figure 5.5), as agricultural expansion, resource processing and market diversification will take place based on the existing and forthcoming infrastructures and on the further growth of changwat centers. In the long-run, the dual development axis and ladder structure will be transformed into a spatial structure consisting of three growth poles of Phuket, Surat Thani and Songkhla-Hat Yai (See Figures 5.6).

Within this process in future, relative specialization of functions will increasingly take place among three these major centers as summarized in the Table 5.1:

Accordingly, the relationship between the Upper and the Lower South will change. Within the South, the Upper South will be relatively specialized into intermediate goods supply based on its land, water and agricultural resources and the materials to be externally brought to Surat Thani and Phuket while the Lower South will be relatively specialized into the supply of various urban consumption and assembly goods based on its substantial local market. In terms of external relations, the Upper South economy will be increasingly oriented toward the western-situated countries through Phuket and toward the Central Region, including Bangkok/Eastern Seaboard while the Lower South economy will be increasingly oriented toward the eastern and neighbouring Asian countries and toward Bangkok/Eastern Seaboard through intermediate industrial and distribution functions of the Upper South, Surat Thani in particular.

With reference to the dichotomy of top-down and bottom-up approaches, the strategies above go by the top-down approach, which derives itself from the conception that what the Upper South can do for the national intention in regional develop-

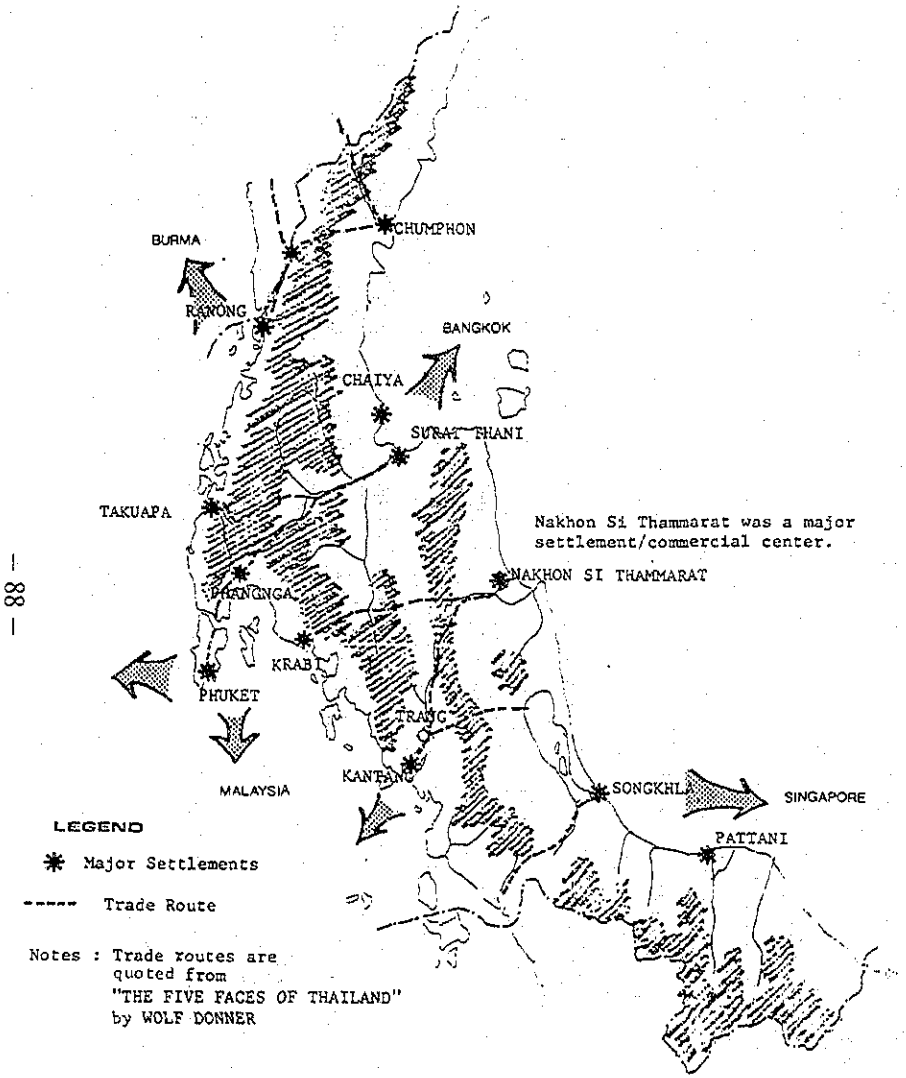


Fig. 5.1 REGIONAL STRUCTURE CENTURIES AGO (PROSPERITY OF TIN TRADE)

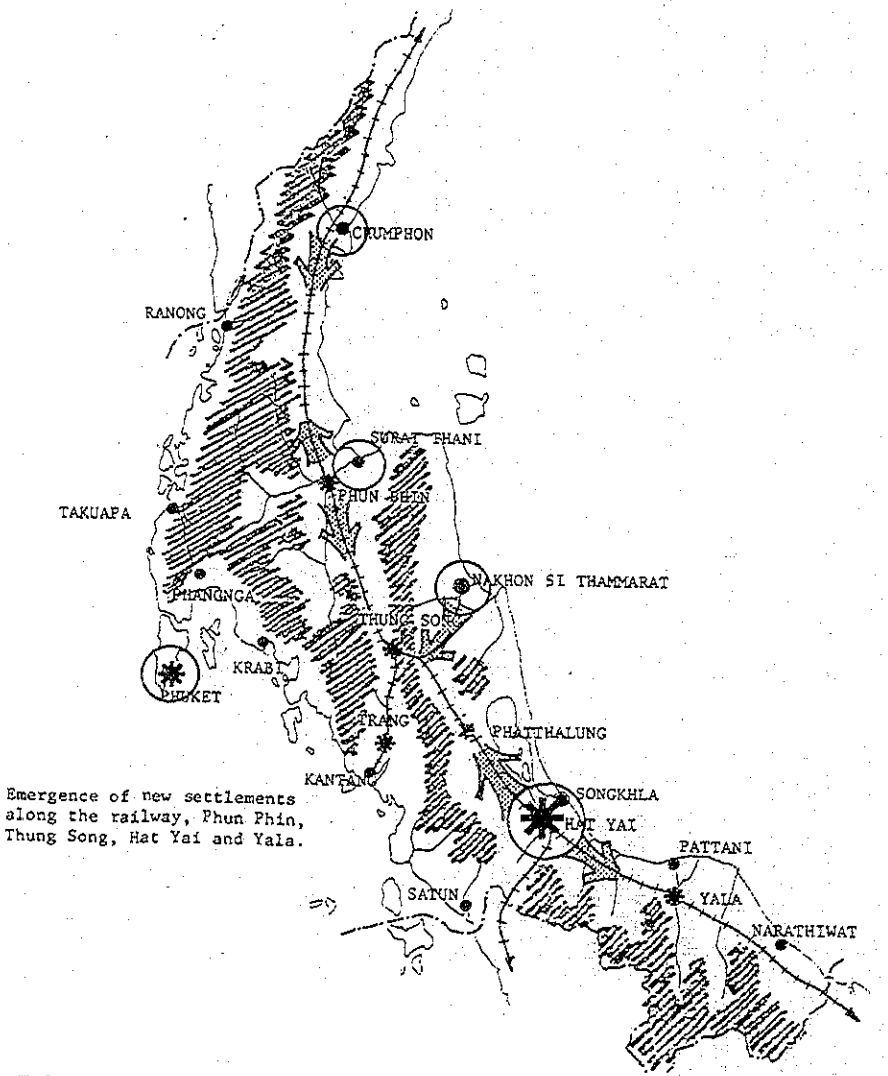


Fig. 5.2 REGIONAL STRUCTURE AT THE BEGINNING OF 20TH CENTURY (INTRODUCTION OF RAILWAY)

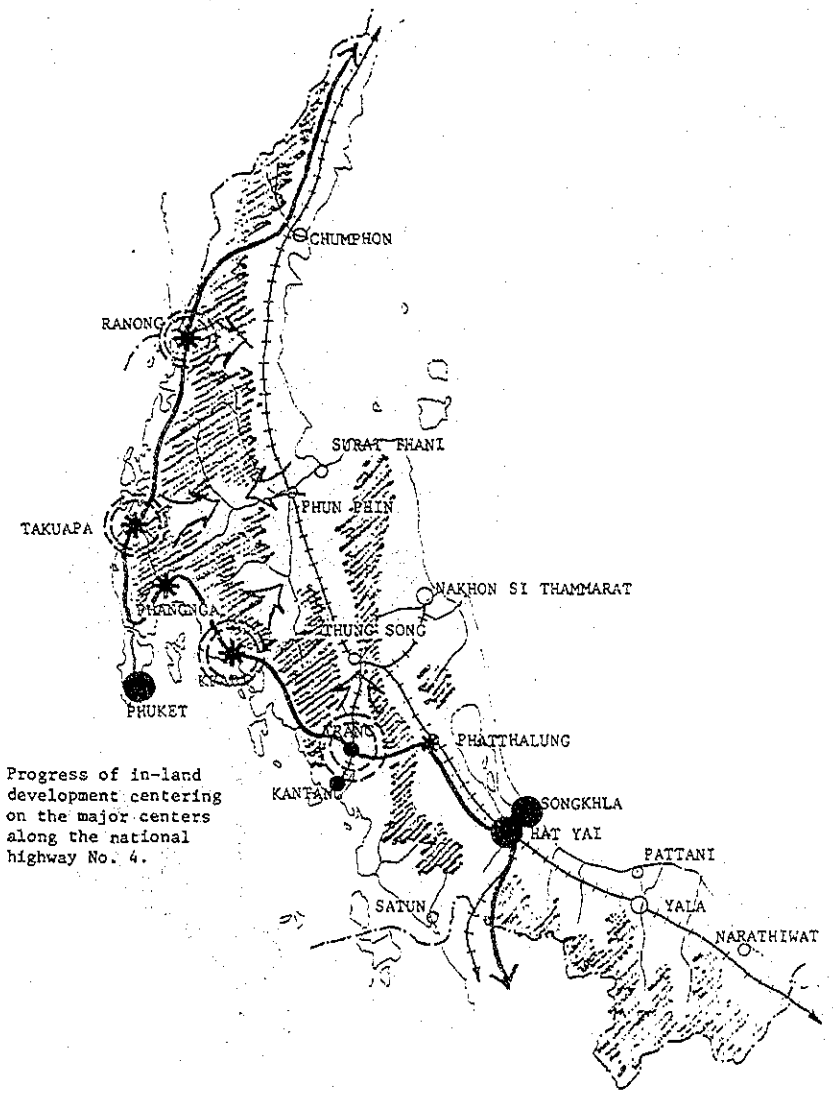


Fig. 5.3 DEVELOPMENT OF NATIONAL HIGHWAY ROUTE 4
(ENLARGEMENT OF RUBBER PLANTATION/TIN MINING INDUSTRY)

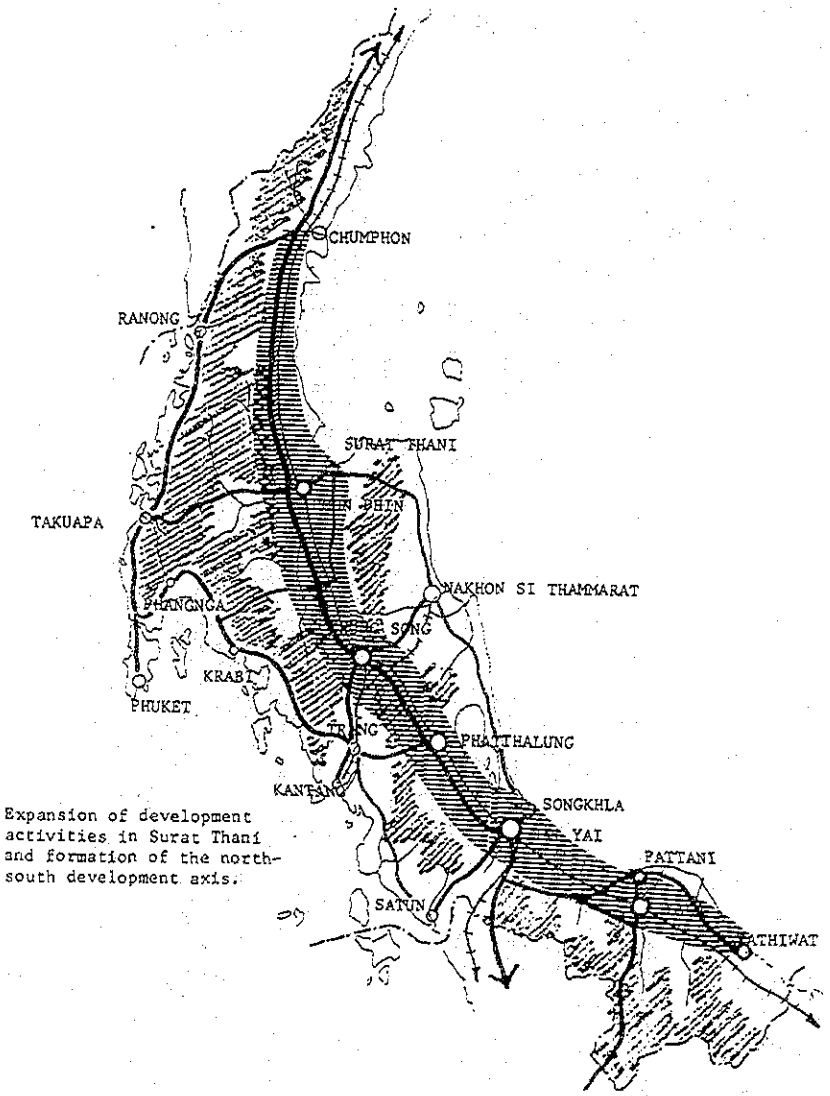


Fig. 5.4 FORMATION OF BASIC OVERLAND SKELETON
(DEVELOPMENT OF NATIONAL HIGHWAY ROUTE 41)

