



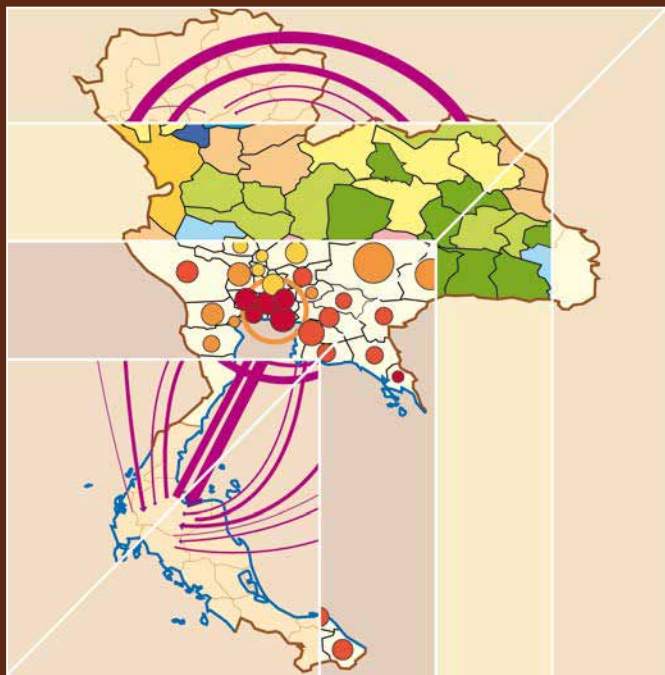
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Asst. Prof. Katawut Waiyasusri

Atlas of Thailand

Spatial structures and development

Under the direction of
Doryane Kermel-Torrès



SILKWORM BOOKS



Atlas of Thailand

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Doryane Kermel-Torrès

Introduction

With this *Atlas of Thailand. Spatial Structures and Development* our intention is to present an image of Thailand which incorporates both the internal dynamics of the country and its integration into globalization. We include a range of spatial information and maps using a variety of computer-assisted techniques. This is the first atlas of its kind to be produced for Thailand although similar ones are already available for other countries on the Indo-Chinese peninsula (Vietnam by Christian Taillard, 1993, Laos by Bounthavy Sisouphanthong and Christian Taillard, 2000). Previously, only a more traditional style of atlas was available, aimed at an academic readership in Thailand (*Thai atlas*, Sawat Senanarong and Nom Ngamnisai, 1986) and another work which, although not given the title "atlas", nevertheless included a rich selection of maps (*Thailand: the environment of modernization*, Sterstein, Larry, 1975).

Our aim is to portray Thailand's spatial structures and to situate the country's social and economic dynamics into a territorial context. The country has undergone many changes throughout its long history as the Kingdom of Siam became the Kingdom of Thailand, and also in the shorter time span of the dynamics generated by the vigorous growth the country has experienced from the middle of the 1980s. We therefore hope that this atlas will bring a new contribution to current views on the analysis of Thailand's spatial configuration.

In producing any atlas a number of choices must be made: choice of scales, choice of levels and periods, choice of topics and data (statistical and qualitative), choice of analysis, data processing and representation methods.

Spatial, temporal and statistical references

In the context of our double objective of analyzing national spatial forms and examining their integration into the world-system, we have considered data at several levels according to the degree of interest they bring to the analysis. External relations are shown at world level, with a change of perspective allowing us to situate Thailand in the context of Eastern Asia. At national level, we have favored an approach based mainly, though not exclusively, on a subdivision into provinces, or into other variously delimited regions. By zooming in, we are able to study the internal dy-

namics of two peripheral regions (the North-East and the South) at the level of a watershed, a province or in the finer mesh of the districts. This process was also adopted for the analysis of some themes in the Bangkok metropolitan region via several spatial perspectives (region, city and some districts).

Maps were prepared on different scales. The main base map, showing international frontiers (islands included) and province boundaries, was created from maps produced by official agencies, the Royal Thai Survey Department (*Administrative Division 1990*) and the National Statistical Office (NSO) (*Phaenhi sadaeng khet amphoe tambon thetsaban lae khomun phunthan khong changwat ph.s. 2538*. [Maps of amphoe, tambon, thetsaban and basic provincial data 1995]). National and provincial contours were simplified to avoid the visual confusion that an accumulation of too many details can create: the procedure consisted of eliminating some points while still respecting the overall shape of the spatial units. This generalization, and the fact that some islets may be absent, must not be interpreted as a statement on Thailand's boundaries: it is justified by our concern to produce a map that is a clear cartographic representation within a set format. The distortion of the contours on some maps was used to highlight certain phenomena and processes.

We decided to present spatial structures as they existed before the Asian crisis that hit Thailand in July 1997. We hoped to understand and describe spatial configurations that are the product both of the country's long history and of the more recent processes of vigorous growth. Combined together, these time scales have shaped the outstanding features of contemporary Thailand: hyper-concentration of population and wealth at the center of the country, regional imbalance. As they diverged, they allowed the emergence of new areas under pressure from a world-system that selects its territories and which is supported by the governing classes and entrepreneurs. Given the time-honored "memory" of the territories - with their different degrees of resistance and evolution - the lapse of time between the 1997 crisis - with the recession of the national economy and its social consequences - and these first years of the 21st century - with movements of recovery - is probably not long enough for the relative positions of the areas to have been modified to any considerable degree. And even had this been the case, it is still too soon to assess the changes in all their complex-

ity and globality, especially given the time needed for the statistical information required in an atlas - homogeneous in time and space - to be generated and analyzed. In due time, the state of knowledge presented in the *Atlas of Thailand* will be a useful reference tool with which to appreciate the spatial effects of those possible upheavals.

Most of the statistical maps show the situation in 1996, or in 1995 (rarely before) if the data were not available, or in 1997 when the nature of the data required it (changes in the standards applied by international agencies for constructing statistics, data from surveys carried out between two dates). Given the approach described earlier, but also the time required to produce an atlas and the time lag in updating statistics by the producer bodies, it was decided that we should maintain, as far as possible, a homogeneity in the dates of observation in order to provide a relevant basis from which to compare maps, i.e. comparing different but complementary phenomena taking place in identical spaces. These constraints also explain the fact that results from the 2000 population and housing census have been used in part (see Methodology appendix). Reference maps show the situation in 2000 (transport and energy networks, investment incentive zones,...) while stating the situation in 1996. Other maps, from the work of other authors, are in variable time frames.

The diachronic approach imposed by the analysis of spatial dynamics required a reasoned choice of reference date according to the theme treated, although still dependent on the availability and comparability over time of the statistics. The years selected, which vary from chapter to chapter, show the spatial evolutions resulting from population dynamics (since 1970 and before for certain phenomena), the role of the state in the construction of the territory (according to important periods and dates in the country's history or politics), changes in land use and agricultural production (1976 and 1978), and in industrial growth and diversification (1986).

The *Atlas of Thailand* exploits a variety of sources, first and foremost of which are statistics from public bodies in Thailand. We have used demographic variables from housing and population censuses; also social and economic data produced by different ministries and public agencies, some published and some not, which we obtained either directly from these bodies or from the National Statistical Office.

This covers information at national level, combining the provinces together in some cases and sometimes keeping them separate, at regional level, from combinations of provinces which varied according to the different bodies, and at district level. Data from international bodies were also incorporated. All this statistical information (the qualitative data also) then underwent critical analysis after statistical and cartographic processing, as a result of which any data not thought sufficiently reliable was rejected. Other data is commented on in the relevant thematic chapters.

Methodology basis

Several types of maps have been produced, using different techniques. Here we mention only the broad outline of the methodology: for a more detailed description, see the Methodology appendix. Reference maps (relief and hydrographical system, transport networks, historical maps) were prepared using computer-assisted mapping techniques. The majority of maps are statistical mapping and were produced by computer processing. These are analytical maps when they show the spatial distribution of one or two variables, structure maps when they define simple spatial groupings, synthesis maps when they combine a large number of variables. Graphs have been added to represent the insertion of Thailand into global markets, national sector evolutions, or to show some regional characteristics for which a map would not be appropriate.

The maps were produced from a variety of different sources. Each one makes a concise reference to the source used, which is expanded in the bibliography. This is organized into three parts: cartographic, statistical, bibliographical. Some reference maps are taken, either in part or in their entirety, often with modifications, from maps prepared by other authors using different techniques (remote sensing, aerial photographs, topographical surveys). As well as the statistical sources already mentioned, we also used bibliographical sources, to produce an inventory, for example. The statistical and bibliographical sources listed at the end of the atlas also refer to the commentaries that accompany each plate and the chapter introductions.

For the English spelling of Thai place names we used the official transcription taken from the *Romanization Guide for Thai Script* (Royal Institute,

Bangkok, 1982). For names that were not included, the transcription used by other authors or specialist bodies was adopted (e.g. Donner, Wolf for the relief; Royal Thai Irrigation Department for the hydro-graphical network and irrigation). "Tai" was reserved for the ethno-linguistic groups. See the comments adjacent to plate 9 Provinces and their centers for the geographical terms used.

The themes

The volume brings together authors who are experts in the different methods and themes covered. It is the fruit of prior collaboration between Thai and French researchers, a sociologist, a remote sensing expert, an urbanist and, for the most part, geographers, so it draws on a broad range of experience in field studies, in analyses and in methods developed during earlier research projects on a variety of themes.

Several themes are covered here, organized into nine chapters. The vitality inherent in the country's opening up to the outside world is shown by its relations with the world-system, its place in the vast area of Eastern Asia and its unique features in comparison with other countries that make up this region. The major outlines of the physical and administrative organization and the main axes and nodes that structure the country lead on to an appreciation of population and productive activities distribution. The population is shown in its ethno-linguistic, religious and demographic dimensions with the accent on localization between rural and urban areas, and spatial mobility. The role of the state in the construction of the territory and its partnership with the private sector are analyzed through a variety of key areas, from the formation of the nation-state to the constitution of infrastructure and networks.

Activities are localized by sector before characterizing agricultural and industrial areas, like-wise the tertiary sector, infrastructure and main axes with the flows of population and merchandise. We concentrate on three regions in our analysis of intra-regional dynamics: the metropolitan region of Bangkok, with flexible delimitation, because of its importance in the constitution of the national territory; the North-East, and the South to illustrate the peripheral regions and to which different authors brought detailed knowledge of the characteristics and dynamics. Social

imbalances are indicated by income, consumption and education levels. The spatial organization of the country, revealed in its complexity by all the maps in the atlas, is presented using two different forms of graphic expression, thus demonstrating territorial structures, their relations one with another and their internal compositions.

The aim of the *Atlas of Thailand* is to offer a reasoned and critical overview of our present knowledge; it does not seek to be an exhaustive study. We decided to avoid a multiplicity of maps, with an even greater quantity of information, which would only have reaffirmed what the thematic selection shows already. We set about uncovering what the dynamics of these last two or three decades have brought about in the way of changes or stability to territories which result from a long history. While the *Atlas* hopes to be a tool for a better knowledge of Thailand, and of the spatial expression of economic and social development strategies, useful for understanding changes and preparing diagnoses for the future, it will also be whatever its readers, teachers or students, planners or entrepreneurs, want it to be. Their critical eye will examine the information it contains but will also seize on what it does not contain, and the reasons for these omissions: apart from the reliability and availability of information, not all data is pertinent for mapping. We have no doubt that this atlas will give rise to discussion, to new questions, themes will need to be broadened and data will have to be updated: it is with the aim of inviting others to continue the analysis of spatial changes that it has been produced. The *Atlas of Thailand* is a beginning and not a conclusion.

Situations of the territory

At the beginning of the 21st century, the Kingdom of Thailand, formerly the Kingdom of Siam until 1939, a constitutional monarchy since 1932, had a population of 60 million inhabitants across an area of 513,000 km². The country began to take on its present shape in the 19th century when the Kingdom accelerated the opening of its economy (commercial treaties with European powers) and ceded some land on the fringes, while still retaining its political sovereignty. Buffer state between the French and British empires, Thailand was the only country in the region to avoid colonization (see plate 20 Changes in boundaries and frontiers (18th-20th century)). The march towards development and growth, the country's strengthened integration in the world then took an unusual route, very different from that of the other South-East Asian countries, from Myanmar to Vietnam, from the Philippines to Malaysia. Between 1950 and 1990, Thailand symbolized stability and peace in a continental South-East Asia that was prey to ethnic wars (Burma became Myanmar in 1989) and wars in the Indo-Chinese peninsula. The country was a bastion of capitalism, and with help from the United States, to whom it was allied in the fight against communism from 1949 to 1975, devoted resources to economic growth and development. The end of the cold war, with a shake-up of the regional environment at the end of the 1980s, offered renewed economic and political perspectives which reinforced Thailand's ambition to play a vital role in continental South-East Asia, if not in the entire South-East Asian region.

Thailand's relations with the world-system occur on several scale levels: the world, or at least an area from Europe and the Middle East to the United States; Eastern Asia, a vast geographical unit with a growing interdependence; South-East Asia, a geographical area to which the expansion of the Association of South-East Nations (ASEAN) from five to ten nation-states has given new relevance, and the Indo-Chinese peninsula, especially bordering countries.

The share of foreign trade in the country's economy, which increased from 50% of the Gross Domestic Product in 1980-1990 to 70% in 1990-1996, indicates the extent of Thailand's integration into globalization, greater than other countries in the region (except Singapore and Malaysia); this increase shows the effects of vigorous industrialization and the country's integration into Asian intra-firm exchanges (**plate 1 Economic relations and integration**). The

integration is also based on investments made by the giants of Eastern Asia in Thailand and by Sino-Thai entrepreneurs in the less developed Asian countries (especially bordering countries) and in China, thanks to an early "normalization" of diplomatic relations (1975) and the reactivation of social links. Travel into and out of Thailand emphasizes the growing role of Eastern Asia, even its pre-eminence, despite the importance of the American and European poles (**plate 2 Foreign and Thai travelers**). Income from international tourism and migrant workers' remittances are so important, especially in coping with the trade balance deficit, that in the 1980s these items were taken into account in the planning process and were the subject of government promotions. Like the other flows, labor migration helped strengthen the interdependence of the countries of Eastern Asia; this mobility also reflects the contrasts in their levels of development; at an intermediate level Thailand is both an importer and an exporter of work force whose migrations are within Asia (**plate 3 International out-migrations and flights**). Lastly, international air traffic shows a domination that extends beyond the neighboring countries, with Bangkok vying with Singapore for the role of South-East Asian passenger traffic hub.

There is such a diversity of social, economic and political (or cultural and ethno-linguistic) situations throughout Eastern Asia that the countries are all at very different stages in development trajectories (**plate 4 Population and human development in Eastern Asia**). Most of the indicators analyzed show Thailand's considerable progress in the social area, others, however, show how much ground is still left to cover; education in particular is a major issue for a country pursued by competition from other Asian countries. With a much higher level of development than its neighbors, Thailand is able to exercise its domination (market penetration, investments, technical aid and assistance) over an area that corresponds more or less to the territories that formerly owed it tribute: Myanmar, Laos, Cambodia and Vietnam also. The transnational economic cooperation zones (especially the Greater Mekong Subregion) offer Thailand further opportunities to strengthen its regional pre-eminence in the peninsula, to which it claims to be the inevitable gateway, especially for services (**plate 5 Eastern Asian regional integration and production**). Thailand was a very early member of international bodies such as the United Nations (1946) and its technical body ESCAP (Economic and Social Commission for Asia and the Pacific, which is based

in Bangkok), the International Monetary Fund and the World Bank (1949), the World Trade Organization (whose general director for a three-year term since 2002 is Thai). It is also a member of the ADB (Asian Development Bank, created in 1966), and was one of the five founder members of ASEAN (1967) and the main instigator of its enlargement to include the countries of Indo-China (Laos, Cambodia, Vietnam) and Myanmar from the middle of the 1990s.

ASEAN is the only regional organization in an Eastern Asia that is developing a high degree of interdependence with no institutional basis. Flexible and with few constraints, this particular form of regionalization is distinct from other regional models; there are no institutional mechanisms to exercise coercion on the member states and the common space can be used as a shield and as a springboard into negotiations with the major external partners.

The 1997 crisis revealed institutional weaknesses, the ambiguity of the founding principles (such as the non-interference in the domestic affairs of member states, which Thailand and the Philippines tried unsuccessfully to raise in 1998) and the very limited success in the area of economic cooperation, given that ASEAN was built on implicitly political objectives. Among the possible initiatives that were discussed to relaunch cooperation, bringing forward the date for the implementation of the ASEAN Free Trade Area (AFTA) is a political signal for the external partners: intra-ASEAN trade represents 24% of the member countries' foreign trade (but only 15 % for Thailand). The difficulty of the project lies in the definition of a regional preference and competition which, generally speaking, handicaps cooperation between member states.

ASEAN is seeking a partnership with North-East Asia which may be upset by Sino-Japanese rivalry. For even if China benefits from a promising potential which may draw in its neighbors, Japan still remains the driving force behind economic activity. It was from here, in the 1980s, that the "flying wild geese" set off, a process to spread industrial growth between Asian countries, organizing a hierarchy of productive systems (the "Dragons" then the "Tigers"), a regional division of labor and the path to upgrading manufacturing activities and trade goods. Intra-Asian trade (raw materials, semi-finished products) today represents a little over 50% of the foreign trade of Eastern Asian countries, with the western developed

countries remaining the principal outlet for finished products.

This exploitation of economic complementarities has used the networks of the Chinese "diaspora" and has taken root in specific locations (some of the transnational cooperation zones commonly called "growth triangles"), with the result that Asia's coastal areas are nodes in the network of metropolitan polarization (**plate 6 Networks in Eastern Asia**). The power wielded by some of these centers is based on links between finance, trade, industry and service activities: added to this, Bangkok also has one of the strongest rates of urban primacy. Recently, land net-works have been reactivated and, as has long been the case with Mekong, borders are opening up thus offering Thailand the possibility of exploiting to the full its central position in continental South-East Asia. While separated from Myanmar by a barrier of mountains, Thailand is for the most part open to Indo-China and this continues far to the south, linking its south peninsula with Malaysia and articulating continental spaces with maritime spaces (**plate 7 Relief and hydrographical system**). Active land clearance has made Thailand one of the countries of South-East Asia that devotes the largest proportion of its territory to agriculture (**plate 8 Environment and natural resources**). An intense exploitation of natural resources, on which economic growth was based, has meant that some of these are now scarce (wood, minerals, including precious stones, produce from the sea), and Thailand has moved on to exploit those of its immediate neighbors. If the administrative division of the country into provinces has little physiographic or historical basis (**plate 9 Provinces and their centers**), the population distribution of their administrative centers serves to highlight the excessive size of the capital onto which converge the major axes of land communication.

CHANGES in ALTITUDES and LANDSCAPES

The Central Plain, to the east of Pathum Thani



Photo Doryane Kermel-Torrès

A vast depression filled with alluvium from the Chao Phraya and its tributaries, this densely populated area is well suited to intensive, diversified agriculture (rice-growing, horticulture, sugar cane). Infrastructure is well developed (roads, irrigation and drainage canals). Its proximity to Bangkok has encouraged industrialization and urbanization, especially along the road axes.

Hills and mountains in the north, towards Chiang Mai



Photo Alain Vergnes

These areas have been fairly recently cleared, to the detriment of the mixed forest. The lowlands are under rice cultivation (glutinous rice during the rainy season) or field crops (groundnut, maize, mungbean, soybean). The systems on the higher lands, occupied by ethnic minorities, have undergone major changes (market economy, development programs).

Towards regional integration driven by trade and investments

The opening up of the Thai economy has not only proved to be a stimulus for economic growth but has also been a consequence of this growth. Exports diversified from the 1970s onwards into more manufactured products, while at the same time the USA market weakened and those of Japan and Western Europe developed. Between 1986 and 1996, there was a 7-fold increase in the value of exports, manufactured products became established, the trade deficit widened and markets became more diversified. The growth in exports slowed in 1996 as a result of competition from other countries and it has since developed at a very uneven rate. Like the other most developed ASEAN countries, Thailand has recently reduced import protection through the ASEAN Free Trade Area (AFTA) agreement.

During the period 1986-1996, trade with North-East Asia developed, though there was a great deficit, with Japan getting far ahead of Taiwan and Hong Kong. The growth of trade with the countries of South-East Asia, which today form ASEAN, was considerable, to the benefit of Thailand, with Singapore and Malaysia heading the group. At practically the same level in terms of value, exchanges with the European Union and with North America have different characteristics: whereas more than 90% of trade with North America involves the USA, and generates a surplus, there is a considerable deficit with the chief European partners, headed by Germany. Although trade with the Middle East has increased (imports of petroleum products), trade with other regions (Russia-Eastern Europe, South Asia) is still on a small scale.

Despite a drop in their relative value, agricultural and fishing exports remain high largely due to their diversity and their integration into the industrial transformation sector. The relative value of exports of manufactured goods has increased considerably: electronic and electrical goods and transport equipment have supplanted textiles and confection. Imports of intermediary products and components have increased, especially from Japan and Taiwan, Hong Kong and Singapore. These countries, in addition to the USA and the European Union, import more and more assembled products, especially in intra-firm exchanges (see chapter 5 Industry).

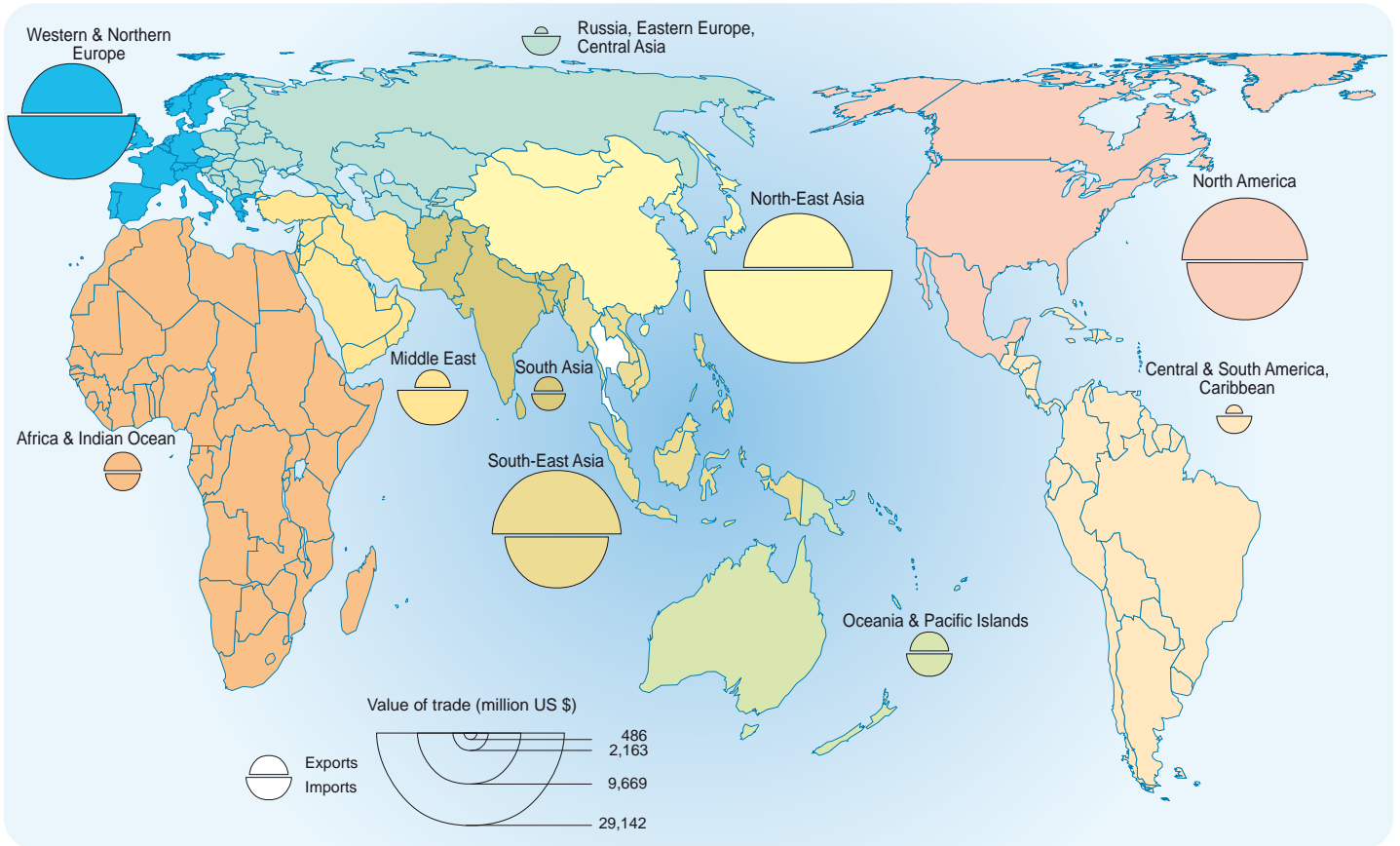
The interdependence of trade and investment has gained in strength. Foreign direct investment played an important part in the rapid expansion of the manufacturing sector from the end of the 1980s.

Investments tripled in 1988, headed by Japan (supplanting the USA) with major contributions from Hong Kong, Taiwan and Singapore. Thailand is seen as an attractive platform for production and exports, as much for reasons of cost as for the political and economic environment that prevails. Countries of the European Union (United Kingdom, Germany, France) have invested much less. Investments focus mainly on the manufacturing industries, and to a lesser extent on real estate or the commercial sector. Although they slowed between 1993 and 1996, they have now taken off once again and are increasingly put to reinvestments in existing enterprises.

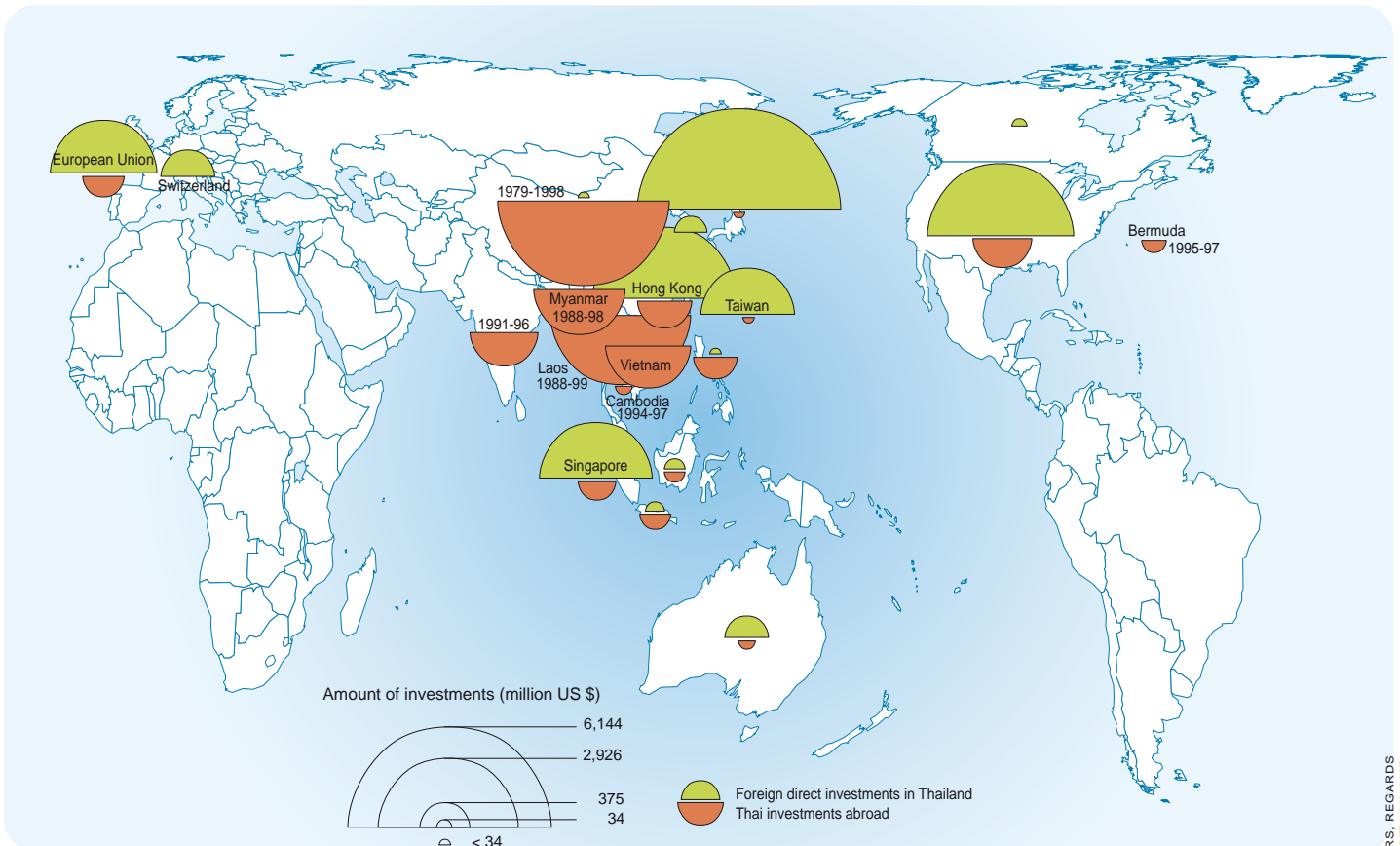
More than 90% of the Thai investments abroad approved by foreign countries are in other Asian countries, above all those which are less developed and which do not invest, or invest very little, in Thailand. Initial investments in 1979 went to China, which received the largest amounts, then extended to other Asian countries. Committed to responding to the needs of the emerging markets (China, Vietnam, India, Myanmar), investments concentrated mainly on the agro-food industry and also on certain consumer goods (electrical products, transport equipment) some of which have been redirected towards the world market (produce from breeding and aquaculture with the Charoen Phokphand group). At the beginning of the 1990s, investments were extended to the service sector (telecommunications in China, India, Indonesia, the Philippines, Indo-China; hotels in the USA and Europe), real estate and the establishment of industrial parks (Myanmar), construction (Philippines).

The trend to localize industrial units in countries that are close geographically and where labor costs are lower accelerated in 1995-1996: this concerns mainly the textiles and confection industries in Vietnam, Cambodia and Laos which offer advantageous trade agreements with the European Union. In Laos, Thailand has a large stake in electrical or transport infrastructure, putting it at the head of foreign investors. In Myanmar, where it is in 3rd place, it has invested heavily in aquaculture and urban amenities. Since 1998, the economic crisis has slowed the flow of Thai investments abroad.

Foreign trade (1996)



Thai investments abroad and investments in Thailand (1988-1997 if not specified)



Sources : Bank of Thailand, 2002
BOI, 1999
ESCAP, 2000

The dominance of Eastern Asia in international travel

International tourism for business and pleasure plays a vital part in the Thai economy. With 7.2 million foreign visitors in 1996, Thailand is the 18th most popular world tourist destination and the 3rd destination in Asia. Since 1985, tourism has been the main source of foreign currency and in 2002, tourist income reached 7.7 billion US\$ or 6% of the Gross Domestic Product. It is also considered to have a major impact on employment, though estimates of the number of jobs associated directly and indirectly with this sector tend to vary.

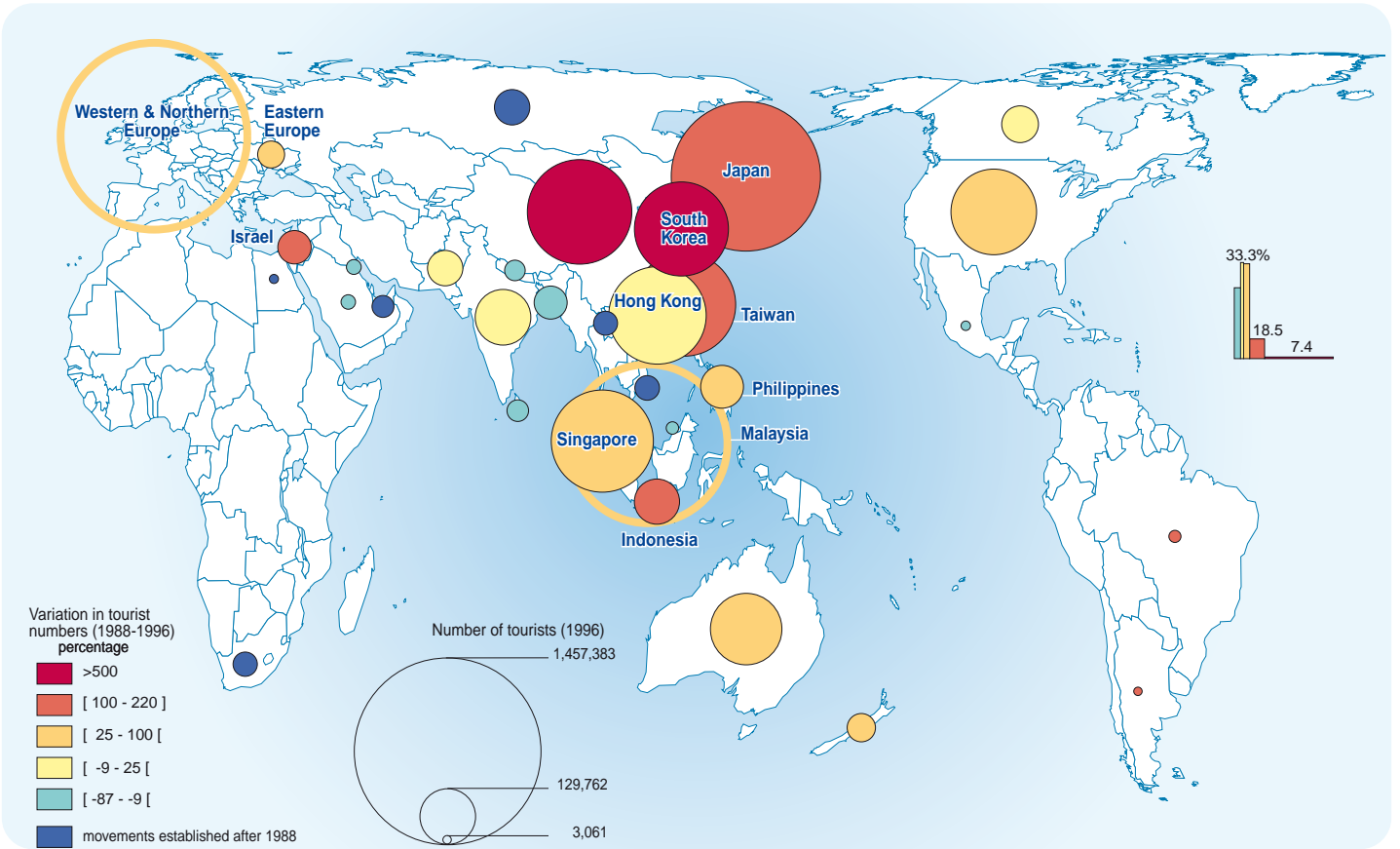
The international tourist industry began to expand in the mid-1950s, due mainly to the American presence, with major growth in the country's transport infrastructure (especially the development of the Don Muang international airport in Bangkok) and hotels. In 1960, the number of tourists was barely above 80,000, but this increased 14-fold by 1975, making income from tourism the 5th highest foreign currency earner. Less than 10 years later, tourism had risen to 2nd place, exceeded only by rice exports. The industry continued to grow, apart from slight falls in 1991 due to the Gulf War and in 1992 as a result of internal political violence, confirming the importance of this sector which, since the end of the 1970s has been a major factor in economic growth. The promotion of tourism has also been an important component in the country's economic policy and is included in the five-year plans, with publicity campaigns run throughout the world. The latest, "Amazing Thailand", was launched by the Tourism Authority of Thailand immediately after the onset of the financial crisis of July 1997, proof of how important the government considers tourist income in offsetting unfavorable economic effects: in 2002, the number of foreign tourists was almost 11 million.

Given the competition from neighboring countries, Malaysia and Singapore in particular, and a changing image as a tourist destination due to the effects of industrialization and poorly planned urbanization, Thailand is now attempting to segment and diversify its geographical markets by opening up new and varied sites and services, thus becoming the inevitable gateway into neighboring countries whose tourist services are still in their early stages: in this the country has been greatly helped by the fact that Bangkok is the hub of air travel for the region (see also chapter 6 Tertiary sector). New trends have emerged since 1988 and the geographical origin of foreign tourists is more varied now with the develop-

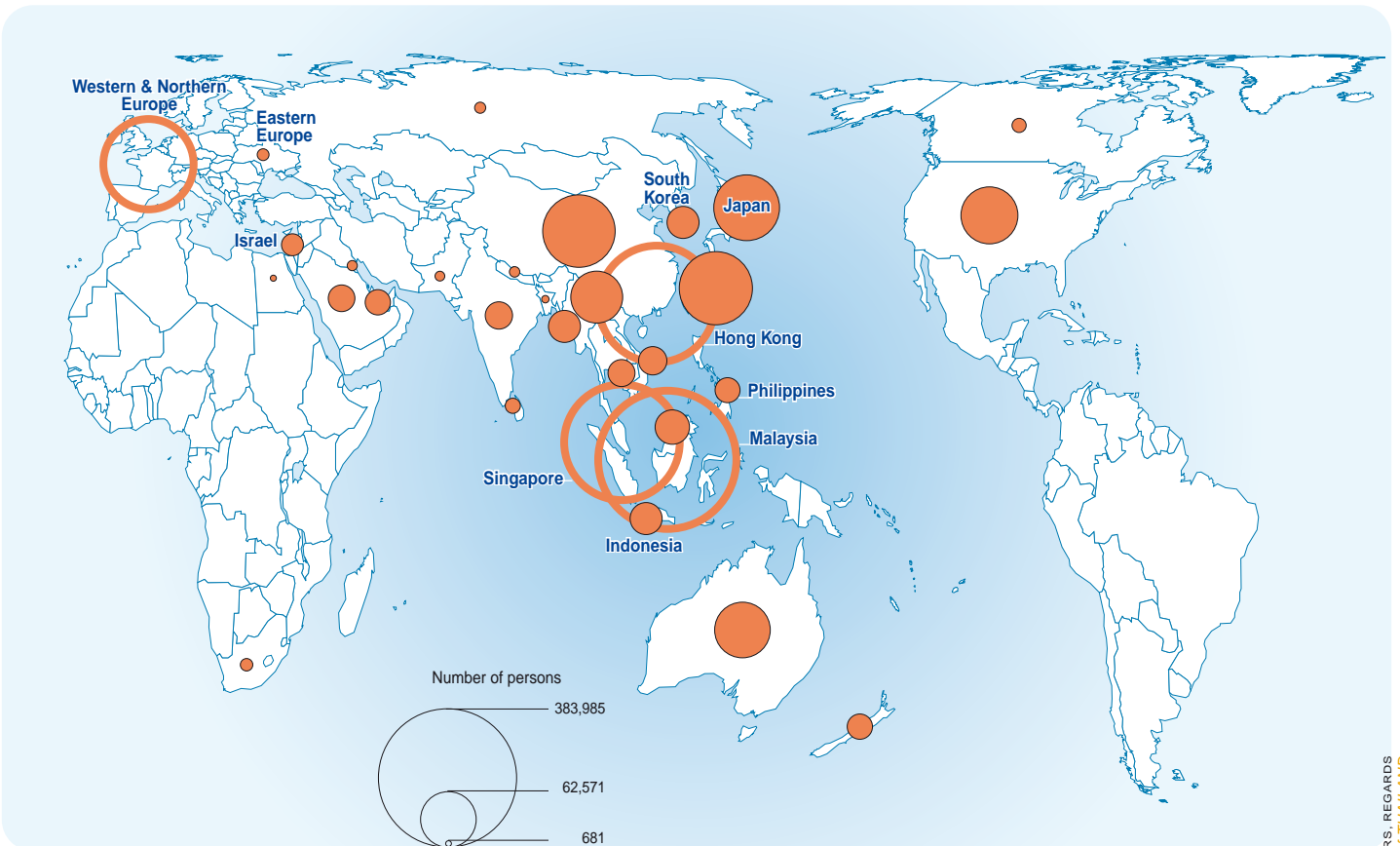
ment of international communication, the opening up of certain countries and improvements in standards of living. Although the proportion of Europeans and north Americans decreased slightly in the 1990s, the higher income Asian countries (Japan, Hong Kong, Singapore, South Korea) became significant tourist markets for Thailand. China, which has provided the greatest increase in tourist numbers, is particularly promising and Malaysia, due to its geographical proximity and higher purchasing power, remains in the lead, though the overall proportion of Malaysian tourists has decreased. The position of Eastern Asia has strengthened: with about 4.5 million tourists, it accounts for more than 60% of international tourist movement.

Thais travel to foreign destinations for both leisure and business, also to study and work abroad on a legal basis. The growth in numbers of travelers, with an almost 10-fold increase between 1975 and 1996, correlates with the insertion of Thailand into the world economy and from 1987 with the increased influence of a middle class. The sudden increase seen at the end of the 1970s was due to official worker emigration whose importance is more apparent for Middle Eastern countries and Asian destinations such as Brunei and Taiwan (see plate 3 International out-migrations and flights). The sharp contrast in the number of Thais traveling to Eastern and South Asia, 80% and less than 2% of total movement respectively, confirms the strength of Thailand's relations with the former. Pulling ahead of Hong Kong and Singapore, until now the two preferred destinations of well-off Thais for shopping trips, tourist traffic across the border into Malaysia is now considerable (and probably the movement of non-registered workers too), similarly for Laos, though on a much smaller scale. Professional and private trips, as well as family visits by the Chinese-Thai population, account for the movement of Thais into China, mainly into the south of the country. The effects of the economic slowdown on the purchasing power of the middle classes and on the number of jobs offered abroad have led since 1995 to a reduction in the rates of growth of visits by Thais abroad, and in fact in 1997 and 1998 these figures were negative.

Countries of residence of foreign tourists (1988-1996)



Countries of destination of Thai nationals (1996)



Sources : Alpha Research, 1995, 1999

Migration and air travel contribute to regional integration

International labor migration is the result of wage disparities between countries for the same work and level of qualification. Thailand sends workers to richer countries (Middle East, North-East and South-East Asia) and receives workers from its less developed neighbors (Myanmar, Cambodia, Laos, and recently Bangladesh). From 1978 onwards, the government offered its own placement services and promoted work abroad, given the importance to the economy of migrant workers' remittances in foreign currencies (in 2001, about 2 billion US\$ per year and one third of the current account-balance). During the 1990s, 1.5 million Thais emigrated legally, to take up poorly qualified jobs: factories and construction sites; different types of services involving mainly women (Japan and Hong Kong), agriculture (Malaysia, Israel).

At the end of the 1970s, emigration was primarily directed towards the oil-fields in the Middle East which, in 1985, took almost 90% of Thailand's registered out-migrants. However, the Gulf crisis and a further diplomatic crisis with Saudi Arabia saw recruitment plummet and the total out-migration movement from Thailand did not return to its 1989 level until 1993 (140,000 out-migrants) with the speeding up of new flows opening into Eastern Asia from the middle of the 1980s. This geographical shift was first towards some of the ASEAN countries (about 40% in 1992, and 25% since 1994, to Brunei and Singapore especially) then to countries of North-East Asia (over 60% since 1994, especially to Taiwan).

The 1997 crisis has hit migrations with same intensity as it has hit the economy, affecting Asian countries both as exporters and importers of workers. After a downturn, the movement of Thais (more than 200,000 registered out-migrants in 1999) increased by 10%, in particular to Taiwan, Singapore and especially Malaysia, and this despite a considerable drop in numbers to Japan and Brunei. Illegal emigration (about 110,000 out-migrants in 1996) into Japan and especially Malaysia has probably increased as a result of the dual effect of immigration restriction measures taken at the height of the 1997 crisis and the large number of placement agencies that have sprung up.

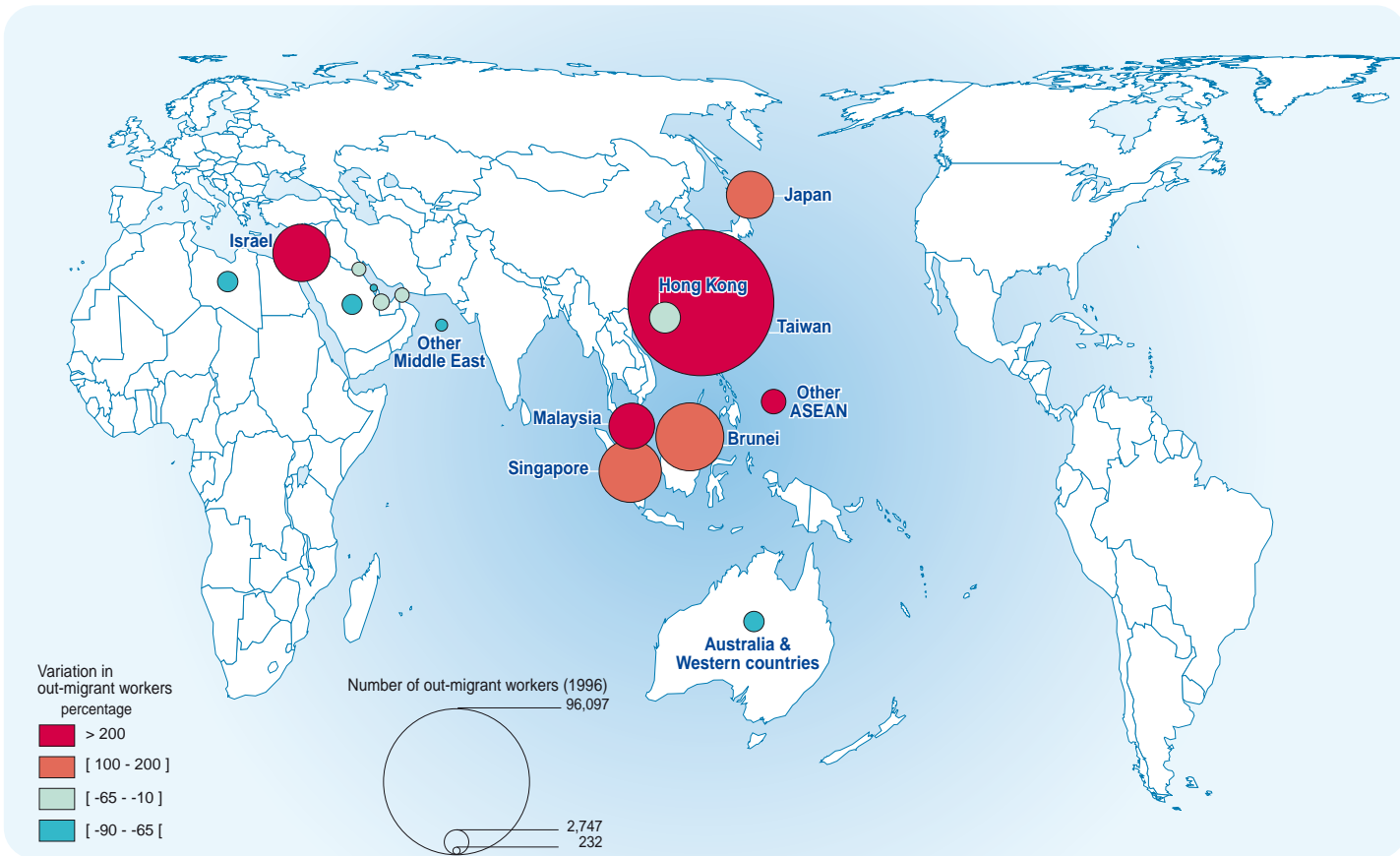
Apart from executives and technicians in foreign and Thai enterprises (where the increasing numbers contribute to improving production technology), immigration involves mainly non-qualified

workers. Since the end of the 1980s, high growth and a shortage of cheap labor have stimulated employment in factories, the service sector (hotels, construction), agriculture and the fishing industry. Almost 80% of the million workers concerned are illegal immigrants, and immigration is made easier as a result of the extension and permeability of the land borders, and collusion between the placement networks and local authorities and businessmen. To limit the influx of unqualified workers, and despite pressure from groups of entrepreneurs, the government combines a series of measures involving the expulsion of illegal immigrants, amnesty for those who legalize their situation (including the payment of taxes normally recovered from employers) and opening up some jobs and provinces to immigrants.