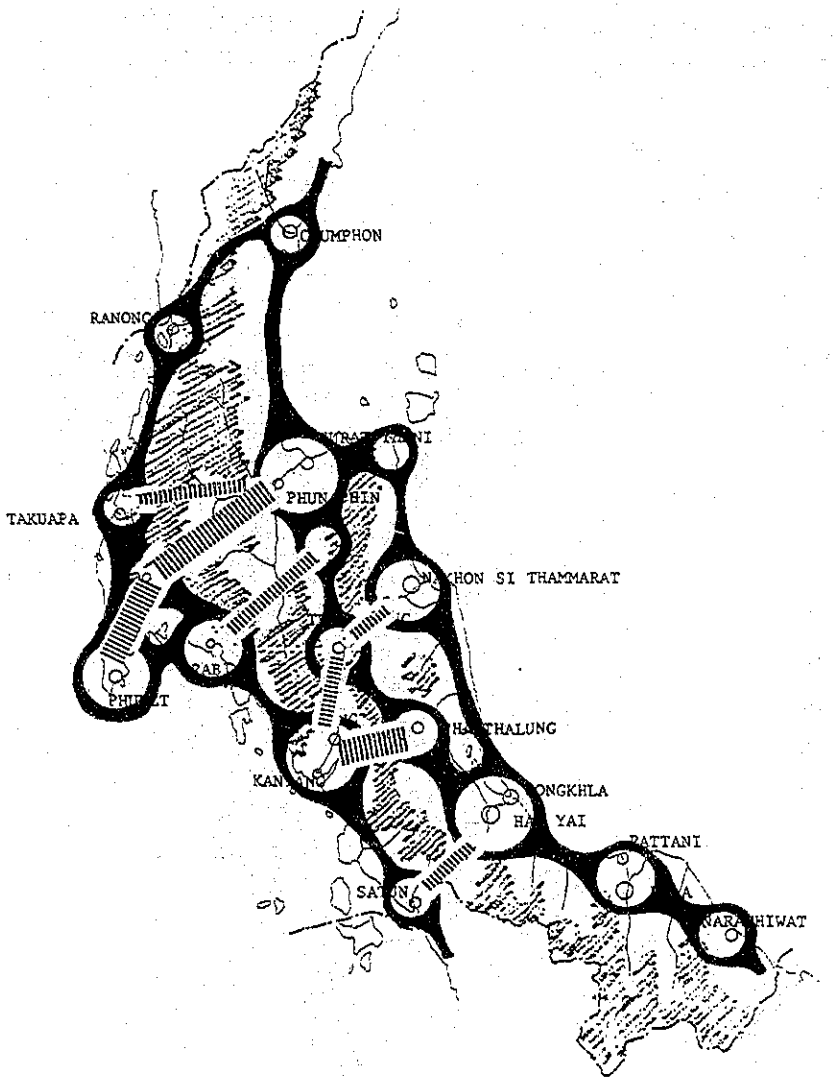


Fig. 5.5 DUAL DEVELOPMENT AXIS AND LADDER STRUCTURE:
SHORT-TERM CONCEPT OF SOUTHERN SPATIAL STRUCTURE

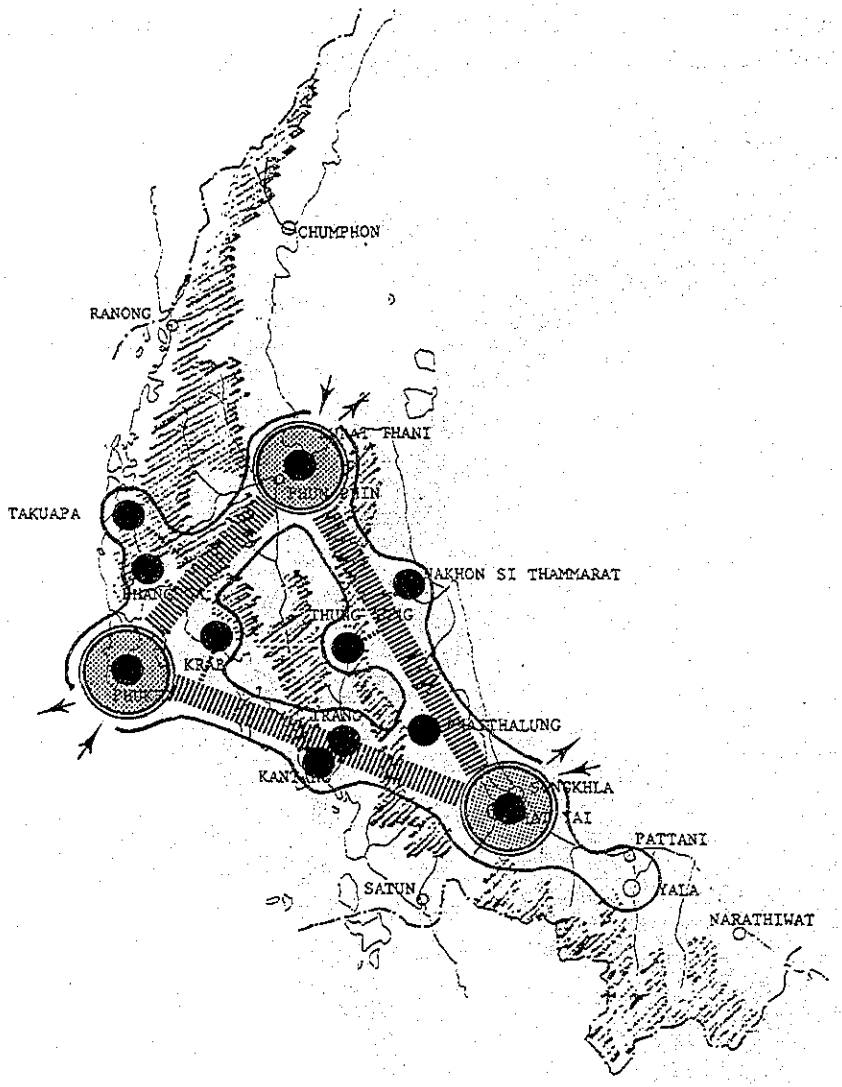


Fig. 5.6 THREE GROWTH POLES STRUCTURE:
LONG-TERM CONCEPT OF SOUTHERN SPATIAL STRUCTURE

Table 5.1 SPECIALIZATION OF URBAN FUNCTIONS OF PHUKET, SURAT THANI AND SONGKHLA - HAT YAI

Urban Centers	Main Features	
	Present	Furure
Phuket	– Center specialized into primary comodity trade, international tourism and related investments within its hinterland. – Center of local business which are relatively independent of the mainstay of the national economy.	– Center of international trade, export industries, material import, tourism and technology development as the country's main entrance to the western situated countries. – Urban service and distribution center for the Andaman Coastal Area.
Surat Thani	– Urban service center for Changwat Surat Thani	– Center of regional industries and transportation as a relay point between Phuket, Songkhla-Hat Yai, Bangkok and Eastern Seaboard.
Songkhla-Hat Yai	– Center of the South with limited influence over the Upper South – Gateway to Malaysia in trade and tourism	– Real administrative and economic center of the whole South with viable subregional centers of Phuket and Surat Thani channelling economic and other service over the Upper South – Center with comprehensive urban and industrial functions for the South as a regional counter pole to Bangkok

ment. The strategies give a priority on intensive input of capitals and technologies from outside the Upper South to stimulate and reorganize the existing regional economy. However, the top-down approach needs to be complemented by the bottom-up approach, which derives itself from the conception that what the Upper South should do to meet the needs of existing economy and people. Figure 5.7 shows the results of our survey on the most desired three project types in each amphoe. Strategies based on the bottom-up approach would give a priority on fostering self-supporting socio-economic base through the effective utilization of local capitals and technologies, and the intentional development of local public knowledge and capabilities. Without this bottom-up approach, impact of external investments and technologies would not be infiltrated into all sections of the Upper South.

Specifically speaking, the strategies proposed in this plan need to be complemented by the following efforts at the local level:

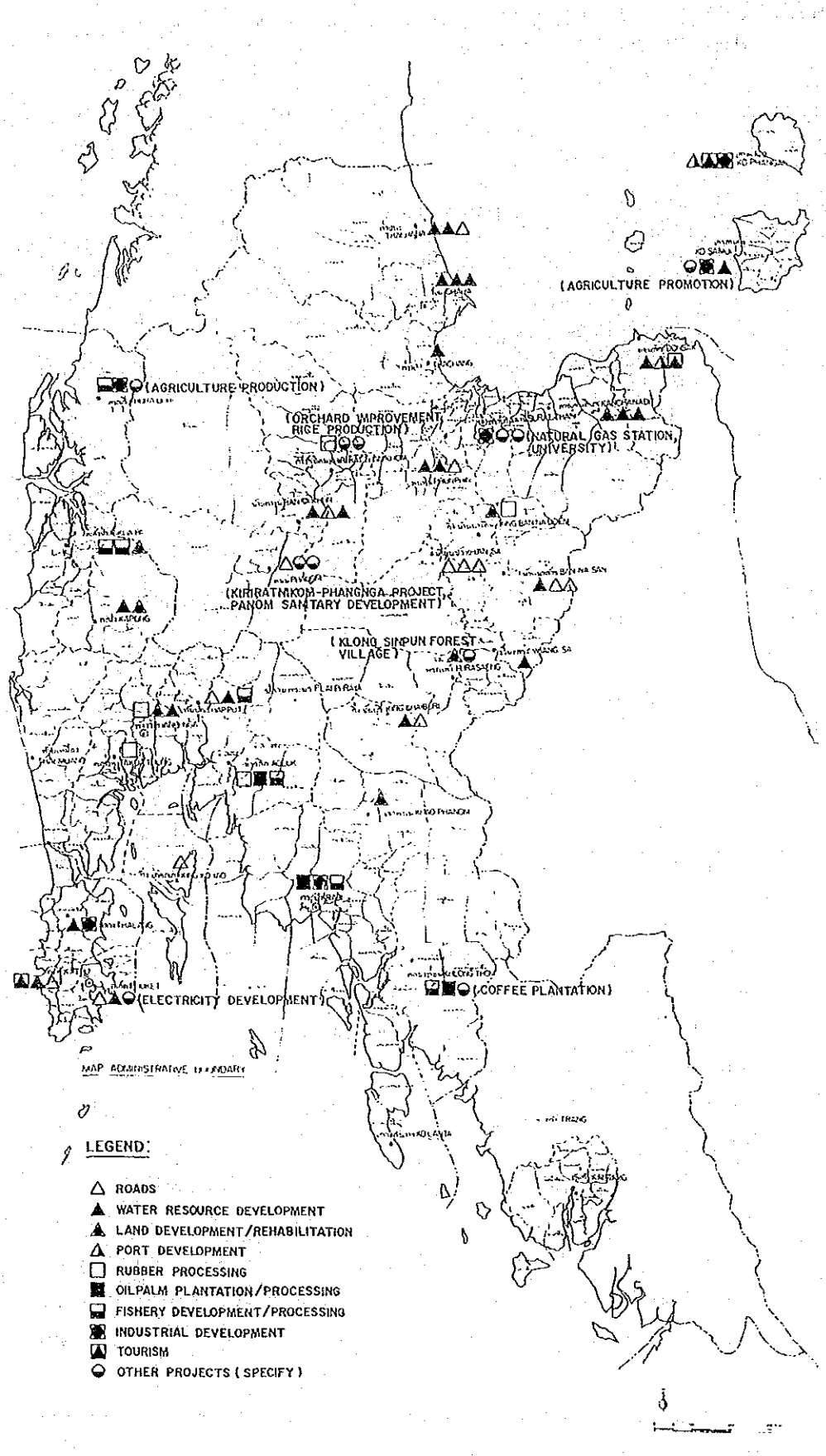


Fig. 5.7 THREE MOSTLY DESIRED PROJECTS OF AMPHOE

(1) Improvement of social services including school and nonschool education, and health services in order to ensure the basic human needs for development and the social stability;

(2) Preservation and intentional utilization of the local traditions and cultures in an effort to enhance the identity of the Upper South as a source of local patriotism;

(3) Strengthening of local government's capability to finance, plan and monitor development;

(4) Improvement of efficiency, reliability and quality in production, processing and distribution of local resource materials;

(5) Problem solving in the relations between local society and large external investors especially in terms of environmental impact and land acquisition; and

(6) Improvement and maintenance of terminal infrastructures such as rural roads, community water supply, small-scale irrigation and power distribution.

Needless to say, these efforts are necessary not only in the Upper South but in all provincial areas as a part of the national effort to absorb population in provinces for checking excessive expansion of Bangkok, expand domestic market for manufactured products, improve local conditions for inducing external investments and maintain social stability of the country.

Regional planning is a means to bridge the national targets with the local capability and willingness. In this context, this subregional planning addresses itself primarily to bringing national intentions to the subregion in accordance with the top-down approach. Despite that actual development process in area involves both the top-down and the bottom-up approaches, a combined approach in other words, planning of different levels should have different responsibilities within the current multilevel planning system in Thailand, from the viewpoint of overall planning efficiency. It should be noted, therefore, that this study with a stress on top-down approach is believed more useful for the Upper South regional development when it is complementary to planning studies at the levels of changwat and below.

5.2 AREA SPECIFIC STRATEGIES

5.2.1 Phuket Urban Area

Potential of Phuket Urban Area is that it will have an international deep seaport by the end of Fifth Five-Year Plan period. The Port will serve for the Upper South in the short-run and possibly the whole country in the long-run as far as the goods to and from western situated countries are concerned, thereby attracting goods flows and business oppourtunities. Second, Phuket Urban Area has an international airport with direct access to Bangkok, Singapore and Penang. It is a source to attract tourists, foreign ones in particular. Together with Phuket's advantage to have an international deep seaport soon at a strategic point of the country, the airport has potential to attract more diversified activities such as international trading, export industries and technology research development. Third, added to this point is the natural environment of high quality together with decent urban amenity. This is a substantial advantage over other parts of the South not only for tourism development but for attracting investors, managerial people, researchers and engineers. Fourth, there is already an accumulation of international business experiences based on the trade of tin, rubber, oil palm and other products. As is suggested by the fact that Phuket ranks virtually the third in the country following Bangkok and Songkhla in number of international calls, this accumulation makes urban economic base of Phuket different from those in other urban areas.

On the other hand, bottleneck to the development of Phuket Urban Area is first that it is situated at the deadend of land transport network and thus rather isolated. For this reason, the interactions between Phuket and other urban centers as well as the extent of its hinterland have been limited compared with other major urban centers, as is demonstrated in the results of Reily/Godlund model analysis on the area of influence determined by the urban service functions represented by provincial service GDP and the interprovincial capital road distance (See Figure 5.8). Second, the space of Phuket Island is limited. In the limited space, conflicts tend to emerge among different activities such as tin mining, tourism, fishing and urban expansion. Both population density and GDP per area of Phuket are by far higher than any other changwat with regional urban growth centers or second-generation growth centers. Top three changwat in population density and GDP per area are Phuket, Chonburi and Ratchaburi with population density of 246,166 and 124 persons per square kilometer and 3,5 million, 2,2 million and 0.9 million thousand baht per square kilometer, respectively (1980 data). The conflicts will be intensified without proper spatial management if industrial development is accelerated. Third, Phuket is limited

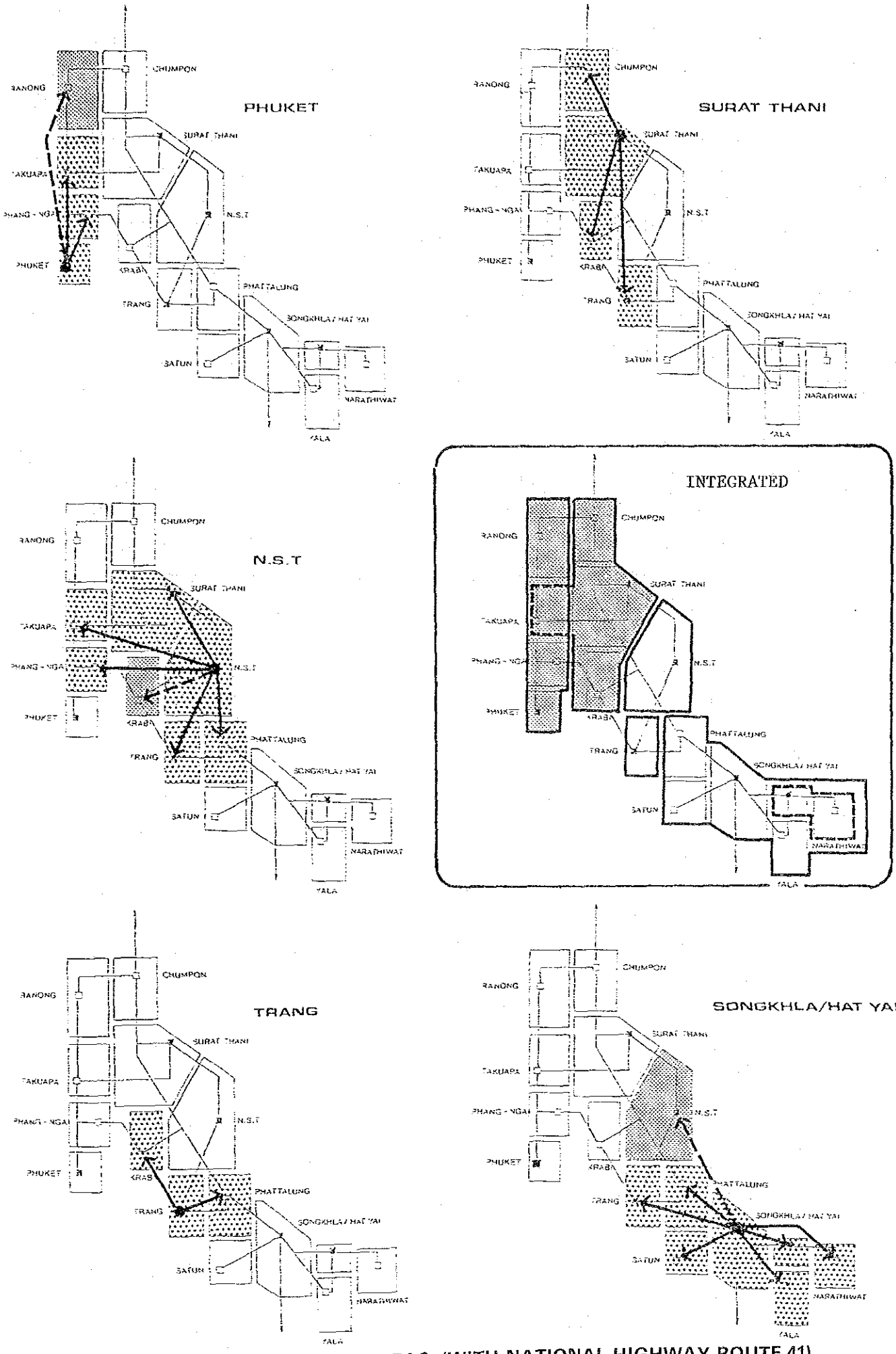


Fig. 5.8 ECONOMIC INFLUENCE AREAS (WITH NATIONAL HIGHWAY ROUTE 41)

by water resources. It suffers from supply shortage alreay. Even with Bang Wat Dam reservoir water to be distributed soon, water demand is anticipated to exceed its capacity by 1990 or so.

Therefore, the strategies to maximize potentials and solve bottlenecks of Phuket Urban Area will include the followings:

1) To strengthen the land transport link between Phuket and Bangkok through Surat Thani and to encourage marine transport links with Krabi, Kantang and other urban centers with coastal ports along Andaman Coast.

2) To encourage growth of the industries related to local resources and induce export industrial investments by making use of Phuket Deep Seaport and Airport. Industrial linkage between Phuket and Takua Pa should be strengthened to maintain metal working technologies cumulated based on tin mining in Takua Pa and combine them with funds available in Phuket to foster more diversified engineering industries.

3) To develop tourism intensively in limited beach and preserve natural asset in other beaches and to strengthen planning and monitoring function of local governments as the center of an integrated Phuket-Phangnga-Krabi Tourism Zone.

4) To foster Phuket City as a regional urban growth center specialized into international trade, goods distribution, tourism, financial activities, technology development and other service functions. In view of concentration of many activities in limited space, physical expansion of urban area should be guided properly with special attention to upgrading efficiency and attractiveness for international functions, grouping industrial and distribution activities and securing proper residential area without causing conflict with area for other uses.

5) To increase water supply capacity in good time so as not to discourage new investors from being attracted and to ensure people sufficient supply of drinking water.

5.2.2 Surat Thani Urban Area

Potential of Surat Thani Urban Area is first that it is situated at the center of existing and possible transport links, including National Highway Route 41 to Chumphon/Bangkok and Thung Song/Songkhla, and Route 401 to Takua Pa/Phuket and Khanom/Nakhon Si-Thammarat. Also many provincial highways converge into Surat Thani Urban Area. It has the north-south railway line with branch line starting

at Phun Phin up to Khiri Ratthanikhom which is on the way to Phuket. Tha Thong Port and a new deep seaport proposed at Khanom are possible entrance of the Upper South to seaboard industrial areas along the Gulf of Thailand, including Eastern Seaboard. With this transport advantage, transport- and distribution-related industries have been rapidly growing. Among all changwat with regional urban centers and second generation growth centers in the country, Surat Thani ranks the second in terms of growth rate in the transportation and communication GDP. Top five changwat in the growth of transportation and communication GDP during 1978-82 (at constant prices) are Chonburi (21.7 percent per annum), Surat Thani (20.8), Phuket (18.3), Khon Kaen (18.2) and Nakhon Ratchasima (18.0). With strong government policy guide, this vigorous activity will be followed by industrial growth. Second, Surat Thani Urban Area is fairly close to the coast with easy access to deep sea extending over Khanom. No other changwat, including Songkhla has easy access to the sea as deep as found in this area. This is a potential factor to expand domestic material based industries into those using direct foreign material inputs even partially. Third, Surat Thani Urban Area has easy access to its hinterland endowed with various resources, including land, water and coast. Vast cultivated and cultivable lands are suitable for expanded oil palm plantations, rubber replantations, irrigation, multiple use of coconut land, fruit cultivation and livestock production. Fish farming productivity is high in Ban Don Bay because of fertile silt from the Tapi-Phum Duang Rivers.

However, Surat Thani Urban Area is limited by the following bottlenecks. First, Ban Don Bay, the entrance to sea for Surat Thani is very shallow and not suitable to develop deep seaport, which could give a great impact over industrial development in Surat Thani Area if it were able to be developed adjacent to Surat Thani Municipality. Effort will be made to permanently continue the channel dredging, but it will cost nearly 10 million baht just every year for Tha Thong Port to maintain its capacity to accommodate 1,000 ton vessels.

Second, Ban Don Bay Coastal Area is concentrated by many activities such as fishing, fish farming and agriculture. The coast is covered with mangrove and it should be protected to a maximum extent possible although shrimp farming is rapidly encroaching mangrove area already. Environmental problem will be intensified further if industrial and urban expansion will take place without proper pollution control and land management.