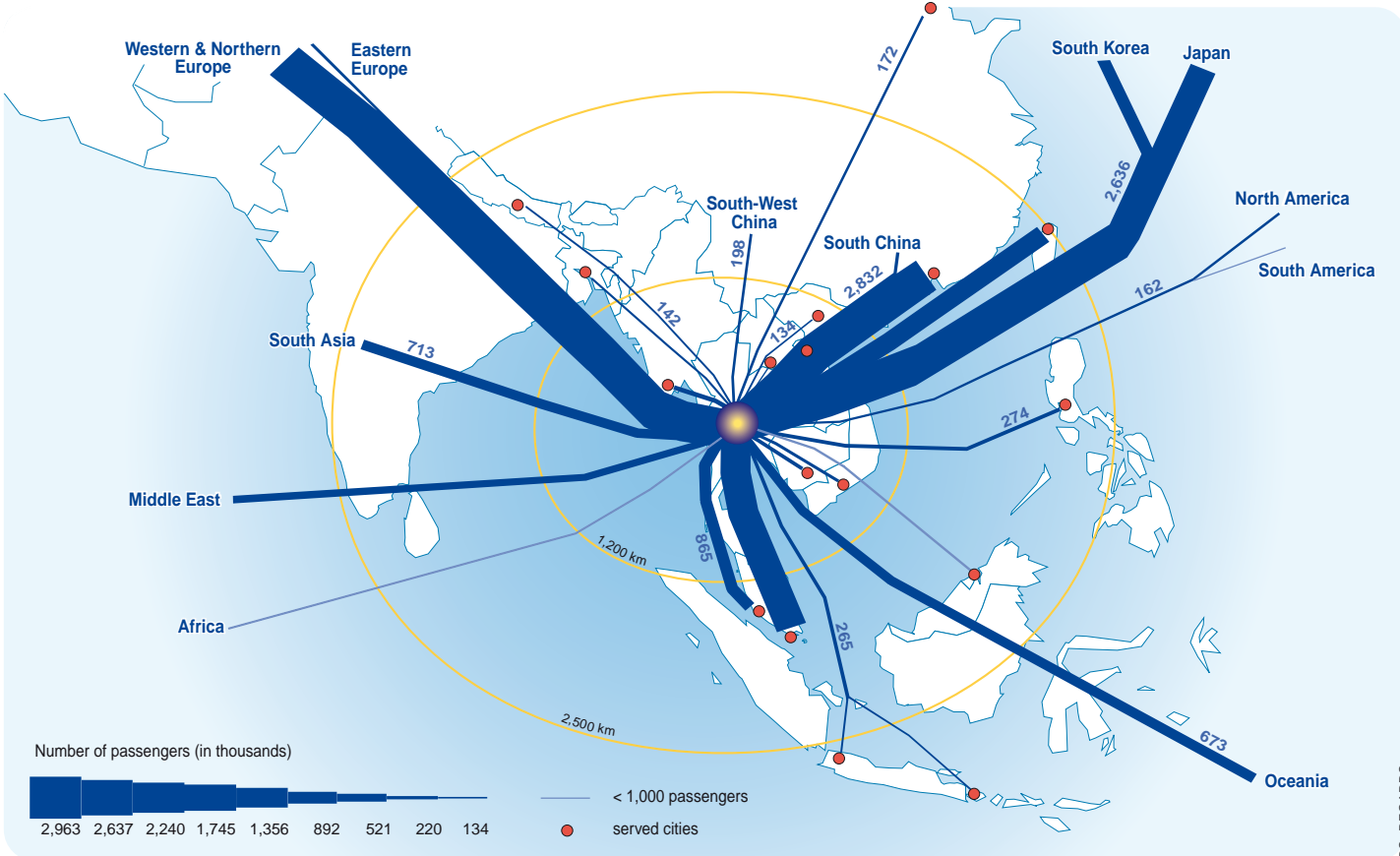
Thailand (Bangkok and four other international airports, see plate 54 Passenger traffic) is linked to two of the richest regions in the world (Europe, and Japan-South Korea) and to two of the largest airports in Eastern Asia (Hong Kong, Singapore) via four air routes used by more than 2 million passengers. Almost 60% of the traffic occurs within a radius of 2,500 km, with less than 10% between Thailand and South Asia. Agreements restricting the movement of national aircraft fleets account for the very low level of regular flights to North America, thus forcing passengers to transit via other Asian airports.

Leisure and business trips by Asian nationals between these airports and Bangkok add to the traffic while the major tourist movements justify the scale of traffic with Europe and, in part, with North-East Asia (see plate 2 Foreign and Thai travelers). The opening up of the countries of Indo-China (Vietnam, Laos, Cambodia) and Myanmar has reinforced Bangkok's role as the hub of the region and has allowed the introduction of direct flights to northern Thailand (Chiang Mai, Chiang Rai) which have also been stimulated by the renewed economic and social relations with southern China. Faced with the near saturation of Bangkok airport and in order to maintain Thailand's regional and worldwide position, construction of a new international airport was begun in 2002 in Samut Prakan province.

Registered labor out-migrations (1990-1996)



Passenger international scheduled flights (1996)



Sources : Ministry of Transport and Communications, 1998
Yongyuth Chalamwong, 1998

Substantial differentiations in development levels

The total population of Eastern Asia is almost 2 billion inhabitants in 1997. Mainland China accounts for the largest proportion with 63% of the total and an area 44% greater than all the other countries combined. South-East Asia, which corresponds to the ASEAN, has 25% of the total population and covers only slightly more than 25% of the area: Indonesia predominates with 200 million inhabitants over a territory larger than Mongolia but scattered across many islands. Vietnam and the Philippines have similar populations and areas. Thailand ranks 6th for population and 5th for area. In a region where the demographic transition is neither uniform (rates of annual demographic growth range from 2.5% in Malaysia to 0.6% in Japan), nor yet complete, Thailand's rate is among the lowest at 1.7%, similar to that of Singapore and Hong Kong. Among the small states and the special administrative region (Hong Kong), Singapore is the smallest, and the sultanate of Brunei has the smallest population.

Thanks to its oil resources, Brunei also has the highest real Gross Domestic Product *per capita* (GDP) measured in terms of Purchasing power parity (PPP-estimated by comparing the prices of similar goods and services between countries): it is ahead, very far ahead in some instances, of the "Newly Industrializing Economies" or "Dragons" (Taiwan, Singapore, South Korea, Hong Kong), and even Japan. Nevertheless, these countries remain the economic poles of Eastern Asia. Thailand and Malaysia are notable in the group of "Tigers" (Brunei excepted) with a GDP *per capita* of twice that, or more (Malaysia), of Indonesia and the Philippines and they are also ahead of China. Laos, Myanmar, Cambodia and Mongolia appear as the least developed with a GDP *per capita* of less than 1,400 US\$: Vietnam is only a little above this threshold.

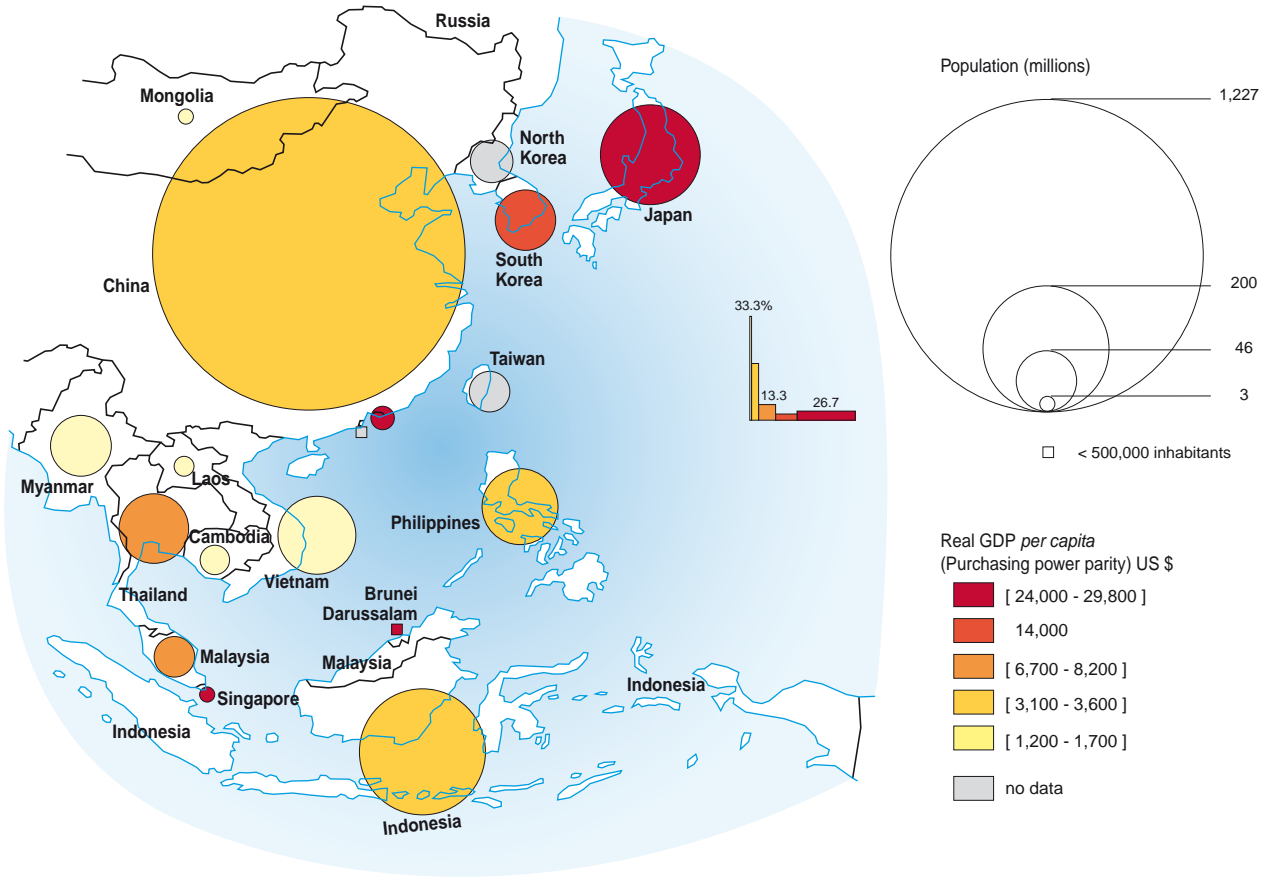
Development levels in Eastern Asia are characterized by major intra-regional differentiations. Economic achievements and social progress were considerable after the 1960s in South-East Asian countries such as Malaysia, Indonesia, Thailand; they were begun much more recently in the Philippines and Vietnam, and are inadequate in Laos, Cambodia (recipients of the largest amounts of aid per inhabitant) and Myanmar (excluded by the international community). Poverty has receded in all countries but within a single country there are still wide disparities in incomes between urban and rural areas and between regions (centers and peripheries), while urban poverty

is emerging as a result of rapid urbanization. Income distribution in Thailand is one of the most inequitable (see plate 66 Income and consumption indicators).

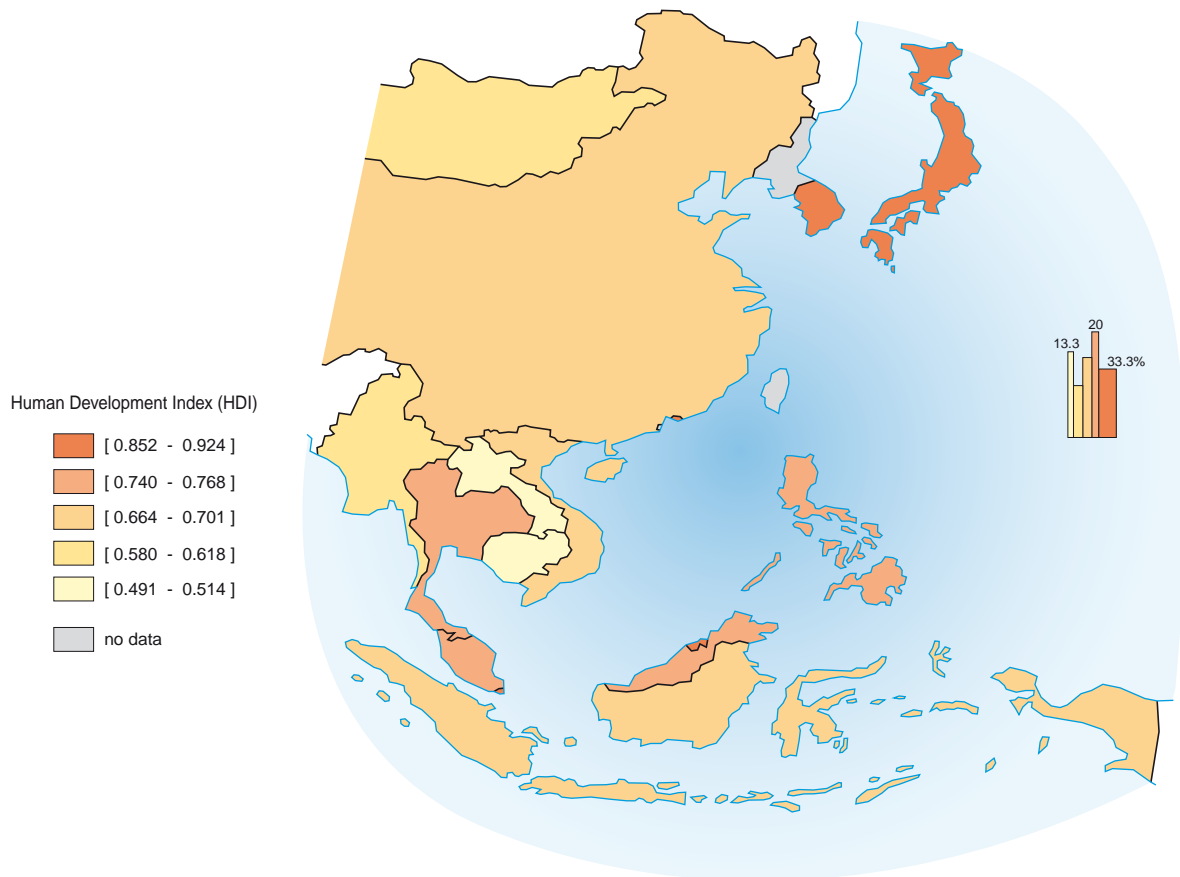
The Human Development Index (HDI), which is constructed from three main indicators (life expectancy at birth, educational attainment, real GDP *per capita* in PPP), reveals certain features of social development in Thailand. There are some major differences between the HDI rankings at regional level compared with certain hierarchies established solely on the basis of the GDP. In the same class as Japan, Hong Kong, Singapore, and Brunei are in the lead and joined by South Korea (higher value for education). Among the less developed countries, Myanmar and Mongolia have a higher HDI than Laos and Cambodia thanks to their life expectancy and educational attainment. For the same reasons, Vietnam is in the same category as China and Indonesia.

With an intermediate HDI (0.753: "medium human development"), Thailand ranks 67th in the world, in the same category as the Philippines and Malaysia. Compared with the Philippines, Thailand's real GDP per inhabitant is almost double, level of life expectancy is similar and the educational attainment indicator is much lower. Compared with Malaysia, only education is better, life expectancy remains lower despite the improvement in some aspects of living conditions (provision of electricity, water, health services in rural areas...). The three-year difference in life expectancy is the result of infant mortality and maternal mortality rates that are three times higher. Although the adult literacy rate (almost 95%, the best in South-East Asia, along with the Philippines) gives Thailand a higher educational attainment indicator than Malaysia, the gross enrolment ratio, on the other hand, is one of the lowest in the region (scarcely higher than Laos, Myanmar and Mongolia) and reflects the low levels of enrolment in secondary education (see plate 67 Education at primary and secondary levels). This factor is a major stumbling block to the country's ability to draw on a better qualified labor force.

Population and Gross Domestic Product (1997)



Human development (1997)



Source : PNUD, 1999

A multi-polar Eastern Asia

As well as belonging to multilateral bodies, Thailand is a member of APEC (1989), a consultation forum initiated by Australia (with USA support) and devoted to promoting free exchange around the Pacific and negotiating commercial disputes. In 1967, the country was one of the five founder members of the only regional organization in Eastern Asia, ASEAN, with headquarters in Jakarta, which was later joined by Brunei (1984), Vietnam (1995), Laos and Myanmar (1997), Cambodia (1999). At the end of the cold war ASEAN served as a platform for the launch of new arenas for exchanges of views including the Asian Regional Forum (ARF, 1994) on questions of security in Eastern Asia (with the European Union, the USA, Russia) or Asian-Europe Meeting (ASEM, 1996).

The turbulences that the region has undergone (monetary devaluations and the financial crisis at the end of the 1990s, internal difficulties in Indonesia, problems of forest fires, piracy) demonstrate the limits of an "à la carte" regionalism and the weakness inherent in economic integration between member countries. ASEAN is therefore attempting to reactivate cooperation: establishment of a free-trade area (AFTA), starting in 2002 for the first six members, between 2006 and 2010 for the last four; relaunch of the AIA (investment area) and AICO (industrial cooperation); beginnings of currency-swap arrangements. ASEAN is also turning towards China, South Korea and Japan but although ASEAN+3 has expressed a desire for cooperation (industry, trade, investment), negotiations to establish a free-trade area seem to be further advanced with China, with whom Thailand and other ASEAN countries already have bilateral trade agreements.

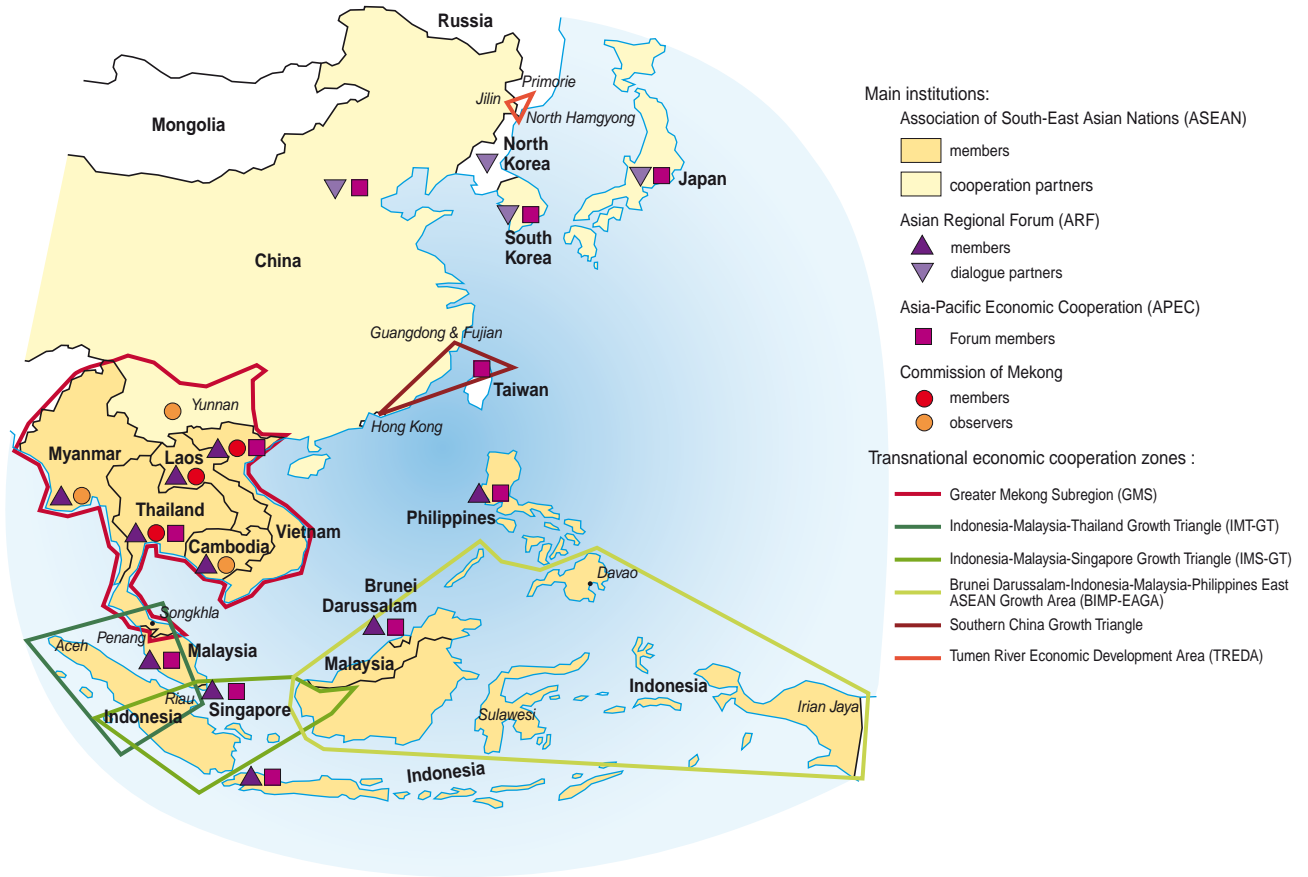
Thailand belongs firmly to some of the continental and insular transnational cooperation zones that began to multiply in the 1990s in South-East Asia, whereas in North-East Asia, with the exception of TRED (1995) and the Southern China Growth Triangle (beginning of the 1980s), there is a dearth of such cooperation zones. Thailand is a member of the Commission of Mekong (reactivated in 1995) which since 2001 has concentrated on the management of water resources. As part of the Greater Mekong Subregion (1992), Thailand is also engaged in intergovernmental cooperation, whose strategic aim is continental transnational integration; this initiative is supported by the Asian Development Bank and based on sectoral forums and proposes the creation

of economic corridors (see also plate 6 Networks in Eastern Asia). For the five southernmost provinces, Thailand participates in IMT-GT (1993). This project is based on the exploitation of spatial and economic complementarities (reproduction of IMS-GT, 1989) and for Thailand and also for Indonesia, it is supposed to readjust the spatial balance of growth. Cooperation, which for the moment is bilateral with Penang, concerns interconnection of infrastructure (electricity, transport), although the creation of a transnational industrial zone is still under consideration.

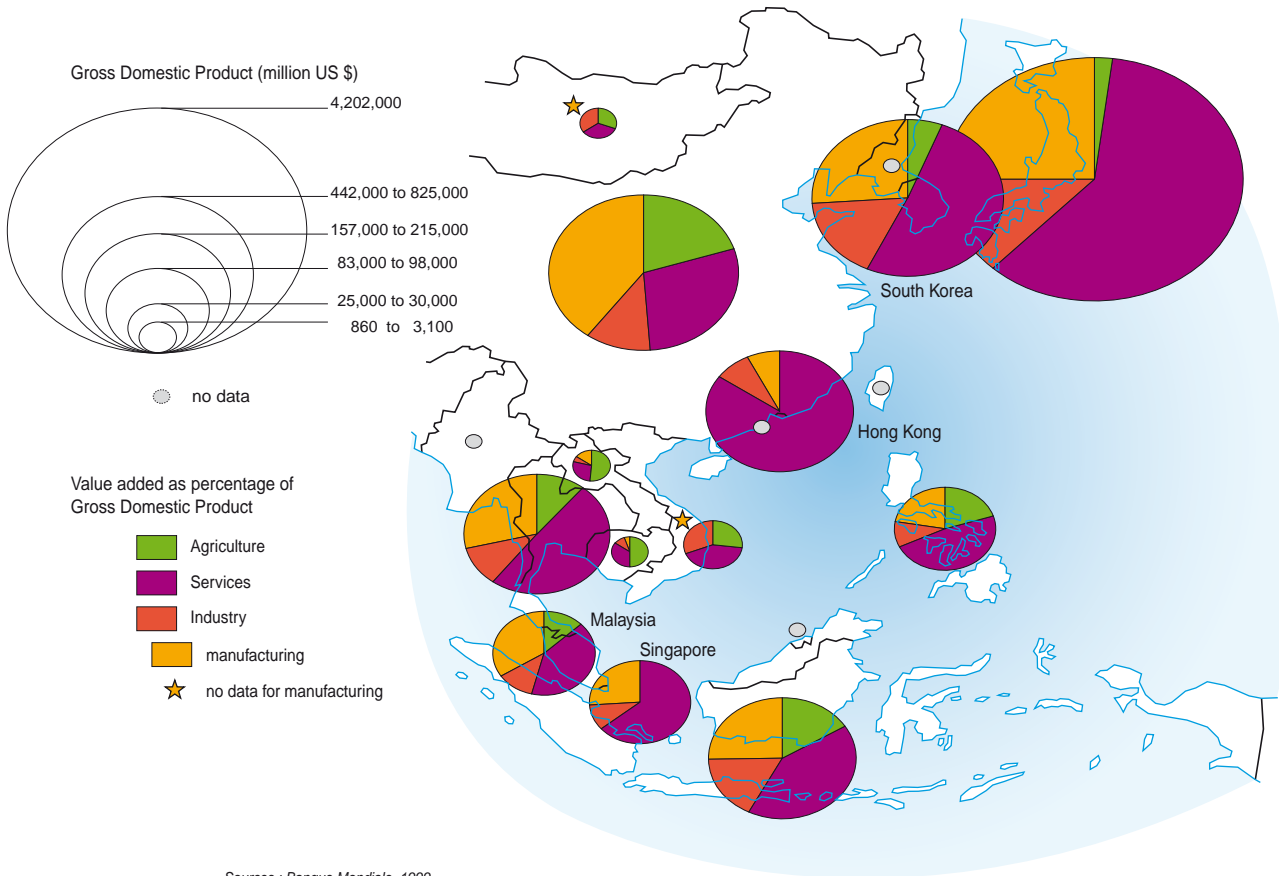
Singapore and Hong Kong have successfully used the principle of zones such as these to delocalize their manufacturing industry into adjoining areas, while retaining high technology production or higher value added end-product transformation; Japan (1980s) and the four "Newly Industrializing Economies" (1990s, Taiwan, Singapore, South Korea, Hong Kong) have also exploited complementarities of this kind, but based on a network operation. The Japanese Gross Domestic Product (GDP) in 1997 was five times greater than that of China, which is the rising power of Eastern Asia, while still retaining a large agricultural sector, like the Philippines or Indonesia, two countries where mining or oil-production is developed. Agriculture also appears vital for those countries considered to be the least developed but where there are major sectors other than services: Laos (manufacturing and hydroelectricity), Mongolia (coal), Myanmar (gas); or for Vietnam (manufacturing).

The structure of production in Thailand is quite similar to that in Malaysia (for a GDP that is almost double) but, unlike the agricultural and industrial sectors, the value added of services is much greater in Thailand, thus strengthening its ambition to be leader of continental South-East Asia, or even of the region. Singapore remains the center of South-East Asia due to the concentration of advanced services, headquarters of multinationals and the coordination of shipping; its economic development is comparable to that of Hong Kong, command center lying at the junction between South-East Asia and North-East Asia.

Regional cooperation (2001)



Structure of production (1997)



Sources : Banque Mondiale, 1999
Fau N., 2003
Foucher M., 2002

The pre-eminence of coastal cities and maritime networks

In a context where nation-states are tending to weaken as economic players, very large cities like Bangkok form an integral part of the world metropolitan network that has been created from the emergence and affirmation of innovation, command and control centers in the global economy. The Thai capital is located on the Pacific side of Asia, one of the three globalization arenas (the others are North America and Western Europe) of the hierarchical urban spatial organization: it contains the largest cities in the world (those with over 2 million inhabitants) to which are added here the state capitals that fall below this threshold. There are more major cities here than in any other region of the world (37 or 43 if capitals below the threshold are included).

This representation of the network of major metropolises is combined with another showing the organization in Eastern Asia of the “world cities network”, according to a ranking into categories labelled “alpha, beta and gamma”: this inventory is based on the cities’ level of advanced producer services to enterprises (accountancy, advertising, banking, legal services). The “alpha” cities are interactive organizers of the global network, the “beta” cities are both relay cities that link the global to the national economies and organizers of the regional level where the “gamma” cities are the major nodes, like Bangkok.

The map shows a double differentiation of the network between the north-eastern and south-eastern sub-groups. The Japanese megalopolis is the cornerstone of the first sub-group (Japan, South Korea, Taiwan and northern China), with Tokyo, largest city in the world (and one of the four truly global cities), associated with Seoul, third largest city in the world; but there is also the important Chinese continental urban network. Around the South China Sea, the second sub-group brings together major port metropolises, most of them state capitals and generally with a very high rate of primacy (calculated according to the population of cities of more than one million inhabitants), such as Bangkok or Manila. Hong Kong and Singapore are here the major nodes of the global metropolitan network, for North-East Asia and South-East Asia respectively, with Hong Kong playing an interface role between on the one hand the two sub-groups and on the other mainland China.

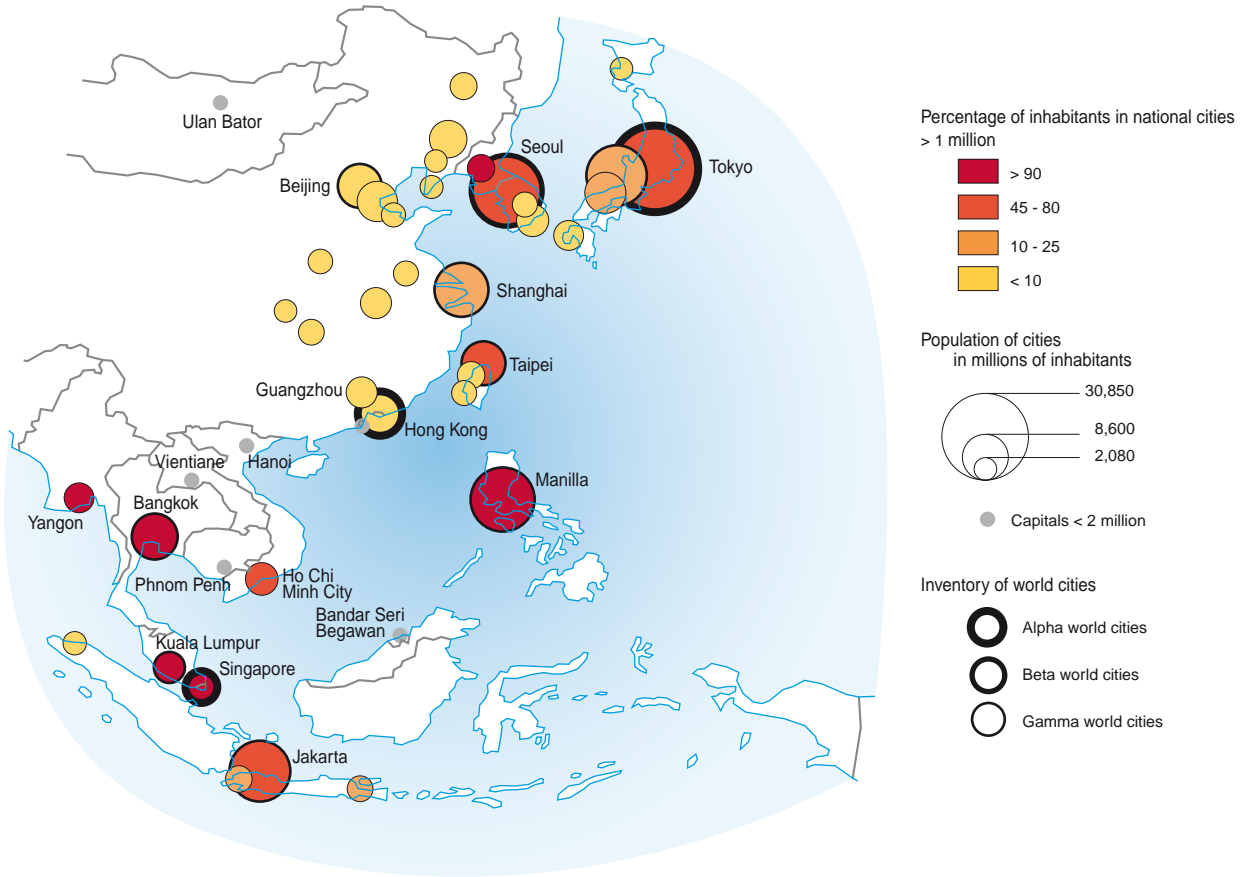
The seas of South-East Asia are at the heart of trade between Asian countries and between these countries and the rest of the world. Developed in the

19th century by the colonial powers in preference to the land routes, the maritime routes were used almost exclusively in the 20th century. The recent economic interaction between rapid growth countries in the region has encouraged the development of containerization. The regional poles for the collection and redistribution of containers remain Hong Kong and Singapore; Singapore in particular polarizes the flow of traffic and organizes the secondary servicing into the Thai ports of Bangkok and Laem Chabang (since 1998, the largest port in Thailand).

The free movement of container ships and oil tankers is threatened by piracy, which is rife in the very busy straits of Malacca and Luzon. The scale of the phenomenon has prompted the Thai government to dust off the ambitious Isthmus of Kra project, this time in the form of a canal (and not a pipeline) which would enable shipping to avoid the detour by the Malacca straits and Singapore. The undertaking may be supported by aid from Japan, most of whose petroleum supplies are transported via this maritime route, and from China, interested in the prospect of access to the Indian Ocean.

The logic of cooperation within the context of the ASEAN or the Greater Mekong Subregion (see plate 5 Eastern Asian regional integration and production), and also the end to conflicts and tension between the peninsula states, have reawakened political interest in land networks. Trade (in either a formal or informal context) between the countries of the peninsula (including Yunnan) is being stepped up and although Thailand as a whole appears to be at the center of the system, it is northern and north-eastern Thailand that are at the focal points of several axes: the major north-south axis Kunming-Bangkok (and its possible extension as far as Singapore), the transverse Hue-Mawlamyine axis. Priority has been given to the reconstitution or the building of major road routes, as rail connections are confronted with technical problems inherited from colonial times (the Thai rail network is compatible only with the Malay network). Inter-state agreements also cover the development of traffic and, regarding the east-west axis, the creation of an economic corridor favoring cooperation in investment, industrial production and tourism.

Urban networks of globalization (end of 20th century)



Peninsular land networks and maritime networks in South-East Asia (2000)



In the heart of the Indo-Chinese peninsula, a country open to the South China Sea

Thailand covers an area of 513,000 km² in the heart of the Indo-Chinese peninsula (2.2 million km²), a continental promontory jutting out between the Indian and Chinese worlds, and facing the archipelagos of the Malaysian world. In this physical region of Indo-China, consolidated since the Mesozoic era into the Sunda pseudo-platform where plains and plateaus predominate, the relief is fairly gentle and for the most part not very high. The peninsula is open to the most southern part of the South China Sea which here covers the largest continental platform in the world with only about ten meters of water. The main features of Thailand's physical structure, as throughout the peninsula as a whole, are, on the one hand the generally low altitudes (half the country at an altitude of less than 200 m) and on the other hand the dominant north-south direction of the major structures. Thus there are large groups like the system of the Western Highland Spine (Chai Range, Tenasserim Range), where the continuous mountain ranges and dense forest cover (see plate 8 Environment and natural resources) form an almost blind border region with Myanmar (apart from a few passes such as the Three Pagodas and Singkhon); the central mountainous axis (Luang Prabang Range, Petchabun Range) or the Malay peninsula with its short longitudinal ridges. We also find this orientation in the water courses in the Menam Chao Phraya basin and its tributaries, and in the mid part of the Mekong river.

In the heart of the country stretches a vast rectangular north-south depression of about 90,000 km², which extends into the Bay of Bangkok: this is the geographical cradle of the Kingdom of Siam (see plate 21 Formation of the nation-state territory) and the heartland of Thai rice cultivation (see plate 33 Rice). It contains the great central alluvial plain, a low-lying area at an altitude of less than 100 m dotted with isolated hills, drained by the Chao Phraya river system which is navigable in all seasons from Bangkok to Nakhon Sawan, and with a basin covering an area of 170,000 km² in all. The Central Plain is subdivided into two main regions. In the north, upstream from Chainat, are the plains and hills of the piedmont where the rivers Ping and Nan converge. In the south, downstream from Chainat, is the delta system of the Chao Phraya (plain of Bangkok) associated with the adjacent peripheral lowlands: the low-lying valley of the Pasak in the north-east, the valleys and deltas of the Meklong in the west, and the Prachin in the east, and the coastal plain in the south-east, at the foot of

Banthat Range.

In the north, the relief of the country's highest mountain region (Doi Inthanon, 2565 m) is very compartmentalized as it is an extension of the southern area of Yunnan. It is structured in a series of parallel strips running north-south, where Paleozoic ranges, often rising to above 1500 m with dense forest cover (Chai Range to the west, Luang Prabang Range to the east), alternate with long valleys (Ping, Wang, Yom and Nan) where there is a succession of narrow gorges and Mesozoic rift basins. These (Chiang Mai, Lampang, Nan, and Chiang Rai to the north) rise between 200 and 500 m and they are centers of irrigated agriculture, which have also fixed the main local urban centers.

The north-east of Thailand corresponds to the Khorat plateau, a vast structural unit extending for 170,000 km² and formed of sub-horizontal Mesozoic sandstone, sloping generally from north-west to south-east. This area is very clearly defined by the arc of the Mekong valley (border with Laos) to the north-east, and by jutting scarp lines in the west (Dongpraya, Phetchabun Range), the south (Khao Khieo) and the south-east, where the Dangrek Range marks the border with Cambodia. Across this wide, gently undulating depression dotted with low hills run the wide alluvial valleys of the Mun and Chi basins (135,000 km²) and other small tributaries of the Mekong.

The south of the country (71,000 km²) draws some of its unity from the fact that it is part of the Malay peninsula, and therefore has extensive sea borders. To the north of the Isthmus of Kra (24 km wide, altitude under 70 m), the Tenasserim Range, an extension of the Western Highland Spine, dominates a narrow coastal plain. In the south, mountain ridges at an altitude of over 1000 m (Phuket Range, Nakhon Si Thammarat Range, Taluban Range) alternate with relatively broad alluvial plains (Tapi basin, Thale Sap coastal plain, Pattani valley). The eastern and western shores are in complete contrast: on the South China Sea the coast is low lying and regular; the Andaman Sea coast is rocky and indented, bordered by a multitude of islands and islets (limestone stack at



Acute problems managing natural resources

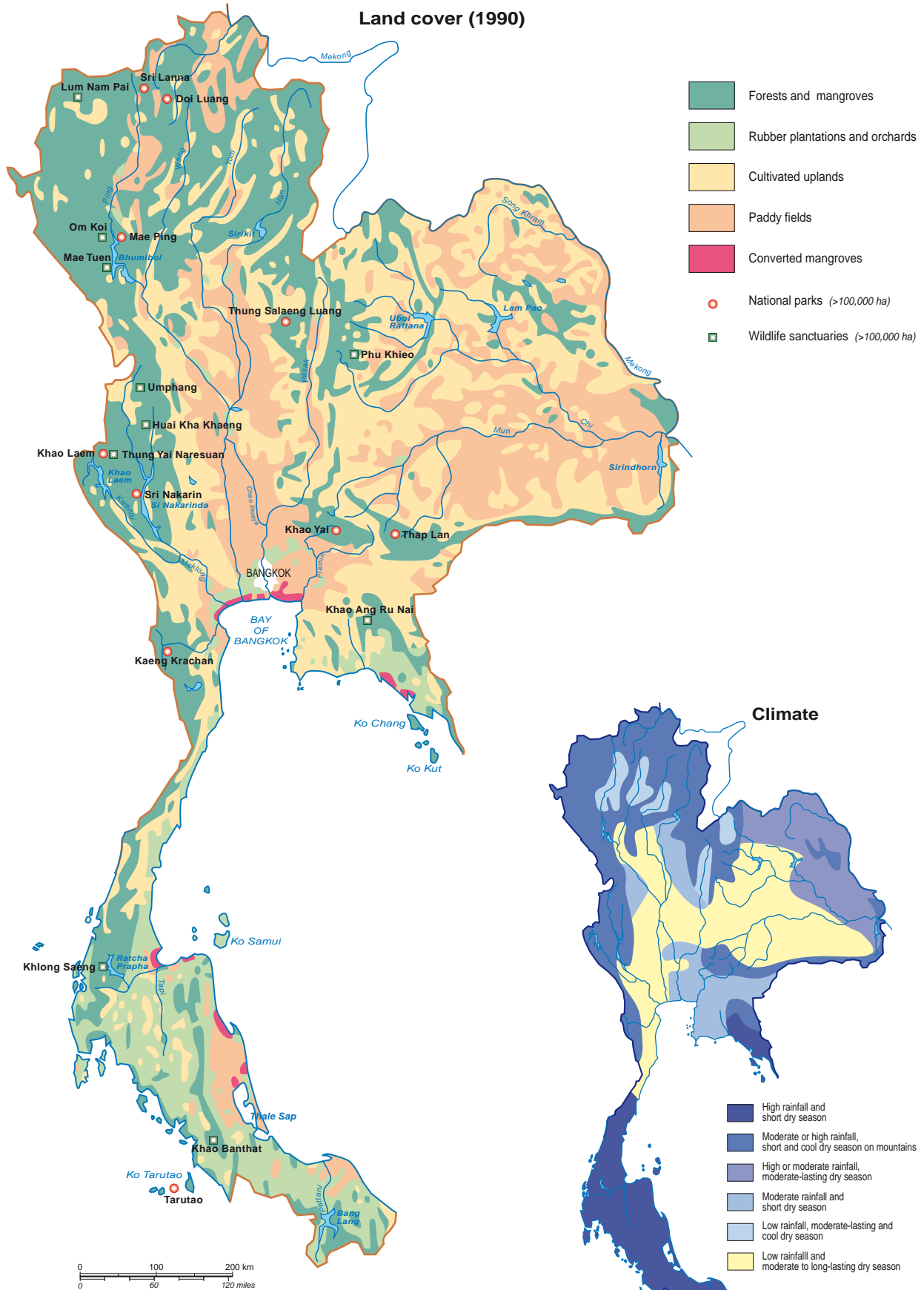
The climate of Thailand is determined by the country's position in tropical latitudes between two ocean masses, and its exposure to the monsoon winds: it is characterized by high temperatures and heavy rains with high levels of regional variability. Marked rainfall seasonality and interannual variation represent the main constraint for agricultural activity, as they affect the timing of work, the acreage planted, yields and production levels. Amount of rainfall depends on exposure to one or another of the two monsoons, or even both, then on the local length and timing of the monsoon. The south-west monsoon, from April-May until October, brings with it heavy rains that represent a minimum of 75% of annual precipitation, even 90% on the reliefs, with marked differences between places. The north-east monsoon then brings in cool, dry continental air: the dry season can vary from 5 to 10 months with only the eastern coast of the peninsula receiving abundant rainfall. The south of the country and the south-east of the Bay of Bangkok receive heavy rainfall (from 2 to 4 meters), and they have a dry season of about 2 months, whereas the center and part of the Khorat plateau (leeward effect) receive much less (about 1 m) with a dry season of 6 to 8 months. These extended dry seasons and major annual variations make agriculture without irrigation a hazardous activity.

Thailand has the largest proportion of land given over to agriculture of all the countries of South-East Asia: from 20 to 25 million hectares according to sources, or 40 to 50% of the country's total area. The large-scale land clearing, which was begun in the middle of the 20th century in the central basin of the Chao Phraya to extend rice-growing areas, has reached the low and middle terraces where cash crops have been planted on the slopes (cassava, maize, sugar cane): between 1950 and 1980 agricultural land was increased 5-fold by this type of conversion. The peninsula, because of the specific features of the rainfall, has its own type of land cover: rubber tree plantations (and oil palms) and tree crops predominate over paddy fields and upland crops (see also plate 31 Land utilization).

Agricultural expansion led to a considerable decrease in forest cover, already impoverished since the 19th century by the commercial logging of noble species (see plate 23 Deforestation). For the 1990s, the estimates of forest cover vary between 15% to almost 30% of the total area, so great are the divergences on defining what is considered as "forest".

The mangrove has also been affected by deforestation (cutting of timber, implantation of infrastructure, including tourist facilities, mining and salt production, aquaculture) which between 1975 and 1990 has reduced the total area of cover by half (less than 2 million km² today). Since 1980, aquaculture has been the main reason for the conversion of mangroves and has affected the entire coastline of the country, because of the gradual delocalization of this activity towards the east and south: the coast of the Bay of Bangkok has suffered most destruction, and that of the Andaman Sea has been most recently affected.

The phenomenon of deforestation has dominated the debate on the environment, a fairly recent debate in Thailand, and has mobilized government and university institutions, Non-Governmental Organizations and rural communities. To conserve plant and animal resources, the government brought out laws at the beginning of the 1960s creating national parks and wildlife sanctuaries (an area officially covering almost 15% of the country), before setting up the principle of "forest reserves", to be managed commercially. Since the survival of populations settled in these areas long before the reserves were created is compromised, the application of these measures raises strong opposition from farmers, indignant because of the concessions made to industry (replanting with eucalyptus or bamboo for the paper pulp factories) or tourism (installations within the perimeter of the parks) and anxious about the repercussions of the major infrastructure planned (dams). Current disputes concern land, water resources, the forest or mangrove and involve many protagonists (see plate 62 Land use in the South: Pak Phanang watershed). The increasing number of disputes is an indication of the extent of the social and ecological imbalances created by an economic growth which although impressive has been poorly managed regarding natural resources. To deforestation, erosion, land-slides and flooding, are added acute local problems of soil salinity, water pollution caused by uncontrolled industrialization and an irrational use of chemical inputs in certain areas of agriculture, aquaculture and livestock breeding.



Sources : Gray D., Piprell C., Graham M., 1994
 Huke R.E., 1982
 MAC, 1994
 TDRI, 1987

76 provinces and their centers

Thailand is divided into 76 provinces (*changwat*). This territorial administration system was established over a long period of time, starting at the end of the 19th century (see plate 21 Formation of the nation-state territory), and the established meshwork of provinces changed little between 1933 and 1992: seven new provinces were created by division (especially in the North-East) and there has been one fusion. Historically, the *amphoe* is the subdivision of the province, but reforms are afoot to increase the representativity and autonomy of local governments at the even lower level of the *tambon* (see plate 22 Territorial administration).