Third, in spite of their very rich water resource, Tapi and Phum Duang River are not controlled, with a result in chronic existence of a Tapi River flood routing area which

occupies approximately 170 square kilometers when exceptional floods occur. Total possible floods area is estimated at 400 square kilometers, including the crop lands subject to Phum Duang flooding, those subject to Phun Phin flooding and sea tidal flooding area in addition to the Tapi flood routing area. With the completion of Chiew Larn Dam, Phum Duang flooding will be controlled to a great extent but other areas are subject to further control. Flood control of these rivers will help reduce the dredging cost of Tha Thong Port as well although it might give a negative effect on coastal fish farming by reducing the discharge of fertile silt from these rivers.

Fourth, Surat Thani City has many weaknesses because it has grown rapidly only in a short period of time as road transport network was developed in the Upper South recently. Urban infrastructures are inadequate especially in water supply, drainage and urban streets. Urban functions such as goods distribution, administration and education are not strong for the size of itself and its large hinterland. Surat Thani and Phun Phin at the distance of 12 kilometers each other have grown similarly as centers of goods distribution but on different transportation bases of Ban Don Port in Surat Thani and a railway station in Phun Phin. These two urban centers have not form a division of works yet to be a functionally unified twin city as a center of the Upper South.

Fifth, partly due to immatured urban functions of Surat Thani, smaller urban centers such as Ban Na San, Wiang Sa and Chaiya at the fringe of Surat Thani Urban Area have not fully played their role as intermediate centers in spite of their different individualities in socio-economic basis.

Therefore, the strategy to maximize potentials and solve bottleneck of Surat Thani Urban Area will include the followings:

1) To encourage growth of local resource-based industries and induce backward industrial linkages with outside the South including Eastern Seaboard and forward linkages with industries and market in the South. Careful guidance of government is needed to group industries in selected areas from the viewpoint of efficiency in infrastructure/utility use and environmental control.

2) To develop and expand Surat Thani-Phun Phin Twin City with an an emphasis on strengthening distribution functions of the city by integrating existing and forthcoming transport facilities such as highways, bypasses, railroad and ports. Development of efficient transport facilities such as truck terminal, warehouses, loading/unloading facilities, construction materials depot and bus terminal are needed for this purpose as

well as for overcoming limited capacity of Tha Thong Port and stimulating industrial investments. Planned urban area expansion/improvement of about 1,900 hectare or nearly two times as much as the areas of existing administrative areas will be necessary, in view of very limited space of Surat Thani Municipality and Phun Phin Sanitary District.

3) To develop, in the long-run, a new deep seaport and coastal industries dependent party on imported heavy materials possibly at Khanom. Reservation of industrial area in advance will be necessary in view of the space consuming nature of these industries.

5.2.3 Hinterland

Hinterland of the Upper South comprising Phuket Metropolitan Area, Takua Pa Area, Tapi-Phum Duang River Basin including Surat Thani Metropolitan Area, Central Lowland, Kantang Area and Ko Samui Area have different development potentials while all areas suffer from similar bottlenecks.

1) Potentials of Phuket Metropolitan Area

Potentials of Phuket Metropolitan Area covering the coastal part of Changwat Phuket, Phangnga and Krabi are tourism, fishery including fish farming and energy. The area is endowed with coastal tourism resources of different kind, including beach in Phuket and Krabi and superb coastal view in Phangnga and Krabi. Beach alone has many competitors in the rest of the country and neighbouring countries but the combination of these different resources with a decent urban amenity of Phuket having easy international access is little found elsewhere. Another factor to enhance tourism potential of this area is a limited environmental capacity of the Phuket Island.

Fishery, fish farming in particular, is a high potential activity, too. Fish farming is supposed to increase rapidly with both private and government investment input, although marine fish catch of Changwat Phuket, Phangnga and Krabi started to decline since the late 1970s.

Energy, lignite in Krabi in particular, is another important resource. Lignite reserve was estimated at 30 million tons, of which, very recently, economically recoverable reserve is determined to be 12 million tons which can meet the demand of a 75 MW lignite thermal power for 25 to 30 years. Due to this recent estimate, EGAT has changed the original plan to develop by the early 1990s three units of lignite thermal power plant with 75 MW capacity each plus one unit of coal fired thermal plant with

150 MW capacity into a revised plan to develop one unit of 75 MW capacity lignite thermal plant plus two units of 150 MW thermal plant using imported coal.

A good access of Krabi to imported coal together with the availability of existing lignite handling system is a potential to further develop Krabi as the energy supply center for the South. Added to this is a potentiality of Phuket Metropolitan Area, Krabi in particular, to have an easy access to both crude oil in the Middle East and fuel consumption market in various part of the South, making it possible to set up a local refinery.

2) Potentials of Takua Pa Area

In Takua Pa there are many tin-related industries which have accumulated a large concentration of experiences and technologies in shipbuilding, machine reparing and shipbreaking. These industries have a possibility to evolve diversified engineering industries starting from tin-related metal working industries through farm machineries, construction machineries and so on. However, this potential is in a precarious position because of depleting tin resources, fluctuating world market for tin, deteriorating environmental condition especially in terms of landuse and watershed due to uncontrolled onshore tin excavation and relative isolation from major urban centers such as Phuket and Surat Thani. The area suffers from flood. Compared with a large contribution of this area to the national export earnings, very limited effort has been made to rescue this area from this position and to utilize its potential further for long-term regional development. Special treatment deems necessary in this area and this is why we identified this area as a separated hinterland unit.

3) Potential of Tapi-Phum Duang River Basin/Surat Thani Metroplitan Area

Tapi-Phum Duang River Basin and Surat Thani Metropolitan Area overlap partly each other. If fully utilized, it is not technically difficult for this water supply potential to meet the water demand of the double cropping irrigation enabling almost 100 percent of self-sufficiency in rice and the industrial water demand in Phun Phin/Surat Thani, on top of the demand from ongoing hydropower project at Chiew Larn.

The Basin/Area produces a variety of crops including rice, rubber, coconut, coffee, other tree crops such as sataw, rambutan, lancet, jack fruit, palmyra, durian, mangosteen, tangerine, betelnut, and vegetable such as pumpkin and yard long pea. Livestock production can also be grown through the multiple use of coconut land and converting rehabilitation area into pasture land. Rehabilitation area is identified in

this sector plan of primary resource development. It is the area subject to forest encroachment but not suitable for cropping. Livestock in the South has potential for export because of its disease freedom and transport access to foreign countries. In addition, fish farming of oyster and shrimp is also prosperous in Ban Don Bay because of fertile silt in the Bay, existence of mangrove being suitable for shrimp farming and a good access to Surat Thani Urban Area. Similarly with the fish farming in Phangnga Bay, depleting marine fish resource and increasing fuel oil price have been encouraging fishermen to go into the fish farming activity.

The area is endowed with potential mineral resources, including tin, gypsum, wolfram, barite, antimony and zircon. They are exported out of the area for tin metal, construction material, and industrial materials. Many of these products and resources offer the growth of processing industries in Surat Thani and Phuket Urban Areas as well as those in Bangkok Region including Eastern Seaboard. For example, barite can be used as a material for a paper processing and gypsum for construction materials in Surat Thani.

4) Potential of Central Lowland

This is a vast area of low intensity land use extending over southern one-third of Changwat Surat Thani and northern half of Changwat Krabi. In this area, the land of about 2,700 square kilometers is identified suitable for cultivation of tree crops, including oil palm. About seven percent of it has been used for oil palm plantation already after a rapid expansion made by private effort during the past decade. However, scattered expansion of low intensive cultivation of rubber, subsistance rice and other crops will make it more and more difficult to secure the oil palm plantation area which desirably needs at least 20,000 rai to meet the minimum size of processing plant, unless quick actions are taken by the government for land management, extension services, feeder road construction and social facility improvement.

5) Potential of Kantang Area

Kantang is an enclave in the reference area of this study. It is a major base at the Andaman Sea Coast to export rubber with railway connection which is estimated to contribute 30 percent of the rubber collected in Kantang not only from Changwat Trang but a quite extensive area of the South. The area is also a major base of fishing and fish processing for export. Recently, fish farming has been growing fast, too, based on the fish marketing channel established in Kantang and the availability of feed using the waste from fish processing. With Phuket Deep Seaport in future, however, the

main function of Kantang Port will change from export to coastal feeder to be connected with Phuket Deep Seaport due to high cost anticipated in dredging its long river channel and removing an obstacle river island to make Kantang into a full-fledged export base. By strengthening the link between Kantang and Phuket through coastal shipping, Kantang and its immediate hinterland, Changwat Trang, will be able to more fully utilize their potential resources through the processing in Kantang as well as in Phuket. They include rubber, frozen fish, coffee, pepper, palm oil and forestry products. It will, however, take five to ten years for Phuket Deep Seaport to be in full operation after its construction is completed, in consideration of a time period required to foster the know-hows of cargo handling, port management and trade activities. Till then, Kantang will keep playing the role of major export base in the Andaman Sea Coast.

6) Potential of Ko Samui Area

Ko Samui Area is linked with Surat Thani Urban Area through coastal shipping connection with Ban Don and Khanom Ports. It is endowed with natural tourism resources including beaches and hills. Tourists, especially foreign tourists are rapidly increasing since scheduled ferry and speedy boat were made available.

However, administrative machinery available in the island, namely amphoe office, is too weak to cope with various problems involved in rapid tourism development such as fragmented expansion of tourism facilities along beach, water supply shortage, garbage problem and practices against community morality. The island does not have strong government arms unlike Phuket where intensive tourism development will be somehow managed.

7) Bottlenecks to Hinterland Development

Many parts of the hinterland suffer from more or less common bottlenecks. First one is that aside from Phuket and Surat Thani, there are few viable intermediate urban centers on the east-west development axis which has interregional importance, whereas along the railway line between Surat Thani and Kantang, a series of intermediate urban centers are found at every 40 kilometers interval on average including Ban Na San, Chawang, Thung Song, Huai Yot, and Trang. The lack of viable intermediate urban centers within the Upper South has been an obstacle to forming the east-west development axis between Phuket and Surat Thani in intraregional context.

Second, resources available in the hinterlands are depleting. The most drastic example is the depletion of forest area. During the period 1973 to 1982, the forest area is estimated to be decreased by 31 percent. The deforested area during this period is equivalent to more than 50 percent of the total deforested area in the South. Timber production ceased to exist in Krabi since 1979. Firewood production ceased to exist in Surat Thani since 1978, in Krabi since 1979 and in Phuket since 1980. Instead, timber and firewood production started rapidly in Phangnga since the late 1970s. But the production will soon decline and stop eventually as was the case in other changwat. Marine fish is also a depleting resource. Fish catch started to increase rapidly since trawl fishing was introduced in the early 1960s but it was stagnant or declining since 1978 when peak production was recorded (See Figure 5.9). There is a regulation on the size of fishnet but it is often disregarded in actual practice. The fish catch in the Upper South will decline soon as was the case elsewhere in the Gulf of Thailand.

Third, social and rural economic services such as medical service, social eduation, drinking water, electricity and telecommunication are still inadequate. Households served with piped water supply system are more or less 10 percent only, those with electricity are about 25 percent except Phuket, those installed with molded bucket for toilet is below 50 percent except for Phuket and most households use traditional energy such as wood and charcoal for their fuel. Rural electrification has been rapid but still 960 villages out of all 1375 villages have no access to electricity in the Upper South as of 1982. Amphoe provided with telephone network are limited to four Amphoe Muang, Thalang, Takua Pa, Chaiya, Phun Phin, Ban Na San and Kantang only. The remaining 30 amphoe have no telephones at all.

8) Strategies for Hinterland Development

Thus, the hinterland of the Upper South is proposed to be developed under the following strategies comprising those specific and common to areas. The area specific strategies are as follow:

(1) To strengthen interactions among coastal areas of Phuket, Phangnga and Krabi to form an integrated Phuket Metropolitan Area. Tourism and coastal shipping play a vital role in this integration. Coastal shipping system, including ferry boat should be developed between Phuket Deep Seaport and other coasal ports, including Krabi and Kantang. In this connection, reinforcement of urban and resource processing functions of Krabi should be stressed because of its access to many parts of the South, including Phuket, Surat Thani, Khanom and Trang as well as to Central Lowland.

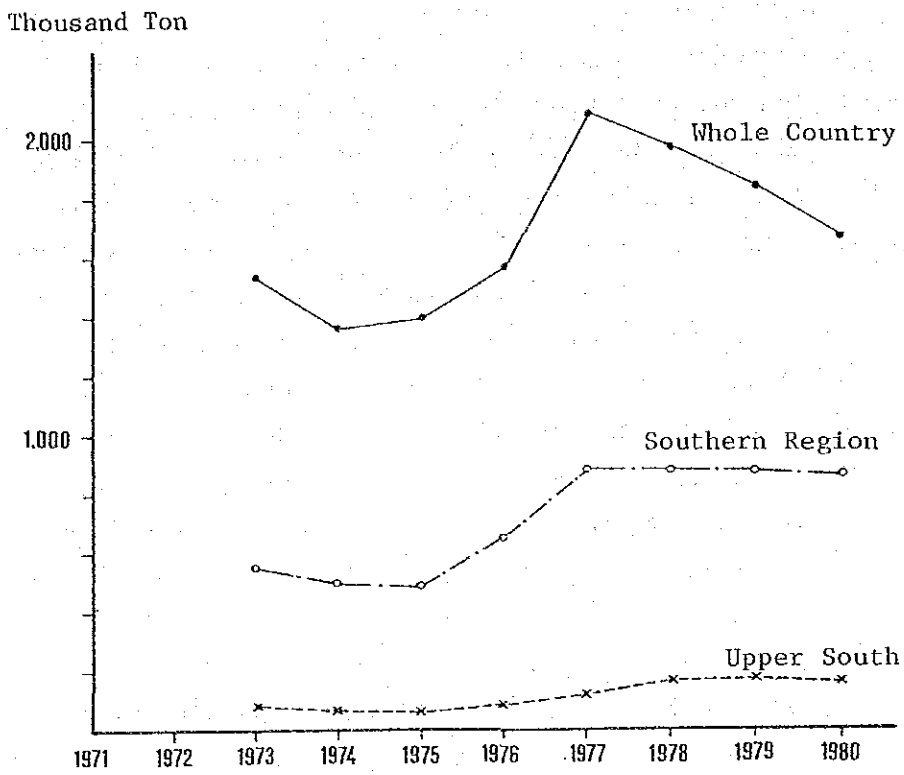


Fig. 5.9 FISH CATCH IN THAILAND

Source: Fisheries Record of Thailand, 1982

(2) To develop Krabi as the energy supply center not only for the Upper South but for the whole South making use of its lignite resource potential, ongoing thermal power expansion program, access to the foreign crude oil and coal, and the location convenient for distributing energy resource to various parts of the South.

(3) To revitalize and rehabilitate economic base of Takua Pa with emphases on the land rehabilitation of tin-excavated areas to control flood and siltation of rivers and the upgrading and diversification of existing technologies such as painting, shipbreaking, shipbuilding and repairing. Expensive river management investment is not recommended to be put in this area partly because it will not meet the Takua Pa economy which is to be maintained or rehabilitated rather than expanded and partly because it is more important at this moment to control landuse and building activities rather than to encourage population and economic activities move into man-made antiflood area which might cause even more serious damage with exceptional floods. The upgrading and diversification of existing technology need to be carried out in close coordination with industrial promotion activity in Phuket because Takua Pa is rather isolated while most of investors of tin mining and related industries have their base in

Phuket. Demonstration and training of metal frame manufacturing, metal working and building/repairing of non-tin-mining boats in Takua Pa is expected to play a role of technological nursery for metal-related industries in the Upper South, Phuket Urban Area, in particular.

(4) To strengthen the management of Tapi and Phum Duang Rivers. The strategy involves early completion of Chiew Larn Dam and implementation of Kaeng Krung Dam for power generation in the first place. Second task is the acceleration of Phum Duang and Kaeng Krung Irrigations after completing ongoing irrigations in Khlong Tha Chang and Khlong Tha Thong. These irrigations and crop intensification will enable Surat Thani to produce the rice sufficient for the whole Upper South. Third task is the flood control at the down stream possibly by developing a by-pass water way at the junction of Phum Duang and Tapi Rivers. Forestation of upstream area is also important under this strategy.

(5) To promote tree crop plantation, oil palm in particualr in the Central Lowland. Oil palm market is promising in both domestic and foreign market. Our landuse study has identified the highest potential area extending over amphoe Khian Sa, Plai Phaya and Phra Saeng where the land suitable for large-scale oil palm plantation is found to amount to about 1000 square kilometers which accounts for 65 percent of the land under low intensity landuse in these amphoe. It is situated at the backland of Amphoe Ao Luk where private oil palm plantations are expanding rapidly because of easy access to the main highway.

The strategies common to many areas of the hinterland are as follows:

(1) To foster selected viable centers as intermediate centers of goods distribution, resource processing and social services. They include Krabi, Kantang, Takua Pa, Phangnga, Wiang Sa, Chaiya, Phanom and Ao Luk. While fundamental role of these centers are as described above, each center will have specialization based on its own resource and locational advantages; Krabi will be specialized into transportation and trade activities in relation to Phuket, industries to support energy production, agro-based industries and industries to support mining activities such as fluorite and gypsum; Kantang into processing of fish as well as rubber and timer; Takua Pa into metal working and some engineering industries in technological and financial relations with Phuket; Phangnga into fish and agro-based industries; Wiang Sa into industries to support gypsum mining and transportation and fruit processing; Chaiya into traditional handicrafts and culture-based tourism; Phanom into agro-industries and agricultural research; and Ao Luk into industries to support fish farming and oil palm

processing.

(2) To intensify agricultural production in existing cultivated area through replanting of rubber, irrigating rice fields, increasing quality competitiveness of the tree crops and promoting multiple use of land, particularly the coconut land for bee-culture, pasture raising, production of mushroom, cacao and pepper.

(3) To accelerate development and improve maintenance of terminal infrastructures such as small-scale irrigations, reservoirs, ground watersupply, rural roads, rural electricity, telecommunications and community facilities such as clinics and social education facilities.

5.3 SECTOR STRATEGIES

5.3.1 Primary Resource Development

Basic resource advantages of the Upper South are land and water. Coexistance of vast underutilized land with abundant rainfall and large rivers can hardly be found elsewhere in Thailand. On this ground, the Upper South produces a variety of tropical crops, including rubber, oil palm, coconut, coffee, cashewnuts, sataw, rambutan, lancet, etc. The Upper South is endowed with mineral resources also, including tin, lignite, gypsum, tantalite and other rare metal resources. Unlike Eastern Seaboard which has limited elements to generate substantial benefits during a gestation period of heavy new investments, the Upper South must make use of its resources to bridge present underdevelopment and the new industrial/international-based development. In fact, the Upper South is estimated to have been contributing more or less 10 percent of the national currency earnings through its export of tin, rubber and fish alone.

For the landuse and land development, we propose a landuse guideline based on the analysis of a landuse capability matrix. Broadly speaking, 40 percent of the land needs to be conserved, reforestated or rehabilitated, while the remaining 60 percent can be used for promoting tree crop plantation, irrigation and crop intensification as well as for reserving space to be used in future. Under this guideline, two actions are proposed specifically; Takua Pa Tin Mining Area Rehabilitation being a crucial land rehabilitation project and Central Lowland Development being a massive oil palm development program.

For the water resource development, different strategies are necessary for two distinct areas; Tapi-Phum Duang River Basin and the remaining part of the Upper South. In the Tapi-Phum Duang River Basin, river water demand, of which about 90 percent will be consumed by proposed irrigation projects, is no more than 30 percent of the total usable volume of water in the year 2000, but water demand will then reach about 60 percent of the total usable volume of water without irrigation in the rest of the Upper South. Thus, in the Tapi-Phum Duang River Basin, the important strategy is to promote multiple use and control of the rivers particularly with the Chiw Larn and Kaeng Krung Dams which have been ongoing or planned for power generation purpose. In the rest of the basin, the important strategy is to ensure water supply especially to Phuket which is now in pressing need of water and rural settlements in the Central Lowland. In addition, water management of Takua Pa River Basin is proposed in coordination with Takua Pa Tin Mining Area Rehabilitation Project.

For the agricultural development, it is stressed to change the current pattern of resource exploiting production into a pattern which is more ecologically balanced and stable. Important strategies include:

1) Acceleration in the rubber production through yield increase and the oil palm production through both planned expansion of land and yield increase;

2) Diversification of crop and multiple use of farm lands, rubber and coconut planted lands in particular, for maintaining soil in good condition and stabilizing income of small farmers;

3) Achievement of rice self-sufficiency by expanding the irrigation capable of dry season cultivation;

4) Development and accumulation of tropical agricultural technologies and resources, seeds in particular. Surat Thani Horticulture Research Center is recommended to be reinforced and expanded, in this regard; and

5) Establishment of a network for agro-products distribution and processing with agro-products centers in selected intermediate urban centers.

For the fishery development, two strategies are recommended:

1) To maintain and increase marine fish resources of the adjacent sea by designating it only for the use of the small-scale fishing and fish culture, in which the Upper South is

endowed with a few potential sea at both sides of the Gulf of Thailand and the Andaman Sea.

2) To contribute to maintaining the domestic fish supply capacity by promoting deepsea fishing and improving the local system of fish preservation and processing.

Under these strategies the following actions are of particular importance:

1) Designation of aquaculture zones in Ban Don Bay, Phangnga Bay and Kantang Bay, improvement and diffusion of aquaculture technologies and expansion of hatcheries for seed production;

2) Study, experiment and development of artificial reef with a research center in Phuket; and

3) Fish Port and processing base development at Tha Thong, Kantang and Phuket.

5.3.2 Industrial Development

Toward the year 2000, a limit in agricultural expansion in terms of both land and yield vis-a-vis the need to create 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 are 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, food stuff, wood and minerals;

2) Import substitution industries of basic and 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 many

electric appliances and parts, and other miscellaneous assembly goods such as footwears, 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 disadvantages of agglomeration will appear sooner or later in the form of 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 and 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 resource-based industries, the Upper South is endowed with a variety of agricultural and mineral resources. 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 markets of the western-situated and surrounding countries, the accumulation 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 investiments.

Having these advantages 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 related 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 in 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 1980 to 2000, being nearly the same proportion attained at the national level at present.

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. 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.

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 organization proposed is the Industrial Development Corporation (IDC) to be organized jointly by private and public at subregional or regional level. It should be stressed the 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 (IEAT). The IFCT might as well take part in such local organization.

Third is the Industrial Promotion Zone of Board of Investments (BOI) 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.

5.3.3 Tourism Development

Tourism is a growing industry in Thailand. The country has been attracting tourists increasingly from the surrounding countries in addition to those from European countries to which Thailand has better access than other parts of the Southeast Asia. Domestic tourists have also been increasing in response to urbanization. The Upper South has been attracting 8.1 percent of foreign and 6.8 percent of domestic tourists against the national total tourists generation mainly for its coastal tourism resources and air transport access to three major tourism markets of Bangkok, Kuala Lumpur and Singapore. The relative magnitude of the Upper South in the Thai tourism will be greater as the tourists from the surrounding countries will increase.

Number of tourists, in terms of hotel guests, to the Upper South is expected to increase at an annual rate of 8.7 percent to reach 1.8 million persons per year in the year 2000, comprising 0.4 million foreign and 1.4 million domestic tourists. In consequence, the tourists expenditure in the Upper South will amount to 3.1 billion baht or six percent of the service sector GDP in the year 2000.

The Upper South is endowed with a variety of existing and potential tourism resources, including the beaches coexisting with good urban amenity in Phuket, superb coastal views of Phangnga and Krabi with possibly better access from Phuket, the beaches of Ko Samui being a resort of long-term potential in the eastern coast and other inland tourism resources such as historical and cultural assets in Chaiya and Wiang Sa, and Chiew Larm Dam as a man-made tourism destination in the natural environment. There are, however, several problems in making use of these resources. First, the resources are scattered in a considerably wide area without good transport to connect them each other. This is compounded with the second problem of monsoon which causes seasonal fluctuation of tourism demand. The hotel occupancy rate fluctuates between 25 percent during off-season and some 70 percent during on-season in Phuket. Third, urban services and utilities are still poor to satisfy tourists and increase the capacity of tourist spots to accommodate more tourists. Water supply is a crucial issue in Phuket. Fourth, the lack of a definite system of administrative responsibilities and the shortage of budget for tourism development are serious constraint to coordinate private and public investments and harmonize environmental

control and tourism promotion. Another related problem is the lack of some major capitals to enable top class accommodations to be established as a trigger for development in both Phuket and Surat Thani.

Tourism development in the Upper South needs to address itself to (1) attracting as many tourists as possible in the expected tourism market, (2) maintaining the high quality of resort spots by controlling the pattern of tourism investments to meet with a capacity of tourism resources and (3) making tourism sector contribute to regional development by enhancing the region's reputation for industrial and other investors and creating a part of the demand necessary to support various infrastructure development.