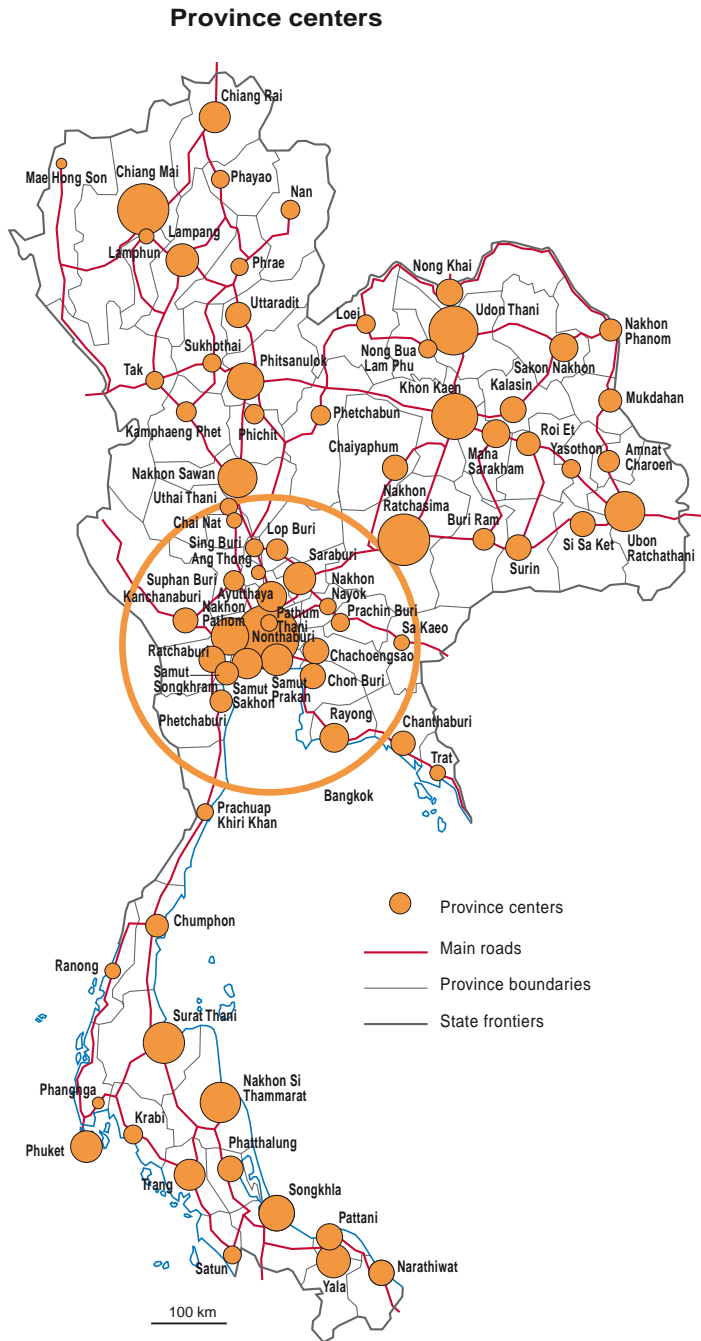
Planning is organized at province level. There were some attempts to draw up regional plans in the 1960s and 1970s covering the regions qualified as peripheral: the North, the North-East and the South; in official documents, these three units are still designated in this way for statistical purposes, and generally with the same delimitation. Several administrative agencies and also the National Statistical Office (NSO) defined a fourth spatial unit, the Center, which included Bangkok province. Again for statistical purposes and to take into account the differential effects of growth in population and economic activity, the Center can in turn be broken down into four areas: West, Center (or Upper Center), East, Bangkok Metropolitan Region (or Bangkok and Periphery, or even Bangkok and Vicinity) (see plate 56 Inter-regional trade). In the context of this last subdivision, Bangkok and Samut Prakan, historic poles of growth, can be considered separately (see plate 43 Enterprises under the Board of Investment). In this atlas we refer to the four major regions thus: North (17 provinces), North-East (19 provinces), South (14 provinces) and Center (26 provinces), and directional references are expressed as north, north-east, south and center.

Similar distinctions have been made in relation to the metropolitan area of the capital. The Bangkok Metropolitan Region (BMR) referred to by planners is clearly defined, Bangkok and the five adjoining provinces (Samut Prakan, Pathum Thani, Nonthaburi, Nakhon Pathom, Samut Sakhon), but cartographic analyses refer to a metropolitan region that is not limited by province boundaries and which can differ in size and shape according to the phenomena or the processes observed. However, the Bangkok Metropolitan Region (BMR) has neither independent administration nor representatives (see also plate 58 Urban and industrial development around Bangkok).

The same is true for the Eastern Seaboard, an “urban industrial region” set up in the 1980s by the state in tandem with the exploitation of the oil reserves in the Gulf of Thailand (see chapter 3 The state and the construction of the territory).

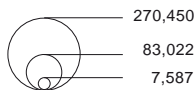
The provincial centers have the same name as the provinces of which they are the administrative and political center. All have the status of municipality which allows them to claim financial support from the state and to be provided with particular facilities (health, education,...). However, some cities are larger than the provincial centers (see plate 16 Municipalities). The primacy of Bangkok is overwhelming with over 5.5 million inhabitants (20 times more than Nonthaburi, in the neighboring province; 30 times more than Nakhon Ratchasima, the country's third city and the first city in the peripheral regions). The communication routes, of which only the major axes have been represented here, structure the urban net-work in an axial pattern. Bangkok, along with Nonthaburi and Pathum Thani, are the crossroads of a road network with a radial configuration (see plate 24 Transportation networks). Further north, Ayutthaya and Nakhon Sawan are important nodes in the network, as are Phitsanulok and Chiang Mai in the North, Nakhon Ratchasima and Khon Kaen in the North-East and, to a lesser extent, Surat Thani in the South. The emergence of land networks at the level of continental South-East Asia should strengthen the position of some of these centers, such as Phitsanulok and Khon Kaen (see plate 6 Networks in Eastern Asia).

Cartographic analysis of Thailand as a whole is on several scales. The smallest (when there is a single map per plate) is 1: 6 250 000. Two intermediate scales, 1: 7 400 000 and 1: 10 000 000, are used for the largest maps on plates with 2 or 3 maps (or 2 maps and a graph or table, like the one shown here). The largest scale used is 1: 15 400 000 on plates with 4 maps (or 3 maps and a graph). The maps that have been deliberately distorted have no scale, as



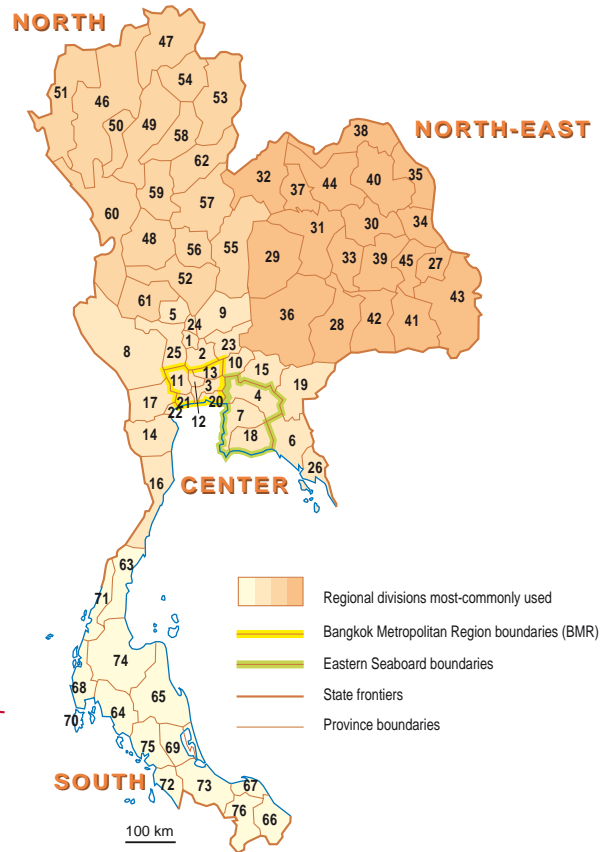
Municipal population of province centers (1999)

Bangkok = 5,655,570 inhabitants



Sources : Ministry of Interior, 1999
 NSO, 1995
 RTSD, 1990

Regional divisions



76 provinces

North-East:

- Amnat Charoen 27
- Buri Ram 28
- Chaiyaphum 29
- Kalasin 30
- Khon Kaen 31
- Loei 32
- Maha Sarakham 33
- Mukdahan 34
- Nakhon Phanom 35
- Nakhon Ratchasima 36
- Nong Bua Lam Phu 37
- Nong Khai 38
- Roi Et 39
- Sakon Nakhon 40
- Si Sa Ket 41
- Surin 42
- Ubon Ratchathani 43
- Udon Thani 44
- Yasothon 45

Center:

- Ang Thong 1
- Ayutthaya 2
- Bangkok 3
- Chachoengsao 4
- Chai Nat 5
- Chanthaburi 6
- Chon Buri 7
- Kanchanaburi 8
- Lop Buri 9
- Nakhon Nayok 10
- Nakhon Pathom 11
- Nonthaburi 12
- Pathum Thani 13
- Phetchaburi 14
- Prachin Buri 15
- Prachuap Khiri Khan 16
- Ratchaburi 17
- Rayong 18
- Sa Kaeo 19
- Samut Prakan 20
- Samut Sakhon 21
- Samut Songkhram 22
- Saraburi 23
- Sing Buri 24
- Suphan Buri 25
- Trat 26

North:

- Chiang Mai 46
- Chiang Rai 47
- Kamphaeng Phet 48
- Lampang 49
- Lamphun 50
- Mae Hong Son 51
- Nakhon Sawan 52
- Nan 53
- Phayao 54
- Phetchabun 55
- Phichit 56
- Phitsanulok 57
- Phrae 58
- Sukhothai 59
- Tak 60
- Uthai Thani 61
- Uttaradit 62

South:

- Chumphon 63
- Krabi 64
- Nakhon Si Thammarat 65
- Narathiwat 66
- Pattani 67
- Phangnga 68
- Phatthalung 69
- Phuket 70
- Ranong 71
- Satun 72
- Songkhla 73
- Surat Thani 74
- Trang 75
- Yala 76

Population

Thailand is not occupied solely by Thais, who probably originated in the Changjiang [Yang Tse Kiang] basin, though they do indeed make up a very large part of the population. The country is certainly an ethnic, linguistic, cultural and religious mosaic, despite the imposition, from the time of King Chulalongkorn (1868-1910), of a unifying language and culture with the aim of creating national unity (**plate 10 Main ethno-linguistic groups**). Thailand is known as one of the last of the Theravada Buddhist monarchies (along with King Sihanouk's Cambodia since 1993) whose ideologies are based on the nation (*chat*), religion (*satsana*) and monarchy (*phramahakaset*). For many centuries Buddhism, the national religion, has had the support of the King, who is required by the Constitution to be of the Buddhist religion, even though he is considered to be the protector of all religions practised by the population. Reformist and progressive movements that have emerged since the 1960s, to confront the challenges of the modern world, and also the various scandals involving popular abbots and bonzes have weakened the authority of the Supreme Patriarch (*somdet phra sangkharat*) and the Council of the Elders (*mahatherasamakhom*). Although there are indeed a religious code, clergy and temples, there are no rituals as such for being accepted into this religion, and the fact that some do not practise religion and that there are other beliefs, especially in spirits and supernatural forces, is fairly well accepted.

Beliefs specific to the Chinese, whether associated with Mahayana Buddhism, Taoism, Confucianism or the cult of the spirits, have until now fed syncretic movements, often inspired by Buddhism, but they do seem to be the subject of renewed interest, contributing to a movement of sinisation that is becoming more and more evident in a kingdom renowned for its great spirit of religious tolerance (**plate 11 Religions**). Nor should the dynamism of Islam be underestimated, even though it affects only a few provinces, and the influence of Christianity too bears no relation to the small number of practising Christians, with Thailand the least Christianised country of South-East Asia (**plate 12 Islam and Christianity**). The Hindus are very much in the minority (21,500 in 1990) although the divinities, the Indian classical languages and other symbols of Hinduism are very much in evidence in Thai culture. Together with the Sikhs, however, they do make up a powerful economic group (finance, textile industry, real estate).

In the first half of the 19th century, Thailand was an under-populated country. The population of 1 to 3 millions was gathered around the political centers, along the waterways and the Mekong in the valleys and basins in the north and north-east, and in the Chao Phraya delta. It spread from these settlement cores as the cultivated area was extended into the Chao Phraya delta using new hydraulic improvements and the land was cleared upstream from the river delta towards the north and north-east. With the advance of the agricultural frontier right up until the 1980s the population was able to spread throughout the country and this helped slow the rate of urbanization. Whereas in South-East Asia, there are sometimes extremes of population distribution, between the uplands and the lowlands, the coastal areas and the interior, these differences are less marked in Thailand where the average population density is 110 inhabitants per km² (**plate 13 Population distribution and growth**).

After the compulsory settling of prisoners of war from Laos, Cambodia and Vietnam at the very beginning of the 19th century, the populating of Siam was later based on immigration from China, which probably accounted for half the population increase in the 19th century. In 1949, the Immigration Act closed the borders and from the 1960s authorized the entry of only 2,000 Chinese annually. The massive population increase after the Second World War (at least 3% per year until the 1970s) is due to natural increase, reinforced by a decrease in the mortality rate thanks to the eradication of malaria and a nationalistic policy supporting a rising birth rate. Although justified during the war, with the expansionist aims of Phibun Songkhram (1938-1944) (see plate 20 Changes in boundaries and frontiers (18th-20th century)), the natalistic policy was maintained after this to guard against the threat of communism. A birth control policy was instigated in 1970, resulting in a rapid decrease in the birth rate, then in an ageing population (**plate 14 Demographic characteristics**). Demographic growth decreased to 2.7% per year between 1970 and 1980, before dropping to slightly less than 2% between 1980 and 1990 and to 1.06% between 1990 and 2000. The rising trend for the active population dropped off at the end of the 1990s, thus putting at risk the country's model of economic growth which is highly dependent on manpower, especially in the industrial sector, where there is already an erosion of competitiveness in relation to neighboring countries. The over-sixties will probably constitute more than 10% of the population in 2010 and some thought will have to

be given to how to cope with this ageing population, as life expectancy has now reached 70 years for men and 75 years for women.

Thailand ended the century with one of the lowest rates of urbanization in Eastern Asia, at only just 19% according to the 1990 census and 31% according to the 2000 census (**plate 15 Rural and urban population**). The urban population has in fact long been underestimated due to a purely administrative definition of urban areas. Under the heading of urban residents are included populations living within the municipalities (*thetsaban*), though the boundaries of these units are often too restricted, given the physical extension of the city. All the provincial centers and some other towns were promoted to municipalities by government decision after the Royal Decree of 1953 (**plate 16 Municipalities**). Until recently, the government, which was very highly centralized, was reluctant to agree to the devolution of power inherent in municipality status: municipalities numbered 117 in 1947, and this figure had increased to only 139 by 1996. The inclusion in the 1980 and 1990 census definition of urban population of the inhabitants of the sanitary districts (*sukhaphiban*), areas provided with sanitary amenities, with over 5,000 inhabitants, was intended to provide a more accurate picture of urbanization, but there were not yet sufficient of these defined areas to properly reflect the rate of urbanization. It was only in 1999, with the enforcement of the decentralization process, that the number of municipalities, through the Sanitary District to Municipality Conversion Act, was significantly increased to 1,131 through the classification of 981 sanitary districts. The purpose of this reform is administrative and political (see chapter 3 The state and the construction of the territory), and although it allows a better understanding of urbanization, the definition of urban areas is still not based on functional and socio-economic criteria.

Migrations between rural areas, which still predominated at the end of the 1980s, have decreased, mainly because land clearing for agriculture began to wind down in the 1960s (41% of migrations in 1990, compared with 63% in 1970) (**plate 17 Inter-regional migrations**). Such migrations today are simply short distance moves, whereas migrations into the cities cover much greater distances, from one region to another; by far the majority of these are into the central provinces, currently undergoing urbanization. Movement from the rural areas to the cities has

increased from 10.5% in 1970 to 18.4% in 1990, giving rise to a corresponding increase in returning movement (5.4% in 1970 compared with 12.6% in 1990). However, the population census is not an exhaustive tool for the study of migrations. Only the five previous years are considered, using a person's usual place of residence, which does not take into account their actual place of residence. It also masks the majority of temporary migrations, which represent an essential part of rural family strategy and which have increased considerably since the 1970s. The census basically gives information on permanent or semi-permanent migrations, which in fact apply to only 8% of the population aged 5 and over between 1985 and 1990 and this brings out only a selective profile of migrants, young, unmarried people with a higher than average level of education.

The complex nature of migratory movements is such that they probably modify population distribution less, in fact, than their scale would suggest (**plate 18 Importance of migration in the provinces**). Whereas before, seasonal migration predominated because of the importance of agricultural work, this is now tending to decline in favor of longer stays. Migration towards the pioneer fronts and areas of intensive agriculture as well as absorption by the agricultural sector of the excess active population tended to slow down the urbanization process until the 1980s. In 1990, 66.3% of the active population still worked in the agricultural sector, according to the census which, although overestimating this percentage as it counted main employment only, nevertheless indicated the degree to which the agricultural sector still absorbs the working population.

The demographic profile of the provinces clearly reflects the spatial dynamics of the country (**plate 19 Population distribution and demographic features**). The extension of agriculture and then urbanization have resulted in a population distribution that forms a pattern of concentric circles around Bangkok with clearly defined major peripheral areas in the north, north-east and extreme-south.

MAINTAINING RELIGIOUS and FAMILY TIES

Young monks at Wat Phra Keo in Bangkok

The population is 95% Buddhist. Buddhist institutions played an important role in schooling the young rural population up to the 1960s: the temple (*wat*) represents the center of the village education, just as it is the heart of the life of the community. The large urban monasteries still house schools. For a few months or perhaps years, the novitiate is an integral part of the crucial stages in a man's life.



Photo Doryane Kermel-Torrès

Migrants welcomed by their village in the North-East for the Buddhist new year (*songkran*)



Photo Doryane Kermel-Torrès

Urban centers, especially in the Bangkok metropolitan region, attract workers from rural areas, the majority from the North-East and the North. Ties with family and village remain strong, even for the youngest who return home for religious events and festivals and who take refuge there if ever they suffer job losses or illness. Income from migration contributes in return to support some farms.

An ethno-culturally homogeneous country despite its diversity

Compared with its neighbors, Thailand is a fairly homogeneous state in terms of its ethno-cultural mix. More than 95% of the population are declared Buddhists (Theravada Buddhism) and more than 90% have a Thai language as their mother tongue. Primary school education is for the most part in central Thai (Siamese language), with the exception of a few mountain populations close to the borders with Myanmar or Laos. There are regional differences, of course, (Tai Yuan in the north, Lao or Khmer in the north-east), but the only populations still to resist assimilation into the Thai nation are the Muslims of Malaysian origin in the five southern provinces close to Malaysia and a few mountain groups in the north, who settled less than 50 years ago on Thai territory and grow opium poppies.

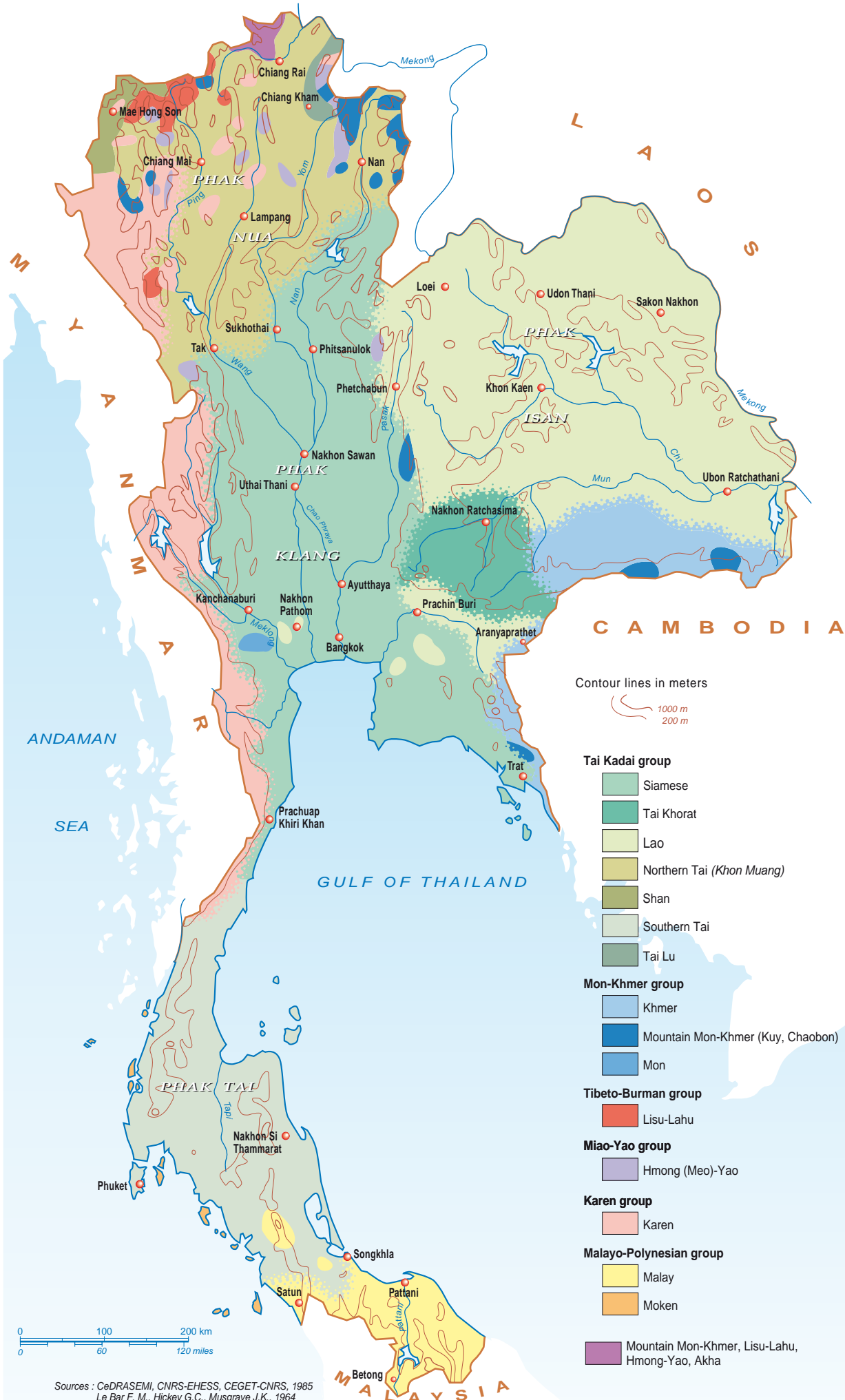
All cultural differences are seen by the bureaucracy as threats to the integrity of the nation, founded on the three pillars of the Buddhist religion, the monarchy and the Thai language (central Thai). The idea of autonomy, even in a uniquely cultural sense, is quite foreign to this centralist state where an overwhelming majority of the population speak the Thai language and are Buddhists. Ethno-linguistic differences emerge even among the Tai who make up the largest ethno-cultural group. Their importance must not be exaggerated, however, as they are much less than in neighboring countries like Myanmar or Laos. Unity greatly predominates over diversity, largely due to the power of the state, vector of modernity. The boundaries between units are fairly relative and imprecise, as can be seen from their outline on the map. The colors indicate only the relative predominance of the ethno-linguistic group represented.

The mountain regions to the north and west are the southern fringe of this vast, divided polyethnic area, the "uplands of the north Indo-China range", stretching from Assam to Guanxi and including parts of Vietnam, Laos and Myanmar. The same ethnic groups can be found on both sides of recently drawn, arbitrary boundaries. They are mobile and from a culture that is very different from that of the Tais, especially the Tibetan-Burmese, the Hmong and the Yao, who traditionally practise the cult of the spirits. The internal instability of neighboring regions, Laos and in particular Myanmar, maintains the mobility of these groups and a relative insecurity, strengthened by the existence of the Golden Triangle of drugs. Because the pressure of numbers limits access to

the land in the basins and valleys, the Tais from the north (or *Khon Muang*) are tending to move back up onto the hill slopes. There are three distinct levels, the *Khon Muang* in the lowlands, the Karen and Mon-Khmer ethnic groups in the valleys, and up to a height of 1,200 meters the Tibetan-Burmese, or Hmong-Yao, grow opium on the uplands. These distinctions are tending to become blurred, with improved accessibility and the intensification of mountain agriculture, giving rise to migrations between altitude areas.

The *Phak Isan* (or North-East), which forms part of the Mekong basin, is inhabited for the most part by Lao who migrated there from Laos in the 18th and 19th centuries. On the southern edge, in the Nakhon Ratchasima region, Khmers and Khorat Tais (descended from the Siamese) have settled since the 14th century. When the Lao Isan became aware of their individuality after being educated in the Siamese language (after 1921) and migrating on a large-scale to the capital, a form of regionalism was born. The North-East has elected representatives from the left-wing opposition on a regular basis, especially since after the Second World War, the relative underdevelopment of this region compared with the rest of the country became more apparent.

In the South, the Islamic religion and the language barrier (Jawi, a local variant of Malay, is better understood and written than Thai) have delayed integration of the four mainly Muslim provinces of Pattani, Narathiwat, Yala and Satun. Autonomists and then separatists have occasionally carried out guerrilla action with varying degrees of force since the 1948 revolt. The north-south split through the Thai peninsula is clearly due to a large predominance of Thai Buddhists in the north, whereas in the provinces adjoining the border with Malaya, the result of an Anglo-Siamese treaty of 1909, Muslim Thais of Malaysian origin make up almost 80% of the population. The Moken, pearl divers and shell gatherers, move about between the Malaysian and Myanmar islands, but they have also established two villages on the island of Phuket. Their dialects are related to Malay, with many Burmese and Mon-Khmer words, and they are animists.



A tolerant Kingdom

Buddhism is the declared religion of 95% of Thais and its followers represent by far the majority in almost all the provinces. In the 12th and 13th centuries the Mons brought Theravada Buddhism to the Thais, the only school of Hinayana ("Lesser Vehicle") Buddhism still in existence. The sacred language is Pali, in which the scriptures, the Tipitaka, are written. Buddhism is generally practised in monasteries (*wat*), which house the community of monks (*sangha*). The monk (*bhikku*) is the central figure in Buddhism.

To Thai people touring their country generally consists of visiting famous pagodas and Buddhist pilgrimage places: the sacred places of the central region have been well served since the late 19th century by waterways, roads and railways. Sunni Islam is the second religion, even though the proportion of Muslims in the country is contested between the administration and the Muslim institutions (between 4% and 10%). Representing the foremost religious minority (almost 2,240,000 in 1990), the percentage of Muslims varies considerably across more than half the country, but they are in the majority in the southernmost provinces of Pattani, Narathiwat, Yala and Satun. In 1990, Christians represented barely 0.5% of the population, about 290,000 people, mainly Catholics. They are the principal minority in the north and the north-east, and account for almost 14% of the population in Mae Hong Son.

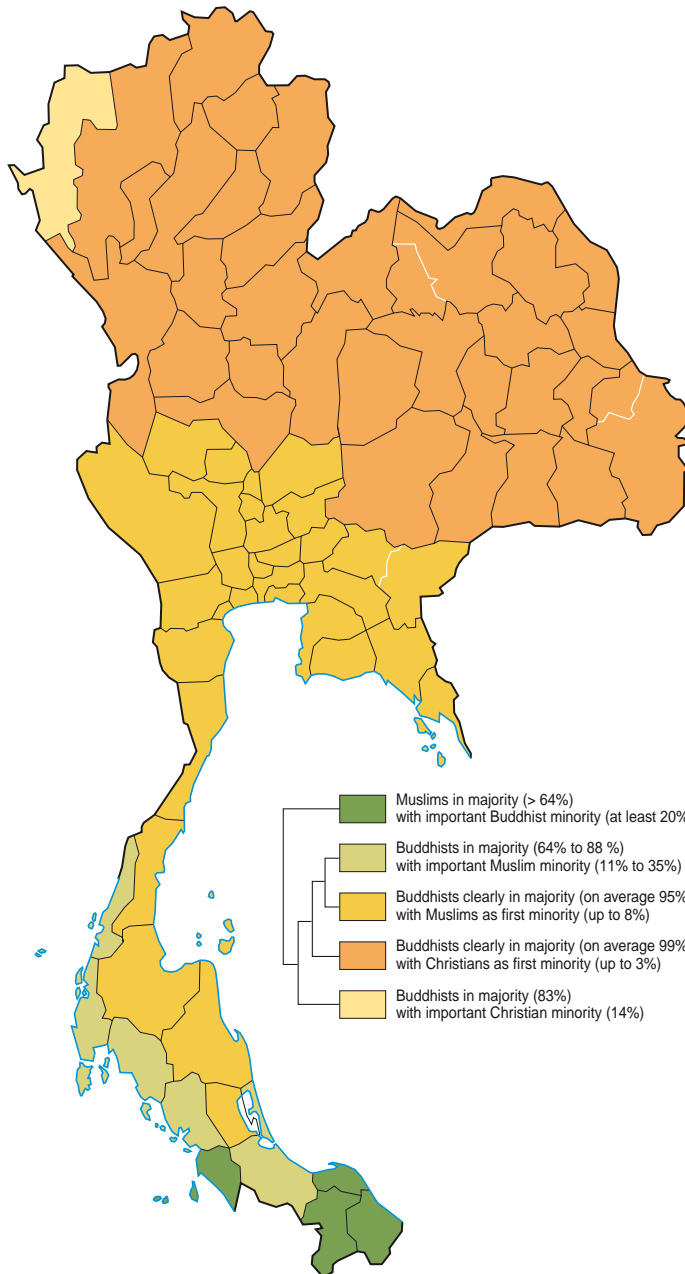
The beliefs of the Chinese are very eclectic, almost as if they did not represent a well-defined category of "religion". However, the supernatural is omnipresent: when a place of worship is required to protect a district or a market area, a small shrine is sufficient. The distribution of *san chao* shows that there are few Chinese in the most heavily populated regions in the north and especially the north-east, even though there are communities in all the provincial cities and in many rural areas. The Chinese are present in almost all the districts of Bangkok, where half the country's entire Chinese population lives. Among all the countries of South-East Asia, it is in Thailand that the Chinese have most influence. Their power derives less from their numerical strength than from their dynamism and their forms of solidarity, which can be seen through their associations and now in their wealth. Estimated at 14% of the population, they probably control more than 80% of the capital, or as much as the Chinese in Singapore, where they represent about 78% of the population.

The Chinese population comes mainly from the three coastal provinces of south-east China (Guangdong, Fujian, Guangxi) and the island of Hainan. For historical reasons, the Teochiu outnumber the Hakka, the Hainanese, the Hokkien and the Cantonese. The Chinese have come in large numbers since the end of the 19th century to work in the tin mines and rubber plantations in the south, in the paddy fields and the railroad yards and they gradually took over most of the trade. They then diversified their business activities, investing in such sectors as banking and manufacturing industries; they entered the professions, and were able to penetrate the administration sector. From 1987 onwards, they were the first to profit from the economy's glorious decade which, being of their making, is the product of a certain Chinese culture.

There has never been much anti-Chinese sentiment in Thailand, even if some avenues of work were closed to them for a long time. Both nationalist and conservative governments, Phibun Songkhram (1938-1944 then 1948-1957) and Thanin Kraivichien (1976-1977), took measures to promote forced assimilation (thaisation of names, closing of Chinese schools, limiting time that the Chinese language was taught). With the re-establishment in 1975 of diplomatic relations with China, then the dissociation of China from the Thai Communist Party and its rural guerrilla campaign, and the strong economic relations between the countries from 1987, the "Chinese problem" was eliminated completely. The coming to power in 1988 of Chatchai Choonhavan resulted in a renaissance of Chinese schools and even the opening of the Hua Chiew Chalerm Prakiat university in Bangkok.

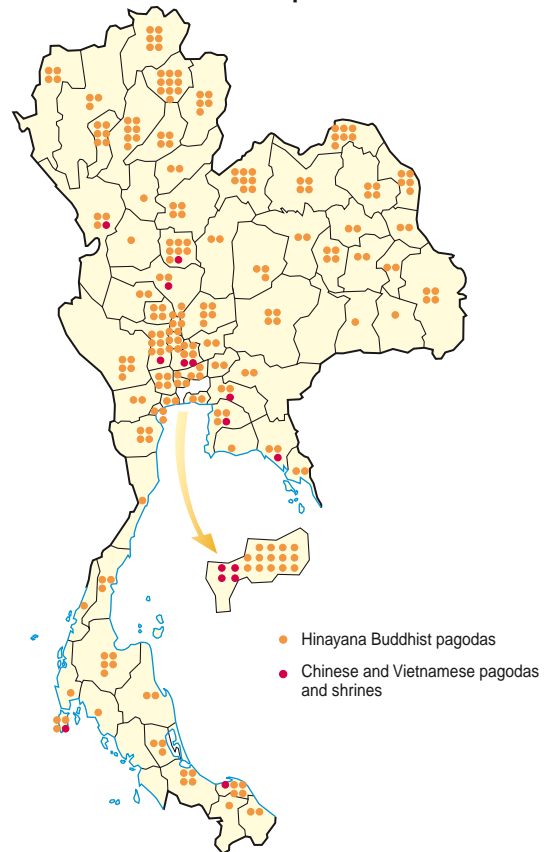
Chinese businessmen began to be involved in politics, financing political parties and standing for parliament. Of 22 Prime Ministers since 1932, at least 14 have been of Chinese origin. Because there has been a subtle movement towards sinisation since the 1970s, the successful assimilation of the Chinese, through schools and mixed marriages, is a model rejected by some analysts. The situation is right for the creation of a new Sino-Thai identity. This should be all the more easy to achieve as the Chinese have already had a tremendous influence on Thai culture.

Main religions (1990)

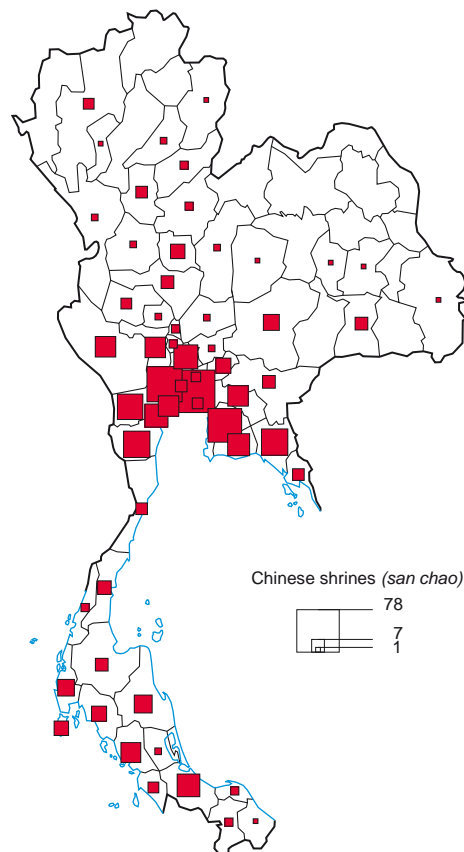


Sources : Ministry of Interior, 1994
 NSO, 1990
 Praphat Trinarong, 1959
 TAT, [circa 1990]

Famous places of pilgrimage and worship



Presence of the Chinese (1994)



Islam and christianity: two religions shared by different ethnic communities

The distribution of Muslims throughout the country shows that Islam is not limited to just the few provinces adjoining Malaysia. Though they are much in evidence in the sparsely populated provinces of Pattani, Narathiwat, Yala and Satun, they are also an undeniable presence in other southern provinces: Songkhla has more Muslims than Yala and Satun though slightly fewer than Bangkok. These five southern provinces (containing more than 60% of Thai Muslims) represent the heart of the native or long-established populations who have been converted, throughout the course of history, an entire province at a time.

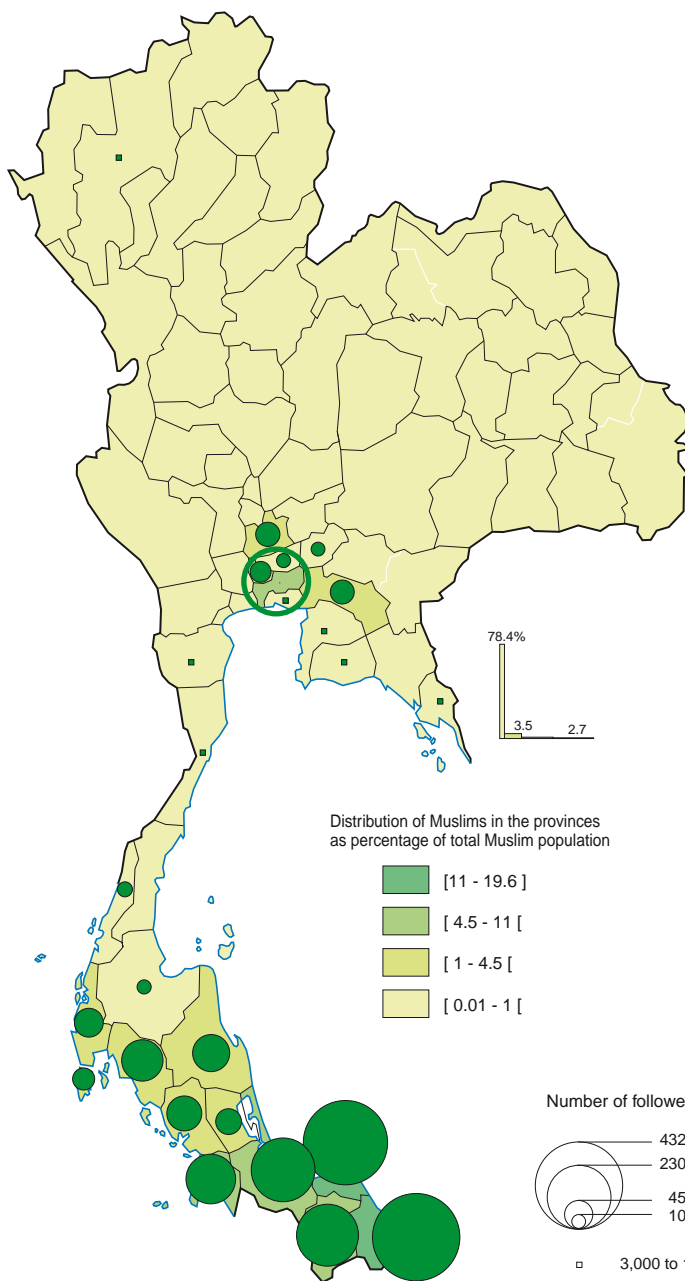
The Malay Muslims, Jawi speakers, for a long time nurtured a separatist movement, incited by the ultra-nationalist policies of Thai governments between 1930 and the 1950s, and supported by the neighboring state of Kelantan in Malaysia and, since the 1970s, by a few Arab countries. For a long time this state of insecurity was endemic, despite a more conciliatory type of politics since the 1980s which has calmed tempers and reintroduced debate into the electoral and government arena: the south has benefited from the coming to power of two Prime Ministers from this region (though not Muslims), General Prem Tinsulanonda (1980-1988) and Chuan Leekpai (1992-1994 and 1998-2001). The "incidents" that have occurred from time to time are a reminder that some Muslims are still not satisfied with the thaisation process, even though between the 1970s and the 1990s a quota system dispensed Muslim students from taking an entrance exam into many higher educational establishments.

In those provinces where the Buddhist religion predominates, Muslims tend to belong to families who are or have been migrants, refugees or deportees, depending on the time of their arrival. Many in the Minburi and Nong Chok districts of north-east Bangkok are descended from prisoners of war, deported from Pattani in the 19th century. In the central provinces of Chachoengsao and Ayutthaya, there are many villages of Muslims of Malay origin. Muslims originating from the Indian sub-continent (Tamils, Bengalis, Pakistanis) settled in towns bordering Myanmar, where they have taken up cattle trading, and in Bangkok around the Harun mosque. The Chams, originally from Cambodia for the most part, number only a few thousand and have settled in Trat province and especially in Ban Khrua in the heart of the capital. In the northern provinces of Chiang Mai,

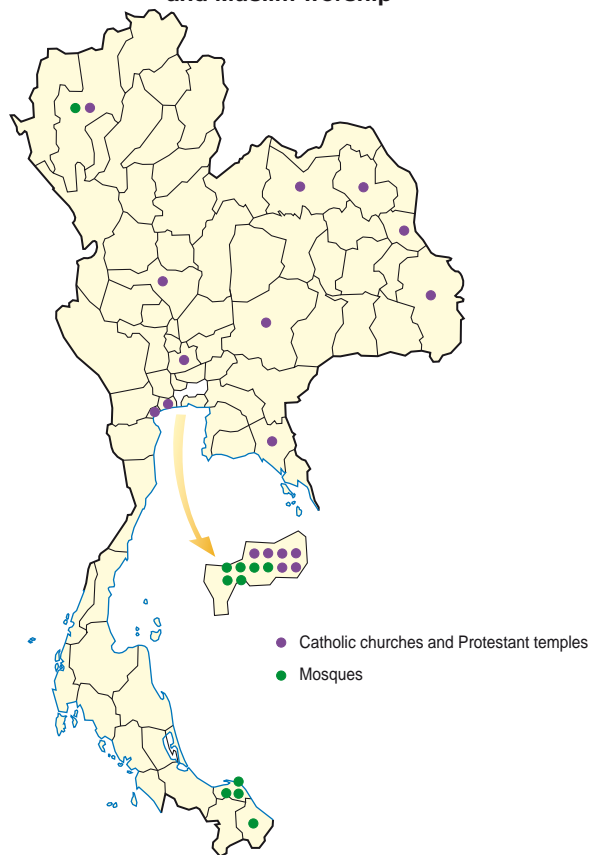
Chiang Rai, a fraction of the Yunnan Chinese or *Ho* Chinese minority is Muslim. Other Muslims originate from Java and Sumatra, Arabia or Persia. The main trend is of a great mixture of origins, to which are added Thai spouses converted from Buddhism, and this has happened to such an extent that in Bangkok in particular *mutsalim* (Muslim) tends to be presented as the sole category of identity, the ethnic origin being silently passed over.

Christianity reached Siam in 1555 with Portuguese Dominican friars. They were followed at the beginning of the 19th century by Protestant missionaries from the American Presbyterian Society, but this religion has never successfully implanted itself among the Theravada Buddhists. The Christian missionaries instead tried to convert the mountain-dwelling minorities in the north (Karen) and the Chinese in the center and the south of the country. In the south-east, especially in Chanthaburi, Catholicism involves Vietnamese and Chinese communities who originally arrived as 18th century immigrants. Many villagers of Vietnamese origin in north-east Thailand are Catholics and Sakon Nakhon has as many Catholics as Bangkok. Catholics are fairly well represented among teachers, doctors, intellectuals, politicians of Chinese and Vietnamese origin. Missionaries have played a vital part in introducing medicine and modern education into Siam: the Bangkok Nursing Home run by Protestants and the Saint Louis Hospital by Catholics are merely the best known of their kind. It is certainly in the education sector that their influence is most strongly felt: a large proportion of the country's elite have passed through one of their schools (Mater Dei, Saint John) or their universities (Assumption Commercial College), which the less well-off Christians can no longer afford to attend. Christianity may still be trying to convert the mountain populations, said to be animists, and compete with the Buddhist monks, but its main task is trying to adapt to the inevitable urbanization of part of its faithful, while still preserving its influence, especially in the field of education.

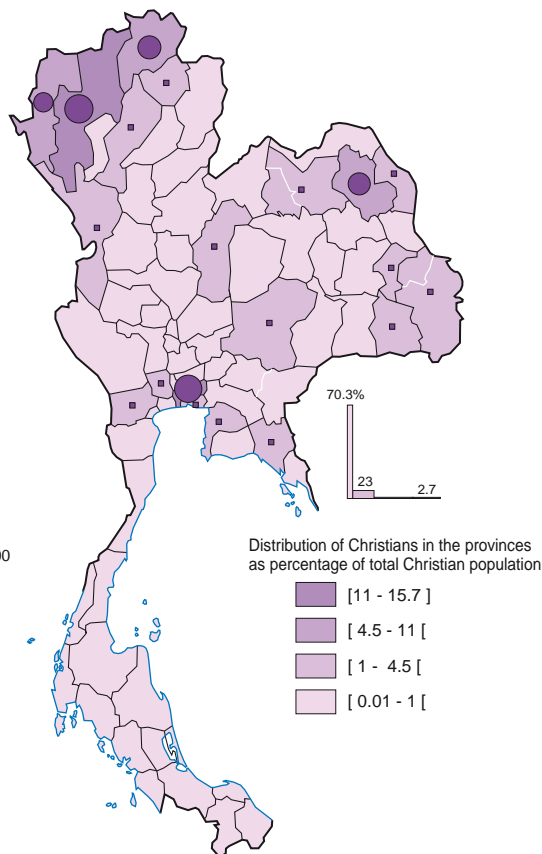
Muslims (1990)



Main places of Christian and Muslim worship



Christians (1990)



Sources : NSO, 1990
 Praphat Trinarong, 1959
 Saowani Chitmuak, 1988
 TAT, [circa 1990]

Well-defined factors of spatial distribution

The population of Thailand in 2000 was just over 60 million inhabitants, 60,606,947 according to the preliminary results of the 2000 population census. In contrast to neighboring countries, the inhabitants of Thailand are distributed fairly evenly, due mainly to the fact that agriculture is widespread throughout the entire country. There is a concentration of population, however, around the capital, in the North-East and in the provinces which include the major secondary cities (Nakhon Ratchasima, Chiang Mai and the Songkhla/Hat Yai conurbation).

Population densities that are truly urban, greater than 1,000 inhabitants per km², are to be found in Bangkok, or slightly lower levels in the neighboring provinces of Samut Sakhon, Samut Prakan and Nonthaburi, which are incorporated into the Bangkok Metropolitan Region (BMR). A less dense form of urbanization has spread along the main communication routes as far as Sing Buri province to the north. In the rest of the country only the province of Phuket has such high densities, due to major in-migrations because of tourist development. Beyond Sing Buri, population densities in the Central Plain, which remains the country's most important agricultural area, drop to less than 200 inhabitants per km², though this is still higher than the national average of 110 per km².

Population densities of 100 to 200 inhabitants per km² can be found in provinces of the North-East and the South (see also plate 63 Population in North-East and South). The high densities in the North-East, still a largely agricultural area, despite a difficult environment, are an important feature of Thailand's spatial organization. In the South, high densities are found in the provinces with the longest established populations on the east coast. In the north and west of the country, population density is low. In the north, the mountains of the north Indo-Chinese range and the central chain isolate the heavily populated flood plains, which are separated one from the other by less densely occupied uplands. In the west, most of the population is concentrated in small valleys, leaving vast areas that were formerly covered by forest under-populated.

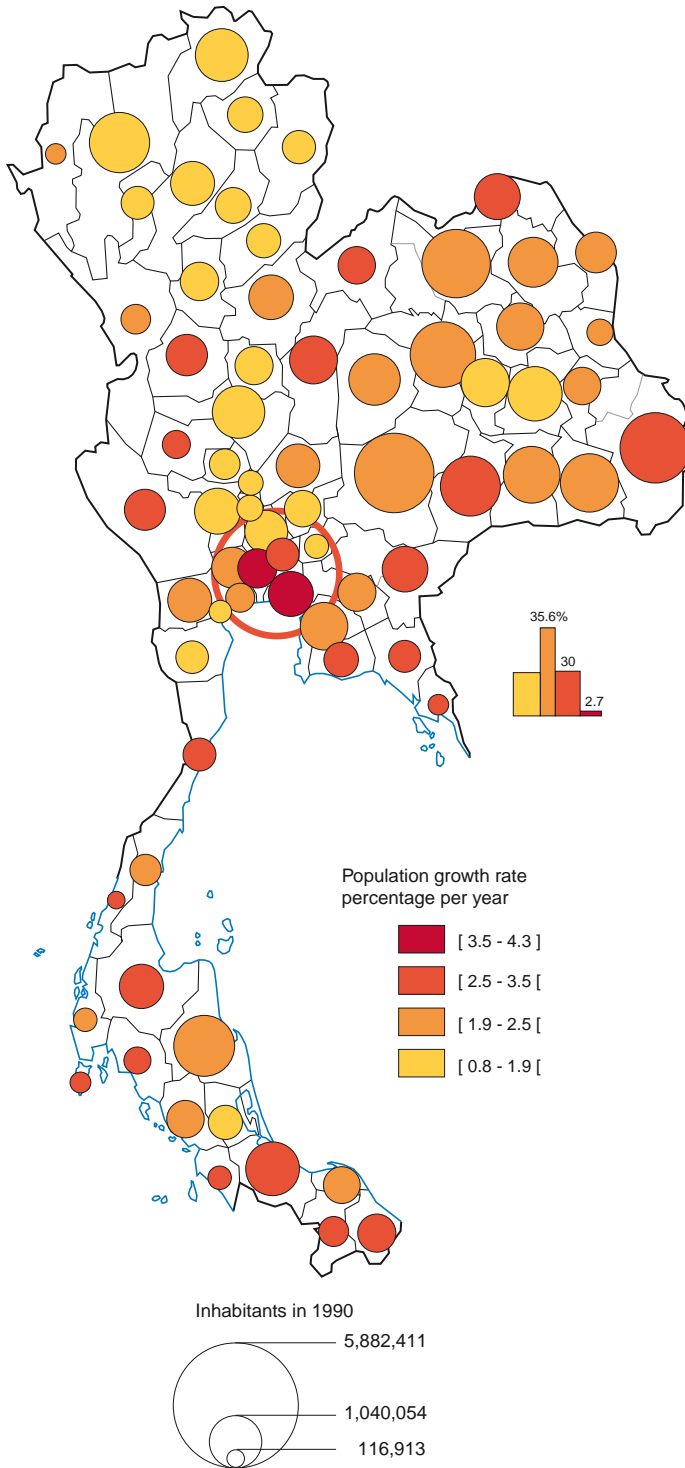
The country's population dynamics are linked with two main factors: the advance of the agricultural frontier and the attraction of Bangkok. Like its neighbors, Thailand has developed for many years in a context of under-population, with people

being grouped together around power centers located in the plains, in the valleys and along the waterways. Exploitation of the land was sustained in the 19th century by policies of agricultural expansion and the digging of irrigation and drainage canals. The agricultural frontier continued to extend to peripheral areas until the 1980s (see plate 31 Land utilization). This accounts for the high population growth until 1990 around the edge of the Central Plain (Kanchanaburi, Uthai Thani, Kamphaeng Phet) and then further towards the east, the south-east (Chanthaburi, Trat), the north-east (Nong Khai, Loei) and in some southern provinces. There, the movement of populations arriving from the east coast in order to establish rubber plantations accounts for the high population growth in the interior and in the western part of the peninsula, which continued throughout the 1990s.

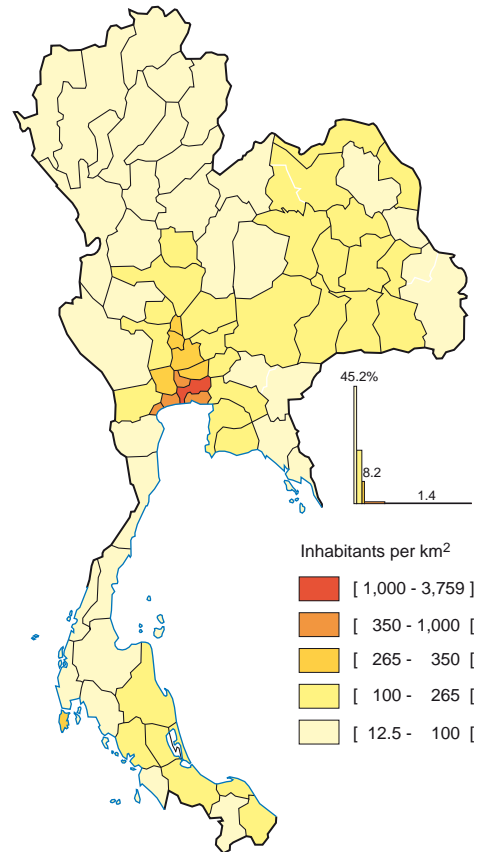
The pull of Bangkok accounts for the increase in the city's population (see plate 18 Importance of migrations in the provinces), and also explains the rise in the 1990s of the populations of the adjoining provinces and the nearest provinces to the east and west as the growth rate of the municipality itself tended to decline. This dynamic has been recognized by planners who, by "extended metropolitan region", mean the region, vaster than the BMR, which includes adjoining provinces such as Chon Buri, Ayutthaya and Ratchaburi. Developments along the Eastern Seaboard, built with the intention of relieving congestion in the port and city of Bangkok, have already attracted a large population to Chachoengsao, Chon Buri and Rayong.

In the provinces of the North and the rest of the Central Plain, on the other hand, population growth is slow. The decrease in fertility, observed in Thailand since the middle of the 1970s, has been particularly rapid here and is combined with high rates of emigration. The population of these provinces as a proportion of the national total has decreased since 1970. In the North-East, fertility rates remain high, thus compensating for a high regional emigration rate and enabling the region to maintain its superiority in numbers in relation to the population of the country as a whole. Fertility rates are also high in the South, especially in the Muslim provinces in the far south, and population redistribution occurs mainly within

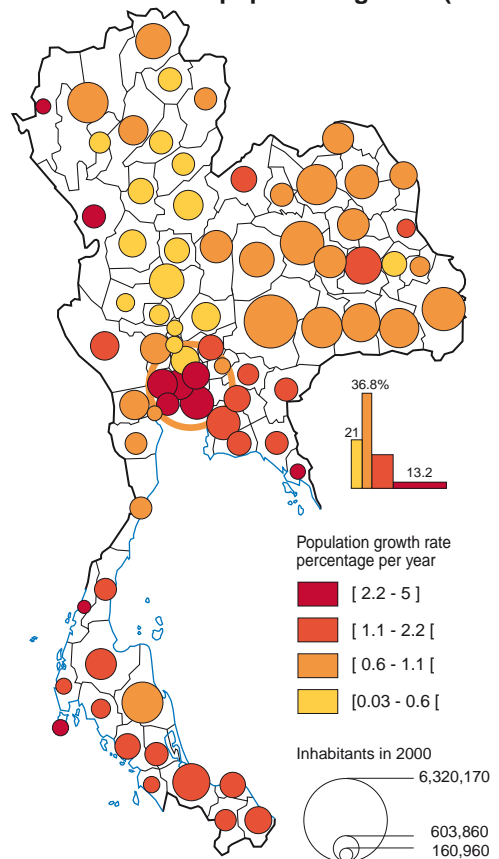
Population in 1990 and population growth (1970-1990)



Population density (1990)



Population in 2000 and population growth (1990-2000)



Sources : NSO, 1970, 1990, 2000

A demographic transition nearing completion

Thailand has experienced a real demographic revolution since the 1970s. The country is witnessing the largest decrease in fertility rates of all the developing countries as can be seen from the rapid and continuing decline in the rate of population growth. The receptive mentality of the people, the level of literacy, the efficiency of the national information network, the rapid development of communications, these are among the main factors which account for women's rapid adoption of contraception, made available through family planning clinics. 15% of married women of child-bearing age used contraceptives in 1970, 68.4% in 1990, according to the census figures. The decline in the fertility rate has been so rapid that Thailand entered the 1990s with a fertility level lower than the universal replacement threshold (2.1 children per woman). There is a time-lag between different regions and between rural and urban areas, as can be seen from demographic surveys regularly carried out by the National Statistical Office (NSO): in 1996 the fertility rate of women living in the municipalities was 1.3 children per woman (a figure largely influenced by the situation in Bangkok, where the fertility rate among immigrants is low), compared with 2.3 children in rural areas. However, the decline can be seen everywhere, being more rapid since the beginning of the 1990s in rural areas, which are now tending to catch up with the urban areas. Mortality rates, which are still higher in rural areas (6.5‰) than in urban areas (4.1‰), are also evening out.

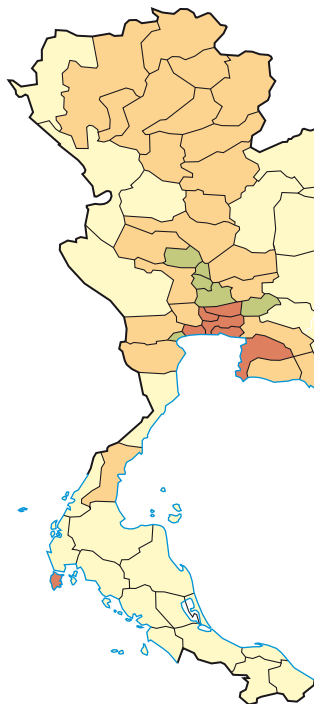
The decline in fertility and birth rates is general, but the north-eastern and southern regions are slightly behind, maintaining a high degree of demographic pressure on the cultivated land and favoring migration towards the pioneer agricultural fronts. Poverty and the low level of development in the North-East do not sufficiently account for this trend, as they apply also to the North: the diversity of local situations seems to influence the rates calculated at regional level. In the South, the presence of a larger Muslim population accounts for the differences from the Thai average. However, the high birth rate cannot be attributed to religious practices as birth limitation policies have been extremely successful in the neighboring Muslim countries of Malaysia and Indonesia. This behavior, associated also with a lesser level of development, is rather an expression of their difference in relation to other Thais.

Changes in marriage-related behavior (marriage at a later age, frequency of celibacy) which could

have an effect on the average number of children per woman would tend to favor a continued decline in the fertility rate. However, strong social trends idealizing the two-child family will probably slow the process. The aging of the population, and the subsequent increase in the number of deaths, means that a noticeable drop in the death rate (6‰) is not likely. Bangkok, where capital was invested at an early date in modern sanitary infrastructure, was the first to be affected, since the 1960s, by the drop in both the death rate and the infant mortality rate. The level of infant mortality (less than one year), which affects boys more than girls, was still at 26.1‰ in 1995-1996, 31.4‰ if we count deaths of those under five years, and this remains a worrying statistic, even in the cities (where it stands at 15.2‰) and particularly in the peripheral regions where rural poverty is still endemic. For the minorities living on the mountain slopes in the north and the west, fertility rates and infant mortality rates are, as far as one can tell given the difficulties of registering births, very much higher than average, because of poverty and the difficulty of access to health services.

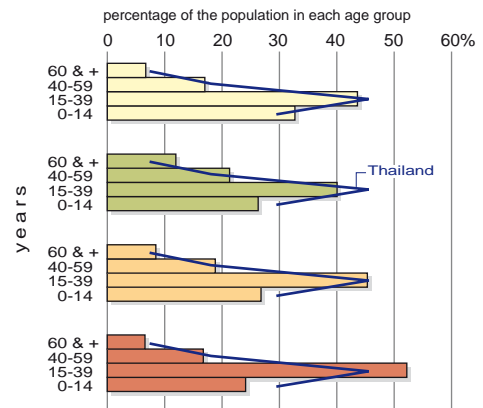
The decline in fertility has consequences for the national and regional age pyramids, which are being reduced at the base, except in the North-East and the South where fertility rates remain high, and broadening at the top. The map showing age groups, like the age pyramids by region, reveals the very specific profile of Bangkok and neighboring provinces: in Bangkok there is a deficit in the youngest age groups and an over-representation of young adults, who have come to the capital for training or to study or work. This is especially true for young women, whose migration to urban areas has become a striking feature of migration patterns. Beyond Bangkok and the neighboring provinces the older populations are in general better represented, because of the departure of the young adults to the capital and the return from Bangkok of migrants who have reached the end of their working life. Young children, on the other hand, are over-represented in almost all the provinces of the North-East and the South.

Population by age groups (1990)

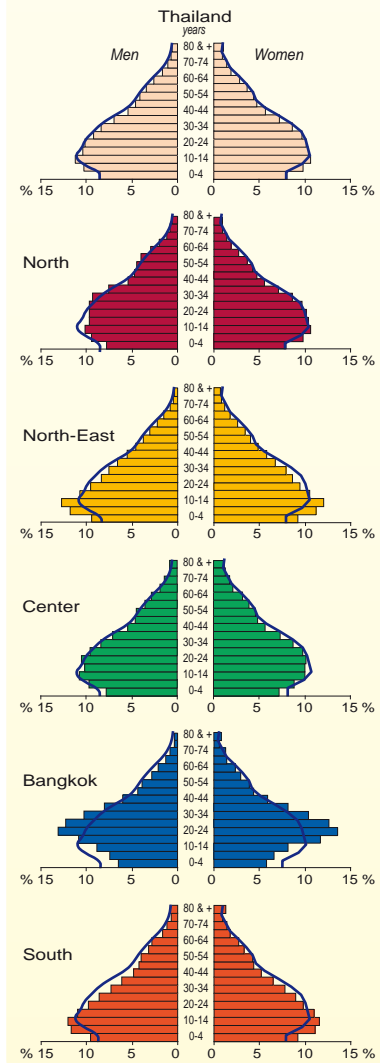


- Large proportion of young population aged 0-14 greater than country average, working population of 40-59 years slightly below average
- Predominance of the two oldest categories, especially 60 & over, ratio of 15-39 age group clearly below average
- Slightly older than country average with working population 15-39 years close to average
- Share of the youngest 0-14 category clearly below average with large proportion of working population 15-39 years

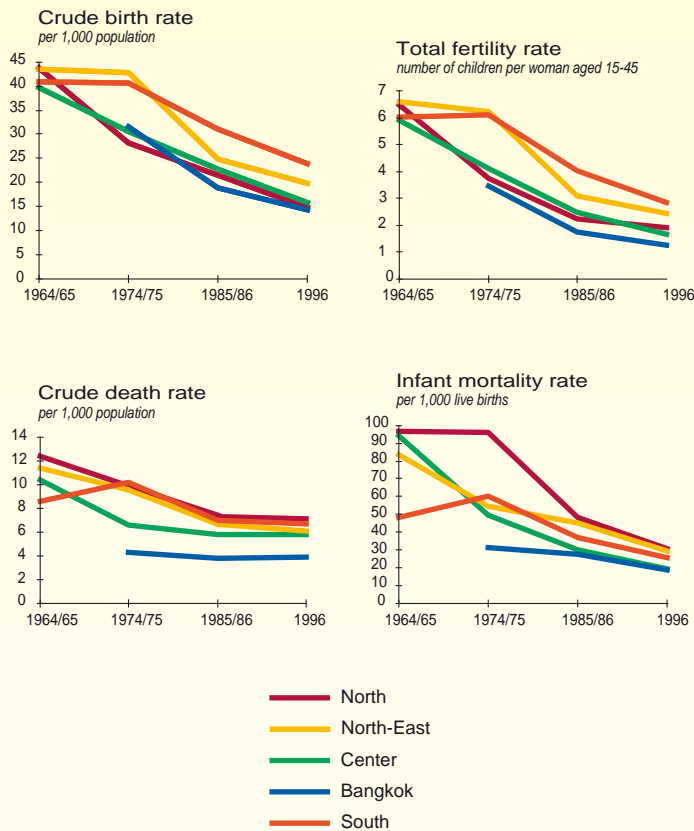
Profile of the classes



Comparative age pyramids of the regions and Thai average (1990)



Variation of demographic indicators (1964/65-1996)



Sources : NSO, 1965, 1975, 1986, 1990, 1996

A country still not extensively urbanized

Thailand is a country where the majority of the population still lives in rural areas. With more than 40% of the land being used for agriculture, it is one of the countries of South-East Asia with the most extensive area of agricultural land and where the population, grouped together in villages, is consequently spread most widely throughout the country. The advance of the agricultural frontier on a national scale and the development of lands at local level have, at first, made it possible to absorb the population growth that has occurred in rural areas. Migration to Bangkok then took over, but since the 1990s, urban mobility has been coupled with a diversification by rural dwellers into fields of activity other than agriculture and this has been possible by the trickle-down of growth as far as villages in the peripheral regions; this process of diversification of employment in the rural areas has checked physical urbanization.

The north-eastern provinces contain the largest rural population and also comprise the most densely populated rural areas. The provinces in the extreme north and the eastern provinces of the peninsula, former population centers associated historically with rice cultivation, still have a very large rural population.

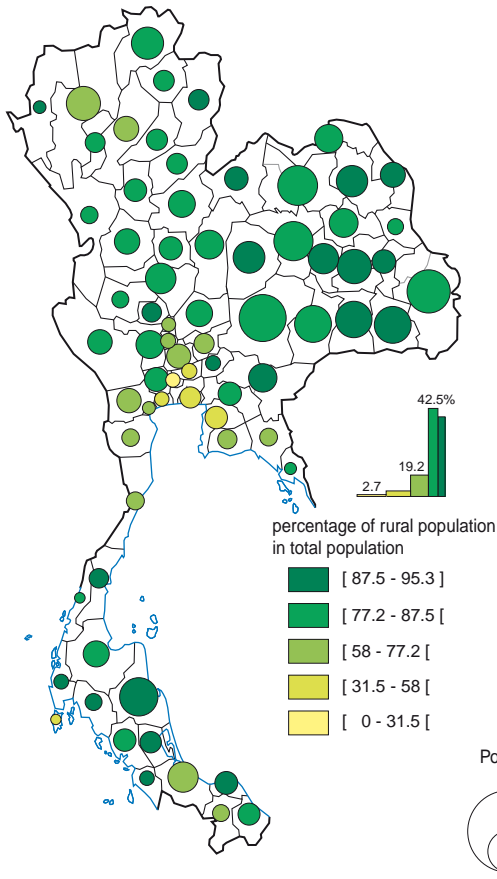
The map of the urban population, compared with that of the rural population, shows the axes of urbanization that are in the process of being structured, and which can be more clearly identified in the plate 16 on municipalities: the Bangkok-Udon Thani axis is more clearly defined than the Bangkok-Chiang Mai axis and the Surat Thani-Songkhla axis, whereas around Bangkok the structure seems more one of concentric rings, with the most urbanized provinces being situated in immediate proximity to the capital. The urban area therefore follows the communication routes out of Bangkok in a star-shaped pattern: it is dense to the west towards Ratchaburi, to the north towards Ayutthaya, and to the south-east where the infrastructure of the Eastern Seaboard has encouraged a ribbon development along the canals and the coast road linking Bangkok and Rayong (see also plate 58 Urban and industrial development around Bangkok). Urban development is virtually continuous from Chon Buri to Pattaya, through newly created municipalities that are sometimes very heavily populated, like Ao Udon with more than 71,000 inhabitants. Since the implementation of the Eastern Seaboard, the urban population of Chon Buri

and Rayong has doubled, reaching 760,500 in 2000, up from 378,300 in 1980.

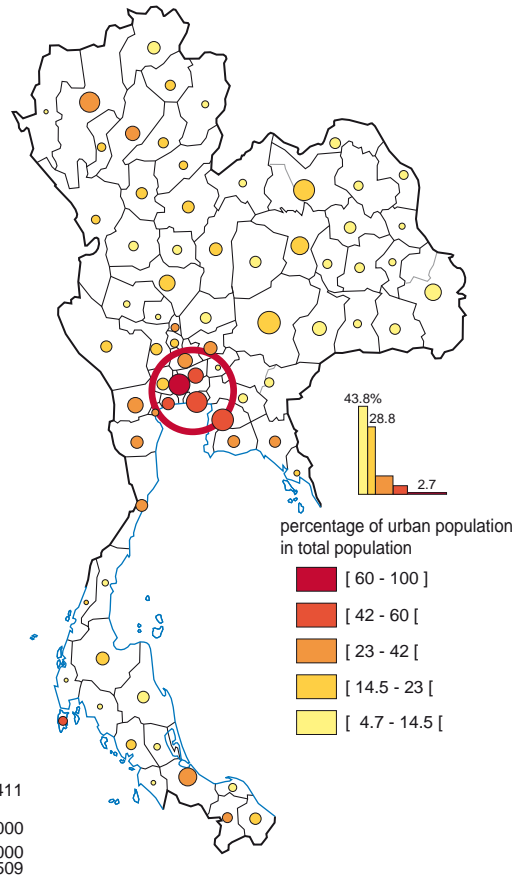
The growth in urban population between 1980 and 2000 (2.4%) was double that of the rural population (1.2%) and much higher than that of the population as a whole (1.5%). This assessment of the urban dynamic is however somewhat skewed by a definition of "urban" which is too administrative in character and changes from census to census. Although the 1970 census considered as urban dwellers only the population of the municipalities (all the province centers and some other large towns), the 1980 and 1990 censuses introduced the population of some sanitary districts and the 2000 census incorporated the population of all the sanitary districts which have been given municipality status. For comparison, the population of the sanitary districts in 1980 has been included in the map showing the growth in urban population for the period 1980-2000.

The growth rate of the rural population is rapid in those provinces where the birth rate remains high, in the North-East and the South. It is also rapid in provinces that were originally sparsely populated and which received a lot of migrants who came to clear the land. These include Nong Khai, Kamphaeng Phet, Phetchabun, Kanchanaburi and more recently Mae Hong Son and Tak or the provinces of the south-east along the Gulf of Thailand and the western part of the peninsula, pioneer areas for developing cash crops, like rubber trees, sugar cane or oil palm. The urbanization process is nevertheless well under way since, in almost all provinces, the urban population is increasing at a faster rate than the rural population, especially in those provinces that are so far little urbanized, those in the urbanization axis in the northeast of the country and in the provinces around Bangkok which benefit from the dynamics of periurbanization: in 2000 the urban dwellers of the Bangkok Metropolitan Region, with just over 8 million inhabitants, represented 45% of the country's entire urban population. The urbanization process is often only recognized after it has happened, and new sanitary districts or municipalities are then created, especially in regions where the population has only

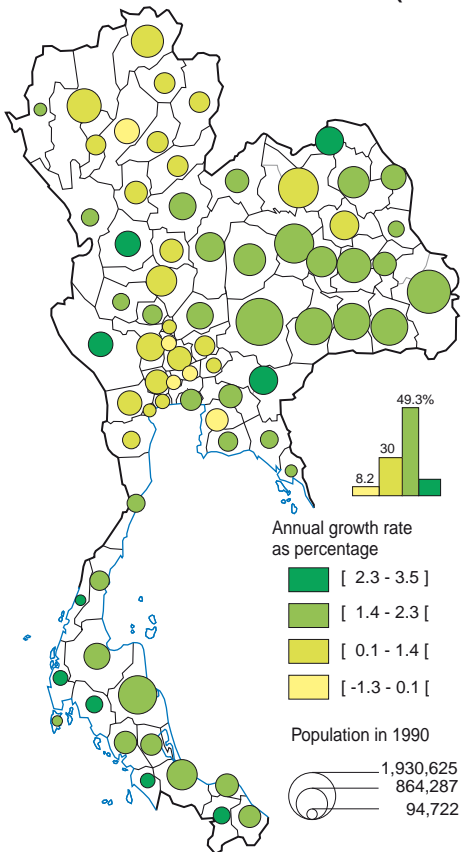
Proportion of rural population (1990)



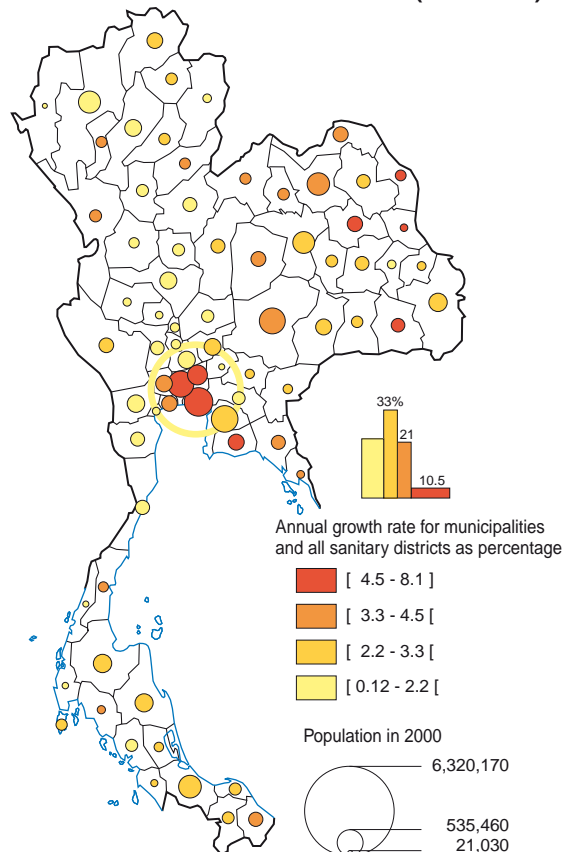
Proportion of urban population (1990)



Growth of the rural population (1970-1990)



Growth of the urban population (1980-2000)



Sources : NSO, 1970, 1980, 1990, 2000

A city network dominated by Bangkok

The location of Thailand's cities and urban areas has two main features: the primacy of Bangkok, and its axial pattern, structured by the major communication routes. The primacy of the capital is an extreme phenomenon, with its origins in the city's geographical location and the country's highly centralized style of territorial management (see chapter 7 Bangkok and the Bangkok metropolitan region). This central role, which can also be seen in the way other activities and decision-making are concentrated, is reflected in the demography of the country, for in 1996 Bangkok and the five neighboring provinces contained just over 50% of the country's municipal population. The primacy of Bangkok province has stabilized to form an extended metropolitan region which polarizes the country.

Excluding Bangkok, the city rank-size curve is fairly regular with a concentration of provincial centers at the top, apart from those in the sparsely populated or newly created provinces. The second-rank cities with populations of between 140,000 and 290,000 inhabitants, Nonthaburi, Nakhon Ratchasima, Chiang Mai, Udon Thani, Hat Yai, Pak Kret (Nonthaburi province) stand out clearly. After this, there is no major break in the ranking of cities by size. The spatial distribution of second-rank cities is determined by their distance from Bangkok: the Central Plain has no cities of this size, apart from the suburban cities of Nonthaburi and Pak Kret, which are functionally linked with the capital, as the concentration of all functions in Bangkok virtually prohibits the development of any other regional centers of command.

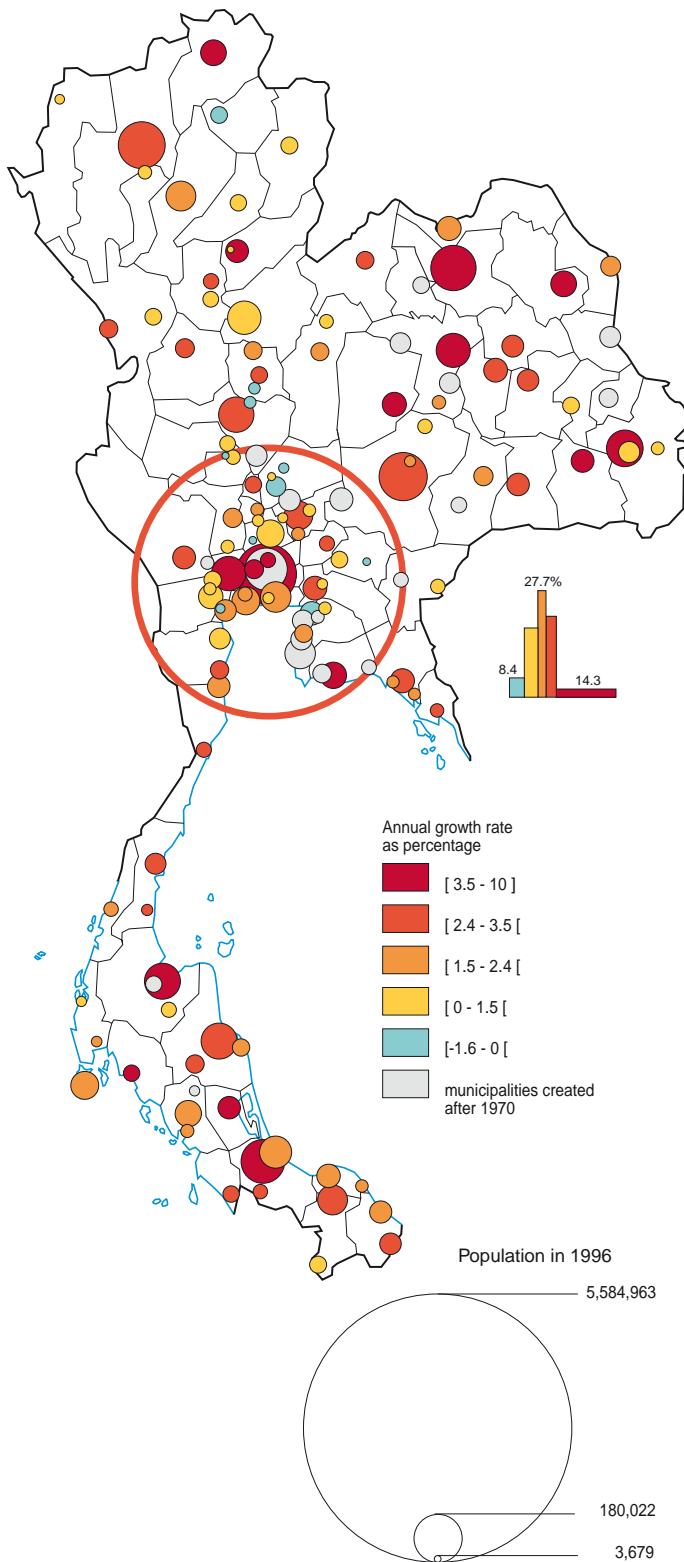
Beyond Bangkok, towns are more scattered. Some are the capitals of ancient peripheral kingdoms and principalities, like Chiang Mai or Nakhon Si Thammarat, but most have been developed by the centralizing will of an administration eager to control and serve the population and the territories. Because of its dense administrative network, Thailand has a remarkably regular scattering of small urban centers. As part of the decentralization process, 981 sanitary districts were transformed in 1999 into municipalities: almost half have less than 5,000 inhabitants and are barely urban. The road network has very much structured the system of cities: the northern axis from Bangkok to Chiang Mai via Ayutthaya and Phitsanulok; the main eastern axis, the Friendship Highway, linking Bangkok, Nakhon Ratchasima, Khon Kaen and Udon Thani and from which secondary roads branch off, from Khon Kaen to Nakhon Phanom and from Nakhon

Ratchasima to Ubon Ratchathani; the southern axis, crossing the provinces of the eastern peninsula, Surat Thani, Nakhon Si Thammarat, Songkhla/Hat Yai, Yala and Narathiwat. The main cities along these axes saw rapid growth during the 1970s, which official population statistics do not always take into account. The size of most of the municipalities, especially the regional capitals, is an underestimation as there is always some delay before administrative boundaries are officially adjusted to take into account actual spatial extension.

Public and private participants have contributed to the growth of the municipalities (2.4% per year from 1970 to 1996). The regional capitals have been given public facilities in accordance with their administrative rank. The ranking of cities by nominating growth centers was a policy started in the 1970s and continued until the Sixth Plan (1987-1991), and this also favored the development of the cities that were selected, even though the amount of investment that was forthcoming did not always match up to expectations (see also chapter 3 The state and the construction of the territory). This policy was extended to many cities before development efforts began to be concentrated in the extended metropolitan area around Bangkok, but did not really succeed in slowing the process of concentration around the capital, mainly because of the persistence of a political, economic and administrative hyper-centralization.

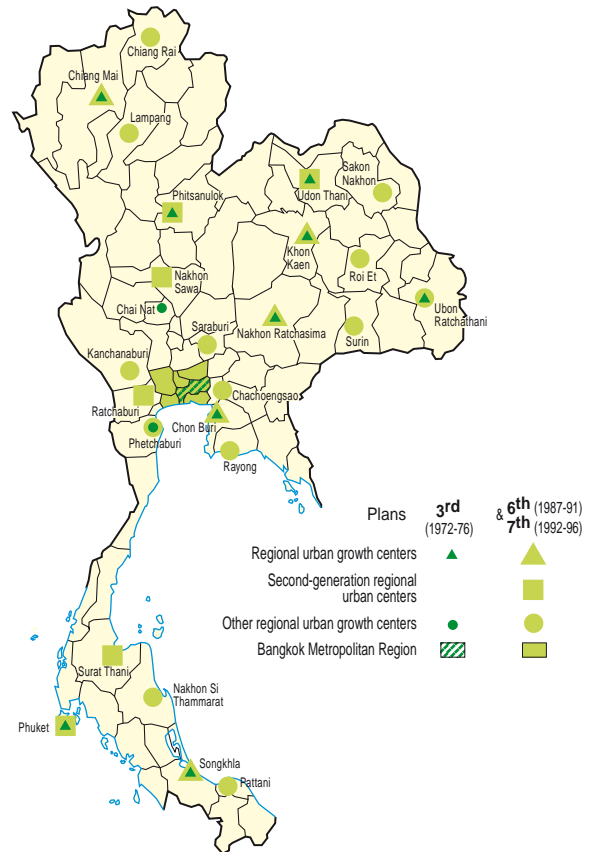
Supported by the benefits from the advance of the agricultural frontier, progress in commercial agriculture and Thailand's very healthy economy, cities in the North-East and the South have experienced higher growth rates than the national average since the 1970s. Since the end of the 1980s, growth in the secondary and tertiary sectors has taken over from agriculture in cities such as Nakhon Ratchasima, Hat Yai or Udon Thani. Cities near the northern and north-eastern borders are anticipating a new dynamism, with the opening up of neighboring countries such as Myanmar, Laos, Cambodia and Vietnam, and the establishment of road and air routes as cooperation becomes established. In the south, the institutionalization of exchanges with northern Malaysia in the context of an economic cooperation zone also strengthens the country's urban dynamic.

Population and growth rate (1970-1996)

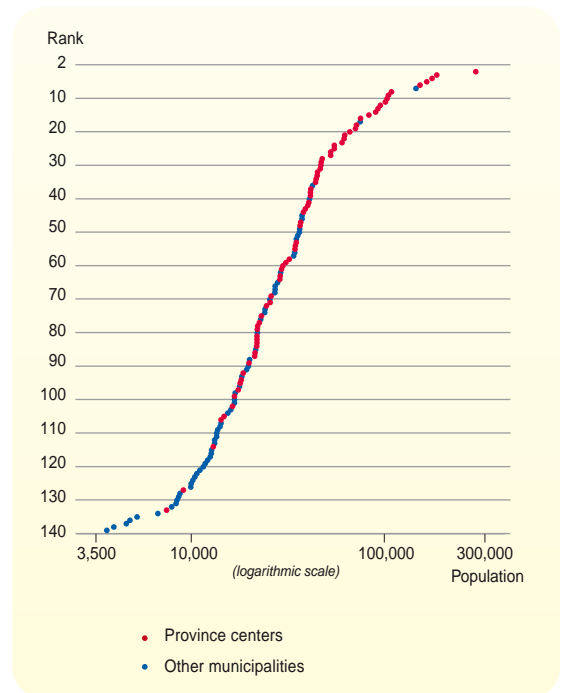


Sources : Ministry of Interior, 1970, 1996
NESDB, 1971, 1987, 1992

Regional urban growth centers under the 3rd, 6th and 7th National Plans



Graph of rank-size of the municipalities (1996) Bangkok excluded



Migration to the Central Plain

Inter-regional migration involves movement between regions, defined by the National Statistical Office (NSO), over the five years preceding each population census. Movement between 1985-1990 reveals the predominance of migration in three main areas: the North-East, where the balance with all regions is negative, the Center and Bangkok. There is a very high level of exchange between these last two, because of the urbanization which is reaching neighboring provinces of the capital, and migration back to the Center of those who had migrated to Bangkok and are returning to their native province. The North-East, a densely populated and less developed region, is the greatest supplier of immigrants. Migrations towards the Center are partly urban, partly agricultural, due to the dynamism of a very diversified agricultural sector.

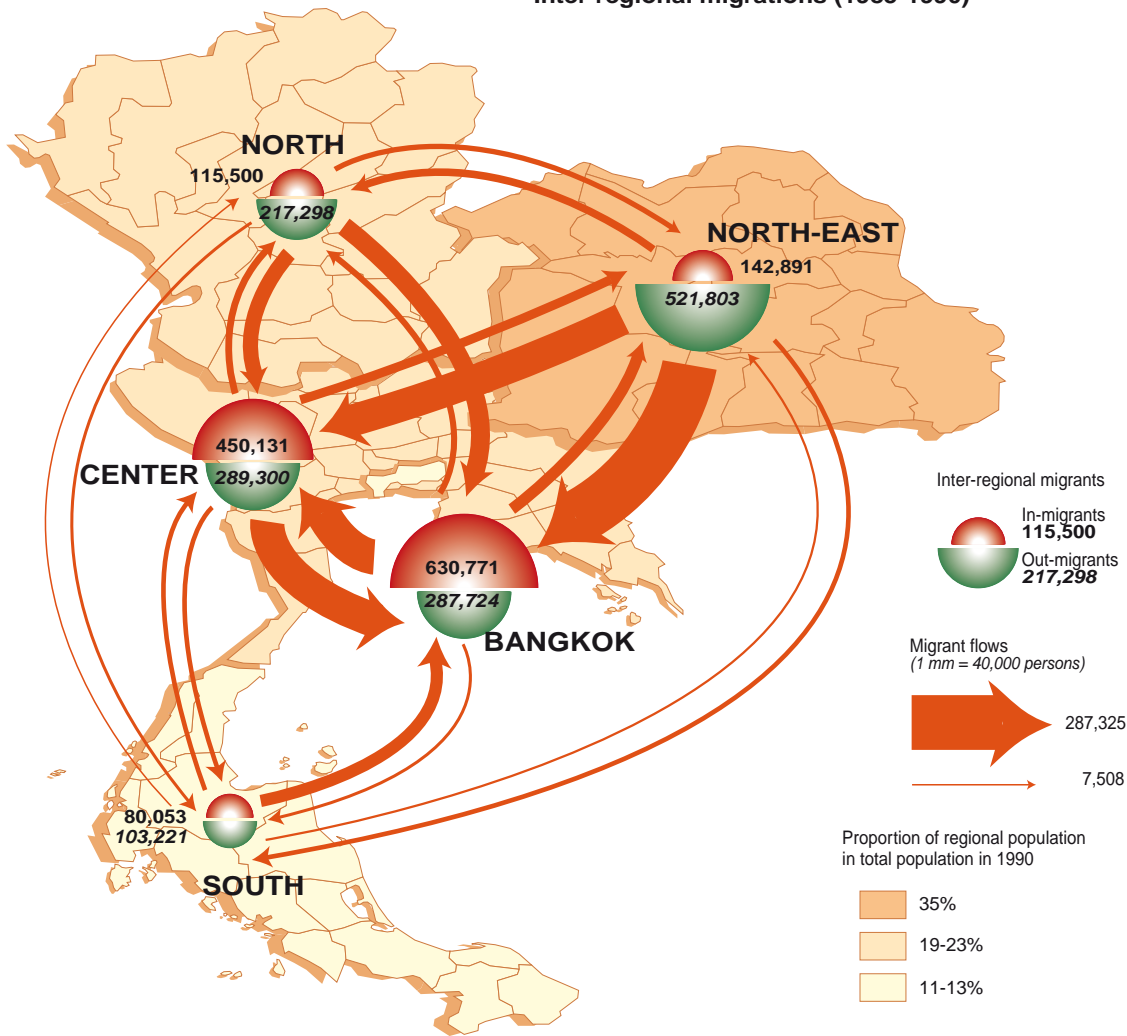
The evolution in inter-regional migration has produced an increase in migratory movements, although with a levelling off in 1975-1980 and a change in the nature of this movement. Migration towards the pioneer agricultural fronts accounts for movement towards the North (especially as the northern part of the Central Plain is considered as part of this region), the Center and the North-East since the 1950s with a marked increase in the 1960s, as the development process accelerated and demographic pressure on the cultivated land increased. At that time the Center appeared to be a major destination for migrations, with land unsuitable for rice production being cultivated with other crops at an accelerated rhythm towards the edges of the plain, as far as the west and the south-east where the first manioc and sugar cane plantations were developed. Until the 1980s, most migration was towards the agricultural edges of the central region. In the North, crops extended beyond the narrow flood plains towards the surrounding slopes. In the North-East, the settled area encroached into the forest, towards the western slopes of the Phetchabun and north beyond the Phu Phan mountains. In the South, the cultivation of the land in the west, then in the center of the peninsula accounts for the fact that for a long time migrations remained intra-regional. Other factors also contributed to limiting inter-regional migration. The North-East, for example, benefited at the end of the 1960s from the dynamic created by the installation of American military bases and the introduction of development programs.

It was during the 1970s that Bangkok began to

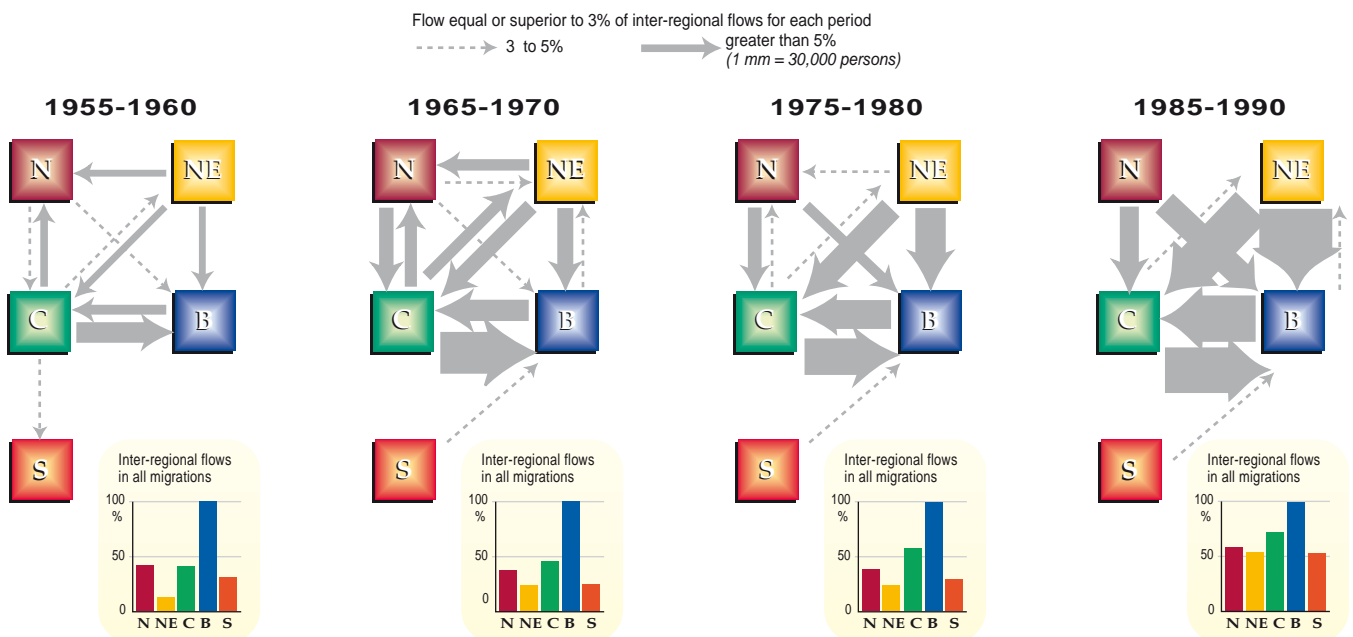
supplant other destinations, and the total number of migrants decreased, indicating the beginning of the closing of the agricultural frontier and the stabilizing of the rural population. The net migration into Bangkok is positive for all the regions. The capital is the principal destination for migrants from the North-East, the largest provider of inter-regional migrants, and it appears to have been an increasingly popular destination in the period 1975-1980. Agricultural activity is still the reason for the Center region's attracting a lot of migrants, especially as the departure of so many of the native population to Bangkok creates a seasonal shortage of agricultural workers which has been very noticeable since the 1970s. Migration to the Bangkok suburbs, the neighboring provinces, then the Eastern Seaboard intensified in the following decade. The monopolization of inter-regional migration by Bangkok and the Center increased still further in the 1980s.

In the period 1975-1980, the number of inter-regional migrations overtook intra-regional migration. The pull of Bangkok became even stronger as new agricultural land became a rare commodity and a more diversified economy took over from agricultural colonization: improvements in the road network facilitated long-distance migration to Bangkok and the neighboring provinces of the Center. In the South, isolated by distances, there was a lot of migratory movement, but for the most part within the region itself, especially from the east coast, which had been populated and cultivated at a much earlier date, to the west. But the region does follow the general trend of travelling increased distances as there is migration to Bangkok. Another feature of the South, is that half of migration is into Malaysia. Although until the 1950s, the southern region received many migrants, since this time the region has a negative balance of migrations, especially as the birth rate, which remained high here, accentuated the demographic pressure locally on the region's resources.

Inter-regional migrations (1985-1990)



Variation in inter-regional migrations (1955-1960 to 1985-1990)



Sources : Goldstein S., Goldstein A., 1986
NSO, 1990

Urban migration begins to predominate

Population movements towards the agricultural frontier and the Bangkok metropolitan region represent the two major migratory movements since the 1950s. The map showing the proportion of residents born in another province confirms that of population growth rates (see plate 13 Population distribution and growth). It shows the major growth in population at the edges of the Central Plain, in the north-east and south-west, linked with the expansion, either spontaneous or organized, of the agricultural frontier.

The large proportion of immigrants to be found in the population of Kamphaeng Phet or Phetchabun is linked with the low population level originally and the high population levels in the neighboring provinces of Ayutthaya, Nakhon Sawan and Phichit, which were settled much earlier and provided a large proportion of their population as migrants. An example of a settlement program, the Self-Help Resettlement at Thung Pho Thaley in Kamphaeng Phet, attempted to settle populations from the Center and the North-East beside a population that had remained until then in the immediate area bordering the Mae Ping. In the south-east, in the provinces of Prachin Buri, Chanthaburi, Trat and Rayong there has been a diversification in agriculture due largely to the topographical conditions and especially to a favorable climate (see plate 8 Environment and natural resources). The west, then the center of the peninsula have been expansion zones for rubber tree cultivation since the beginning of the century and are currently the last frontier for agricultural colonization. Finally, in the North-East, once the nearest areas of land had been cultivated, the inhabitants of the dry and overpopulated heartland of the Khorat plateau came in massive numbers to clear the forest in the frontier province of Nong Khai, extending the settlement which had until then been restricted to the banks of the Mekong.

Migration into Bangkok and surrounding provinces are urban migrations. On the whole, urban migrations tend to outnumber migrations into rural areas. There is a strong positive correlation between the number of migrants and the urban population of the receiving province (correlation coefficient equals 0.89).

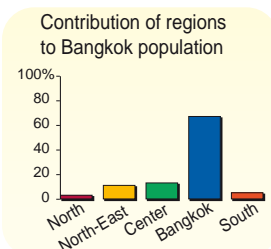
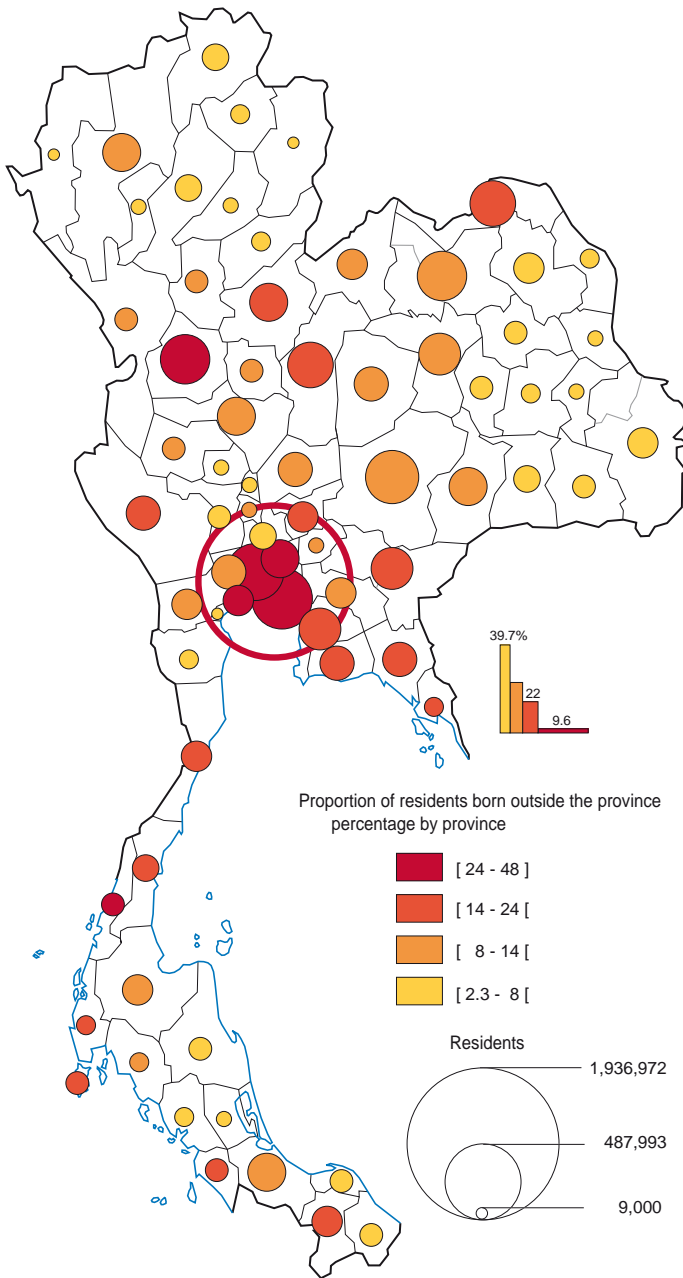
The provinces near the capital, those in the center of the Khorat plateau and on the east coast of the peninsula (Songkhla and Nakhon Si Thammarat) are the main regions of origin for immigrants to

Bangkok. Whereas the provinces near Bangkok provided the capital with its largest proportion of immigrants, at least until the 1970s, the distances involved in this type of migration have tended to increase, especially since the 1980s, with immigrants from the North-East making up an ever increasing proportion of migrants to the capital (see also plate 17 Inter-regional migrations). This confirms the notion that the distance migrants cover is closely correlated with the poverty of the region of origin, especially as the differences between incomes in Bangkok and in the north-eastern provinces is not only a constant, but the gap is slightly widening.