These tasks are to be accomplished in a phased manner; (1) the formation of major tourism centers, i.e., Phuket and Surat Thani, to be followed by integration of peripheral tourism spots in the major centers, (2) the development for the "resort-oriented tourists" to be followed by that for the "city-oriented tourists in response to the changing segmentation in the future tourism market and (3) the investment in consideration of the interactions between tourism development and progress in other sectors, transportation and urban development in particular.

A balance between tourism promotion and environmental control is particulary important in Phuket. We propose to identify the beaches to be developed intensively, those to be developed to a limited extent and those to be preserved. It will be possible for Phuket to accommodate the 764,000 hotel guests expected in the year 2000 by limiting an average room-beach ratio of 140 rooms per kilometer within the two-thirds of the total beach, the ratio being a little lower than the one in the Patong Beach at present.

To this end, it is needed to authorize and enforce the criteria and standards for buildings at beach areas and the beach zoning system, which is to be linked with a package of the tax incentive and the private-public cost sharing in infrastructure and utility development.

Despite that Tourism Authority of Tailand (TAT) is the only public body to plan and implement tourism development, its financial capability is so limited that it cannot execute projects on a certain scale on top of the administrative and study works as carried out at present. For the sake of ensuring effective implementation within a limited budget, it is recommended for TAT (1) to prepare a long-term tourism development program to identify the special development zones like BOI's Industrial Promotion

Zone, the investment framework in such zones and the tax and other incentives for the zones, and (2) to work out a complehensive and clear division of works among central government agencies, local governments and the private sector.

5.3.4 Urban and Human Settlement Development

During the past two decades, population concentrated itself on Bangkok Metropolitan Area (BMA) rapidly, while horizontal expansion of lands contributed to retaining population in rural area. As the industrial sector will gain an increased importance in the national economy, however, urban population will keep growing at a higher rate than rural population not only in BMA but in other regional cities. According to our projection, the urban population will increase from 7.6 to 18.8 percent of the national population during the period 1980 to 2000, while the share of BMA in the total urban population will decline from 61 to 54 percent during the same period.

It is a new trend, in fact, that several regional cities have been growing steadily. The timely government policy input to accelerate this trend will be a key to attaining a more desirable pattern of population distribution.

In the South, location and hierarchy of urban centers have strongly been determined by evolving transport network. In view of the forthcoming internationalization and industrialization the cities with both the entrance to sea communication and the inland access to various parts including their hinterlands will have particularly large growth opportunities; Phuket, Krabi and Kantang facing the Andaman Sea, and Surat Thani and Songkhla facing the Gulf of Thailand. So far, Songkhla/Hat Yai experienced an outstandingly rapid growth based on the agricultural development in its large hinterland, the intensified economic interactions with Malaysia and the accumulation of regional administrative functions.

With the introduction of the East-West Link to connect Phuket as the international entrance as the Andaman Sea Coast with Bangkok via Surat Thani being the gateway to the South, "a three growth pole structure" centering on Songkhla/Hat Yai, Phuket and Surat Thani is strategically proposed to be formed in order to integrate the regional socio-economy of the South. Within this structure, each subregion and local socio-economic unit at lower level will be organized so that their physical, manpower and economic resources do not directly drain out in a piecemeal manner as experienced so far. Integration of urban functions and the activities in their hinterlands is the key issue to foster what we call "regionalism"; self-sustained economic base, regional identity and administrative autonomy.

The strategies for urban development are three folds. First, a new hierarchical system of urban centers should be formed in response to accelerated hinterland development as well as externally induced industrial development around major urban centers. Surat Thani and Phuket will be subregional centers with population of approximately 167,000 and 146,000 respectively in the year 2000. Krabi and Takua Pa will be the major economic and social service centers next to Phuket and Surat Tani. Under these major centers, eight intermediate centers of Khok Kloi, Ao Luk, Chaiya, Don Sak, Ban Na San, Wiang Sa, Phanom and Ko Samui are proposed to be fostered based on their respective industrial seeds and the access to their hinterland resources.

Second, as a point of interlocking interregional/national and intraregional activities, regional functions of Surat Thani-Phun Phin and Phuket Urban Areas should be strengthened. Phuket and Surat Thani are strategic cities. In Phuket as an international city, improvement of international airport and developments of international trading port and its supporting facilities such as cargo terminal and warehouses, and possibly some kinds of free zone should be carried out with high priority. On the other hand, in Surat Thani as a distribution and industrial city, industrial estate, and coastal port in the short run, and deep sea port in the long run, and goods distribution center such as truck terminal are recommended to be developed.

Third, physical capacity of urban area should be increased in Surat Thani-Phun Phin and Phuket. Housing is important in this regard. These two urban areas will need additional 55,000 units during the period 1980 to 2000 and public intervention in housing supply will be viable means to guide urban area expansion. These issues will involve various institutional rearrangement, including introduction of appropreate system for land management and housing supply.

Development of Phuket and Surat Thani will require an urban area being four times as large as the existing urbanized area in respective cities. In order to accommodate national/regional infrastructures on top of various functions and facilities in the cities, urban structure planning is recommended to incorporate the following key elements:

1) Functional network system to interconnect various nodes and centers of the cities, including ports, highway junctions, proposed railway, distribution facilities, central business districts and higher educational facilities.

2) Flexible structure to ensure an orderly expansion of urban area in future on the basis of "ladder pattern" in Surat Thani and "ring and ladder pattern" in Phuket.

3) New subcenters to accommodate future spatial demand and avoid disordered congestion in the existing central districts.

4) Environmental improvement through providing or preserving adequate open space, riverside green, buffer zones in industrial location, recreational facilities and historical/traditional assets.

5) Industrial zones/areas to be designated as distinct from other urban areas from the viewpoint of industrial efficiency and urban environment/amenity.

6) Housing complexes to be developed by public authorities in collaboration with private sector as a guide for urban expansion and subcenter development.

For these urban structure planning to be implemented, the following points are recommended:

1) Strengthening of local government financial base through local taxation improvement and a new urban development fund to be created.

2) Designation of Surat Thani and Phuket, as special development cities favored with special adjustment of central budget allocation.

3) Establishment and enforcement of the urban planning and zoning system for effective land development control.

4) Examination of a possibility to set up "Regional Urban Development Authority" in an attempt to mobilize private capital and facilitate flexible project development.

5) Organizing of joint planning and implementation body by local agencies for specific purposes.

6) Establishment of a monitoring system for urban development.

7) Institutional arrangement for developing, maintaining and operating water supply system between Provincial Waterworks Authority(PWA), local governments and other agencies concerned.

5.3.5 Transportation Development

Transportation system of the South has been developed in the order of sea transport, railway, road and air transport. Sea transport was the only available transportation means to connect the South with Bangkok and outside world by 1922 when the Southern Railway Line was connected with the Federal Malay State Railway System. The Southern Line had development influence on such inland cities as Phun Phin, Tung Song, Phatthalung and Hat Yai. Railway monopolized inland transportation until the mid 1960s when highway development was encouraged to be pursued. Through the road development during the past two decades, the areas which used to be unaccessible were turned into farm land, and human settlements have been developed along the road. Road development was very useful to promote the regional development by enlarging the area for economic activities as well as providing flexible transportation means to carry products to market.

In the course of transportation development in the past, intermodal relationship of the South was drastically changed; roles and functions which were previously performed by sea and rail transport were gradually taken over by road transport. At present, 70 percent of cargoes from the South to Bangkok are carried by road, 25 percent by railway and five percent by sea transport, while, for the opposite direction, 50 percent by road, 30 percent by railway and 20 percent by sea transport. Broadly speaking, sea transport is used only for carrying oil and fuel from Bangkok to the South. Taking into account the distance of 600 to 1,000 kilometers between the South and Bangkok, available means of transportation should be well coordinated in such a way to make best use of their respective advantages; road transport has great advantages in rather short distance transportation mainly due to its flexibility in terms of lot size and timing, and railway and sea transport have superiority in long haul and bulk transportation particularly in terms of cost saving.

The Upper South is proposed to be developed in conjunction with the country's development strategies toward internationalization, seaboard industrial development and decentralization of Bangkok, based on the locational as well as resource advantages at the subregion. Transportation development at the earliest possible stage will greatly contribute to achieving these goals while expanded economic bases will produce grounds for further transportation development. Transportation demand of the Upper South in the year 2000 is estimated to increase by 3.4 times for cargo transportation and by 2.4 times for passenger transportation during the period 1980 to 2000; annual cargo transportation demand will increase from 4.7 million tons to 16.2 million tons and annual passenger transportation demand from 37.8 million trips to

92.1 million trips. Accelerated transportation development will tend to increase the future demand through inducement effect, and decelerated transportation development vice versa.

In view of the overall development strategy of the Upper South, inter modal coordination and expected future transportation demand, transportation development of the Upper South will be promoted based on the following strategies:

(1) To make best use of Phuket Deep Seaport toward internationalization by promoting international trade between the country and the western situated countries. Good inland access to the port is an essential condition for this purpose not only from immediate hinterland within the South but also from Bangkok.

(2) To establish East-West Link connecting Phuket with Surat Thani for linking the Phuket and Andaman Coastal economy more closely with the mainstay of the national economy in Bangkok, and unifying economies of the Upper South at western and eastern sides. Development of East-West Link will accord with the strategy mentioned in (1) above. On top of highway development, railway extension to Phuket could be an alternative development, particularly from the viewpoint of linking Phuket with Bangkok.

(3) To develop an international deep seaport in South Khanom area toward internationalization and industrialization. Khanom Deep Seaport is expected to support the economic development of the Upper South through the retrenchment of inland transportation cost for exporting natural resources and related products, and through providing an excellent site for seaboard industrial development along the coast of the Gulf of Thailand.

(4) To develop highway link between Krabi and Surat Thani for vitalizing Krabi economy and supporting the agricultural development of the Central Lowland inbetween.

(5) To develop a ferry link between Phuket and Krabi for lessening the locational constraints of the Phuket Island and for promoting socio-economic relationship between Phuket and Krabi/the Lower South. Krabi will become an important transportational node on the west coast.

(6) To develop coastal shipping network between Phuket Deep Seaport and Krabi/Kantang Ports for ensuring easy access to international market from Krabi and Kantang. Channel dredging to Krabi and Kantang Ports becomes necessary to accommodate

vessels of 600 to 1,000 dead weight tons.

(7) To improve Phuket International Airport for promoting tourism and supporting Phuket Airport Industrial Estate to be located at the north boundary of the airport.

Of the above-mentioned strategies, East-West Link and Khanom Deep Seaport are considered most strategic to the development of the Upper South in terms of development effects and investment amount required.

Roles and functions required for the development of East-West Link can be articulated as follows:

(1) To improve and develop the transportation network in the hinterland of Phuket Deep Seaport, especially from the viewpoint of heavy vehicle traffic, so as to retrench the inland transportation cost to the Port;

(2) To provide better and efficient transportation network between Surat Thani and Phuket for attaining interactive economic development of the two growth poles and the area inbetween;

(3) To facilitate cargo transportation from Bangkok and other regions to Phuket Deep Seaport which is an alternate gateway to the western situated countries to Bangkok/Laem Chabang Ports;

(4) To provide energy saving transportation means between Bangkok and provinces on the Andaman Sea Coast to cope with the increasing transportation demand in terms of both cargo and passenger; and

(5) To provide additional traffic capacity to the existing and programed transportation network between Surat Thani and Phuket to cope with the future increase of transportation demand.

In view of the comparative advantages of road and railway transport, road transport has its advantages in (1), (2) and (5) above, while railway does in (3) and (4) above.

It is recommended, however, that the development of road link should precede the development of rail link. Road link can accommodate a variety of transportation demand from short to long distance trips. Rail link will play an important role when long haul and bulk transportation demand reaches to a substantial volume. Railway

system of the Southern Line needs further improvement to support East-West Link.

The functions required for Khanom Deep Seaport are enumerated as follows :

(1) To retrench relay transportation cost of primary products of the subregion to Bangkok (650 kilometers) and Songkhla (300 kilometers) for realizing more competitive prices in the international market;

(2) To facilitate the export of manufactured products from inland industrial estates without recourse to transshipment to Bangkok/Songkhla, thus enhancing the possibility of relocating and attracting industries from Bangkok to the Upper South; and

(3) To prepare the space for integrated development of port facilities and industrial sites for large-scale industrial growth in the long run.