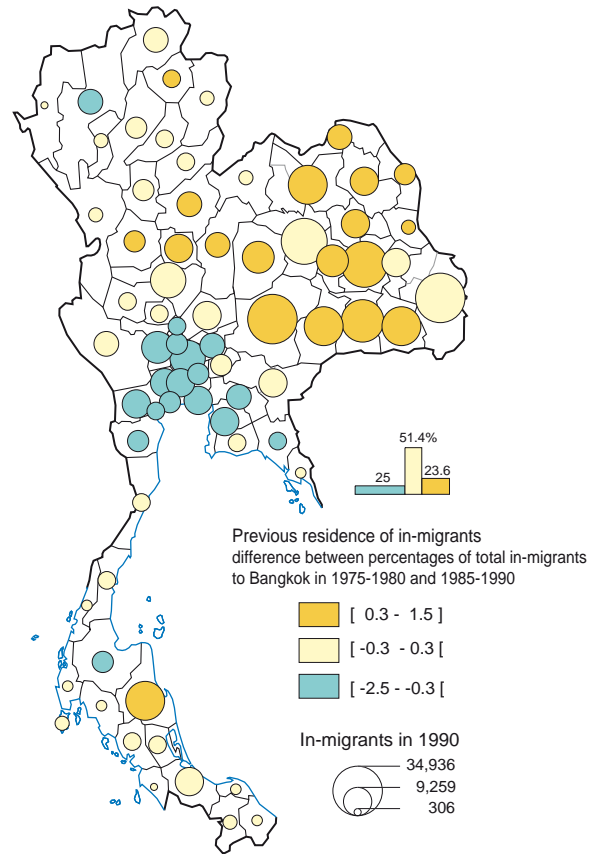
Bangkok receives only half of urban migrants. The regional capitals have now begun to draw in migrants, especially due to their facilities and the diversification of functions and amenities (service sector, shops, universities, etc.). We can also see an increase in movement across the urban hierarchy, from small towns, to Bangkok itself, via medium-sized towns, mainly for economic reasons and for training. Bangkok, however, does polarize migration very heavily, whether temporary or longer-term.

The proportion of the population of Bangkok that is native to the city (64%) appears to have been overestimated. Many Bangkok natives have left the city to live in the suburbs, forced out of the city center by the prohibitive cost of housing, following the homogenization of land use in favor of the tertiary sector (see chapter 7 Bangkok and the Bangkok metropolitan region). Industrial activity is expanding rapidly on the outskirts of the city, following the Development Plans to various degrees, in the north and the south-east, thus also giving rise to a reorganization of the residential systems. The new migrants are thus more and more likely to settle in the peri-urban area, which also receives populations from the city center. Moreover, the census expresses inadequately the importance of short-term migrants, a category which applies to a large proportion of migrants originally from the provinces who are not counted in the capital's population statistics.

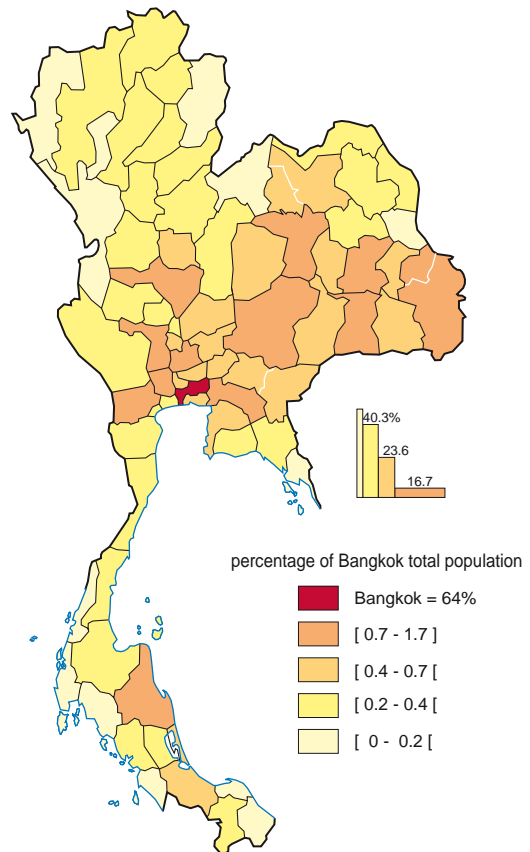
Residents born outside the province (1990)



Migrations to Bangkok (1985-1990) and evolution since 1975-1980



Native province of Bangkok residents (1990)



Sources : NSO, 1980, 1990

Provinces where demographic characteristics mirror territorial settlement

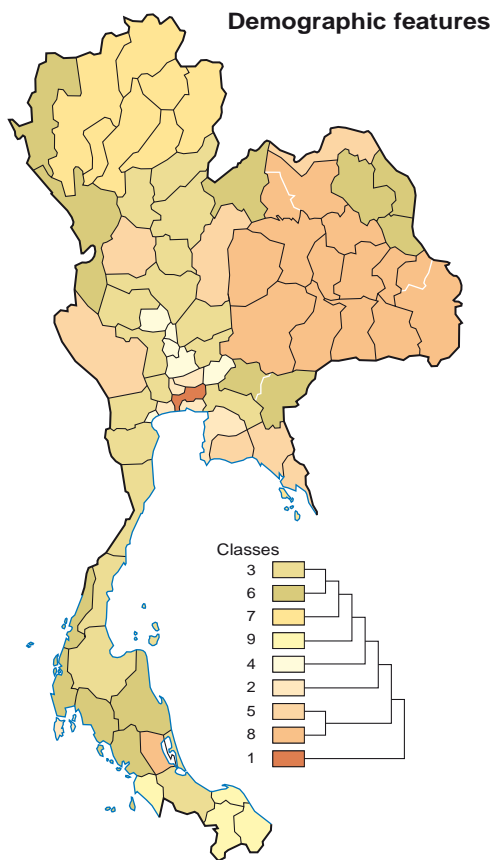
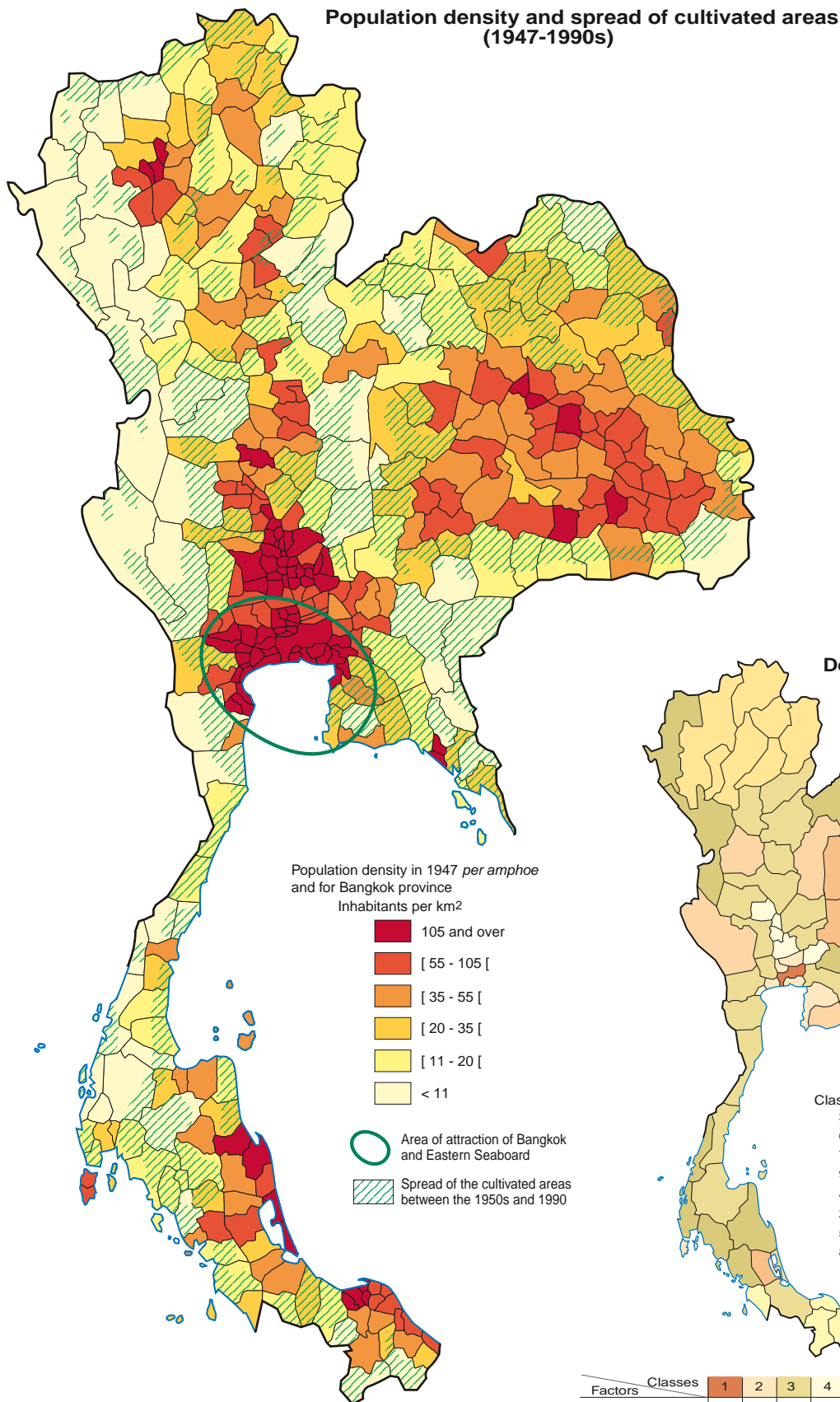
Since the beginning of the last century, we have witnessed a constant expansion in the amount of usable land. From a line joining the principalities in the north with the heart of the country, the delta plain of the Chao Phraya, and continuing along the eastern coast of the peninsula, also from the center of the densely populated Khorat plateau, the cultivated area has consistently expanded at the edges in a variety of ways. The extension of rice agriculture as a result of a better control of flooding techniques has meant that a much larger area can be cultivated around the lowland fringes; the development of cash crops has made it possible to exploit the slopes and soils that are not particularly suitable for rice-growing. Colonization by the peasants of new agricultural lands is currently continuing at a slower rate in the extreme north-west and is intensifying in the interior of the peninsular and the south-east. Cities have now taken over the role of polarizing migrations. Bangkok and its immediate zone of influence (neighboring provinces and Eastern Seaboard) are the main beneficiaries of this, though the urbanization process is also speeding up in other areas.

The spatial organization of Thailand, spreading out in concentric rings with Bangkok as its focal point and on the periphery large, clearly defined areas (north, north-east) and some smaller areas (extreme-south), is reflected in the demographic profile of the provinces. The main features we observe in a principal component analysis of the demographic, migration and urbanization variables are, first of all, contrasts between rural provinces (high proportion of rural population, high birth rate, many young people) and urban provinces (high percentage of urban population, large size of provincial centers, high population densities, over-representation of young adults). Next we note those provinces where population growth is rapid, then the role of the birth rate (number of births per woman, over-representation of under-14s), or immigration (high proportion of non-native residents, over-representation of young adults) in this demographic dynamism.

In the center, only Bangkok has the specific profile of a major metropolis: the growth of its population, which was very rapid until 1990, is basically due to the immigration of young adults, whereas the birth rate is low. The city extends beyond its administrative boundaries into the surrounding class 2 provinces. Here, population growth and urbanization have been very rapid since 1970, and they have been

fuelled by major migratory movements and the spread of industrial activity and residential estates. The urban dynamism generated by the capital does not extend beyond this initial circle of influence, as the primacy of Bangkok prevents the development of any other major cities in this area. Beyond this circle, classes 3 and 4 consist of rural provinces lying along a north-south axis, with little dynamism, aging communities, and from where many emigrate into Bangkok. The class 4 provinces in the agricultural plain of the Chao Phraya and close to the capital, however, still have high levels of population density, with higher levels of emigration into Bangkok and higher levels of non-natives than the class 3 provinces, which are further away and where population growth is less.

The class 5 provinces are spread around the rim of the Central Plain, at the boundary with Laos and in the south-east. These provinces have been actively colonized and cultivated, especially until the 1980s. Urbanization is now thriving in these provinces where previously it was practically non-existent, especially as Rayong, which benefits from the infrastructure along the Eastern Seaboard, is included in this class. The active agricultural colonization front represents the class 6 provinces, which are very rural, with a low population density but where population growth is rapid through natural growth. The class 7 provinces are rural, aging, with their populations concentrated in the valleys, and they appear to be less dynamic, despite the inclusion of Chiang Mai, whose presence has not altered their overall demographic features. Class 8 contains primarily the provinces on the fairly deprived area of the Khorat plateau to the north-east, where population densities and the birth rate are high and which is the main region of emigration to Bangkok. Some major secondary towns have developed here as a result of the road-building carried out in the 1960-1970 period, also the policy of growth poles and internal industrial relocations. The provinces in the extreme south of the country (class 9) differ from the other rural provinces with a high birth rate by their large Muslim population.



Factors	Classes	1	2	3	4	5	6	7	8	9
Rural characteristics		---	--	=	=	=	+++	=	+++	+
Demographic growth		-(1)	+++	--	---	++	++	--	-	++
Birth rate		---	--	=	=	-	++	-	+++	++
Urban growth		---	++	--	---	+++	---	-	++	-
% of Muslim population		=	=	-	-	--	+	---	---	+++
Population density		+++	++	--	+	---	---	---	-	-
% of young population		---	--	=	-	=	+	--	+	++

Sources : NSO, 1970, 1980, 1990, 2000
Pasuk Pongpaichit, Baker C., 1995
Skinner W. G., [circa 1950]

(1) High for 1970-1990, near stagnation for 1990-2000

The state and the construction of the territory

Whether we are looking at the administrative coverage of the Kingdom or at infrastructure provision, a vital factor in the construction of this country has been the state's need to incorporate border areas and establish the authority of the central power. From the end of the 19th century, measures were taken to modernize the Kingdom, to unify and control a territory whose frontiers were defined only gradually and under duress.

The precise demarcation of the frontiers was determined, as it was in the other countries of the Indo-Chinese peninsula, under pressure from the colonial powers at the end of the 19th and beginning of the 20th centuries. However, it was as a formally independent state (along with China) that Siam saw its tributary territories literally amputated by the British and French empires (**plate 20 Changes in boundaries and frontiers (18th-20th century)**). Whatever the true reasons for maintaining political independence (skill of the Siamese diplomats, desire of the French and the British to keep a territorial buffer between their empires), the demarcation of frontiers was in direct opposition to the conception that the South-East Asian states had of their territorial sovereignty and their borders. Based in part on Brahmanism and mainly on Buddhism, the notion of the "agrarian states" (from Ayutthaya, which was constituted in the 14th century, to the Kingdom of Siam in the 19th century) grouped together principalities that were defined more in terms of their center than of their frontiers (**plate 21 Formation of the nation-state territory**). Efforts to resist the colonial threat around the periphery, and then the gradual incorporation of these peripheral regions at the end of the 19th century under exclusively Siamese sovereignty created an extremely centralized system which is not dissimilar to the French and British colonial administrations. Even though Thailand today has succeeded in establishing territorial control and having it respected at the frontiers, something some of its neighbors have not achieved, there are still some fringe areas that are not entirely integrated (see also plate 10 Main ethno-linguistic groups).

The imposition of a uniform system of administration centered around Bangkok and the authority of the powerful Ministry of Interior (created in 1892) are felt at every level and in every sphere of public office, and have produced a centralizing force that is without parallel in continental South-East Asia. The presence of the administration reaches right

down to the lowest level of the village through the inter-penetration of two systems: the deconcentration of central administration and the various forms of local government (**plate 22 Territorial administration**). Although often called for, the principle of democratic decentralization has still largely not been applied, due to opposition from the Ministry of Interior, which fears that such a measure will be inefficient and moreover will threaten national security and unity. The 1995 reforms to increase local government representativity and autonomy, the spirit of which was confirmed in the 1997 Constitution, derived from the civil society (*prachakhon*) whose members have different expectations. Decentralization is demanded by various groups in the name of democracy, it is included in the electoral platform of some political parties, and is defended for purposes of clientelism by both political and capitalist members of these bodies. The question of deforestation is another field that is involved in the democratization process (**plate 23 Deforestation**). The forest areas of Thailand have been the subject of growing attention from the Royal Forest Department and some Non-Governmental Organizations. Measures taken in terms of forest conservation stir up protests and controversies over rights to the use of resources which are not eased by the confusion over the actual extent of the forest cover and the absence of any consensus about the definition of the forest areas.

Most of the country's major infrastructure converges on Bangkok, transforming the capital and its region into a veritable crossroads. Nevertheless, this physical expression of extreme political centralization and economic concentration (radial layout of the major axes and networks, concentration of infrastructure) cannot detract from what has been achieved in the peripheral regions. Some of these developments, begun in the 1950s (new roads opened up) and continued into the 1970s (schools, clinics, water supply, electrification) were dictated by strategic and security considerations. The rural development process was implemented by the military with American aid for checking the advance of communism in the North and North-East and countering secessionist demands in the South. These achievements improved living conditions and integrated into the country's commercial network provincial centers that had previously been marginalized due to a lack of rail services. They nevertheless helped to reinforce the primacy of Bangkok and strengthen regional inequalities, even though the reduction of these inequalities

was an objective that had regularly figured in the planning agenda of the National Economic and Social Development Board (NESDB). This body was created in 1959, and is still a forceful tool for national development and planning. The action of public authorities has always been hampered by the absence of any regional planning and especially by the fear of compromising national economic growth by slowing the expansion of the central pole: the goal of the authorities, since the 7th Plan in particular, is to facilitate the development of the zones affected by metropolization by providing infrastructure and establishing subregional centers.

While not penalizing the Bangkok region, the approach adopted to reduce regional inequalities was to try and stimulate provincial growth by strengthening the industrial and urban-based functions of the regional poles of growth through public investments. The strategy was introduced with the 4th Plan (1977-1981), but did not produce the hoped for results even though it enabled facilities to be provided for some urban centers and, coupled with an industrial deconcentration policy, did facilitate their industrialization. At the beginning of the 1980s, "urban industrial regions" were defined where it was the state's responsibility to create, through infrastructure provision, conditions favorable to private investment in industry and the service sector. The Upper South and Upper Central Regions were defined in this way but the Eastern Seaboard (Chachoengsao, Chon Buri, Rayong) was the first such area to be created and the most developed. It was conceived both as an area of economic deconcentration for Bangkok and as an industrial pole, linked with the exploitation of the petroleum reserves in the Gulf of Thailand, but development was delayed by the economic recession and Thailand's structural adjustment (1981-1986) which deferred the implementation of both public and private projects.

The invitation to private capital, both national and foreign, to participate in the expansion and modernization of the country's infrastructure, and the provision of services and facilities, became more and more urgent as the 1980s progressed. It was from the 6th Plan (1987-1991), and in particular to cope with budgetary inadequacies, that activities considered until then as part of the public domain (energy, telecommunications) were opened up to the private sector. It now participates in all fields that touch on infrastructure and facilities of a social nature,

with nevertheless differing degrees of intervention depending on the sectors and areas concerned. The privatization of public companies, limited almost entirely to the service sector since the state withdrew from its entrepreneurial function at the end of the 1950s, has become, since the middle of the 1980s, a declared aim though one which is implemented only on an irregular basis. The indebtedness of the public enterprises appears to be a handicap for Thailand, which hoped to strengthen its role as the hub of regional communications (**plate 24 Transportation networks**), but the country's inadequate energy resources and disputes over some domestic resources (environmental concerns, conflicts over water use, etc.) have driven it to resort more and more to the potential of neighboring countries (**plate 25 Energy infrastructure and networks**). The debate on the opening of the capital of the national airline has revealed a degree of caution regarding foreign stakeholder investment, while the budgetary repercussions of the 1997 crisis have led the Board of Investment to relax certain restrictions on foreign investments and to rethink its spatial distribution of investment promotion incentives (**plate 26 Investment promotion incentives**).

The good national provision of schools and health facilities, likewise the decentralization of university education cannot disguise the difficulties the authorities are experiencing in coping with the rapid increase in the rate of urban growth (**plate 27 Schools and health facilities**). This has given rise to an imbalance in intervention on the part of the private sector, confirmed in the telecommunications sector, which, since the beginning of the 1990s, has witnessed the establishment of a public/private partnership (**plate 28 Postal and telecommunications infrastructure**): the uneven provision of post offices and telephone networks reflects, moreover, an economic activity that varies in intensity. Although practically the entire country has had access to electricity for over two decades, water supply highlights the contrast between Bangkok and the rest of the country, and especially between the urban and rural areas (**plate 29 Water and electricity supply**). Some of the variables that are processed analytically in this chapter are incorporated into a principal component analysis in chapter 6 Tertiary sector: this complements the spatial analysis of the provision of facilities (see plate 57 Tertiary sector facilities and activities).

ATLAS of THAILAND

ELEMENTS of TERRITORIAL ADMINISTRATION

Lesson in a mountain school in Chiang Rai



Photo Alain Vergnes

A good network of schools and compulsory education account for a literacy rate of almost 95% of the population. Demonstrating a will to encourage linguistic homogeneity, teaching is in Thai and takes no account of regional and local identities. Efforts are made to incorporate the ethnic minorities established in the northern mountainous areas.

Administrative center of the district (*amphoe*) of Nam Phong (Khon Kaen province)



Photo Doryane Kermel-Torrès

In the administrative center of the *amphoe*, which groups together several sub-districts (*tambon*), are the most important government departments (interior, agriculture, industry, public health, education, industry, trade) under the control of the *nai*, representative of the Ministry of Interior. The government has launched reform for allowing the *tambon* more autonomy.

Gradual fixing of national boundaries

The boundaries of the different countries of South-East Asia were not mapped and marked out with any precision on the ground until very recently. Traditionally, the different territorial units (*muang*) were not necessarily adjoining; empty or very sparsely populated forest areas sometimes came in between. The border between two territories was not continuous and was indicated along a communication route by trees or stone columns erected for this purpose, like the Three Pagodas pass or the Singkhon pass between Siam and Burma. Local guards were a symbol of the limit of sovereignty. The boundary area was sometimes a sparsely occupied buffer zone, with no strictly defined boundaries, between two rival sovereigns and sometimes an area of free circulation and settlement for the local populations between two friendly kingdoms, where a too strictly defined border would have been considered unfriendly. These areas on the fringes of the zone of influence of the central powers were not seen as a vital issue, as long as the central zone was not infiltrated or threatened.

The fact that Siam was encircled by minor states or tributary principalities was a major phenomenon, which had to be taken into account when defining boundaries. Although weak, these dependencies maintained their autonomy by declaring submission to the more powerful states who could either inflict great damage or protect them. At the edges of the kingdom there were therefore areas where sovereignty overlapped or was ambiguous.

At the end of the 19th century, Siam came into competition with the British and French colonial powers over the incorporation of these minor states, in defining boundaries and clearly delimiting the borders of exclusive sovereignty. This forced Siam under Chulalongkorn (1868-1910) to put in place a policy of administrative reforms in order to incorporate these dependent territories, with their various forms of status, into a uniform system of provinces under the jurisdiction of a central state (*thesaphiban* system). This rationalization was not without difficulties with a bid for power from France in particular during the block-ade in 1893 of the mouth of the Chao Phraya at Pak-nam by French gunboats. At this time, Siam lost all jurisdiction over its tributary territories on the left bank of the Mekong. Its boundaries were defined between 1893 and 1909 in a series of treaties with France and Britain. These two countries wanted to establish their economic and, to a lesser extent, political influence on the regions bordering their own

empire.

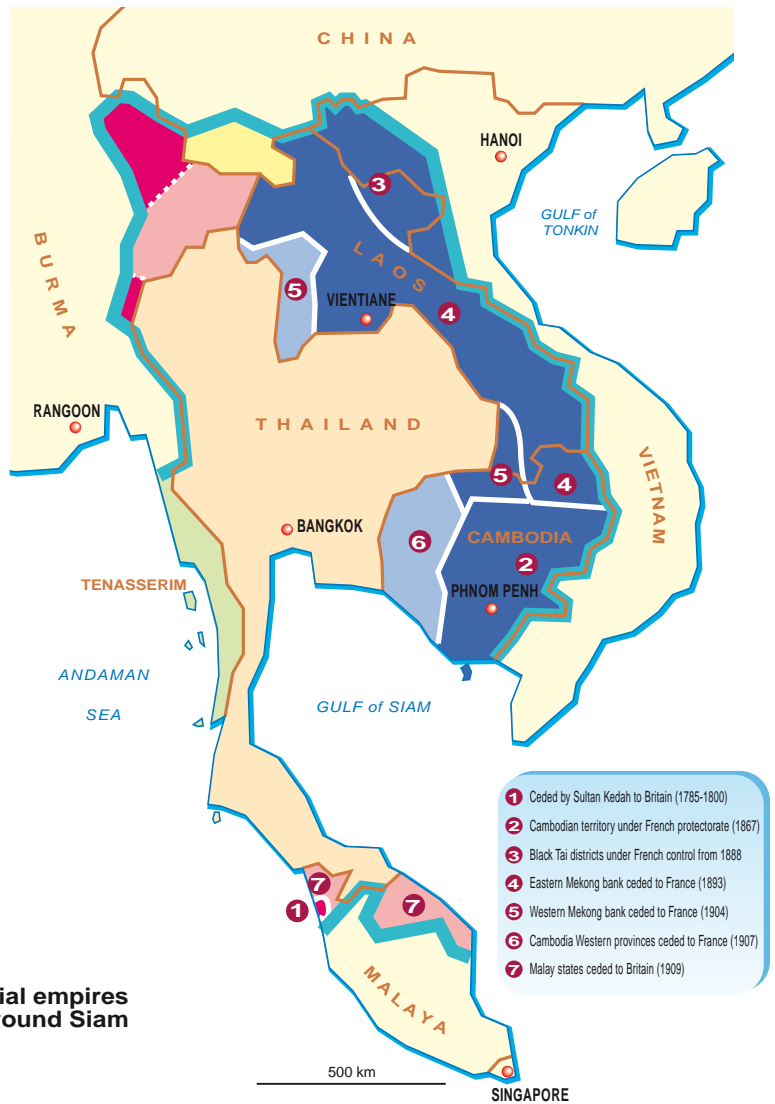
To determine the exact demarcation of the boundaries, a great deal of progress was needed in mapping techniques. This formed part of the modernization process on which Siam had embarked since the reign of Mongkut (1851-1868) and in particular under Chulalongkorn. In 1875, a group of cartographers was created within the Royal Guard and a School of Cartography opened in 1882. The Royal Survey Department was founded three years later. Defining the limits of the national territory of Siam, in the modern sense of the term, with continuous boundaries was now a necessity both for the court of Bangkok and for the neighboring imperialist powers. The first modern map of Siam was produced under the direction of a British officer, J. McCarthy, in 1887. In it, Siam appeared as a buffer zone between the colonial empires of France and Britain.

In 1943, under the regime of Field Marshall Pibun Songkhram, who forged an alliance with Japan just before the Second World War and had pan-Thai expansionist ambitions (hence the name Thailand, which replaced Siam in 1939), Thailand obtained the provinces of western Cambodia (Battambang, Siemreap), Sayaburi (Laos) on the right bank of the Mekong, and the sultanates of northern British Malaysia (Kedah, Kelantan, Trengganu, Perlis). The nationalist Luang Wichit Wathakan wanted to retake, in the name of a "Grand Thailand", all of Siam's 19th century tributary territories and even go further and group together all the Tai-speaking populations in the Indo-Chinese peninsula and southern China. After the Japanese defeat, however, Thailand had to abandon definitively in 1946 all such territorial claims. However, the country's military superiority over most of its neighbors (Myanmar, Laos, Cambodia) and in particular its much higher level of development, enabled it to exert economic and political influence across an area corresponding approximately to that of its former tributary territories in past centuries.

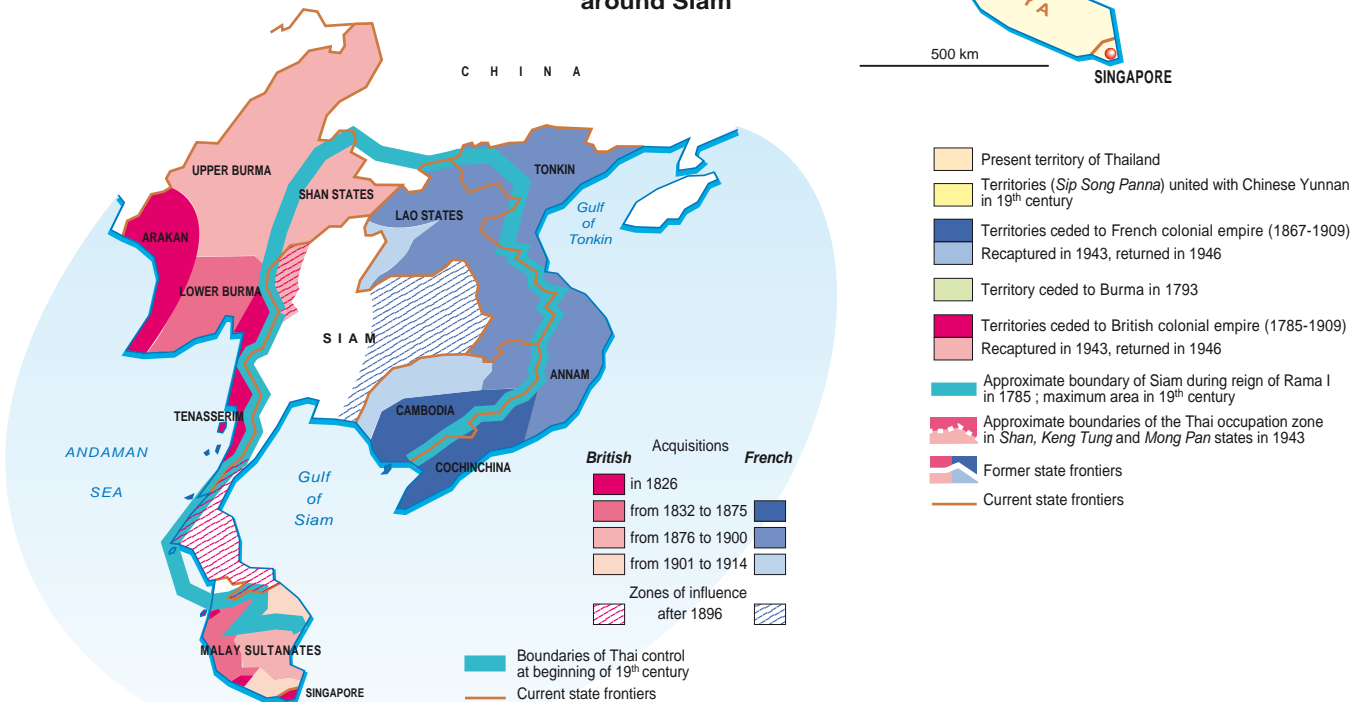
Tai ethno-linguistic groups in Indo-Chinese peninsula and South China



The changing shape of the national territory



Expansion of British and French colonial empires around Siam



Sources : Bruneau M., 1995
 CeDRASEMI, CNRS-EHESS, CEGET-CNRS, 1985
 De Koninck R., 1994
 Fisher C.A., 1964

From Muang to nation-state

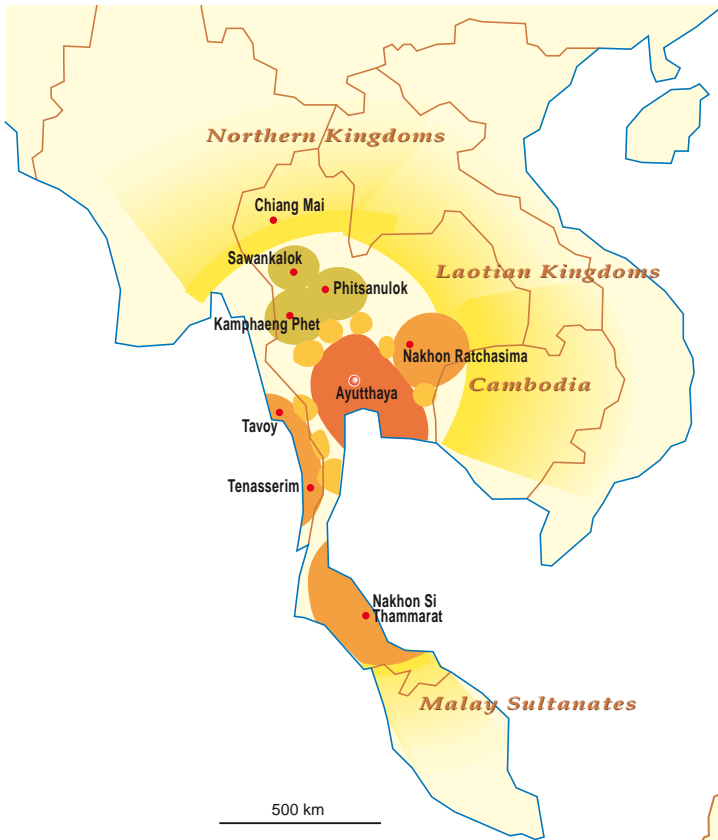
The area that we now know as Thailand has its origins in the Kingdom of Ayutthaya, which emerged in the 14th century at the Chao Phraya delta. The kingdom was taken for the first time by the Burmese in 1569, and was organized, before the accession of Naresuan in 1590, in the form of three concentric rings. This formed a conglomerate of cities, or *muang*, with each one having power and protection over a specific territory. The capital, Ayutthaya, larger than the rest, held sovereignty over the others, though its influence decreased in the more distant territories. The royal domain, *Van Rachathani*, situated at the center, around the capital, was divided into 33 small 4th class provinces administered by civil servants directly responsible to the king. A second ring, made up of the 1st, 2nd and 3rd class provinces was governed by a prince or a high-level dignitary, in the same way as the capital but on a smaller scale (court, army) and enjoyed considerable autonomy. The third outer ring included kingdoms or principalities, *muang*, (Lan Na, Keng Tung, Sipsong Chauthai,...), tributaries of Ayutthaya but enjoying true independence, especially as double or triple allegiances with neighboring states were frequently entered into.

This model was repeated in the Thon Buri Kingdom and Bangkok (Krung Thep Maha Nakhon), following the destruction of the Ayutthaya Kingdom by the Burmese in 1767. The map of the Kingdom of Siam in the middle of the 19th century also shows present-day national and provincial boundaries, although these do not match the earlier boundaries exactly as that time mapmaking was a much less precise skill. Four basic groups of provinces can be seen. At the center, the 4th class provinces, whose governors, designated every four years, were under the direct authority of the capital. The 1st, 2nd and 3rd class provinces formed part of the kingdom as from the 15th century. The external provinces (*hua muang*), situated mainly in the North-East (*Phak Isan*) and added to the Kingdom in the second half of the 18th century, enjoyed real autonomy as they were administered by dynasties of hereditary governors. The outer circle was included in the second half of the 19th century, incorporating tributary states, principalities or small kingdoms (*muang*): kingdoms of Luang Prabang and Cambodia, principalities of the north (Chiang Mai, Lampang) and Malay Sultanates (Trengganu, Kelantan).

The process of unification and homogenization of the national territory was embarked on through a

series of political reforms by King Chulalongkorn, assisted by Prince Damrong from 1892, in particular by the application of the system of provincial administration *thesaphiban*, inspired by the structure of the British Empire. From 1899, the new territorial organization of *monthon*, incorporating all the provinces (*muang*) and tributary states (*muang*) was set up across the country. The aim was to ensure true centralization by nominating a Royal Commissioner at the head of each of these units, responsible for coordinating the administration of groups of provinces, collecting taxes more efficiently and establishing a direct link with the Ministry of Interior, as the provincial governors, very firmly fixed at local level and often on a hereditary basis, were difficult to control from the center. In 1915, this network of 18 *monthon* for the first time covered all of the Kingdom in a homogeneous fashion, abolishing the traditional model of control through concentric rings, where central power tended to diminish towards the edges. The number of *monthon* was gradually reduced to 10, and they were abolished in 1933 when the seventy provinces (*changwat*) were fully integrated into the local administration system, controlled by the Ministry of Interior.

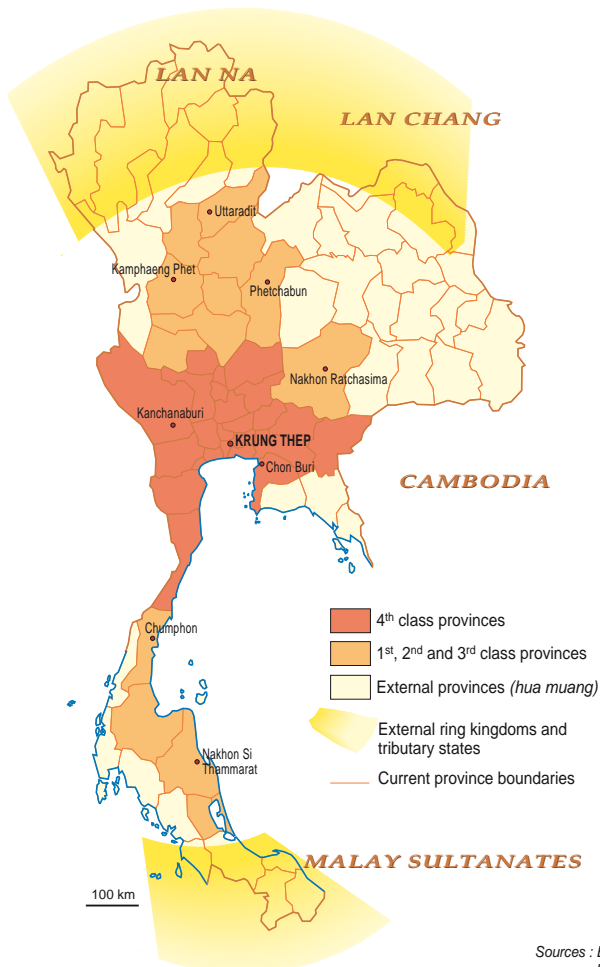
The territory of the Thai nation-state has thus been created over the last five centuries, based on kingdoms whose heart was first in the upper delta (Ayutthaya) then the lower delta (Thon Buri and Bangkok) of the Chao Phraya. Each of these agrarian states, organized in concentric rings, had a capital which also played the role of cosmopolitan trading-post, providing a haven for various merchant communities (Chinese, Malays, Indians, Occidentals). This early participation in international trade, in the same way as the Malay Sultanates, laid the foundations for the capitalist and entrepreneurial structures that enabled Thailand to open up comparatively early to the modern world, and to acquire a unified territorial infrastructure comparable to that of the European nation-states.



Ayutthaya Kingdom (1460-1590)

- Van Ratchathani
Royal domain divided into 4th class provinces (*muang noi*)
- 1st class provinces (*phra mahanakhon*)
- 2nd class provinces under king's sons (*muang luk luang*)
- 3rd class provinces under king's grandsons or nephews (*muang lan luang*)
- Capital
- Other city
- External ring kingdoms (*muang pradhesa raja*)
- Current state frontiers

Siam Kingdom and neighboring states (mid-19th century)



- 4th class provinces
- 1st, 2nd and 3rd class provinces
- External provinces (*hua muang*)
- External ring kingdoms and tributary states
- Current province boundaries

Monthon (1915)



- Monthon boundaries
- Current province boundaries

Sources : Bruneau M., 1988
RTSD, 1974
Tambiah S.J., 1976

Strong administrative presence across the entire territory

The administration of Thailand is organized into 5 levels: center, provinces (*changwat*), districts (*amphoe* in rural areas and *khet* in Bangkok), sub-districts (*tambon*) and villages (*muban*). The number of units grouped together at the upper level varies according to the area covered and the population as well as the willingness of the state to set up the services required by the new units.

Whereas the merging of Bangkok and Thon Buri was justified by the need for a unified management of the problems associated with rapid urbanization, the creation between 1933 and 1992 of 7 provinces duplicated local representatives (governors, ministerial officials) and some of the facilities (sanitation, education) essential to provincial status, even though in some cases the administrative units are not necessarily equal. This is also the case for the districts, the smallest formal administrative unit, placed under the authority of the province, where the head is an official of the Ministry of Interior, as is the governor, and responsible for maintaining the peace and coordinating the work of ministerial officials.

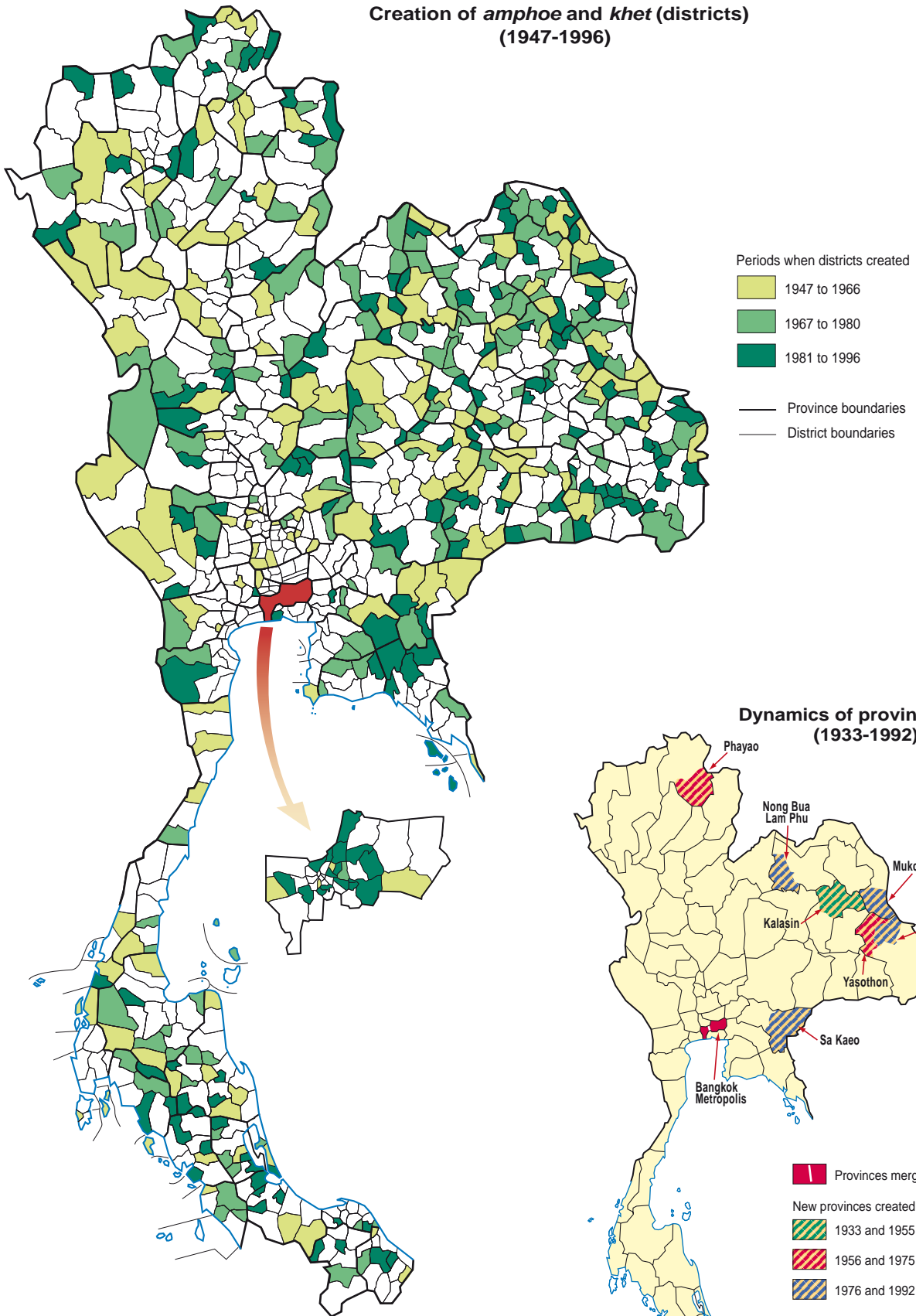
Historically, the *amphoe*, whose subdivisions are determined by the Ministry of Interior, is a crucial element in controlling the territory and providing facilities. The close-knit network already in place in 1947 in the delta and along the Chao Phraya as far as Chai Nat is proof of how long the area had been settled, whereas the subdivision into districts in Bangkok from 1980 was in response to the rapid population growth in those recently inhabited areas. The advance of the agricultural frontier was justification for the rapid creation of districts during the first two periods around the Central Plain (Kanchanaburi, Kamphaeng Phet), in the peripheral areas (Chaiyaphum, Nong Khai, Sa Kaeo) and along the Burmese frontier where the size of the units is typical of zones with a low population density. At this time, there was also a clear reason for creating new districts in the North-East, especially as the country was more closely controlled in the face of the communist "threat": this region holds the record for the creation of districts, a process that was vigorously pursued after 1981 to develop the area's amenities. In the South, the creation of units increased as from 1981, an indication of how agriculture progressed in the interior and the west of the peninsula.

From the end of the 19th century, the administration of the provinces, and then of the districts, was based on a policy of deconcentrating central powers

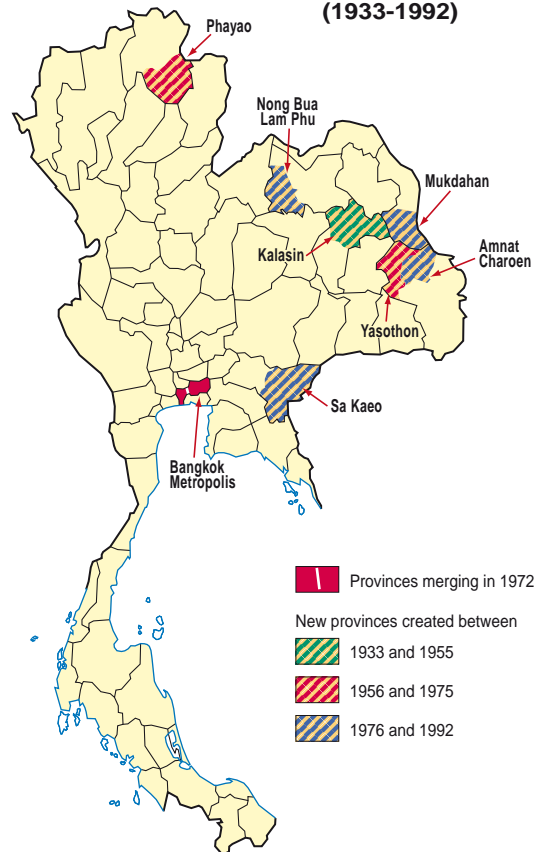
while leaving the sub-districts and villages under the control of elected representatives. The sub-district councils (*sapha tambon*) were initially reserved for elected members, but over the course of the 1980s, district officials joined these bodies, asserting the hold of the national bureaucracy over these local bodies. At the same time, the intervention of central administration in planning and development tended to obscure the role of these councils. Despite great reluctance on the part of the Ministry of Interior, the 1995 reform was clearly in favor of strengthening popular representation in the sub-district councils, by giving them a juristic status and creating Subdistrict Administrative Organizations (SAO) with increased power and budgets: by 1999, more than 90% of the sub-districts had achieved SAO status. Apart from their lack of experience, the difficulties encountered by these bodies reveal a deep-rooted authoritarian institutional culture, with in particular the retention of power by the district head and the governor. Other difficulties concern the duplication of malfunctions at national and provincial levels in the electoral process and representation.

The sanitary district (*sukhaphiban*), the first form of local self-government and a quasi-urban unit, disappeared in 1999 and was reclassified, in the context of the democratization of local bodies, as a municipality (*thetsaban*). For a long time this status was the most highly developed form of local government, but the number of municipalities stagnated between 1946 and 1999 because of the financial commitment required from central government (see also chapter 2 Population). The other forms of local government are: the Bangkok Metropolitan Administration (BMA), with an elected governor since 1985; the Provincial Administrative Organization, whose elected members benefit from greater autonomy and budgetary control as from 1997. These bodies suffer to differing degrees from inadequate and sometimes poorly defined responsibilities, and remain subject to the discretionary power of the Ministry of Interior even though their autonomy has been confirmed by the government that allocated them 20% of the central budget in 2001 (BMA excluded).

**Creation of *amphoe* and *khet* (districts)
(1947-1996)**



**Dynamics of provinces
(1933-1992)**



Sources : NSO, 1980, 1995
RTSD, 1966
Skinner G. W., [circa 1950]

The sensitive question of forest areas

Care must be taken when using and interpreting statistics or maps of the forest areas, mainly because the definition of what is considered as “forest” is not clear. Forest zones defined in 1973 and 1995 from satellite images, as well as the resulting statistical estimates, should be considered as designating the maximum area possible for forest cover: that includes shrub communities and different types of degradation.

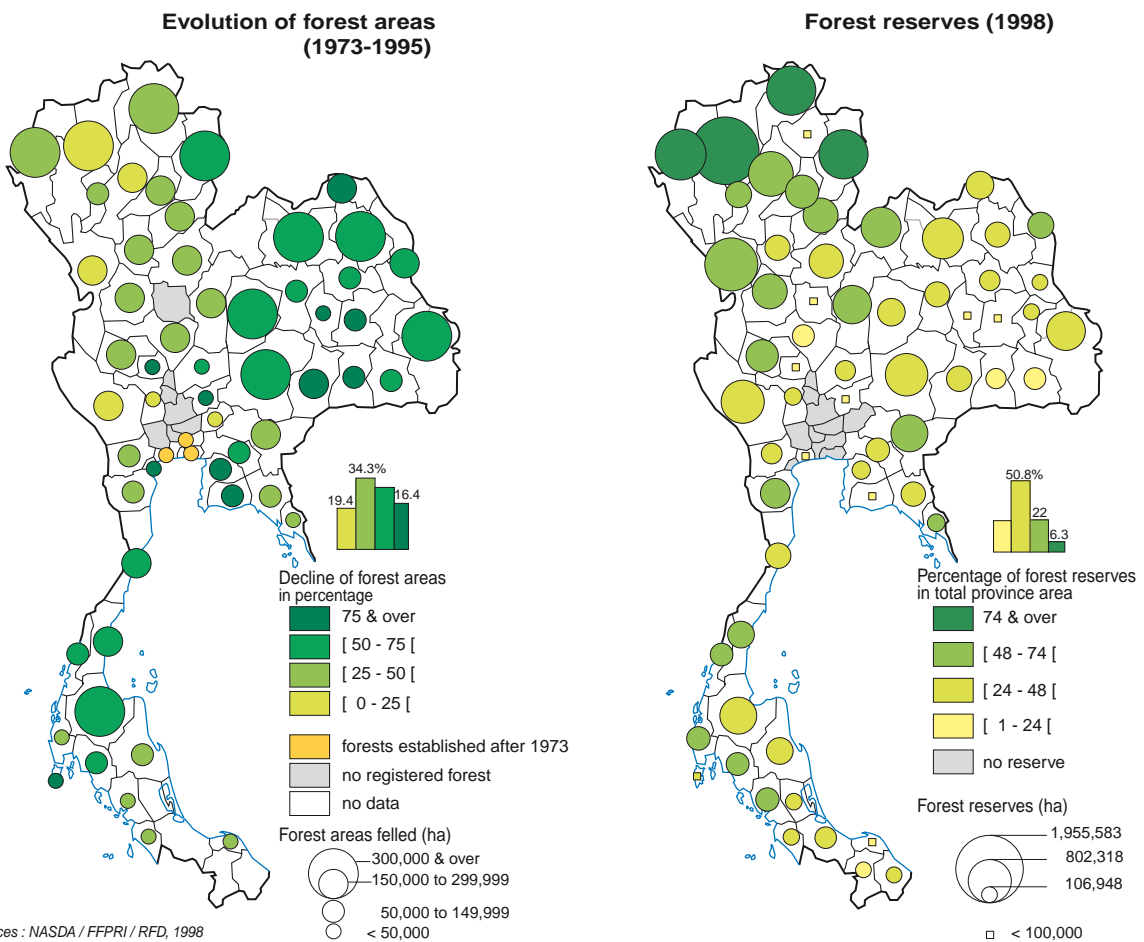
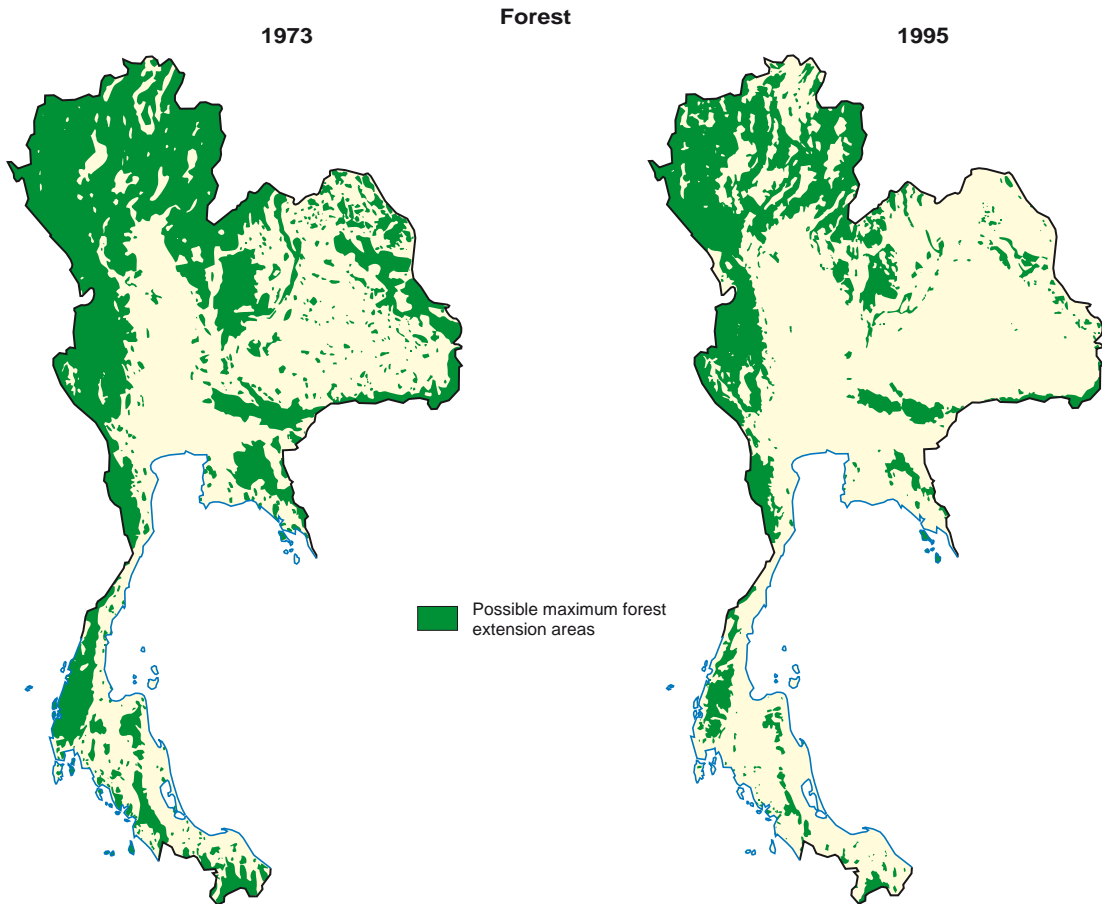
Historically, the retreat of the forests has followed the different stages of agricultural colonization. However, between the middle of the 19th century and the 1950s, commercial logging (mainly teak) was the major cause of deforestation even though clearing for agriculture has also had a significant impact. Rice-growing areas extended far into the lowlands of the Central Plain, then on the piedmonts and into the basins and valleys in the North and North-East. The absence of forest in 1973 at the heart of the Central Plain, which was significant from the middle of the 20th century, is an indication of how long-established a phenomenon deforestation is.

Prior to the Second World War, logging, which occurred in fact on a much greater scale than is generally believed, opened the way to agricultural colonization, which accelerated until the middle of the 1970s. At that time deforestation particularly affected the North-East and the South. As agricultural expansion often accompanied road development, it followed, among others, the strategic roads built during the United States’ war with Vietnam. It was the advance of cash crops (cassava, maize, sugar cane), however, which produced the main changes in the conversion of land on the terraces and the plateaus (see plate 31 Land utilization). Agricultural expansion slowed from the middle of the 1980s, especially with the end of communist guerrilla warfare, thus paving the way, at the beginning of the 1990s, for a degree of stability in the forest cover on a national scale. Nevertheless, agricultural land continued to extend into some regions like the South where more than 260,000 hectares of forests were felled between 1989 and 1995. The rapidly diminishing forest areas incited the government to ban raw timber exports in 1973, after which Thailand became a net importer. This measure was enforced in 1989 with the repealing of forest concessions.

In recent decades, the North-East region has been most affected by deforestation: with 60% of

forest lost on average between 1973 and 1995, this figure is much higher in provinces where the pioneer fronts were particularly active (Nong Khai). In the North, very extensive stretches have been cleared of their forest cover around the valleys and in the intramontaine plains (more than 1.5 million ha for Chiang Mai, Chiang Rai and Nan combined), but this represents only a little more than 30% of the area considered as forest. In the South, the extent of deforestation is slightly less although the forests exist only in a residual state in several provinces (Phuket, Songkhla, Narathiwat, Krabi).

In the face of the deterioration of forest resources and the emotional response from public opinion, some tree plantation initiatives have been introduced and the principle of “forest reserves” was adopted in 1991. The aim of these operations, which distinguish between “natural forests”, which are for conservation, and “commercial forests”, where felling is authorized, seems to be difficult to put into practice due mainly to the malfunctioning of the administrative structure. The area of forest reserves, overseen by the Royal Forest Department, which has been forced to undergo a reconversion since felling is no longer permitted, increased from 11% to 45% of the entire country (more than 23 million ha in 1998). The spatial distribution highlights the potential for forestry in the north, particularly along the border with Myanmar, the limited resources in the North-East and the imbalance between the peninsular coasts, the impact of agricultural colonization being felt later in the west. Defining the reserves, however, does give rise to some confusion because they include in part areas which have been occupied and cultivated by more than a million families since the middle of the 1980s. Among the provinces which have sizeable forest reserves, both in area and in importance for the province, Chiang Mai had officially in 1998 more than 97% of its total area made up of forest reserves, whereas, according to the same source, in 1995 75% of this area was occupied by forests and 10% by crops. By classifying as “forest reserves” areas which are in fact still under cultivation, the government creates confusion and is forced to evict people from so-called reserves, thus creating conflict.



Sources : NASDA / FFPRI / RFD, 1998
 Royal Forest Department, 1999
 Thongchai Charupatt, 1998

Major investment in transport infrastructure

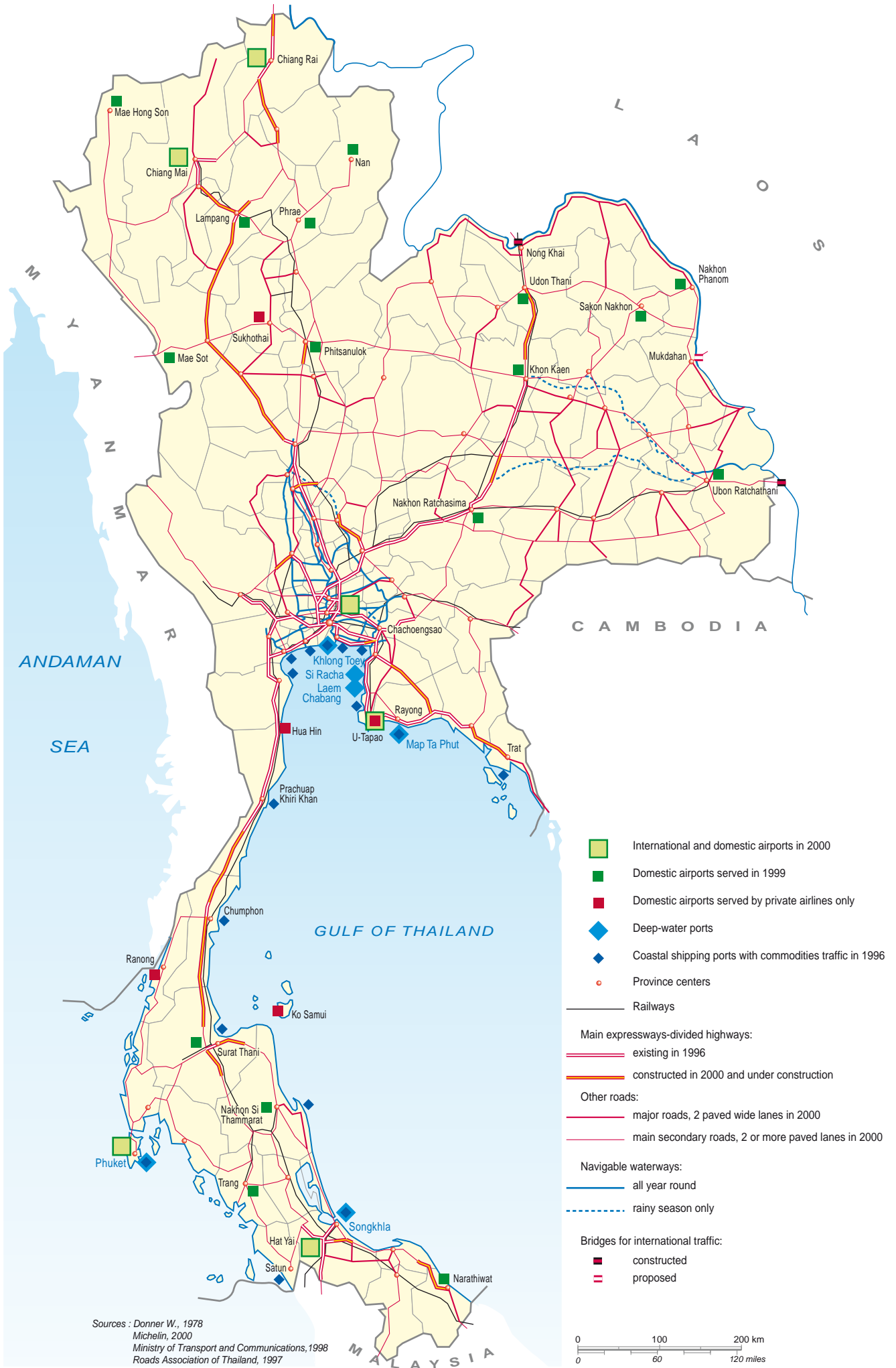
There are excellent road links between provincial centers but the radial arrangement of the rail network and the major roads which fan out from the nucleus formed by Bangkok, Nonthaburi and Pathum Thani still clearly predominates; the air routes too reinforce this pattern (see plate 54 Passenger traffic). The establishment of the capital as a bridgehead for the country's national and international commercial networks dates from the end of the 18th century, using the complex network of canals (*khlong*) that criss-cross the Chao Phraya delta and the port of Bangkok. The radial pattern is largely the result of a political decision at the end of the 19th century to consolidate links between Bangkok and the peripheral regions. The completion in 1939 of railways linking the North, the North-East and the South to Bangkok, was chiefly in order to help these regions become fully integrated into the nation, to facilitate implementation of the centralized program of reforms and to deal with threats of expansion from the colonial powers. There were strategic reasons also for instigating the major road building program, begun in 1950 with American aid and financial support from international agencies; this has brought benefits to the North and the South, and in particular the North-East.

Construction work during the last two decades has improved road links between villages and the major road axes and has pinpointed congested areas where traffic is heaviest. Road building has tended to monopolize government action in land transport and the rail network has undergone only minor expansion since the Second World War, such as the coastal link from Chachoengsao in the Eastern Seaboard development. Bangkok is still a bottleneck and one which has extended to cover some adjoining areas in the metropolitan region as a result of the delay in providing infrastructure compatible with such a concentration of population and activities (see plate 60 Road system and motorization in Bangkok): the very rapid urban and industrial growth between 1986 and 1996 has merely accentuated the pressure on facilities which were already inadequate. This same congestion can also be seen, though on a smaller scale, in the build up of traffic in some of the regional centers such as Nakhon Ratchasima, Chiang Mai or Songkhla/Hat Yai.

With the building of three deep-water ports in 1991 and 1992 on the east coast of the Gulf of Thailand, new infrastructure became available that was compatible with modern maritime transport condi-

tions; it was possible to handle the large increase in volumes and relieve some of the congestion due to inadequate facilities at the Bangkok port, overshadowed since 1998 by Laem Chabang (in 2000, container traffic in these two ports was 1.1 and 2.1 million TEUs respectively). The new ports have attracted private capital (Si Racha and Map Ta Phut) and have close ties with industries on the Eastern Seaboard. These recent developments have increased the number of sites available, but they have nevertheless also resulted in the spatial concentration of points of access to international exchanges, a situation which is only emphasized by the pre-eminence of Bangkok airport, now at saturation level in terms of both cargo and passengers; a new site east of the capital has been earmarked. The two private ports in the South, opened in 1988, have a limited amount of facilities and their own hinterland to service.

Appeals to the private sector have not produced the hoped for results in the provision of public transport systems and infrastructure, apart from the Skytrain, the elevated train system in Bangkok, urban expressways in the Bangkok Metropolitan Region (BMR), and some facilities at the port and airport. In the context of a policy of liberalization and privatization, the national airline company has been opened up to private capital, private companies have been authorized to operate domestic flights and bus links within the BMR and out to province centers. The problem of financing infrastructure is even more topical in the present climate as Thailand seeks to strengthen its economic pre-eminence and become the chief point of access into the Indo-Chinese peninsula, focusing on a strategy of transnational integration at continental South-East Asia level (see plate 6 Networks in Eastern Asia). Among the priority areas for cooperation are the harmonizing of national road and rail networks, a fairly uncertain project at present for rail, apart from the links that already exist with Malaysia, and shipping on the Mekong. The opening up of the Chiang Rai airport to international traffic, the construction of the Nong Khai bridge, and the commitment from Japan to finance the construction of a bridge at Mukdahan are included in the same development context.



Domestic resources insufficient to cope with energy needs

Thailand is a major energy consumer, whose dependence on imports, about 60% of energy consumed, has not been reduced despite the use of domestic energy resources. Efforts to diversify supplies and bring demand under control have been the main directions of the country's energy policy since the first oil crisis. Lignite production increased dramatically between 1970 and 1999 (from 0.3 to almost 20 million tons): it is used in 20% of electricity production, especially from the mines in the North. Since 1981, production from the fields in the Gulf of Thailand has made it possible to partly substitute oil for natural gas in the generation of electricity (about 40%) and to supply the petrochemical sector. However, crude oil resources proved disappointing (3% only of South-East Asia's total production and over 70% of this from the Phitsanulok fields), and gas supplies were not sufficient (almost 14% of regional production, 90% offshore) to satisfy the foreseeable requirements of the different sectors before the 1997 crisis.

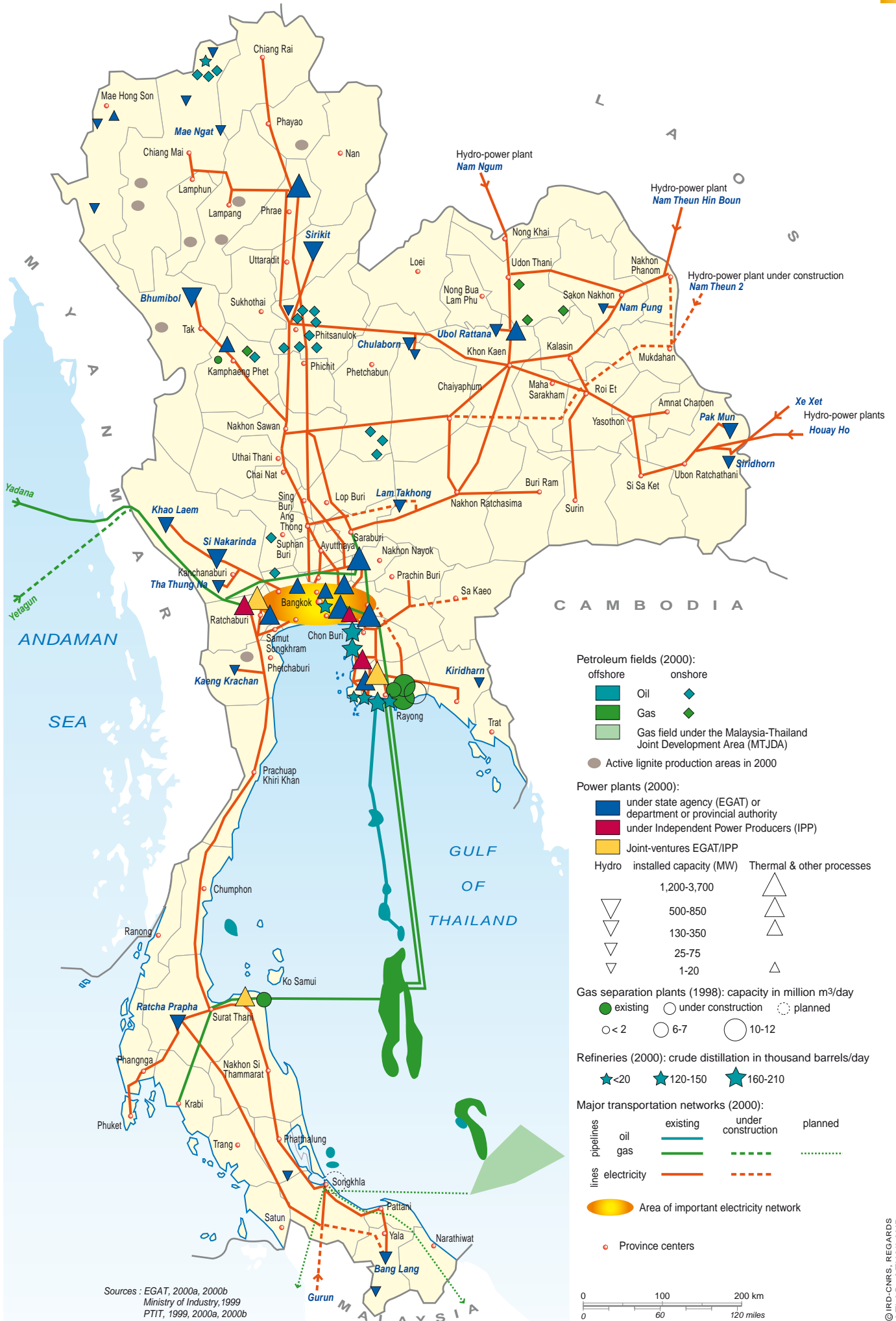
There is still a heavy reliance on imported petroleum, with the Middle East supplying the largest quantities since regional reserves have been depleted, and over a period of years the state has introduced a policy to align the country's refining capacity with consumption that is driven by the transport sector. A regional gas market has developed with the purchase of gas from Myanmar and offshore exploration in conjunction with Malaysia. The considerable growth in the hydroelectricity sector (a little over 10% of the existing electrical capacity) would appear to be restricted by the limited capacity of the plants that can be installed: Thailand uses the potential of Laos from whom it has purchased electricity for over 30 years.

When the demand for energy was revised upwards, after an earlier drop in consumption due to the immediate effects of the 1997 crisis, this revived interest in Indonesian gas and the purchase of greater quantities of electricity from Laos (by 2006), from Myanmar (2010) and in the longer term from Yunnan power stations in which Thai capital holds a stake of between 25% and 80%. These plans for the future will increase connections to the electricity grid in certain regions to the grids of neighboring countries and reinforce the radial layout of the main electricity lines into the Bangkok region, which dominates consumption and facilities. The North-East and Laos will thus become more closely linked, and while Khon Kaen already emerges as a point of intersection between

several major electricity lines, the position of Roi Et will be confirmed. The North will link up with the power stations of Yunnan (Jinghong) and Myanmar (Shan state) and the South will strengthen its links with Malaysia.

The question of electricity supply is a social and economic issue that has been a priority since the 1960s for a state that is so concerned about control of its territory: considerable progress has already been made, since 98% of villages are now connected to the grid (see also plate 29 Water and electricity supply). Although the exploitation of petroleum fields has not produced as large a petrochemical complex as was hoped, it has nevertheless enabled a major industrial base to develop on the Eastern Seaboard where crude oil refineries and gas separation plants are concentrated. It has also made it possible to modernize gas transportation modes (sea and land gas pipelines) and power production techniques (combined cycle power plants).

The liberalization of the electricity industry resulted in 1992 in its opening up to private capital. The Independent Power Producers' share in production then increased, representing about 25% in 2000. Foreign investment is particularly important in this sector and power plants to which the public-enterprise Electricity Generating Authority of Thailand (EGAT) has contributed, via its commercial subsidiaries partly open to private capital, have been set up in areas where the risks associated with supply and demand are limited. Electricity production and distribution in the areas that are economically less dynamic remain the responsibility of provincial agencies or specific ministries. Despite the effects of the crisis on the public budget and the wishes of the government, the privatization of EGAT has been postponed and its monopoly over electricity transport and distribution is intact. The situation in the petroleum sector is similar: exploitation has been open to foreign companies since 1971, the liberalization of the transformation process was initiated in 1992 and confirmed in 1997, and the privatization of the PTT (Petroleum Authority of Thailand) was begun in 2001, yet it still has a monopoly on gas purchase and distribution while participating, via its subsidiaries, in very large-scale operations in association with the private sector.



Conflicting incentives to spatial deconcentration of investments

Thailand's spatial investment policy consists of dividing the country into zones, with the level of privileges granted to companies via the Board of Investment (BOI created in 1959) being determined according to the zone in which they are located. These privileges may be indirect grants (tax concessions, reduction of import duties on raw materials, intermediate products and machinery) and facilities (use of foreign capital, employment of foreign nationals).

The spatial organization of investment promotion was outlined in 1972, after more than a decade of supporting private investment without giving consideration to the location factor: a few urban districts were designated to receive the largest amounts of public aid. In 1983, the approach became more all-encompassing, with three specific zones being defined, and the degree of privileges they received being directly related to their distance from the Bangkok-Samut Prakan pole: however, until 1986, the special promotion districts still received the highest level of incentives. Successive readjustments have taken into account the advance of the investment front away from the pole and have pushed some groups of provinces into the zones with less advantageous tax exemptions. The areas that have the highest level of incentives are all the provinces in the peripheral regions. As well as its declared objectives of promoting a social and spatial balance, since 1972, when the first measures favoring export-oriented industrialization began to emerge, the BOI has offered investors the opportunity to access pools of cheap labor in the peripheral regions and combat the gradual erosion of their competitiveness on the international markets. Salary-related policies reinforced the comparative benefits of using this work force by fixing a lower minimum salary in the peripheral regions, with the exception of 5 provinces where the legal wage is between 8% to 25% higher.

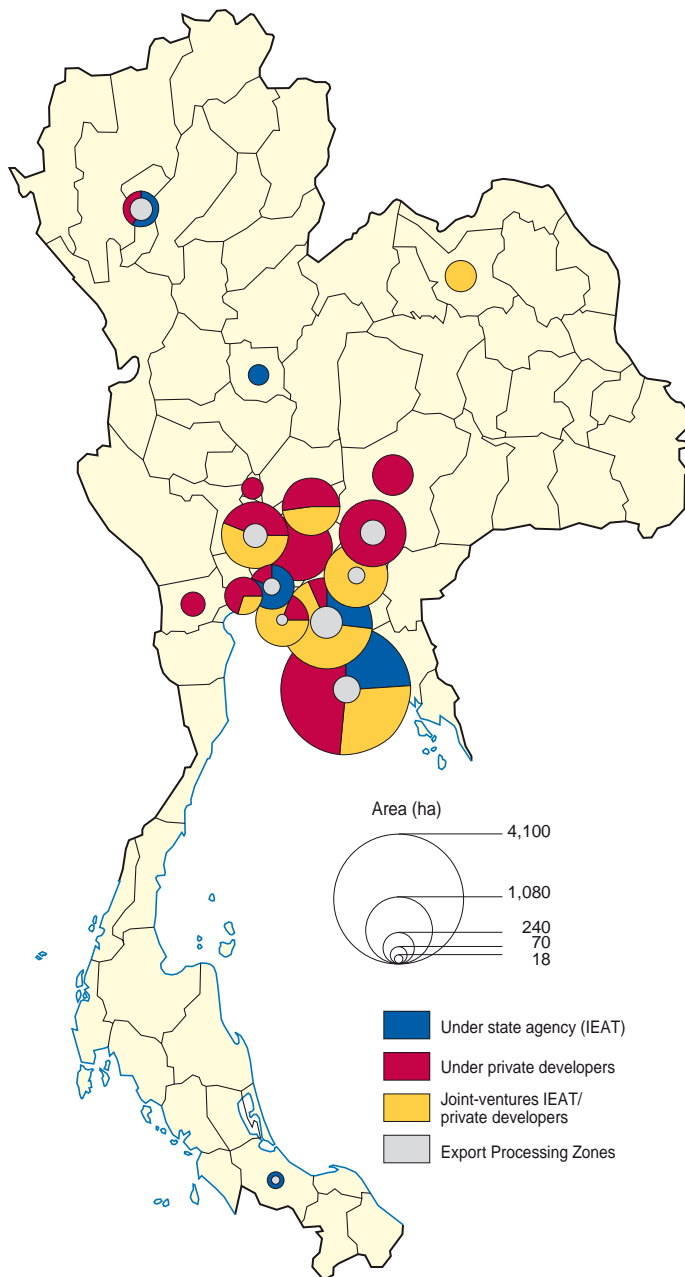
Spatial adjustments made in 2000 created a special zone 3, with the highest level of incentives, from some of the most underprivileged provinces in the peripheral regions. The three provinces on the Eastern Seaboard are now in the same zone, though Rayong had benefited from the same treatment as the peripheral regions for almost twenty years. Given the deterioration in the country's fiscal situation since 1997, it is expected that the subsidies awarded to new investors, especially foreigners, will be much more effective in meeting the country's economic and

social needs. The fact that the World Trade Organization challenged the criteria being used was also a good argument for taking the inequalities in spatial development more into consideration.

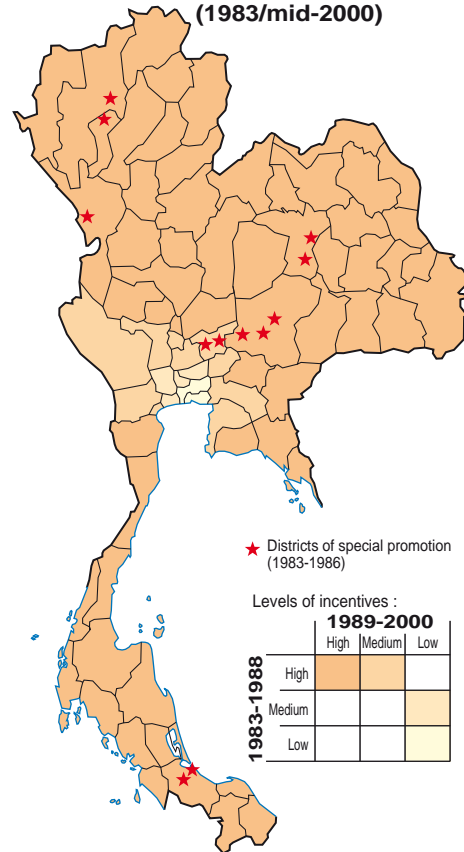
The fact that location and subsidies criteria are closely linked has given rise to a complex system of incentives and the BOI has been able to use its discretionary power to anticipate or accentuate trends that had not been clearly announced. The level of exemptions accorded to companies settling in the low or intermediate privilege zones is raised according to criteria which, although constantly changing, are seen as essential for economic growth (volume of exports, employment creation, sectors classified as priority). The resources available were totally inadequate to develop the industrial estates which had been intended to deconcentrate the location of companies and provide them with the facilities necessary for rapid growth. This situation has resulted in an appeal for assistance on the part of the public authorities to the private sector and the granting of exemptions to industrial estates of whatever status, which can be more substantial than those already in force in the provinces concerned.

In 1998, private developers managed over 45% of the total area of the industrial estates without government assistance and almost 40% in partnership with the public body, the Industrial Estate Authority of Thailand (IEAT). The result of this public/private partnership was a major spatial imbalance in the location of industrial estates, with short-term investment profitability taking priority over geographical deconcentration, a priority only for the public authorities. Industrial estates set up in some poles of the peripheral regions with a boost from the IEAT, Nakhon Ratchasima excepted, represent less than 10% of their total area. With a high level of IEAT participation, the Eastern Seaboard, conceived as an area of industrial deconcentration for the central provinces, accounts for a little over 50% of the total industrial estates area, with only slightly less than half of this being Export Processing Zones: they receive increased benefits (duty-free) according to the exporting performance of the enterprises. Private capital, on the other hand, has established the majority of the industrial estates in the central provinces.

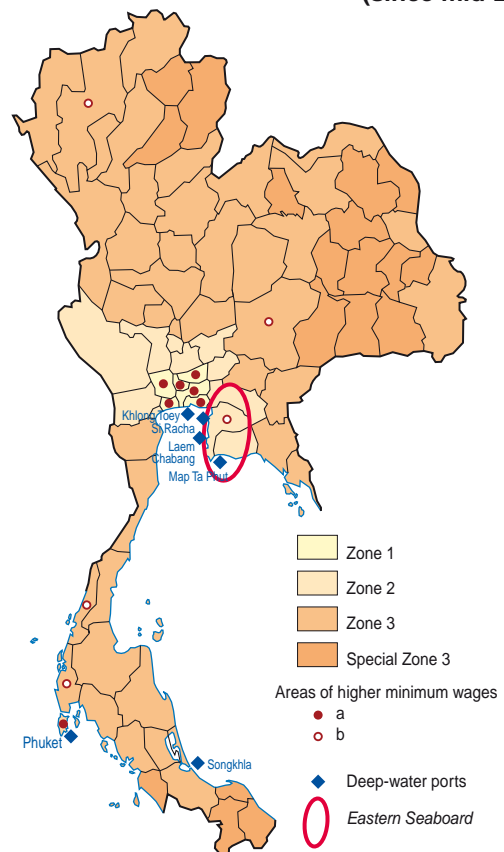
Industrial estates (1998)



Dynamics of the BOI Investment Promotion Zones (1983/mid-2000)



BOI Investment Promotion Zones (since mid-2000)



Sources : BOI, 1995, 1998, 2000
Kermel-Torrès D., Schar Ph., 1997
Yuthasak Kanasawat, 1995

A major effort to provide educational and medical facilities

Despite the excellent level of school provision throughout the country after a major effort made in the 1960s and 1970s, overcrowded classrooms in the cities and a lack of educational materials hinder the learning process, the authorities finding it difficult to cope in particular with urban growth. The Bangkok Metropolitan Region (BMR) and also Chon Buri and Songkhla seem to be particularly underprivileged, with class sizes of 30 to 36 pupils. Government expenditure on education (3.5% of Gross Domestic Product (GDP) and 19.5% of the state budget in 1996) has not increased as a proportion of GDP since 1970.

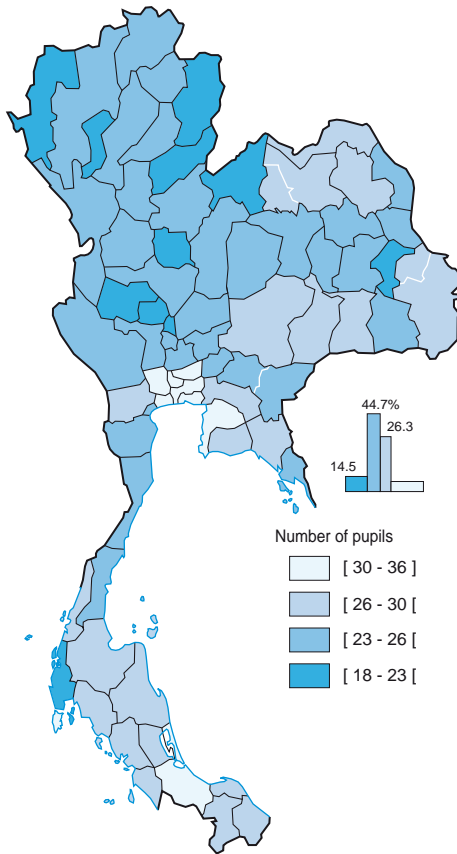
Elementary education is still absorbing almost half of total expenditure on education. The proportion spent on higher education was greatly increased at the beginning of the 1990s, from 10% in 1985 to almost 20% in 1996. The proportion allocated to secondary education, however, remains low, at 22% in 1996 (against 19% in 1985) for a school population that is twice that of higher education. More than half of the country's universities are concentrated in the Bangkok Metropolitan Region (BMR). While the policy of university decentralization remains fairly limited in numerical terms, there is nevertheless a considerable spread of universities throughout the country. The creation in the 1960s of regional universities in Chiang Mai, the second largest university center in the country, Khon Kaen and Songkhla was extended in the 1990s, with further new universities being created and a scattering of minor centers set up in many provinces. Several campuses were established on the outskirts of Bangkok to cope with the increase in student numbers in the capital's universities.

The state education system accounts for a growing number of students at secondary level (73% in 1976, 87% in 1996), but the private sector retains its presence at primary level (13% of pupils in 1996) and is increasing in the higher education sector (20% of students in 1996 against 7% in 1986). Given the increasing demand for places, the reduced capacity of the traditional universities and the mass Open-to-all University system (with no restriction on student numbers) where the academic level is low, the way is open for more and more growth in the private sector. The question of the extent to which the state should be responsible for education is at the heart of the debate engendered by the Eighth Plan for education (1997-2001), which recommends that state universities be self-governing.

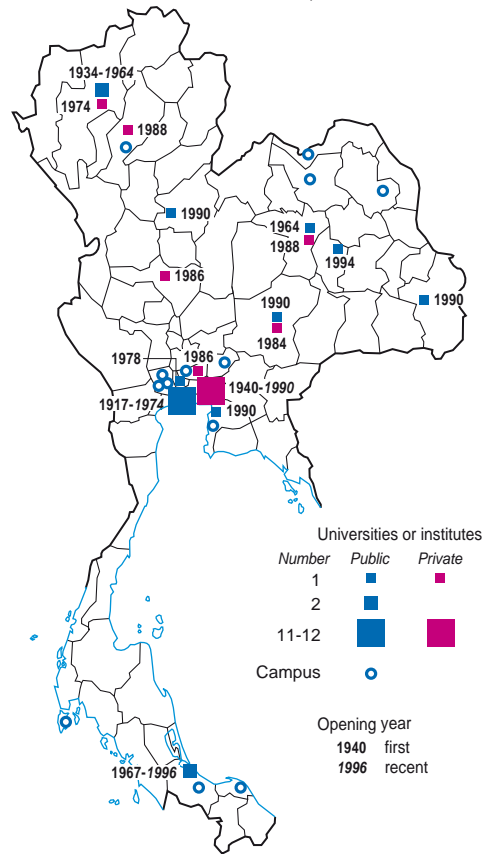
The fact that the country is well served with regional and provincial hospitals, with good local medical provision in the districts, the sub-districts (all equipped with a health center since 1996) and in sensitive areas such as the mountain border regions, is a major achievement of public health policy over the last 30 years. Between 1975 and 1995 the proportion of visits to a regional or provincial hospital has decreased by half, in favour of the health centers. This definite progress in access to health care is however limited as there are not enough doctors (81% of urban dwellers have access to facilities with a doctor, as opposed to 47% of rural dwellers). There has recently been a sharp increase in family expenditure on health, associated with the changing needs that accompany a changing society. Since 1992, priority has been given to quality of service and health insurance and more recently to lifestyle and environmental problems.

The development of health services is considerable in all regions: in 1995 at national level, there were nearly 300 inhabitants per health care professional and the number of inhabitants per doctor fell between 1985 and 1995 from 15,700 to 10,500 in the North-East, from 13,300 to 5,600 in the North, from 8,000 to 5,500 in the South and from 1,500 to 1,000 in Bangkok. However, outside the BMR, only areas with large numbers of tourists, a few regional cities and the border areas that are more susceptible to health risks have a high level of health care provision. The North-East in particular is poorly equipped, as it was under-equipped in the past and has not made up this deficit to the same extent as the North, whereas the South inherited a much better situation. After declining between 1970 and 1988, the private sector has benefited from the rapid improvement in quality of life in the 1990s, to reach 23% of the total number of hospital beds in 1995, against 13% in 1985. This sector occupies an ever-increasing place in the areas of high purchasing power, mainly the Bangkok urban area where it represented 40% of hospital beds in 1995 (with a particularly high rate of increase in the suburbs), and in some regional towns and tourist areas (Chon Buri, Phitsanulok, Chiang Mai, Phuket). Health provision is still however almost exclusively the domain of the public authorities in most provinces.

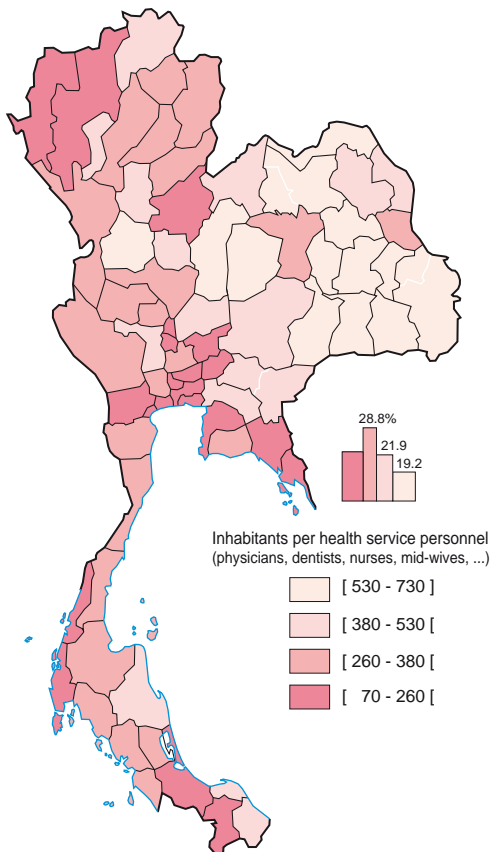
Pupils per class (1996)



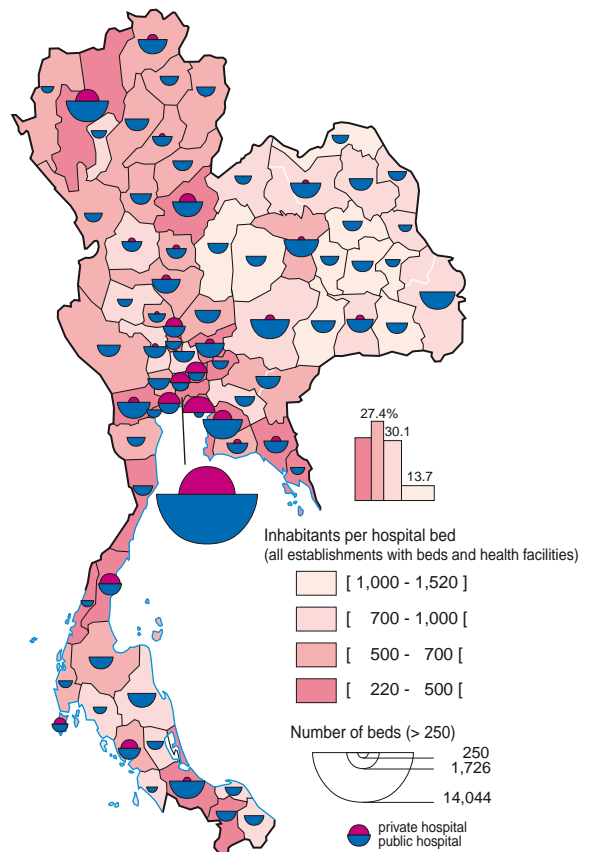
Higher education institutions (1996)
with more than 1,000 students enrolled



Health services (1995)



Health facilities (1995)



Sources : Ministry of University Affairs, 1998
NSO, 1990, 1997d, 1997e, 1997f, 2000

The increasing role of the private sector in communications

The country is not well served with post offices (1 post office per 50,000 inhabitants at national level) and provision varies widely from one province to another. The under-provision in relation to population density affects mainly the North-East and to a lesser extent the rapidly growing (in population terms) outskirts of Bangkok. This situation reveals, on the one hand, the wide variety of economic situations in the provinces and, on the other, the difficulty facing the authorities in coping with the rapid increase in needs arising from the rapid growth rate in the Bangkok metropolitan region and also in regional cities which have undergone rapid expansion (Nakhon Ratchasima). The lack of post office provision in the most rural provinces should be seen in the context of a low level of postal activity (between 2 and 8 postal items sent per inhabitant in 1996 for the north-eastern provinces, compared with 72 in Phuket and 112 in Bangkok). To compensate both quantitatively and qualitatively for the inadequacies of the public sector, private postal services provide a vital local service in Bangkok and the main cities.