On the east coast, Songkhla Deep Seaport is scheduled to be completed by the end of the Fifth Five-Year Plan period. This port is expected to further promote the regional development of Hat Yai/Songkhla Area as well as to retrench inland transportation cost of primary exporting products. Though Songkhla Deep Seaport will contribute to saving inland transportation cost of primary exporting products of Surat Thani Area to some extent, the Port will have little effect on regional development of Surat Thani. For the development of the subregion, it is vital to construct an international port. The distance of 300 kilometers observed between major ports on the Malay Peninsula can provide an important rationale for establishing another international port.

Necessary conditions for the deep seaport are enumerated as follows:

(1) To be able to accommodate ocean going vessels of at least 15,000 dead weight tons, taking account of the vessel size operated between Singapore and Bangkok;

(2) To keep the necessary deviation from international shipping route to the minimum and to ensure the easy maneuverability of ocean going vessels;

(3) To keep easy the construction and maintenance work including water channel from the viewpoint of investment cost and construction technology;

(4) To have enough space adjacent to the port area for the integrated development of

port and industry in the long run; and

(5) To minimize the environmental destruction which is expected to be caused by Port construction, channel dredging and vessel operations.

In view of the above conditions, South Khanom is the best location for developing a new deep seaport.

It will be very necessary to coordinate the development schedule of Khanom Deep Seaport with that of Songkhla Deep Seaport. From the viewpoint of developing a balanced port network system and the pressing need for eastern side of the Upper South to have a fully usable port, it will be better to start the first stage construction of this port than to proceed to the consecutive expansion of Songkhla Deep Seaport, after the completion of the first stage construction of the latter port.

5.3.6 Energy Development

The availability and cost of energy has increasingly been a major constraint to economic development of oil-importing countries, including Thailand which imports the oil, both crude and products, to meet 75 percent of its energy consumption. Although the world oil market appears to be glut at this moment, it admits of no doubt that the finite fossile energy resources will increase their value again towards the end of the 1980s and beyond.

In spite of its heavy dependence on the imported oil which absorbs 38 percent of the national commodity export, it will be inevitable that Thailand will consume more and more energy for industrialization. Thailand is endowed with domestic energy potential, too, with off- shore natural gas, hydropower and lignite. Meanwhile, traditional energy sources such as firewood and charcoal have been contributing about 20 percent of the total national energy consumption. However, depleting forest resources have been urging a fast transition from traditional to commercial energy. It is thus a pressing need to establish a national framework for energy import/production, transformation and logistics coupled with effective pricing policies to control energy demand, supply-mix and regional demand-supply balance.

In line with these national perspectives, resource and geographical advantages of the Upper South are expected to be made use of in the energy development not only for itself but for the whole South and in turn, for the country. While the South is a relatively isolated energy consumption market in Thailand, the most of its internal

energy resources are concentrated in the Upper South, including hydropower potential of Tapi-Phun Duang River, lignite potential in Krabi and potential direct access to the offshore natural gas in the Gulf of Thailand on eastern side and to the crude oil from the Middle East on the western side.

The energy consumption in the Upper South is still marginal. It shares 2.8 percent of petroleum products, 2.5 percent of traditional energy and 1.5 percent of electricity in the total national consumption. Energy consumption per gross regional products is also considerably smaller than the national average. The magnitude of its energy demand in future will, however, be enormous in view of the proposed regional development involving fast industrial and urban growth as well as accelerated expansion and intensification of agricultural landuse. Petroleum demand is estimated to increase by 3.5 times and electricity demand by nine times during the period 1980 to 2000.

Accordingly, a net additional capacity requirement of electric power generation is estimated at 821 megawatts for the whole South in the year 2000. This requirement will adequately be met by the latest power development plan of EGAT (January, 1984).

In attaining this capacity increase, priority should be given to the maximum utilization of power resource endowments in the Upper South including lignite reserves and hydro-potentials. With the EGAT plan, the Upper South will hold over 90 percent of the total installed power generating capacity of the South with a result that it will be the power center of the South. In line with this direction, a project of imported coal center will be called for in the Upper South in order to satisfy the EGAT plan by introducing imported coal of 800,000 tons per annum on top of fully utilizing the potential lignite.

Another priority action is to improve quality of existing power supply service especially for industrial and urban development. Further acceleration is recommended in the Power Distribution Reinforcement Project Third Stage by PEA.

Regarding the petroleum product supply, the key issue is that the products are brought from a single remote supply center in Bangkok to various scattered consumption centers in the South. A loss from this inefficient system involving the double trip incurred in crude oil procurement and product replenishment practice is reflected in the fact that the product prices in the South are higher than those in Bangkok by 0.4 baht per litter on average.

In view of increasing demand for petroleum products toward the year 2000, the South will offer a petroleum market large enough to afford a refinery with its possible capacity of 60,000 barrels per day. This capacity will meet more or less 60 percent of the petroleum import requirement of 97,000 to 115,000 barrels per day expected in the year 2000 on the assumption that natural gas supply would reach a maximum possible extent of 1,200 to 1,660 million standard cubic feet per day (MMSCFD) and that the proposed programs of existing refinery's expansion and debottlenecking is completed on schedule. Benefits from this refinery is the less expensive petroleum products in the South and the diversified petroleum supply centers in the nation. In addition, this refinery holds advantage of easing the problem of expensive petroleum products import.

Location of the refinery is proposed at Krabi for its easy access to both the Middle East and the various parts in the South. Easy access of the proposed site to deep sea area will alow direct entrance of the tanker which is more than twice as large as the one used in the refineries in Sri Racha.

Traditional energy will increasingly be replaced by commercial energy, LPG in particular, since the sustainable yield of woods in fuel purpose is limited to 612,000 cubic meters per annum and firewood or charcoal are already as expensive as LPG in terms of per unit caloric prices. LPG Depot Project of Petroleum Authority of Thailand (PTT) in Surat Thani has increasing importance in this regard.

As for natural gas, it is most probable that the gas will start to be exhausted after realizing the peak production of 1,000 to 1,200 MMSCFD in the late 1990s. With this limited availability in view, we adopt the idea that the natural gas should be utilized in Eastern Seaboard for pushing forward on its implementation and bringing up economic returns of the existing 425 kilometer long pipeline. Should the natural gas supply exceed 1,100 MMSCFD, however, the Upper South would have a chance to utilize it for power generation.

5.4 PHASED DEVELOPMENT AND PROJECTS

5.4.1 Phased Development

The strategies above are proposed to be implemented in a phased manner in correpondence to changing roles of the Upper South subregion in meeting the national challenges of internationalization, industrialization and decentralization. Figure 5.10 describes such phased strategies, in short, medium and long terms although short and

medium strategies will overlap and so are medium and long strategies.

Short-term strategies to be pursued during the period of Fifth Five- Year Plans are:

(1) To encourage current resource export and tourism activities;

(2) To expand current resource processing and related economic activities, including distribution activities, and cumulate local capital and industrial services for further industrialization; and

(3) To reinforce the local base for inducing external investments by removing existing infrastructure bottlenecks, expanding the capacity of local resource supply, rehabilitating crucial environmental destruction and strengthening local institutional/managerial capacities.

Medium-term strategies to be pursued during the period of Sixth five- Year Plan are:

(1) To accelerate and diversify industrial development in Surat Thani based on the southern regional market and in Phuket based on the accessible export market;

(2) To develop new infrastructures strategic to the nation-wide spatial restructuring as well as regional industrialization.

Long-term strategies to be pursued during the period of Seventh Five-Year Plan and beyond are:

(1) To strengthen and diversify international functions in Phuket;

(2) To expand interregional industrial linkage, between Surat Thani and Eastern Seaboard in particular, in response to the potential nation-wide expansion of coastal industrial activities; and

(3) To integrate Phuket and Surat Thani economies and strengthen regional urban functions thereby forming a unified subregion as one of those receiving the activities and population decentralized from Bangkok.

These phased strategies have been identified under the short and medium perspective toward the end of Sixth Five-Year Plan, the long perspective toward the year 2000 and the perspective into the period beyond the year 2000. (See Table 5.2)

Fig. 5.10 PHASED STRATEGIES FOR UPPER SOUTH DEVELOPMENT

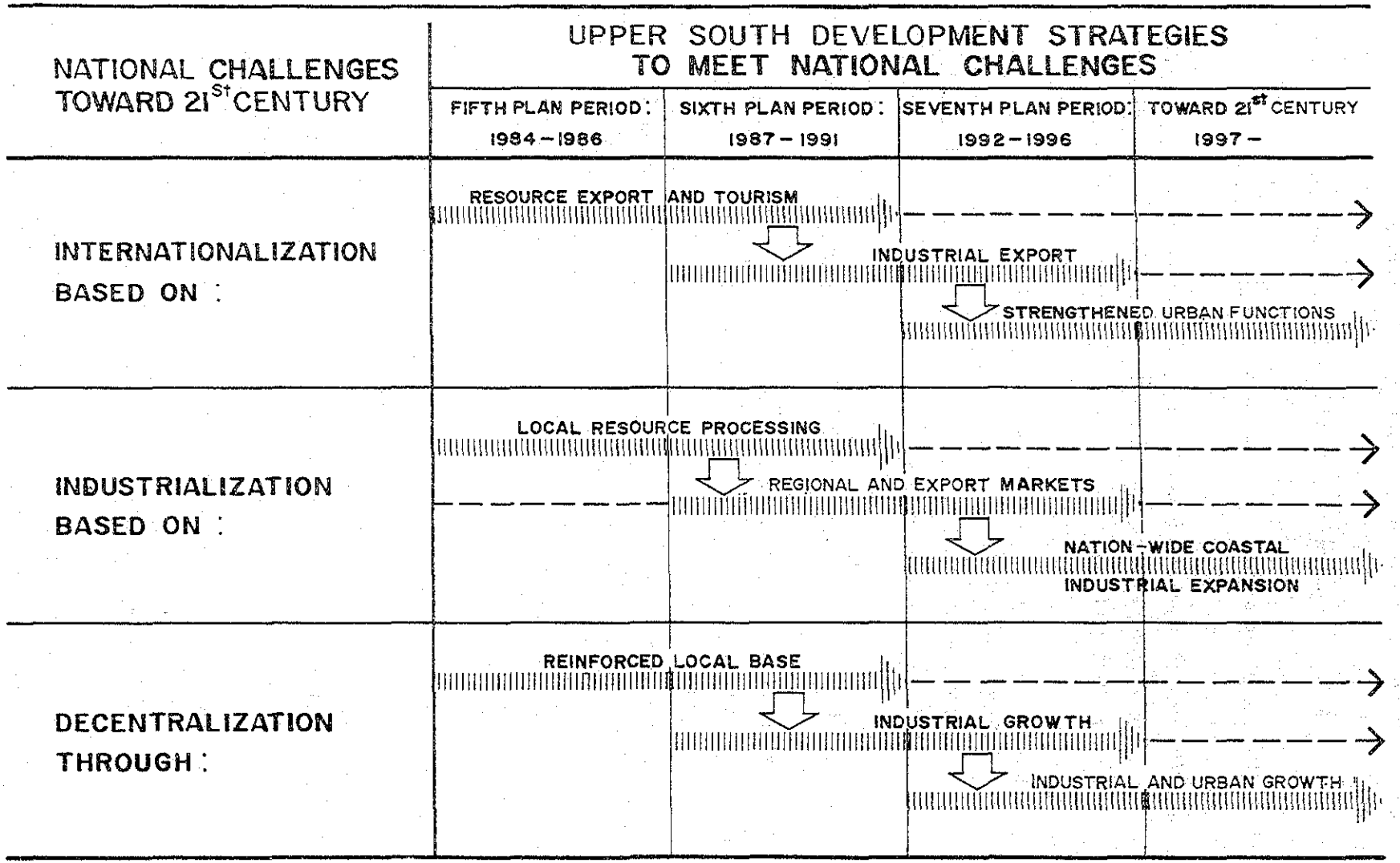


Table 5.2 FUTURE PERSPECTIVES INTO NATIONAL ECONOMY, NATIONAL SPACE AND UPPER SOUTH

	1984-1991	1992-2000	2000-
NATIONAL ECONOMY			
Industrial structure	Transition from agricultural to industrial-based economy	Rapid industrial expansion	Diversification/integration of industrial and service activities
Trade structure	Export of agricultural and light industrial commodities Import of capital goods	Export expansion and import substitution within changing international division of work in manufacturing industries Agricultural export maintained	Expansion and diversification of industrial exports
Financial situation	Tightening financial situation with many large ongoing projects and low level of tax/GDP ratio		
NATIONAL SPACE			
Seaboard Development	Transition from inland-oriented to seaboard-oriented development	Seaboard development and emergence of Siam Bay Coastal Economic Zone	Full penetration of seaboard development into inland, and integration of seaboard and inland development
Bangkok	Full peak of concentration and increased spill over	Decentralization to Eastern Seaboard and regional urban growth centers	Decentralization to second generation cities and overall urbanization