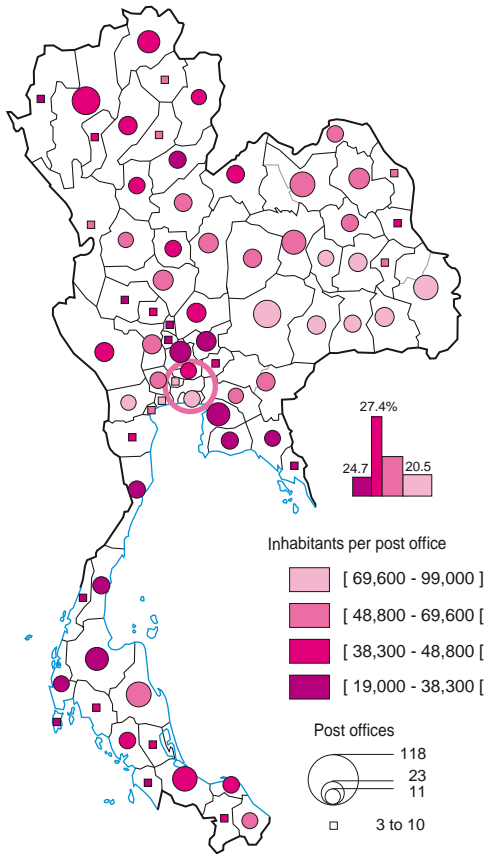
The capacity of the telephone network reflects the different levels of economic activity and standards of living between regions (5 lines per 1,000 inhabitants in Si Sa Ket as opposed to 200 in Bangkok). Bangkok and region have a very high teledensity, with the Greater Bangkok Area alone (Bangkok, Samut Prakan, Pathum Thani, Nonthaburi) containing 61% of all the country's lines in 1996. The extension of industry along the Eastern Seaboard gave rise to an excess capacity in the network (in Rayong, only 83% of lines were in use in 1996, compared with more than 96% in Bangkok) due to the voluntaristic development that had taken place throughout this vast zone of industrial activity and which by the middle of the 1990s resulted in infrastructure that was far in excess of what was required by the businesses already in place (a situation that is being repeated in Pathum Thani province, also undergoing large scale development, on the outskirts of Bangkok). In the rest of the country, the remarkably good levels of provision in Phuket or Chiang Mai are related to the major tourist infrastructure. No province in the North-East, including those which are the most urbanized, has more than 17 lines per 1,000 inhabitants. Despite a 3- or 4-fold increase in the number of lines at the beginning of the 1990s in the least well-developed provinces (revealing a very poor initial level of equipment), most still have fewer than 10 lines per 1,000 inhabitants. In 1994 there were 422,283 mobile telephones, 924,415

in 1996 and 1,105,148 in 1997 (of which 62% were in the Greater Bangkok Area). This rapid development in the 1990s is a new factor that is tending to reduce the effect of regional differences as far as fixed lines are concerned.

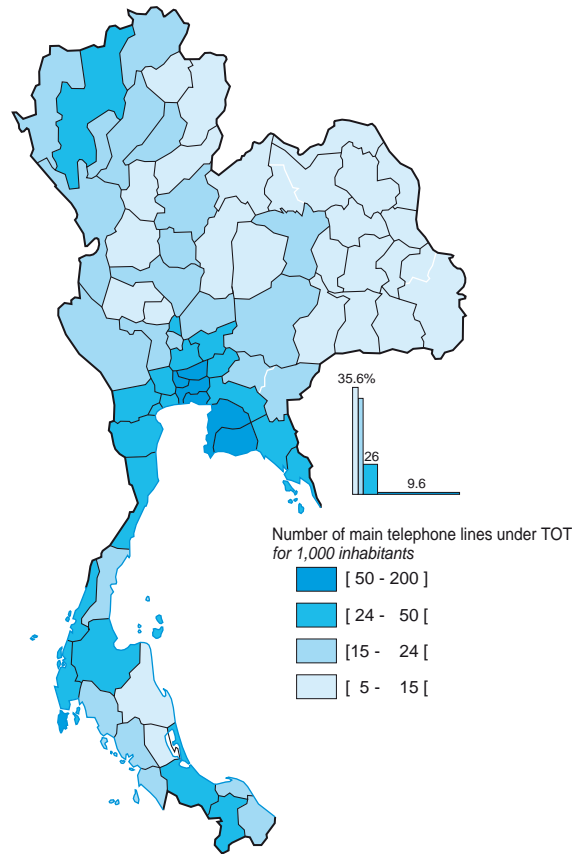
In order to meet a growing demand for main telephone lines, partnerships between the state in the form of public enterprises, the Telephone Organization of Thailand (TOT) and the Communications Authority of Thailand (CAT), and private operators were established between 1992 and 1993. Thus TOT has granted 25 years service concessions to Telecom Asia for the installation and operation of new lines in the Greater Bangkok Area and to Thai Telephone and Telecommunication for the provincial service. In 1996, these operators were responsible for installing more than 90% of new lines. Their participation in the telephone infrastructure system has grown from the management of 300,000 lines in 1994 to 2.3 million lines in 1997, out of a total of 4.8 million, or 48% of the country's telephone lines.

State enterprises have also granted concessions for the development of a large proportion of the new communication technology for mobile phones and telecommunications via satellite. These operations ensure a good level of coverage throughout the country as a whole, although this is nevertheless limited by the poor quality of inter-connections between the telephone systems and operators. They also pave the way for the privatization of TOT and CAT, scheduled in the 1997 Telecommunications Master Plan for 2006. The long-term view held in 1997 by the Thailand Development Research Institute estimated that, on the basis of economic growth being maintained, 10 million fixed lines would be required by 2001 (or, between 1997 and 2001, 250,000 new lines per year for the Greater Bangkok Area and 350,000 for the provinces) and 14 million by 2006, or about 21.5 lines per 100 inhabitants. Given that there were 4.8 million existing lines in 1997 (or about 8 lines per 100 inhabitants), these figures indicate the scale of the increase in equipment needed to match the country's economic development and meet social demand.

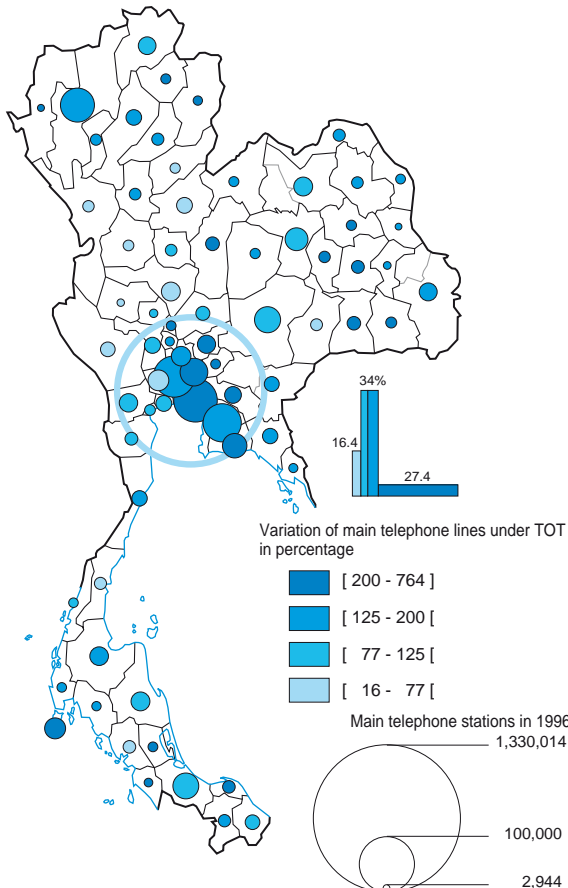
Post offices (1996)



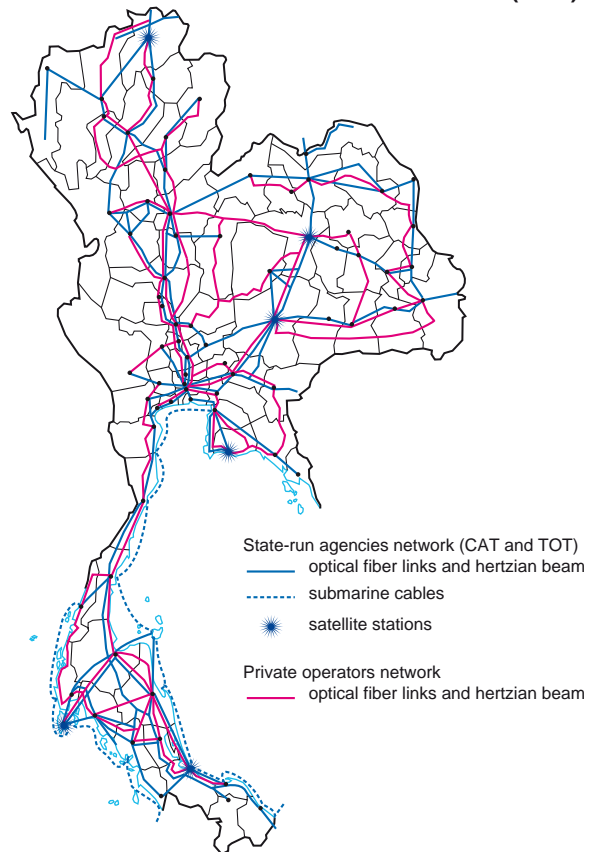
Teledensity (1996)



Telephone lines (1988-1996)



Public and private telecommunications networks (1998)



Sources : Ministry of Transport and Communications, 1998
NSO, 1990, 1997b, 1997c, 2000

Good electricity service, inadequate water supplies

There is a great contrast between Bangkok, and its surrounding provinces, where almost all households have piped water, and the rest of the country: in 1996, one household in two had water in the central region and fewer than one in four in the South.

The contrast between town and country remains considerable with 81% of urban homes supplied with piped water in 1994, compared with only 27% in rural areas. In each region, the most urbanized provinces and also a few rural provinces which have undergone improvements through specific development programs stand out above the rest. Due to population growth, a lack of planning and main-tenance, and insufficient local ground water, water supplies in 1990 were still not satisfactory in 35,529 villages, half of which are in the north-east of the country. According to the Ministry of Public Health, 1.73 million rural homes were without drinking water in 1994. Programs since the 1960s to provide facilities, mainly wells, have proved inadequate, and so the focus since 1992 has been on installing water pipelines with the aim of supplying 70% of villages by 2001. This development has been felt in the North-East particularly, where the proportion of homes with piped water increased 2.3-fold between 1990 and 1996, and there was a corresponding decrease in the provision of public wells.

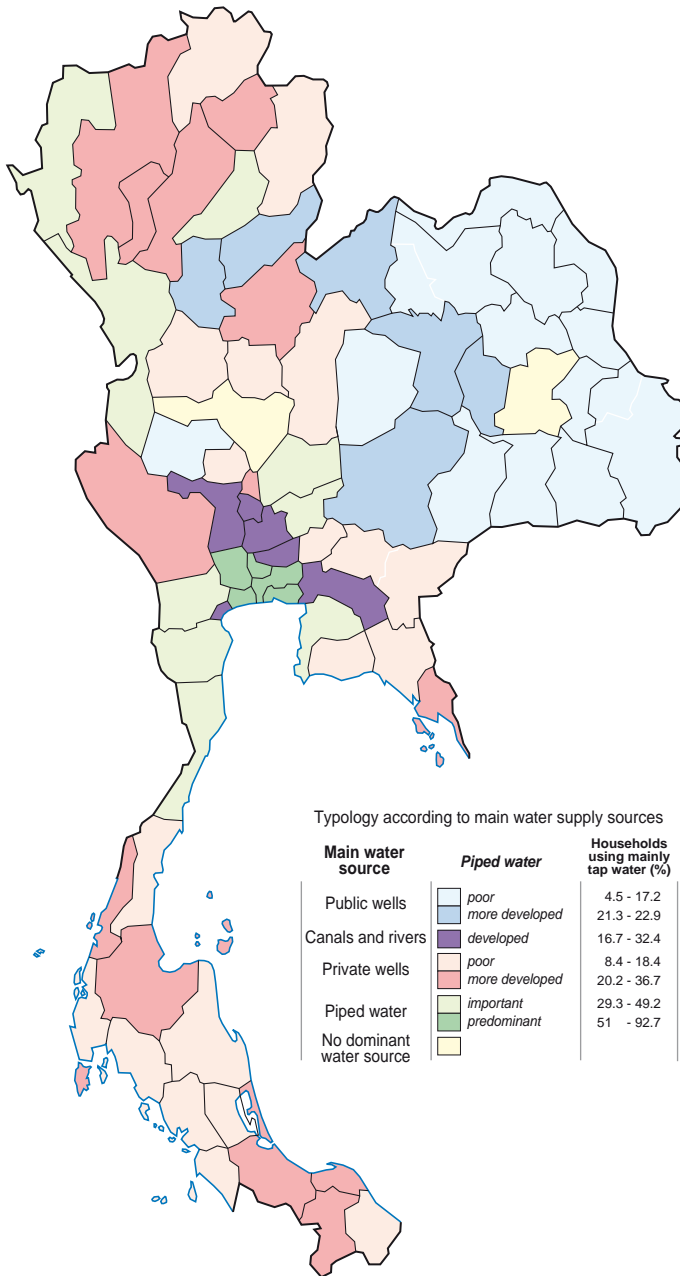
The North-East and the South have contrasting water supply profiles. The South has a reduced amount of public infrastructure, compensated for by private wells, which, in 1990, were the main source of water for between 47 and 80% of households, according to the provinces. Piped water supplies improved little between 1990 and 1996, an indication of the persistent weakness of public intervention. The North-East, on the other hand, has benefited since 1960 from large-scale improvement schemes: the use of public wells predominates in all provinces and the installation of piped water is improving considerably. Until the middle of the 1970s, the government, with invaluable help from the United States, concentrated its rural development actions on this region for strategic reasons in order to counter communist insurrections. Thus between 1966 and 1972, the Potable Water Project covered 600 zones, mainly in the North-East, with the specific aim of winning the loyalty of the local populations. Since then, attention has continued to be focused here as there is a chronic water shortage. In the North, private wells predominate, but

less markedly than in the South. Piped water is fairly well developed and there have been remarkable improvements since 1990 in some of the most rural of provinces (Mae Hong Son, Tak).

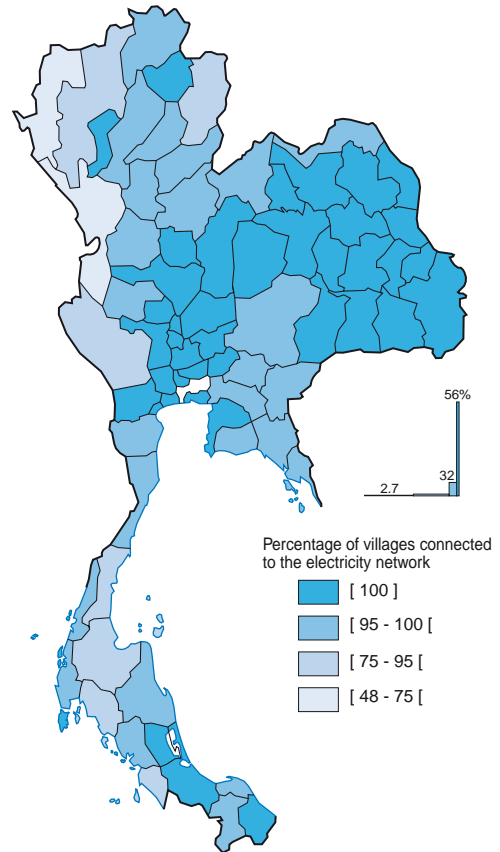
In 1994, the Ministry of Public Health considered the quality of drinking water in Bangkok and the main cities to be adequate, with the notable exception of the squatter settlements. Throughout the rest of the country it remains inadequate, however: only 46% of samples collected met health standards. In 1996, 925,000 homes, especially in the Central Plain and the periphery of Bangkok, were mainly using water from the canals and rivers. In order to cope better with the shortages, the management of amenities and water provision planning were handed in 1992 to the provinces. In response to increasing demand and to provide more widespread coverage, in 1996 the task of improving and extending the water services in some provinces was delegated to private companies for 25 years.

In 1995, 98% of villages were connected to the electricity supply and 88% of homes were connected, thus the aim to supply electricity to the rural areas was very largely fulfilled. And this was achieved by the end of the 1970s, especially under the Third and Fourth Plans (1972 to 1981) which made rural development a priority. As in the case of the water supplies, we find here, but with a better success rate, the effects of basic infrastructure improvement programs aimed at countering uprisings, especially in the North-East. Establishing an extended road network provided support for the provision of electricity to rural areas. In 1995, only 9 provinces had fewer than 95% of their villages supplied with electricity. The mountainous provinces in the north-west along the border with Myanmar are the least well supplied (especially Mae Hong Son, with 181 villages out of 379 without electricity). The other provinces not yet fully equipped have a considerable number of households without electricity, although the villages are on the grid. In the South, 9/10 of the villages of Chumphon and Krabi are supplied, but only 6 out of 10 households are connected.

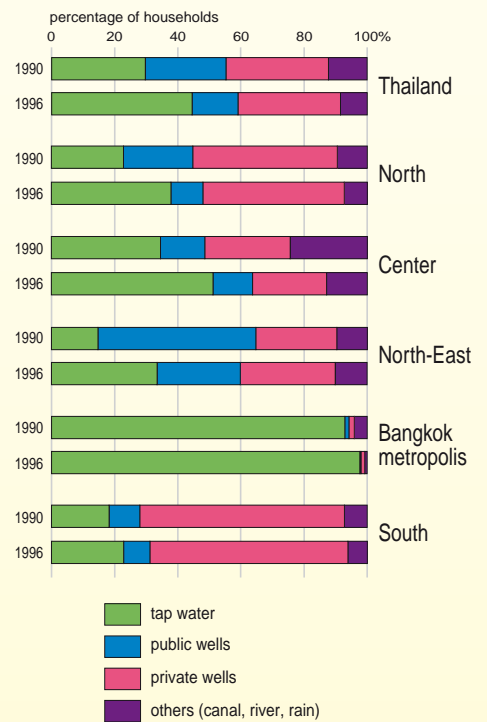
Water supply for domestic use (1990)



Rural electrification (1995)



Domestic water supply sources (1990-1996)



Sources : NSO, 1990, 1995, 1997a

Agriculture

Agriculture was the main driving force behind the economy until the 1960s. The high levels of growth recorded during the next decades were due to the success of other economic sectors, and the performance of agriculture and its role in the industrialization process have tended to be overlooked. The rapid response by farmers to market incentives and their ability to constantly renew productions, have provided the raw materials needed to establish a powerful national agro-industrial sector, they have satisfied the growing and diversified demand of the urban classes and maintained Thailand's position among the leading exporters of agro-food products in Asia.

At the end of the 1950s, when the economy was moving towards industrialization through import substitution, the state introduced taxes on agricultural productions and exports that particularly affected the rice-growing sector (Rice Premium 1955-1986): they represented an important source of funding for large-scale investments in agriculture and other economic sectors (hydro-agricultural infrastructure, communication). By maintaining rice prices artificially low, until the collapse of world prices in the 1980s, the state was able to control the cost of industrial labor and move into an export oriented industrialization (see chapter 5 Industry). Industry's high demand for labor and its spatial spreading towards the periphery (1990s) have created neither a massive rural outflow nor a disaffection for agricultural activity. Agriculture continues to employ about 50% of the working population, despite the low level of profits from traditional productions and the wide variations in incomes associated with fluctuations in world market prices (**plate 30 Agricultural households and product**). Alongside the trend in the census to overestimate numbers of agricultural workers by taking into account main employment only, the true proportion of workers in agriculture and their low income levels have to be moderated by the large numbers of rural workers who engage in multi-activity (seasonal or temporary) in different sectors of the economy, and are thus able to support farms which are barely profitable.

Thai agriculture is peasant-based, with predominantly small and medium-sized owner-occupied farms. In 1996, the total area given over to agriculture, as defined by the Ministry of Agriculture and Co-operatives, was 21.2 million hectares (45% of the entire country) of which 19.7 million hectares were cultivable land. These figures have been calculated

by subtracting built-up areas, idle land and pastures from the total agricultural area. After the signing of the Bowring Treaty (commitment by Siam to provide rice for the British Empire, 1855), the rapid increase in productions was achieved essentially by expanding the cultivated areas. Agricultural colonization was achieved in successive phases, in a spontaneous fashion and on an individual basis (**plate 31 Land utilization**). The pioneer movement was backed by the state and benefited from the 1950s from the introduction of new cash crops, which enabled farmers to turn over to cultivation land that was unsuitable for rice-growing. The supply of land increased faster than the agricultural population, thus allowing a suitable man/land ratio to be maintained, at least until the end of the 1980s, which for most of the country marked the closure of the agricultural frontier (average land-holding size of 4.7 hectares in 1990, and constantly decreasing since).

Agriculture remains for the most part rainfed and subject to seasonal variations, even though the development of irrigation lay at the heart of the state's planned measures to support the agricultural sector. Most state investment has been concentrated in the Central Plain, benefiting rice farming yet not giving rise to any real Green Revolution (**plate 32 Irrigation**). Generally speaking, Thai agriculture is still not very productive, and a significant diversification in productions has not been accompanied by major technical changes. High-yielding varieties, with the exception of just a few crops or a small number of irrigated zones, are little used and the consumption of chemical fertilizers is, on average, amongst the lowest in Asia despite a rapid increase since the 1980s associated with the development of various forms of contract farming. Small-scale mechanization (tractors, rotovators, threshers, pumps) has seen considerable progress throughout the country, strengthened in the 1990s by the increased cost of labor and the shortage of workers. The diversification of productions has been very dynamic under the impetus given by the private sector (networks of middlemen, agro-industrial groups) and is more a reflection of the farmers' responsiveness to the signals of the market than the result of public action. Although the state has supported the agricultural sector by constructing infrastructure, agronomic research, credit or agricultural extension, the level of investments has remained low compared with that of other Asian countries and aid has tended to consolidate changes already underway rather than initiate new ones.

Rice remains the main crop, both in area under cultivation and employment generated, and for its contribution to agricultural exports. Today rice farming is faced with a decrease in available resources (labor force, water), high production costs and competition from new Asian exporters on the world market (**plate 33 Rice**). The cultivation of sugar cane, which has developed considerably to respond to international demand, also suffers from increased industrial production costs over the last decade (**plate 34 Sugar cane**). Cassava has been maintained as an important upland cash crop thanks to new industrial outlets with higher value added and more diversified markets: the decrease in exports to the European Union has been compensated by the rapid boom in demand from Asia and from the national industries (**plate 35 Cassava**). Public aid today is tending to limit the advance of rubber cultivation in the South in favor of new tree plantations (oil palm; see also plate 64 Agriculture in North-East and South) and to encourage it in the North-East where its potential profitability is supposed to be high (**plate 36 Rubber**). The advance of crops such as maize, mungbean or soybean (**plate 37 Other crops**) illustrates the peasant farmers' response to the demand from Thai agro-industrial groups, especially in the animal feed sector which forms the basis for the development of new types of contract farming for specialized breeding (**plate 38 Recent breeding and shrimp farming activities**).

Since the 1990s, the choices of diversification or intensification of productions have been an indication of the great extent to which peasant agriculture was integrated into the activity of Thai agro-industry. They are also the result, more than before, of the distribution of the family labor force amongst a variety of agricultural activities and employment opportunities in non-agricultural sectors, the management of workers according to the potential of the agrarian systems and their integration into commercial networks. The history of agricultural colonization and the phenomena of diversification or intensification of productions can be seen by a marked specialization of agricultural regions (**plate 39 Agricultural specialization and socio-economic features**).

While the great flexibility of agrarian systems and the dynamism of the peasant world constitute important assets for agriculture in Thailand, the gradual erosion of its comparative advantages linked with the rapid rise in production costs leaves a threat hanging over the country's export capacities in a context of

a liberalization of exchanges (especially within the AFTA-ASEAN Free Trade Area). The government has launched many new initiatives to develop joint strategies with other countries on the world market (rice, natural rubber).

Attempts to achieve an extensive type of agricultural development have gone as far as they can and the decrease in available resources in the sector (labor force, land, water) presupposes considerable increases in productivity. Intensification of crops and of breeding is already underway and, not being limited to the irrigated farms of the Central Plain, it has based itself locally in the peripheral regions, creating environmental problems (see plate 8 Environment and natural resources). While agriculture is a profitable activity in the Central Plain delta and in a few zones specializing in high value added productions, the most vulnerable groups depend on local opportunities to diversify the non-agricultural part of the family income or on migration towards the urban centers or abroad. Part of the rural world must contend with the low level of agricultural incomes, indebtedness, land insecurity, and the consequences of public projects (eviction because of dams or forest reserves). These different factors feed a social tension that recent populist measures (see chapter 9 Social imbalances and spatial organization) do not seem capable of appeasing and which are finding an expression in the structured peasant movements of the 1990s such as the Assembly of the Poor.

INNOVATION and DIVERSIFICATION in AGRICULTURE

Maize-sheller set up in a field in the northern piedmonts

In response to the intensified rhythms of work, many agricultural tasks are now mechanized: cereal and legume thres-hing, ploughing with small rotovators ("iron buffalo" for the paddy fields) or tractors (on the higher lands). The agri-cultural Bank has widely encouraged the purchase of equipment and better-off farmers and merchants also offer services.



Photo Alain Vergnes

Market gardening and rice-growing in the irrigated perimeter of Nam Phong (Khon Kaen province)



Photo Doryane Kermel-Torrès

As there is insufficient water in some zones in the perimeter for a second rice crop, market gardening is adopted in the dry season. This is on small plots only, and requires considerable inputs in terms of chemicals and labor. Depending on the crops, production is sold either to the urban markets or to agro-industry (development of contract farming).

Retention of active population despite moderate agricultural value added

At the beginning of the 1960s, Thailand had all the features of an agricultural economy, with 80% of the active population engaged in this sector which contributed almost 40% of the Gross Domestic Product (GDP). Despite the very rapid growth of industry, which is highly intensive in its use of manpower, and the gradual closure of the agricultural frontier since the beginning of the 1980s, the agricultural sector continues to employ almost 50% of the active population although its contribution to the GDP has dropped to less than 12%. Although the sector has seen considerable growth over the last two decades (an average of 3% per year between 1980 and 2000) its contribution to the GDP has seen a sharp decrease in the share from crops, linked with the drop in prices on the world markets, and a relative stability in other activities due to the performances of livestock and fishing. At the end of the 1990s we saw the trend reversed as a result of the 1997 crisis (see plates 40 Industrial product and 50 Product of tertiary sector) and a recovery in the prices of some export products (natural rubber).

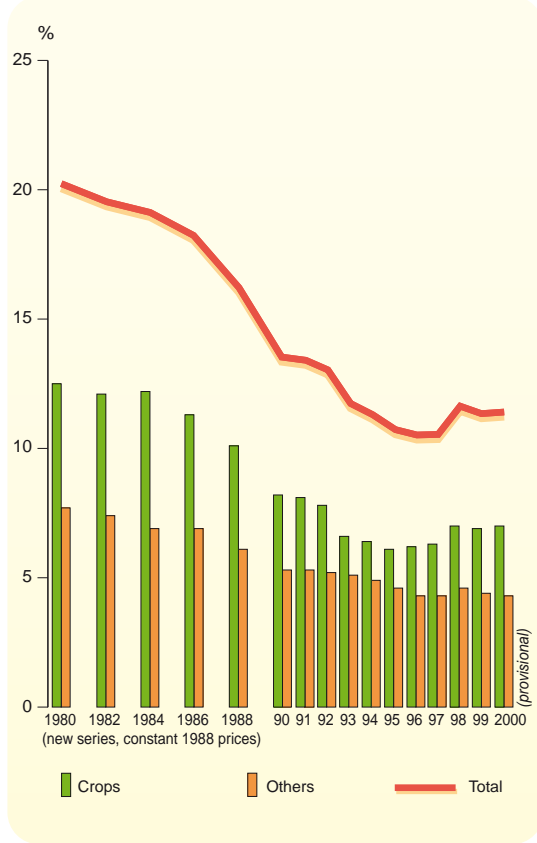
At the time of the 1990 census, agricultural households represented at national level more than half of all households. Their spatial distribution shows very clearly in reverse the processes of industrialization and urbanization in a series of concentric zones around Bangkok. The provinces adjoining the capital form a first ring where the rates of agricultural households are less than 24%. In the South, the province of Phuket, where the economy has diversified rapidly as a result of the development of tourism, and to a lesser extent of industry, belongs to this class. A second ring includes the provinces stretching from Ratchaburi, to the west of the capital, to Saraburi, to the north, and to these is added the province of Chon Buri as a result of the creation of the industrial complex on the Eastern Seaboard. From this group, the proportion of agricultural households increases gradually towards the provinces in the south of the Central Plain and those in the east and the west while remaining lower than or close to the national average. In the North-East, the percentage of agricultural households is more than 65% with the exception of the corridor formed by the three provinces of Nakhon Ratchasima, Khon Kaen and Udon Thani, where, since the end of the 1980s, the bulk of industrial and urban development is concentrated around the provincial centers and along the axes of communication. The North and the South have characteristics that contrast more sharply with the highly agricultural provinces (Nan, Patthalung),

and with others where the effects of industrialization and urbanization are more striking (Chiang Mai, Lampang, Lamphun, Songkhla).

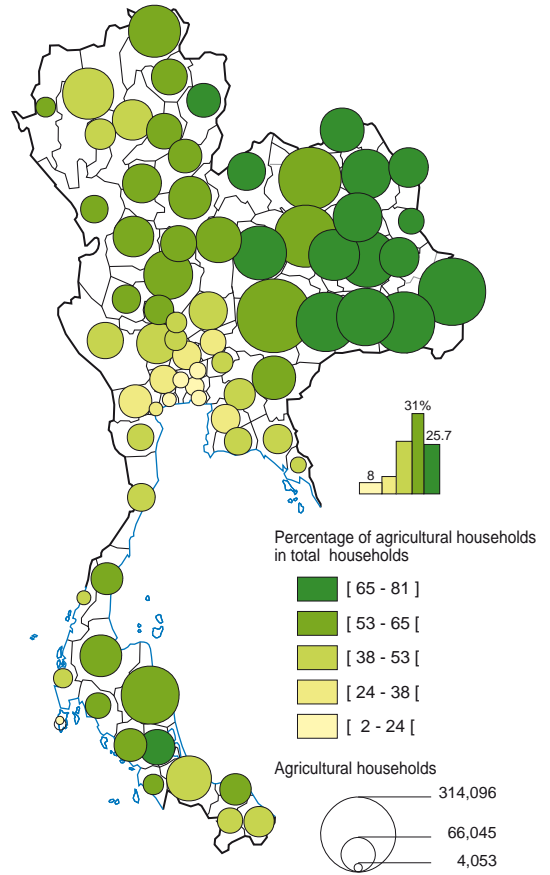
The values produced from agricultural activities and the part that they represent in the Gross Provincial Product reveal a major imbalance between the South and the rest of the country. The South benefits from the high value added linked with the economy of the plantations (rubber trees, oil palms) and of the contribution of fishing to provincial products. With the exception of Phuket, the share of agricultural activities represents more than 30% of the gross product (50% and above in the provinces along the western coast). It was also in this region that agricultural products, under the combined effect of price increases and the development of fish-farming activities, registered, on average, the best performances between 1989 and 1996 as can be seen from the differences between provincial figures compared with the national average. The importance of tree crops (Trat), aquaculture or fishing (coastal provinces in the Center) accounts for the agricultural values produced in these provinces. In contrast, values produced are low in the North and the North-East. These regions remain for the most part characterized by agriculture with a modest rate of value added despite diversification phenomena which enable certain provinces to register agricultural product growth rates similar to the national average (Chiang Mai and Lamphun in the North, Mukdahan and several provinces around Nakhon Ratchasima in the North-East).

The capacity of the agricultural sector to retain the active population of rural origin appears to be strong despite the low average income that it earns locally. As well as the recently acquired character of industrialization in the surrounding regions there are dynamics that are specific to the rural environment: agricultural workers employ economic diversification strategies, especially through multi-activity, which are guided by their commitment to the land which remains strong; agrarian systems are flexible, thus allowing a rapid response to incentives from the agro-industries and world markets.

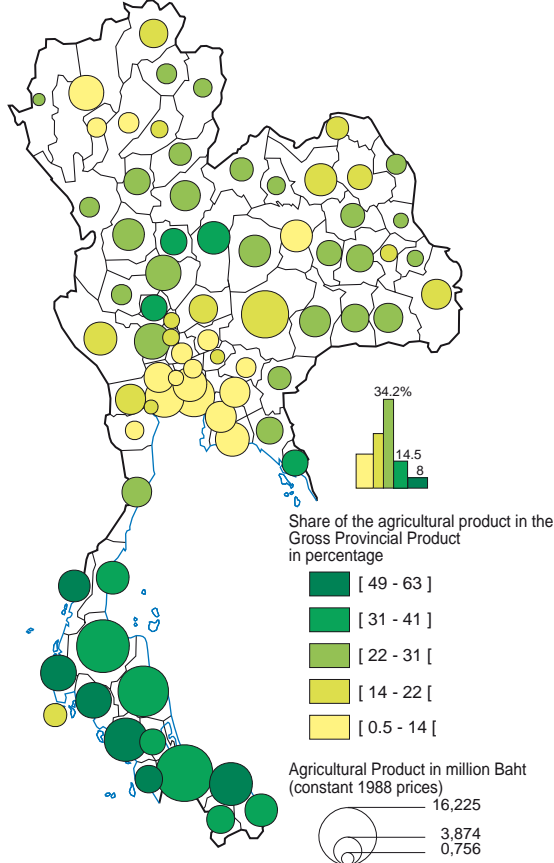
Share of the agricultural product in the Gross Domestic Product (1980-2000)



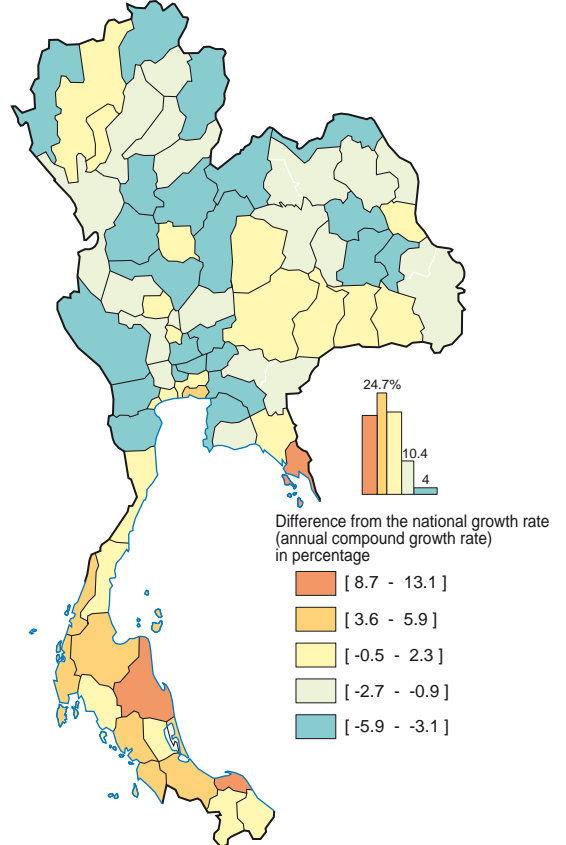
Agricultural households (1990)



Agricultural product and Gross Provincial Product (1996)



Growth of the agricultural product (1989-1996)



Sources : Bank of Thailand, 2002
NESDB, 1993, 1999
NSO, 1990

Pioneer agriculture undergoing diversification

Agriculture in Thailand is unique in South-East Asia, in that it occupies at least 40% of the entire country. The area under cultivation was first extended with the Bowring Treaty (1855) and this process accelerated after the Second World War (4 million hectares in 1940; 20 to 25 million hectares at the end of the 1980s) at the expense of forests. The expansion of rice cultivation, at first into the Central Plain then into the lowlands and valleys of the peripheral regions, was followed, after the 1950s, by the advance of the agricultural frontier onto the uplands as new cash crops were gradually introduced: cotton, maize, kenaf, cassava, sugar cane (see also plate 8 Environment and natural resources).

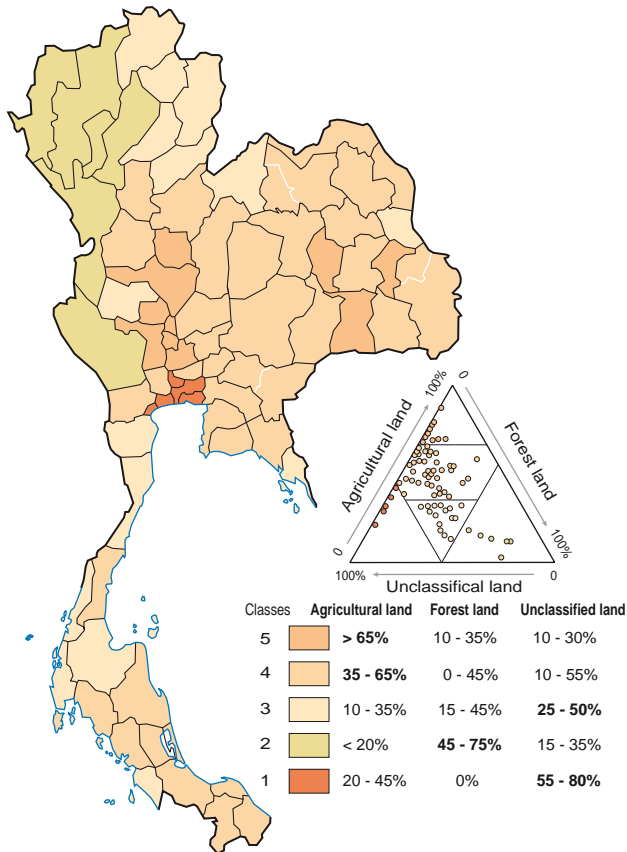
This gradual spatial spread of the cultivated areas is the result of spontaneous colonization by individual agriculturalists, although the pioneer movement was supported by the state through land tax concessions and settlement programs in some frontier zones or zones occupied by ethnic minorities. Drainage and irrigation work at first facilitated expansion of the area under rice farming. After the 1950s, cultivation of the uplands was given impetus by the construction of road infrastructure and the adoption of the new cash crops (which were more profitable than rice) benefited from the role played by the networks of Sino-Thai middlemen (provision of inputs, credit, transport, agricultural extension).

The distribution of the provinces into classes defined according to the major types of land use expresses the combined effects of the duration of land development and the importance of topographical constraints (see plate 7 Relief and hydrographical system). Agricultural land predominates in the alluvial plain of the Chao Phraya, the cradle of rice cultivation, and in the irrigated valleys in the North-East (class 5). In the provinces where uplands and valley bottoms alternate, the situation is more contrasted (class 4): agricultural land occupies between 35 and 65% of the total area, the remainder being shared between forest land and unclassified land, the latter taken up by built-up areas and the communication axes. The pioneer nature of agricultural development is demonstrated by the rapid retreat of the forests, which are now of relative importance only in the provinces that extend over the mountain chains in the north and west and in the peninsula (classes 2 and 3). In the Central Plain delta the predominance of unclassified land (class 1) reflects the influence of built-up areas in Bangkok's extended urban region.

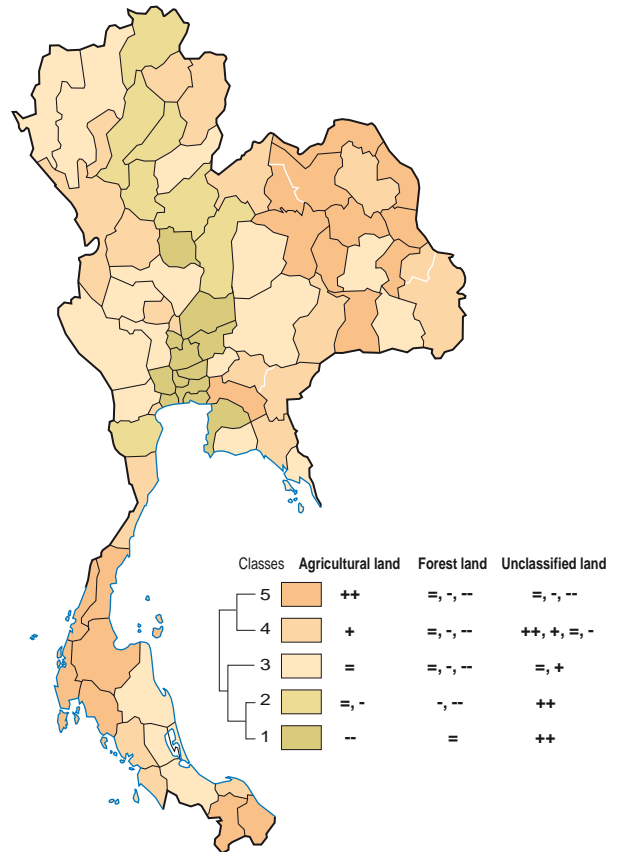
The changes in land use between 1978 and 1995 show a strong advance of urbanized areas in two main directions from this metropolitan region: northwards as far as Lop Buri and out to the Eastern Seaboard in Chon Buri (class 1). This process continued further north in a more diffuse fashion as far as Chiang Rai and west to Phetchaburi (class 2). During this period the proportion of agricultural land in class 3 remained stable, while the unclassified lands were developed to the detriment of the forests. In class 4 and 5, the increase in the percentage of land given over to agriculture suggests that the agricultural frontier was closed here at a later date, or even that active land colonization still continues (South).

Paddy fields represent about 50% of the total cultivable land at national level (see plate 33 Rice), with a high concentration in the Central Plain and the valleys in the North-East (class 1). They are still a major type of agricultural land use in most of the provinces in the North, the North-East and the Center, associated with fruit tree cultivation (class 3) or upland crops: cassava, maize, sugar cane (class 2). Rice cultivation systems become marginal only in the peninsula and the south-east, where there are zones of tree crop plantations (rubber and fruit trees, oil palms; classes 5 and 6; see also plate 64 Agriculture in North-East and South), and in the mountainous provinces on the central axis and the western axis (other crops; class 4). Since 1978 the proportion of paddy fields has been in constant decline: although this decrease has not been so great in the zones that benefit from irrigation or abundant rainfall (class 1), it has been very marked in areas where rice cultivation is more marginal. This reduction reflects the current difficulties encountered by the paddy farmers (price, availability and cost of the labor force) and the effects of new diversification into more intensive and more profitable production, with encouragement from the agro-industry companies through contract farming (flowers, vegetables, fruit trees) or from the public authorities (oil palms in the South, rubber trees in the North-East).

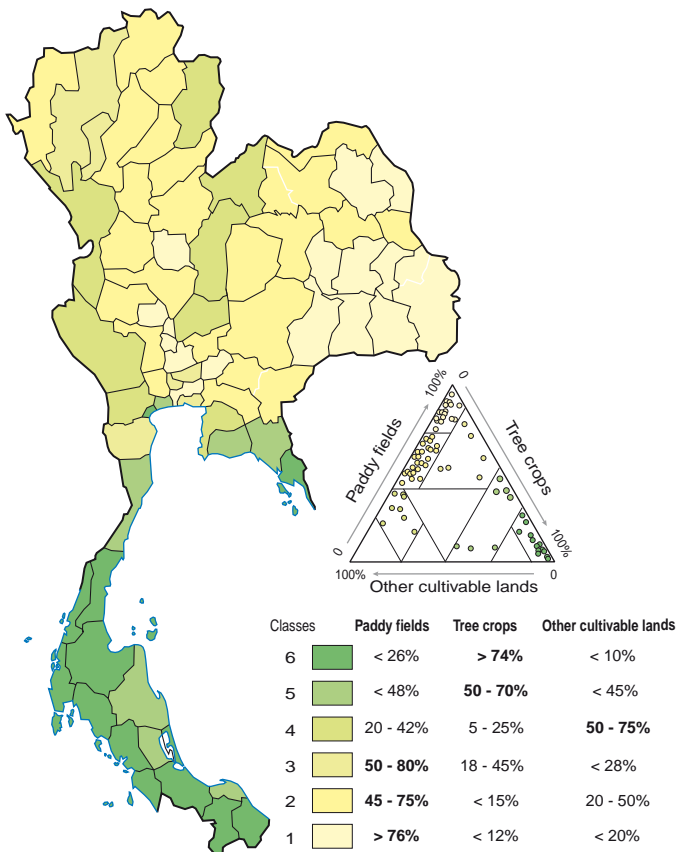
Land use (1995)



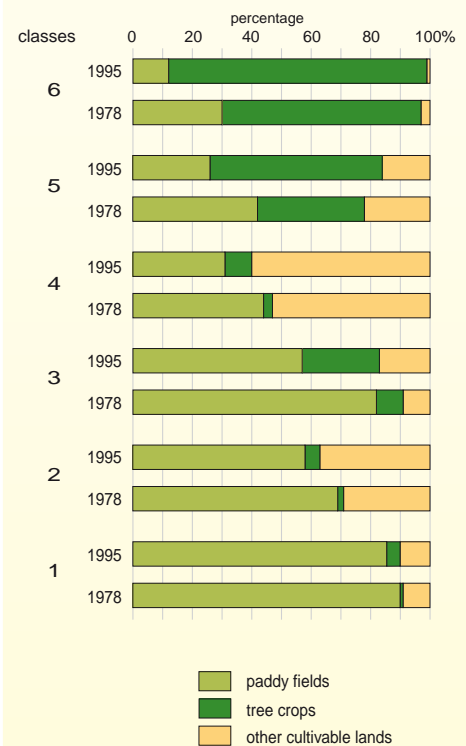
Land use evolution (1978-1995)



Agricultural land use (1995)



Agricultural land use evolution within same class (1978-1995)



Sources : MAC, 1980, 1998

Irrigation: correction of climatic fluctuations and stimulation of agricultural production

Despite a policy of sustained development of irrigation infrastructure since the 1950s, Thai agriculture remains very much exposed to seasonal climatic fluctuations. Rainfall rates represent a real ecological constraint for rice cultivation which, during the monsoon season, requires extra irrigation, even in the wettest areas (see plate 8 Environment and natural resources).

In 1996, 4.6 million hectares are classified as irrigated by the Ministry of Agriculture and Co-operatives, or 23% of the total cultivable land, but there are great regional disparities: 46% of the total irrigated area is located in the Center, 26% in the North, 17% in the North-East and 10% in the South. This refers to the extension of specially built perimeters where a regular water supply depends largely on the nature of hydro-agricultural infrastructure. The enclosed areas fed by the major dams may receive sufficient quantities of water for complementary irrigation in the rainy season, however, there are vast stretches of land, mapped as irrigable, that are dependent on much more modest reservoirs and whose water supply relies on the strength of the monsoon, and is more unpredictable; the North-East, where annual variations in rainfall are greatest, is thus the most disadvantaged region. The slim possibilities of growing irrigated crops in the dry season accentuate regional disparities: thus only 8% of paddy fields are cultivated twice a year (but 40% in the Center, 14% in the North, 4% in the South and 1% in the North-East).

In the 1950s, the state completed the first large-scale irrigation schemes in the Central Plain, using external funding (American aid, loans from the World Bank) to support rice production and exportation. The first two Plans (1961-1966, 1967-1971) placed the development of irrigation at the heart of the government's agricultural policy. Public investment gave priority to the development of the most favorable sites with the best cost/efficiency ratio. Large multi-purpose dams allowed the development of electricity production and irrigation of the lowlands on the Central Plain, the traditional rice granary of the country that has benefited since the end of the 19th century from a good drainage network (see plate 7 Relief and hydrographical system). In 1970, out of more than 2 million irrigated hectares, 70% were in the Center (15% in the North, 10% in the North-East and 4% in the South). However, the implementation of irrigation facilities encountered many technical defects and difficulties (insufficient capacity of the

reservoirs, lack of funds to complete construction, faulty design, poor maintenance arrangements or ineffective organization of distribution systems, strong opposition from farmers threatened with ejection).

The basins of the North have a long history of communal irrigation and water control. The absence of this tradition slowed the rhythm of adoption of irrigated rice cultivation in some areas of the Central Plain and resulted in an unreliable water supply to the plots. The implementation of irrigation schemes in the North-East encountered substantial problems due to the emergence of conflicts between irrigated and rainfed agricultural systems. In the middle of the 1970s, policy shifted towards smaller and less costly structures in the underdeveloped regions (North-East) in order to allow farmers to benefit from the increase in rice prices. The total area of irrigated land reached 4 million hectares in the 1980s. Irrigation may still remain a declared priority of the government's policy to provide aid for agriculture, but the accent from now on is placed on renovating and improving existing infrastructure rather than creating new ones.