	1984-1991	1992-2000	2000-
Eastern Seaboard	Establishing industrial base	Full operation of industrial activities with population absorption Expanding linkages with other industrial areas as a center of seaboard industrial network	Continue operation as one of the intensive industrial areas all over the country Taking over some of the major functions of Bangkok such as distribution and other production-oriented services
Transportation Network	Full utilization and improvement of existing systems Establishing basic transport network for seaboard development	Expansion of strategic links and reinforcing major trunk lines for increasing traffic generated by industrialization and urban decentralization	Integration of national network and local network through all modes of transport development of new rapid national transport system
UPPER SOUTH			
Phuket Urban Area	Strengthened function of distribution and processing of export commodities Increasing magnitude as a center of investment activities Further concentration of tourism activities	Introduction of new major industries Substantial upgrading of transport, urban, water and other infrastructures Emergence of Phuket growth pole as the business and distributive center of the Andaman coastal economy Strengthening and diversifying urban functions as the country's western entrance (industrial export, airtransport, transhipment, vessels, etc.)	One of the three poles of the South in business, export/import, technology development and tourism

	1984-1991	1992-2000	2000-
Surat Thani Urban Area	Improved effiency of existing/ growing agricultural/industrial activities Concentration of commodity flows and growing urbanization attracting more and more investments	Introduction of new major industries Substantial upgrading of transport,urban,water and other infrastructures Emergence of Surat Thani growth pole as an industrial/distributive center of Siam Bay coastal development	One of the three poles of the South specialized in industries and distribution functions
East-West Link	Completion of ongoing highway projects to encourage increased production and diversify markets of primary commodities	Formation of strategic link between Phuket and Surat Thani to make Phuket as the country's western entrance and Surat Thani as the major midpoint between Bangkok and the South	Integration of Surat Thani and Phuket economies and emergence of a unified Upper South surrounding the east-west development axis
Hinterlands	Expansion of central lowland development Completion and expansion of major ongoing water resource development Improved social infrastructures	Full peak of central lowland development Strengthened energy base New Water resource development for agriculture/industry Expansion of rural infrastructures, rural technology upgrading and rural industries Emergence of intermediate urban centers	Full integration of hinterland into Surat Thani/Phuket Urban Areas through East-West link

1) Toward the End of Sixth Five-Year Plan Period

During the period 1984 to 1991, the national economy will be in transition from agricultural to industrial. Manufacturing GDP will exceed agricultural GDP in this period. Main part of export will be still agricultural and other primary commodities, but industrial export will increase its magnitude from 20 percent at present to nearly 50 percent most of which will be light industrial products; if present trend will continue. At the same time, import of basic chemical, metallic and machinery goods will increase rapidly until full-scale production will start in the Eastern Seaboard. Under such circumstances financial situation of the country will be tightened by many large ongoing projects including those in Eastern Seaboard Development Program and a long-term process to strengthen tax collection system.

In terms of space, the period 1984 to 1991 will see the transition from inland-oriented to seaboard-oriented development. Industrialization will naturally accelerated the seaboard development, which will be spurred on by Eastern Seaboard Development and opening of deep seaports such as Laem Chabang, Songkhla and Phuket. Meanwhile, Bangkok will be faced with a full peak of concentration with its population of about eight million in the beginning of the 1990s, and the Metropolitan Area will keep spread. Increasing primacy will be inevitable since ongoing programs for decentralization will need at least five years to take effect and the pattern of trade to attract inter-regional goods flows on Bangkok will basically be unchanged. In the Eastern Seaboard, the first industrial growth pole, some key industries such as gas separation, petro-chemicals and soda ash are expected to start operation with rapid infrastructure development. In terms of national transport network, the 1980s will be the period in which the stock cumulated in the past two decades, highways in particular will be fully utilized. In addition, a progress will be made in establishing basic transport network for seaboard development, including deep seaports and related land transport facilities.

Under these national perspectives, the Upper South development will first have to concentrate its effort mainly on improving the efficiency of current activities and completing major ongoing projects. New investments, both public and private, will then be materialized on this basis.

In Phuket Urban Area, key transport facilities including a new deep seaport, the road to connect it with the Primary National Highway Route 4 and existing airport will be developed or improved. Water supply capacity will be enlarged with Bang Wat Dam Reservoir and its distribution system. These ongoing efforts will strengthen the func-

tion of Phuket to collect, process and export the present resource commodities. This function will encourage the funds which were partly accumulated and partly leaked out to be invested in Phuket.

At the same time, these efforts will enlarge the capacity of Phuket to accommodate more tourists and stimulate commercial and service activities. Thus, expanded transportation, industrial and urban activities will demand new inserts for further development such as deep seaport supporting zone, distribution center, bus terminal and urban expansion/improvement. Coastal shipping, including ferry system between Phuket and Krabi, will accelerate center-hinterland interactions between Phuket and the peninsular part of the Andaman Sea Coast.

In Surat Thani Urban Area, the recent improvement of road network will continuously encourage the concentration of commodity flows, and the growth of transport and related industries. More manufacturing and service investments will be attracted subsequently. Dredging of Tha Thong Port and construction of LPG distribution base will make a turning point for Surat Thani Urban Area to be industrialized. Possibility to establish a catering base for offshore natural gas production is another chance to make use of Tha Thong Port. On this basis, actions will be necessary to form a functional linkage between Tha Thong Port, Surat Thani/Phun Phin urban activities and industries in relation to hinterland resources. These will include development of industrial zone and distribution center at a junction of inland transport possibly in Phun Phin, airport improvement and urban expansion/improvement with an emphasis on establishment of outer infrastructure network including roads and development of new urban complex in relation to the Phun Phin Industrial Zone and distribution center.

To stimulate these activities in Phuket and Surat Thani Urban Area is a new short-cut provincial highway between Phanom and Thap Put. It will reduce the time distance of about four hours on the existing main route between Phuket and Surat Thani via Takua Pa down to about three hours on the short-cut route. This new route will pave the way to develop a new east-west link of interregional importance by increasing traffic demand between two urban areas. At the end of this period, a railway between Phuket and Phun Phin will start to be constructed to prepare for a new phase of development.

With the new short-cut road, agricultural production will also be encouraged in the hinterland because market opportunities will be diversified in terms of area. Central Lowland Development will be accelerated with a larger unit size of plantation. Land

management and feeder road construction in the Central Lowland will be critical at this stage for both investors and existing people. In Tapi-Phum Duang River Basin, ongoing/proposed small and medium-scale irrigation will be completed. Completion of Chiew Larn Dam in 1987 will give a great impact not only on electricity supply but also hydrological performance of the river basin and possibly Ban Don Bay. A careful monitoring will be necessary at this stage to take subsequent steps to overall management of the river basin. Meanwhile, Chiew Larn Dam will be followed by the development of Chiew Larn Irrigation and another EGAT proposed dam, Kaeng Krung Dam. In this connection, reforestation will be accelerated. In Krabi, Krabi Lignite Thermal Power Plant will be replaced/expanded.

In parallel with this, transmission lines will be expanded to integrate new electricity supply bases and increasing consumption in Phuket and Surat Thani Urban Areas. In Takua Pa, it is an urgent task in this period to rehabilitate tin excavated area and control the use of coastal area.

In many parts of the hinterland, efforts will be intensified especially in rubber replantation, rubber nursery stock production, fish farming, rural electrification and telephone network expansion as a continuation of ongoing programs and projects. In addition to these, new actions will be launched to continue beyond this period to encourage multiple use of land by coconut land development and livestock expansion, to foster intermediate urban/industrial centers and to improve social services in rural area with an emphasis on rural water supply, social education and medical service.

2) Toward the Year 2000

During the period 1992 to 2000, the national economy will experience further industrial expansion. Manufacturing will take over the role of agricultural sector in giving main support to the national economy. Industrial and trade structure will also be different from those at present because of increasing interdependence between Thailand and the world economy and changing international economic structure. Import substitution of basic intermediate goods will advance rapidly and create diversified industrial linkages within the country based on the expanded domestic consumption demand. The tightening international market in food and other renewable materials will keep level of the agricultural export increase though it will lose its relative share in the total export.

In terms of space, seaboard will be the mainstay of national development and a seaboard economic zone along the coast of the Gulf of Thailand will emerge during

the period 1992 to 2000. Coastal industrial development will take place not only in Eastern Seaboard but Surat Thani, Songkhla and other viable places, and these places will be linked each other by improved coastal shipping and land transport network. Due to saturating land capacity of the most of rural inlands, population will be absorbed increasingly in the seaboard, coastal cities in particular. In parallel with this trend, economic activities and population in Bangkok will start to decentralize to Eastern Seaboard cities with relatively good access to Bangkok and regional urban growth centers.

Eastern Seaboard will be in full operation in terms of industrial activities and attract a part of the population spill over from Bangkok. Eastern Seaboard will play a role of the center of industrial activities along the Gulf of Thailand.

Basic materials produced in the Eastern Seaboard will be distributed to other industrial areas to be processed into either the consumption goods in respective hinterland market or the export goods partly utilizing other inputs to which respective industrial areas have better access. In the meantime, the national arterial transport network will start to be upgraded based on the enlarged public investment capacity in order to streamline the flow of goods between various parts of the country and the world market/resources and to substantially reduce the time distance between Bangkok and other areas.

Under these national perspectives, the Upper South Development will experience drastic changes. Manufacturing output will be as large as agricultural output. Industrial activities will be based not only on local but on external materials. External material based industries will possibly account for more than half of industrial production. The Upper South will be increasingly interdependent with the rest of the country in the international trade and goods movement, and the industrial development.

Phuket Urban Area will be connected directly with Bangkok by railway. Substantial cargoes will be exported and imported from Phuket Deep Seaport and will attract new industrial and business activities. Further upgrading of highway between Phuket and Surat Thani will intensify interactions between these two urban areas. Some industries attracted to Phuket will locate near the Phuket Airport, which will be expanded, so that they will export their products from airport either through Bangkok and Singapore or directly to some nearby countries. For such industries, it will be necessary to designate free processing zone. These activities will make Phuket into the western entrance for the country as well as the business and distribution center of the

Andaman coastal economy. To meet with this, further efforts will be necessary to properly guide urban expansion and strengthen goods distribution function. Specifically, water supply capacity will need to be increased and the central part of Phuket Municipality will have to be redeveloped. These progress will warrant inducement of a nation-wide research and development function which will attract high technology industries, and region/nation-wide medical center for specific deseases.

In Surat Thani Urban Area, the introduction of Phuket - Surat Thani Rail Link together with full operation of Eastern Seaboard will stimulate the rapid industrial growth. An industrial estate established in Phun Phin by then will be added by another industrial estate at Khanom where a new deep seaport will be developed. While industries in Phun Phin will mainly use domestic materials, those in Khanom will partly use foreign imported materials and ship out not only to the South but to the foreign export markets. Surat Thani and Phun Phin will be integrated into one twin city while some open space will be maintained between the two by landuse control. Present horticulture center in Surat Thani is expanded and specialized not only in agricultural but agro-processing and other related technologies.

In the hinterland, Central Lowland Development will be at full peak and produce a large volume of palm oil to be shipped out to Bangkok Region. Part of the palm oil will be exported through Phuket Deep Seaport. In Tapi-Phum Duang River Basin, further irrigation including Kaeng Krung Dam Irrigation will be carried out. Based on the careful hydrological study after the operation of Chiew Larn Dam of Phum Duang River, river control works especially for Tapi River will be undertaken. In Krabi, an expanded lignite thermal power plant will have to be supplemented by additional thermal power plants using imported coal. It is this period that an additional oil refinery will be necessary for the country. The oil refinery will be established possibly in Krabi for fuel consumption demand in the South. In parallel, it will be necessary to increase the stock capacity of oil products in the South. The present capacity of 41 days is anticipated to decline to about 16 days in the beginning of this period. Actions launched for rural hinterland development in the foregoing period will be expanded further especially for strengthening of intermediate urban centers, rural technology upgrading and development of rural industries.

3) Beyond the Year 2000

Beyond the year 2000, Thailand is expected to be an industrialized country. Seaboard development will penetrate into inland development and the whole national space will be integrated into one entity with an upgraded national transport system having