These improvements and the rapid development in the use of water pumps have made it possible to extend irrigated areas to 4.5 million hectares in the rainy season and to increase from 450,000 (at the end of the 1970s) to 750,000 the areas with two rice crops. Today, through a lack of new investment, the irrigated areas are stagnating and water management remains fairly inefficient (loss of water through seepage, leaks, evaporation). The absence of any property rights over water means farmers have no incentive to use in a more rational and efficient way a commodity that is essentially free. Conceived as an aid to rice production, irrigation has not led to a real Green Revolution as there has been no wholesale adoption of a set of technical conditions (access to chemical inputs, credit facilities) in order to increase yields. Finally, the increasing demand for water for urban, industrial and recreational consumption poses the severe problem, in the dry season, of a sector allocation of resources, forcing farmers to turn towards less demanding crops (soybean, mungbean, sugar cane).



Extensive rice cultivation despite the challenge from international competition

Main staple food and foremost agricultural export crop, rice occupies 50% of the total cultivable area and provides employment for about 70% of the active agricultural population. Thailand is the fifth largest producer in the world and, for about ten years, has been the leading exporter (30 to 40% of international trade).

Over 80% of the annual production of paddy (22 million tons in 1996) comes from major rice, covering more than 9 million hectares in the rainy season. The extent of the first crop in the North-East (55% of the total national area) enables the region to provide 40% of the country's production. The paddy fields are concentrated in the valleys of the Khorat plateau, which stretches from Khon Kaen and Nakhon Ratchasima to Ubon Ratchathani and also in the valleys in the extreme north-east (see also plate 64 Agriculture in North-East and South): in ten provinces, paddy production in the rainy season covers over 65% of the cultivable area and the Nakhon Ratchasima-Ubon Ratchathani axis is the main production zone. The second largest is in the Chao Phraya valley (around 80% of the cultivable area in Nonthaburi, Ayutthaya, Ang Thong, Chai Nat). The provinces in the Center represent 17% of the area cultivated in paddy, but produce about 30% of the national total thanks to the size of the second crop (40% of the surface area). Although yields are only modest, they are among the highest (almost 3 tons/ha and more than 4 tons/ha in major rice and second crop compared with 1.7 and 2.5 tons/ha in the North-East). The North represents 22% of the total area grown under first crop for 26% of production. In the South, rice cultivation is not widespread (less than 5% of the national total is grown) except for the coastal valleys of the eastern provinces, from Nakhon Si Thammarat to Pattani (38% of total cultivable area in Phatthalung).

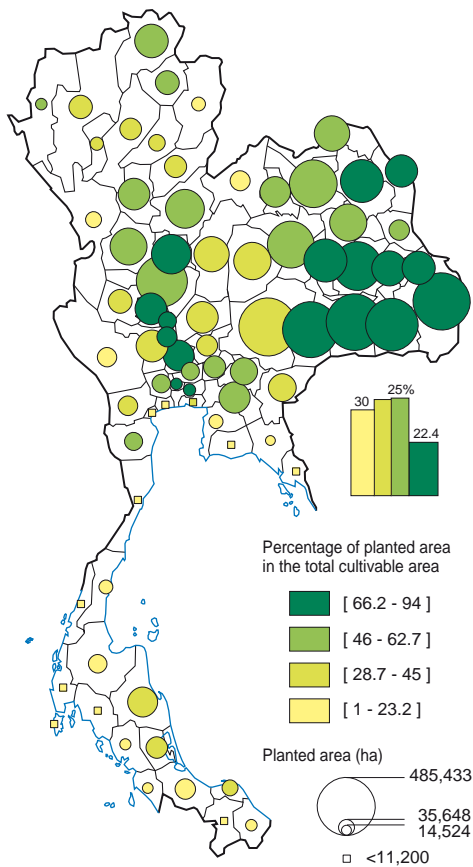
After the Bowring Treaty (1855) until the middle of the 20th century, rice cultivation was developed extensively, in response to demand from abroad. New land was put under cultivation, made possible by the growth in population, and was concentrated in the Central Plain (abundance of lowlands, transport facilities to the port of Bangkok for export) before extending North and North-East via the new rail and road infrastructure. From 1950 to 1970, the areas under paddy in the rainy season increased from 5.5 to over 7 million hectares, annual production doubled (from 6.7 to 13 million tons) thanks mainly to hydraulic developments from which the Central Plain was the

first to benefit. From 1976 to 1996, the area under cultivation increased only slightly (600,000 ha) and unevenly across the territory. Cultivation advanced in the North-East (1.1 million ha were added: irrigation work continued and later closure of the agricultural frontier), the largest increases being found in the northern provinces. The crop increased to 180,000 hectares in the North, but decreased sharply in the South (down 100,000 ha) and especially in the Center (down 600,000 ha).

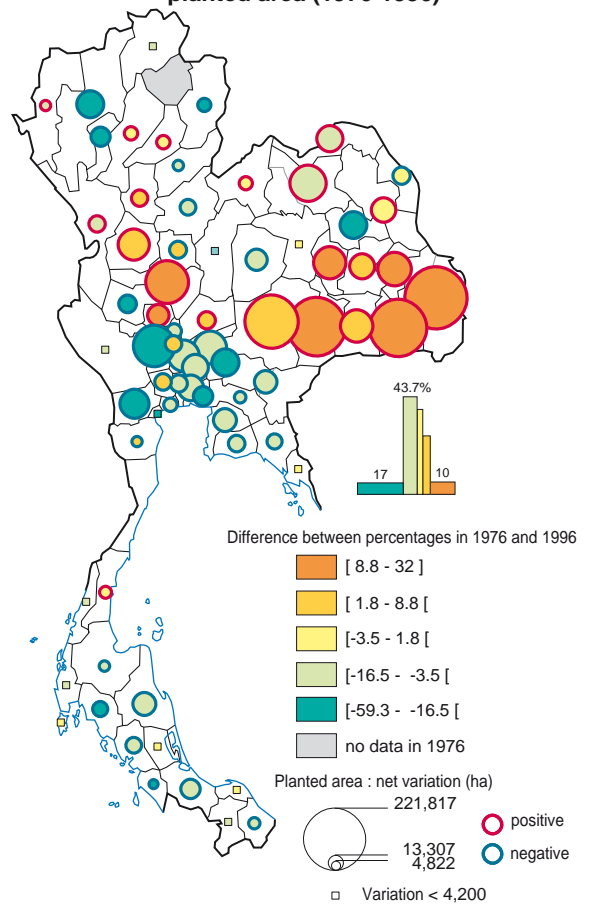
Production reached 20 million tons in the middle of the 1980s. Although productivity increased as a result of mechanization specifically adapted to the small size of the plots (multi-purpose rotovators, threshing machines), the low distribution of high-yielding varieties and the levels of consumption of chemical fertilizers (the lowest in Asia) meant that there was no spectacular increase in yields (2.25 tons/ha on average for the two crops in the 1990s). Since the middle of the 1980s, the planted areas and production have remained stagnant for several reasons: colonization of land suitable for paddy-growing came to an end and there were cutbacks in public investment in irrigation, profitability decreased and there was diversification into other crops and competition with other sectors of the economy for resource allocation (workforce, water).

Sixty per cent of the 15 million tons of rice produced are destined for the domestic market. The industrial implantations involved in rice transformation correspond for the most part to the major production zones, with nevertheless some high concentrations of investment in just a few large regional centers (Chachoengsao and Suphan Buri in the Center, Nakhon Ratchasima and Udon Thani in the North-East, Chiang Mai in the North). Exports include products of varying quality destined for a wide variety of markets: high quality white rice to China, Hong Kong, the United States, or poorer quality rice to Iran and Indonesia, broken rice to the African continent. Thailand is still in a strong position in the world market for the high quality types of rice that have made the country's reputation, but today there is a great deal of competition to contend with from countries like Vietnam and India, which have the advantage of lower production costs.

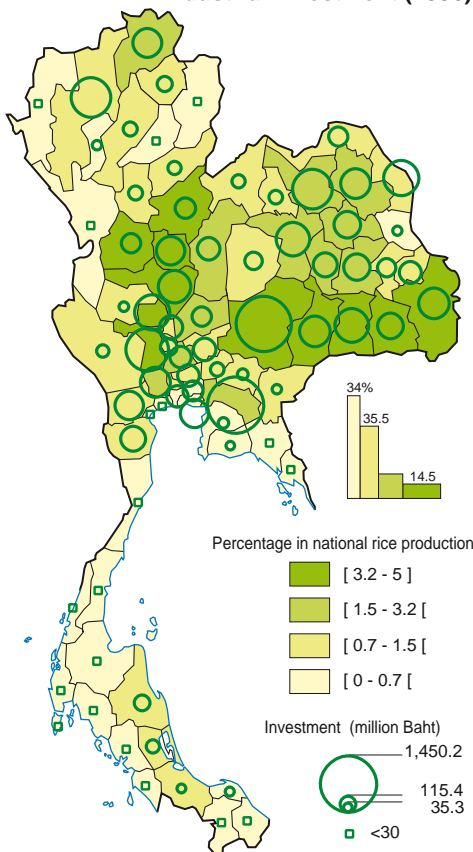
Major rice cultivation (1996)



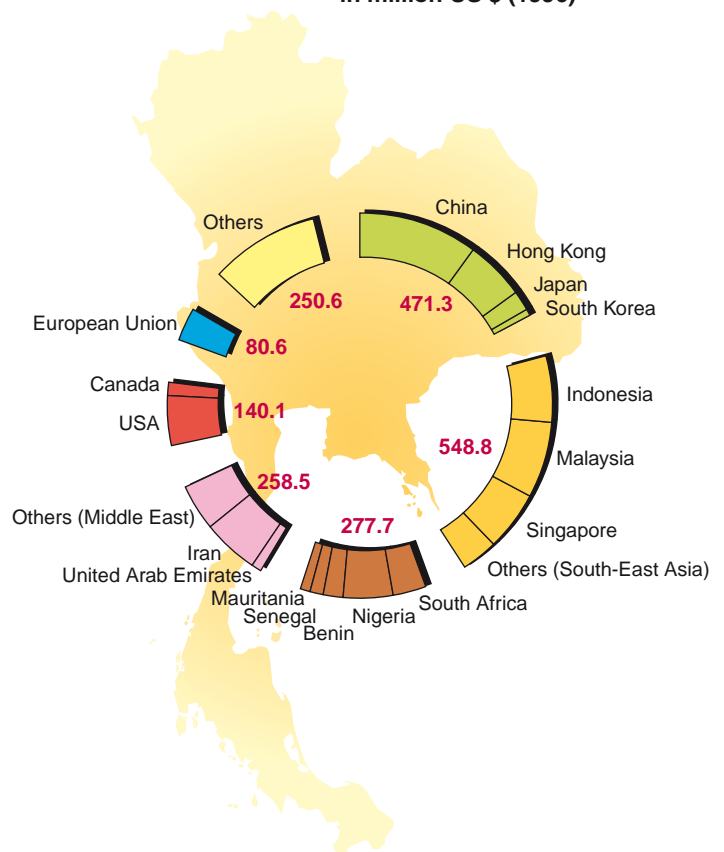
Evolution of major rice planted area (1976-1996)



Total rice production and industrial investment (1996)



Exports of rice by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
MAC, 1980, 1998
Ministry of Industry, 1997
NSO, 1997

Sugar cane: between protectionism and the world market

Despite its importance in Thailand's economy and its position at the world level, the sugar industry is today characterized by poor sugar cane yields (about 50 tons/ha), only modest rates of sugar extraction (100 kg/ton of cane), and an industrial sector which is in debt, and with excess capacity.

In 1996, sugar cane occupies around 1 million hectares with almost 50% concentrated in the Ratchaburi-Suphan Buri-Kanchanaburi triangle and Lop Buri-Sukhothai arc. Kanchanaburi is the main producer for this crop: sugar cane covers 41% of the total provincial cultivable area. The North-East as a whole represents one third of the total area planted with sugar cane, with no more than 13% in Chaiyaphum and 10% in Udon Thani, the first primary producer in this region. To the east of the capital, Chon Buri is distinguished by its planted area as well as by its percentage in the total cultivable area. Towards the south, the crop extends no further than Prachuap Khiri Khan.

Sugar cane cultivation has encountered cyclical development. Exports of refined sugar were one of Thailand's main sources of income in the 18th century. Production for export was dominated by foreign companies and concentrated in the Chao Phraya delta, west of the capital. After the Bowring Treaty (1855) came into force, competition from Europe and changes in the tax system resulted in a rapid decline in the sugar sector in the last quarter of the 19th century and most of the cultivable land in the Central Plain was turned over to paddy fields. Sugar cane has gradually been reintroduced since the 1930s, encouraged by public investment in new sugar mills and protectionist measures put in place by the state, in the context of the import substitution policy. Until the beginning of the 1970s, the increase in the area planted with sugar cane represented a response on the part of peasant agriculture to national demand. In 1976, Kanchanaburi, Suphan Buri, Ratchaburi and Nakhon Pathom cultivated more than 56% of the total planted area, Chon Buri and Rayong, to the east of the capital, 20%. Sugar cane was poorly developed in the North-East, where it was concentrated around new industrial plants (Udon Thani).

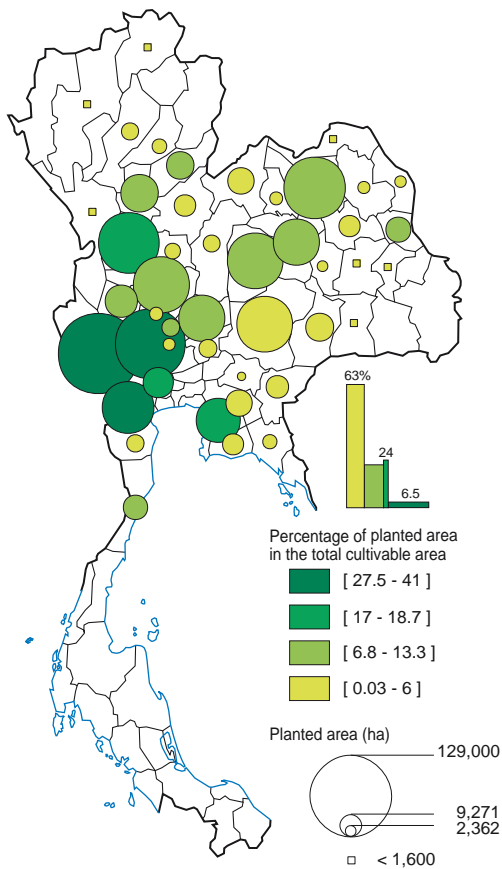
The areas planted expanded between 1976 and 1996 by almost 160%. From the heart of the production region, the crop extended along a northern axis towards Sukhothai and in particular towards the

north-east as far as Udon Thani. This expansion was achieved by clearing uplands and was given impetus by agricultural policies encouraging diversification of products for export and spatial spreading of sugar plants with more favorable installation and operating costs than in the central region. Only the provinces of Chon Buri, Nakhon Pathom and Prachuap Khiri Khan showed a net and relative decrease in planted area between 1976 and 1996 and the proportion of sugar cane cultivated in Kanchanaburi dropped from about 50% to 41%, despite an increase of more than 10,000 hectares; this province remains, however, the main producer, as can be seen from the size and scale of its industrial plants.

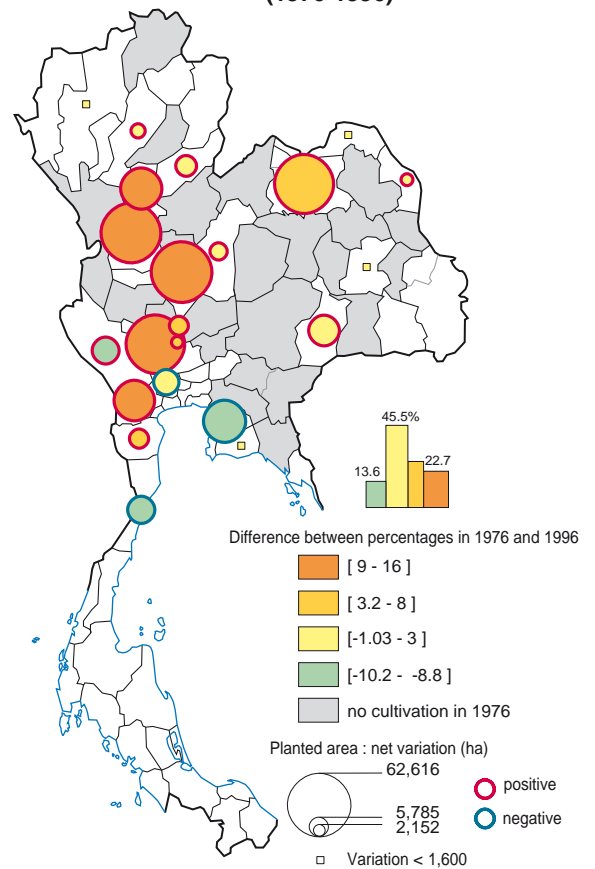
With production levels of 5 to 6 million tons at the end of the 1990s, of which about 75% were exported, Thailand became the world's fifth largest producer and third largest exporter of sugar. The value of these exports (1.335 billion US\$ in 1996) makes sugar cane the third most important agricultural product in Thailand after rubber and rice. Asian markets absorb 70% of total exports (of this almost half goes to Indonesia, Japan and South Korea).

Government protection, introduced during the import substitution period, continued long after sugar became an export commodity, particularly as a result of lobbying by associations of sugar producers. Since 1982, a price stabilization program has been operated by the Thai Cane and Sugar Corporation, which represents the interests of the farmers, industrialists and the state. The sugar cane payment to the producers, which is fixed before the beginning of the crushing season, is based on a sharing system (70:30) between growers and mill owners. This price is calculated on future net incomes from sales on domestic and foreign markets. The difference between the prices obtained on these markets and the price paid to the producers is absorbed by the Sugar Fund and the banks. Nevertheless, price fluctuations have tended to produce a succession of cycles of expansion and regression of this crop which has inhibited investment and intensification in the sector. The increase in industrial production costs over the last ten years and the cash-flow difficulties that companies are experiencing remain a serious problem for the entire sector.

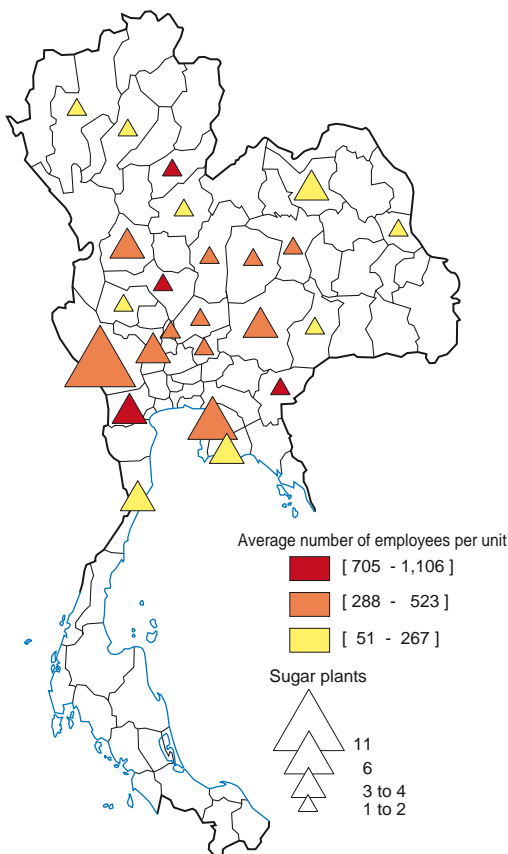
Cultivation (1996)



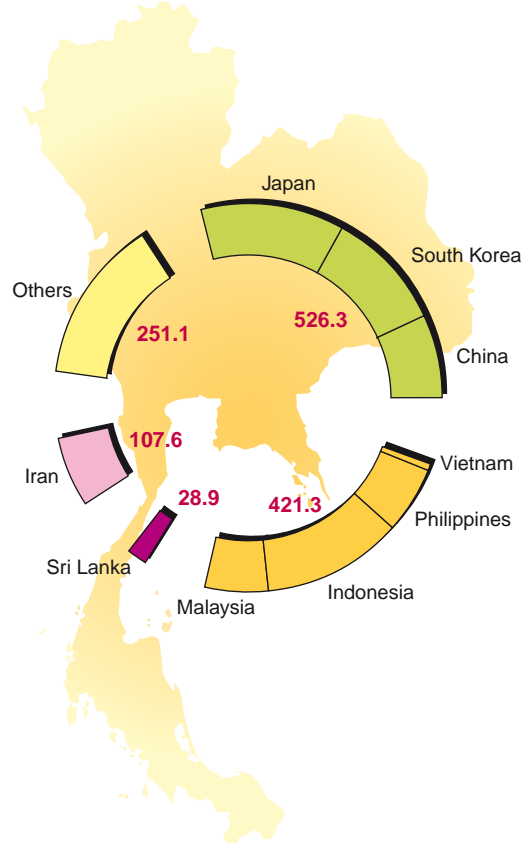
Evolution of the planted area (1976-1996)



Sugar plants (1996)



Exports of sugar and molasses by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
MAC, 1980, 1998
Ministry of Industry, 1997
NSO, 1997

Cassava maintained as cash crop on the uplands

Typical cash crop of the North-East uplands, cassava is, in value terms, one of Thailand's five foremost agricultural exports. Introduced from Malaysia at the beginning of the 20th century into the southern provinces where it was grown as an inter-crop in most rubber tree plantations, the cultivation of cassava spread to all the provinces of the Kingdom before later becoming concentrated in the provinces to the east of the capital, then in the provinces of the North-East.

In 1996, over 60% of the cassava crop was planted in the North-East, with 21% in the province of Nakhon Ratchasima alone, where this crop represents 22% of the cultivable area. The seven eastern provinces of Bangkok are the second production zone with 20% of the total area given over to cassava nationally (about 20% of the total cultivable area in Chachoengsao, Chon Buri and Sa Kaeo). The area planted with cassava increased very rapidly until the end of the 1980s (14,000 ha in 1950, 475,000 ha in 1975, 1.6 million ha in 1989 with production at over 24 million tons) with an expansion from the eastern provinces towards the North-East. In 1975, the eastern provinces still represented 45% of the total planted area. Chon Buri and Rayong, the foremost producers at the time, were also the most important centers for marketing and processing, especially as they received the crop produced in the neighboring provinces in the North-East. Although in terms of land use, cassava is still an important crop in the eastern provinces, it is very much in decline in the former production centers in this zone (more than 35,000 ha lost in both Chon Buri and Rayong).

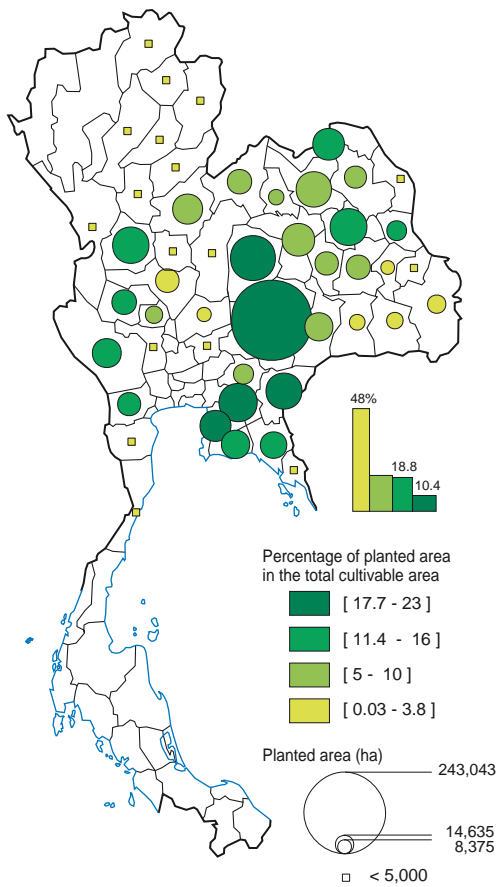
The cassava cultivated area expanded mainly in the North-East, from Nakhon Ratchasima-Chaiyaphum towards Udon Thani-Nong Khai to the north and towards Kalasin-Mukdahan to the east. It was also extended along the western and northern edges of the Central Plain, from Ratchaburi to Kamphaeng Phet and Phitsanulok. In the South, around Bangkok and in the provinces in the north-west, it has been gradually abandoned. The rapid expansion of the crop in the North-East during the 1970s and 1980s can be seen as a response on the part of small farmers to the increase in international demand. This development benefited considerably from the extension of credit facilities, marketing and processing services provided by Sino-Thai middlemen and formed part of the process of agricultural colonization of the uplands in this region (see plate 31 Land utilization). During

the 1990s, total cultivated areas remained around 1.2 million hectares, with average production at about 20 million tons.

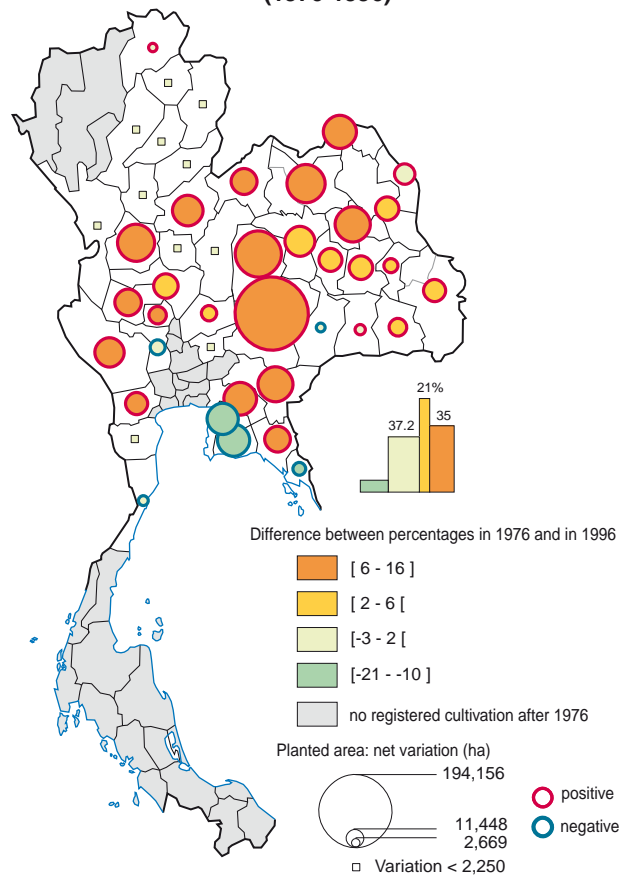
Unlike most cassava-producing countries, Thailand has always grown cassava for commercial ends rather than for self-consumption. The roots are processed into two main products: pellets, used in the production of animal feed, and starch, modified starch and starch products, used in industry. Processing is carried out in a very wide variety of units, ranging from small village workshops producing cassava chips to modern enterprises extracting starch products, and requiring large-scale industrial investment. Spatial distribution of these units mirrors that of the production zones, with a predominance of the North-East around three major poles: Nakhon Ratchasima (1/3 of total national investment in relatively large units), Udon Thani, Khon Kaen. Ayutthaya, at the junction of the communication routes, does not produce cassava but stands out because of the scale of its modern factories, while to the east of the capital, Chachoeng-sao, Chon Buri and Rayong also contain large production units.

Pellet production expanded very quickly from the 1970s in response to the needs of European animal feed industries, the main outlet for exports. Faced with the reduction in quotas awarded to Thailand by the European Union (mid-1990s), industrial production was diversified into starch and modified starch products with a higher value added (and today this absorbs 60% of the root crop production). These also supply national industries (paper, sweeteners, drinks, medicine tablets...) whose needs are increasing considerably. Out of a total cassava production of 18 million tons in 2002, the national market absorbed 5.6 million, of which more than one third was used in starch production, the remaining being mainly used for swine and cattle feeds. Thailand's cassava exports (all types combined) represent about 80% of the international cassava trade. The decrease in exports of pellets to the European Union (Netherlands, Spain) is compensated by the rapid rise in exports of starch and starch products to Asian countries (Japan, Taiwan, Korea).

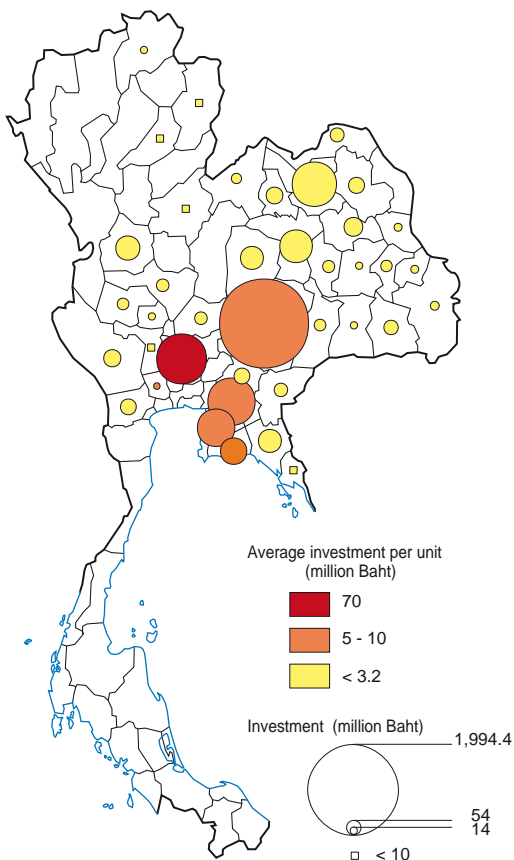
Cultivation (1996)



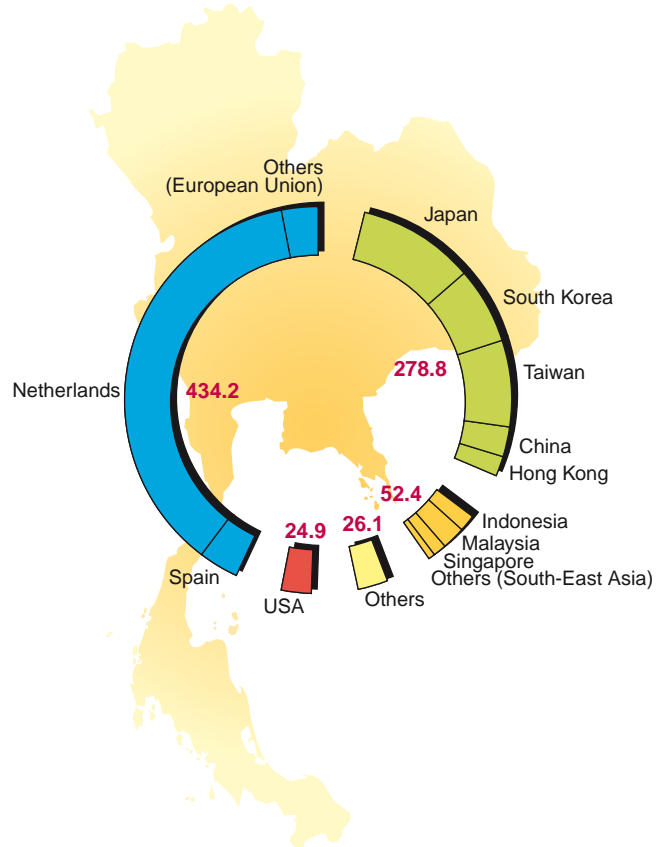
Evolution of the planted area (1976-1996)



Industrial investment (1996)



Exports of cassava and tapioca products by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
MAC, 1980, 1998
Ministry of Industry, 1997
NSO, 1997

Smallholders as the largest world producers of natural rubber

Rubber cultivation was introduced into Thailand from Malaysia at the beginning of the 20th century and developed rapidly in the South and in the eastern provinces of Bangkok. In the 1950s, rubber was the country's second most valuable export commodity after rice. The total area under cultivation, estimated at 1.2 million hectares in 1966, reached almost 2 million hectares in 1996-1997. Rubber production is predominantly smallholder-based, consisting of about 820,000 small production units, with only 10% of the landholdings larger than 40 hectares. Although farms are small in size (2.4 ha on average in 1996), rubber cultivation requires a large labor force, estimated at about 5 million, including tappers.

After vigorous expansion until the middle of the 1980s, the area under cultivation in the South stabilized at around 1.6 million hectares. The region still produces an overwhelming proportion of the country's rubber: 85% of the total planted area in 1996 for 90% of production, of which more than 60% in the Songkhla, Surat Thani, Nakhon Si Thammarat, Trang and Narathiwat provinces. The south-east represents almost 9% of national production. In these two regions, rubber tree cultivation now seems to have reached saturation point and over the last fifteen years some farmers, faced with a shortage of workers, have started substituting rubber for fruit trees. Plantations were developed in the North-East from the end of the 1980s after intervention from the state, which saw this potentially highly profitable crop as a means of developing rural areas. Few plantations are still productive, however, and yields remain low due to a chronic shortage of rainfall.

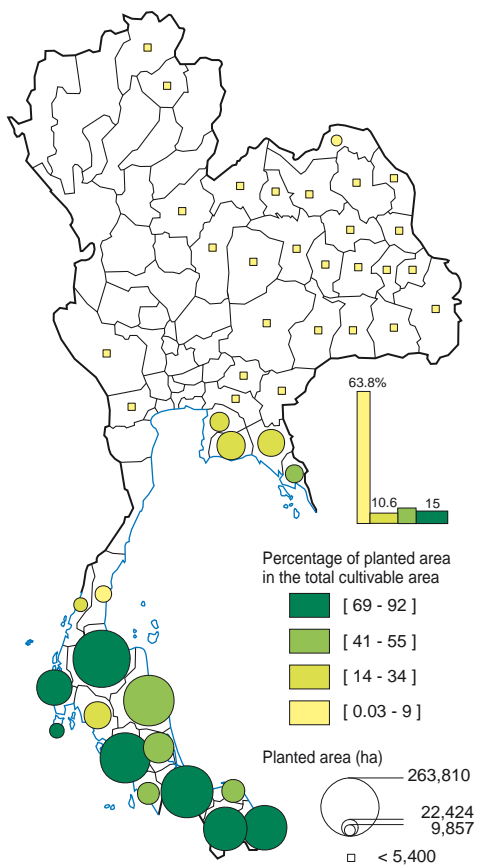
In 1960, the state provided the incentive for a widespread replantation program to overcome the decline in a sector based on tapping ageing trees from traditional varieties. As well as encouraging growers to expand their crops, the Office of Rubber Replanting Aid Fund (ORRAF), funded initially by loans from the World Bank, then until 1985 by taxes on rubber exports and now from the state budget, provides improved varieties, equipment and fertilizer, and also financial aid, 70% of which goes to smallholders (less than 4 ha). In conjunction with this, the first rubber research center (Rubber Research Institute of Thailand) was created at Hat Yai in 1965. Production increased from 170,000 tons in 1960 to over 2 million tons in 1996-1997 with an appreciable increase in yields

(from about 350 kg/ha/yr in the 1960s to 1.3 t/ha/yr on average in 1996, over 1.5 tons in the most productive provinces in the South).

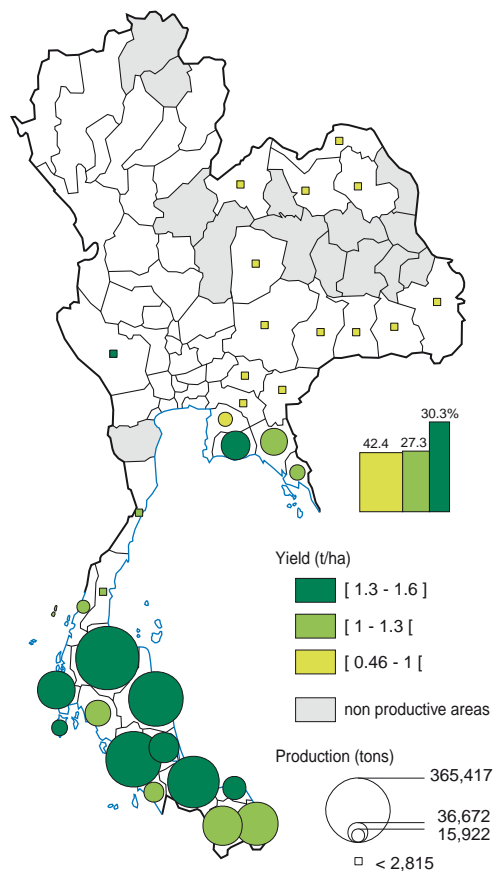
Most of the peasant production is sold to dealers in the form of poor quality unsmoked rubber sheets and the market at national level is still fairly disorganized, with wide price variations linked with the quantities sold, the position of the dealers in the chain or the place of purchase. In order to enable small farmers to get better prices and to encourage improvements in the quality of their product, a rubber market auction system was set up for smallholders in 1991 with the establishment of the first central rubber market in Hat Yai. It also provides information on domestic and world market outlook and price trends. The marketing of latex has expanded since the middle of the 1980s from newly established latex concentrate factories. These units make possible a further value added transformation in large modern companies located in the main production areas (Songkhla, Surat Thani and Trang in the South region; Rayong and Chon Buri in the south-east). Running parallel to this, there is still a traditional industrial sector providing poor-quality intermediary products for the world market.

Since 1991, Thailand has been the leader in world production and the largest exporter of natural rubber. Domestic consumption is only 10% of national production. Almost half of exports are in the form of ribbed smoked sheets, about 30% in the form of standard Thai rubber blocks and 10% in the form of latex concentrate. With a value of over 2.5 billion US\$ in 1996, natural rubber is the country's leading agro-based export. The Asian market represents 60% of this total with almost 30% to Japan and 20% to China where national production is growing rapidly. The quality of national production and the variation in prices on the world market are major problems, however. Disappointed in attempts by the International Natural Rubber Organization (INRO created in 1980) to stabilize the world market by adjusting supply, Thailand left this organization in 1999 and has since tried to develop a combined strategy with Indonesia and Malaysia (these three countries represent 80% of world production) in an attempt to maintain prices that are favorable for the producers.

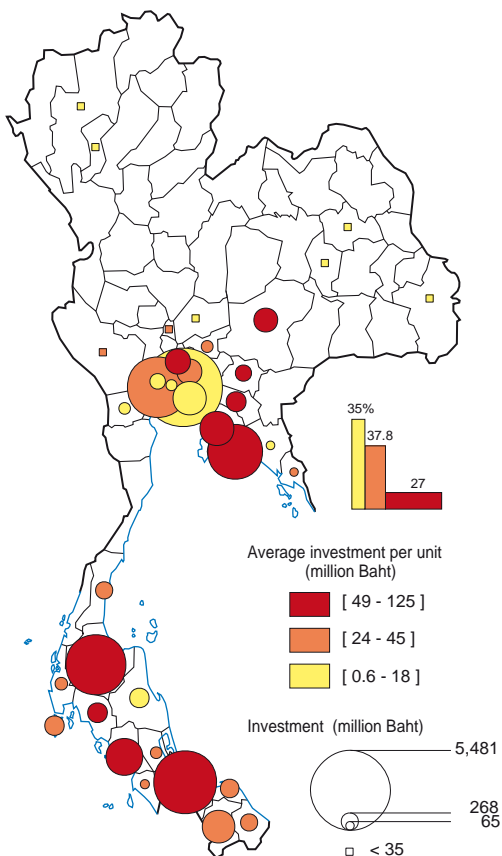
Cultivation (1995)



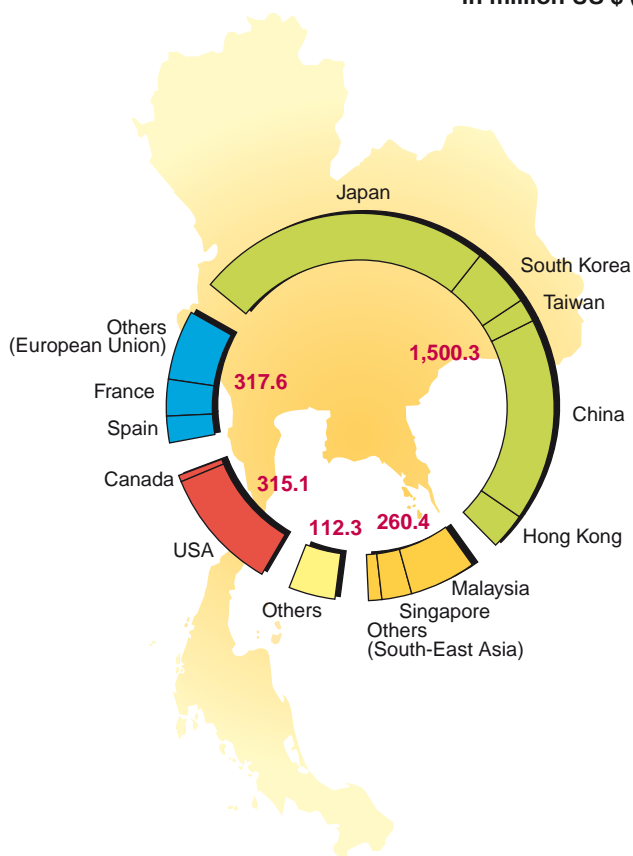
Production and yield (1995)



Industrial investment (1996)



Exports of natural rubber by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
 MAC, 1997
 Ministry of Industry, 1997
 NSO, 1997

Difficulties in meeting domestic requirements in maize, mungbean and soybean

Traditionally grown by small subsistence farmers for self-consumption, maize became a major crop in Thailand only after the Second World War, in response to the demand from foreign markets, especially Japanese animal feed industries. With the prospect of profit from growing maize, farmers were persuaded to expand the cultivation of new imported varieties by clearing forests in the lower North: the crop rapidly extended to the Central Plain uplands, chiefly in the Lop Buri, Saraburi and Nakhon Sawan provinces which are most favorably located in relation to the port of Bangkok from where most of the crop is exported.

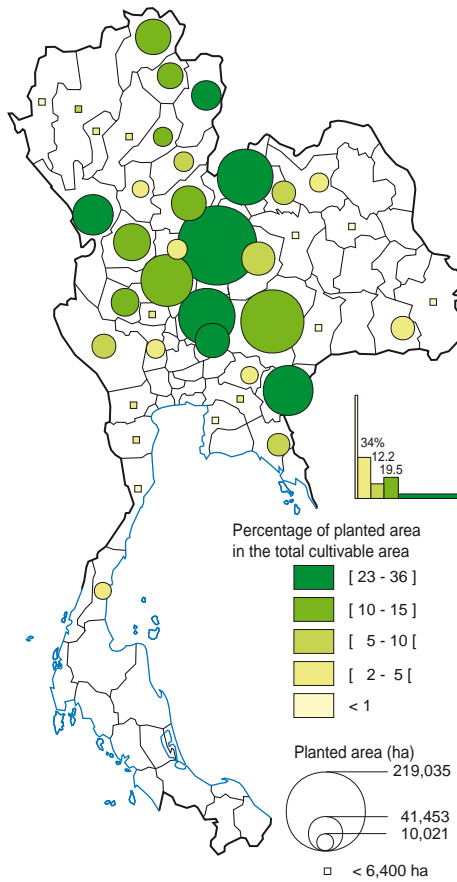
In 1947, maize production covered 23,000 hectares, increasing to 200,000 hectares at the end of the 1950s and 1.3 million hectares in 1976, 75% of which was in the area sometimes dubbed the "corn belt" (Loei, Phetchabun, Nakhon Sawan, Lop Buri, Saraburi and Nakhon Ratchasima). The crop reached its maximum area in the middle of the 1980s (almost 2 million ha) then stabilized around 1.3 million hectares. In these provinces, maize still covers more than 30% of the total planted area despite the major drop in planting between 1976 and 1996, in favor mainly of cassava and sugar cane: Lop Buri and especially Phetchabun and Loei, where the proportion of planted area given over to maize cultivation dropped to just over 20%, remain the major production areas. Together with Sa Kaeo in the south-east and Kamphaeng Phet and Tak in the west, provinces where maize production has increased considerably since 1976, the "corn belt" today produces almost 70% of the total national crop. In the country as a whole, the decrease in planted areas over the last twenty years in the heart of the region of production has been compensated for by the expansion of the crop around the north, west and south-east edges.

Soybean and mungbean can be grown as the first or second crop of the rainy season on the uplands, or in paddy fields in the dry season with irrigation. The planted area increased from 20,000 and 40,000 hectares respectively in 1950 to 100,000 and 200,000 hectares on average at the beginning of the 1970s. Although these crops increased considerably until the end of the 1980s (500,000 ha each), today they cover only 300,000 and 350,000 hectares. As with maize, this decrease reflects fluctuations in the price and profitability of the different crops that can be grown on a plot and, in the case of soybean, the effects of competition from foreign producers. The

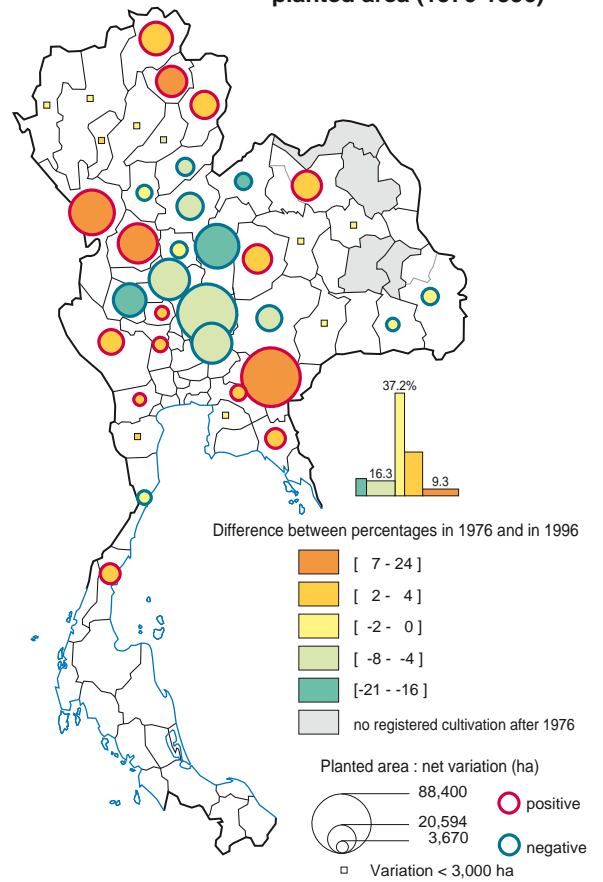
combined planted area for the two crops increased between 1976 and 1996 in the provinces between Tak, Nan, Khon Kaen and Uthai Thani; Sukhothai is the exception, although a decrease in the proportion of these crops and the planted area they occupy has not threatened its strong position. More than 80% of the national production of mungbean comes from the quadrilateral enclosed by Sukhothai, Uthai Thani, Lop Buri and Phetchabun, where it can occupy up to 15% of the cultivable area (Sukhothai, Phetchabun). Soybean cultivation has gradually extended from the northern provinces to the north of the Central Plain and to a lesser extent into the North-East (Loei, Khon Kaen, Chaiyaphum) and south-east (Sa Kaeo). In about half of the area under cultivation, it is a dry season crop planted on the irrigated perimeters, and is encouraged by the state as a rice substitution crop. The North remains the main region of production (70% of the national total in 1996). 20% of national production is consumed immediately, 70% is used in the oil factories and 10% for seed.

Thailand's mungbean production (218,000 tons in 1996/1997) is barely sufficient to cover domestic requirements and exports, which reached almost 150,000 tons in 1990, but were limited in 1997 to under 10,000 tons. Maize and soybean production is now insufficient to meet the country's needs. At the beginning of the 1980s, maize exports (2 to 3.7 million tons), which went mainly to the Asian market, represented 80% of national production. The reason for the very large increase in domestic consumption (less than 1 million tons in the 1980s compared with more than 4 million tons ten years later) is the increase in the requirements of the animal farming sector, forcing Thailand to import (about 400,000 tons in 1995 and 1996). Similarly, soybean production (360,000 t in 1996/1997) today supplies less than 40% of domestic demand. The practice of introducing high prices (via taxes and import quotas) to promote the development of this crop has not had the hoped for effect on production and has led to an increase in the price of animal feed. Sporadic intervention by the state, which is widely criticized by the agro-industry sector, has resulted in a loss of competitiveness for the poultry industry, especially against competition from China for the Japanese market.

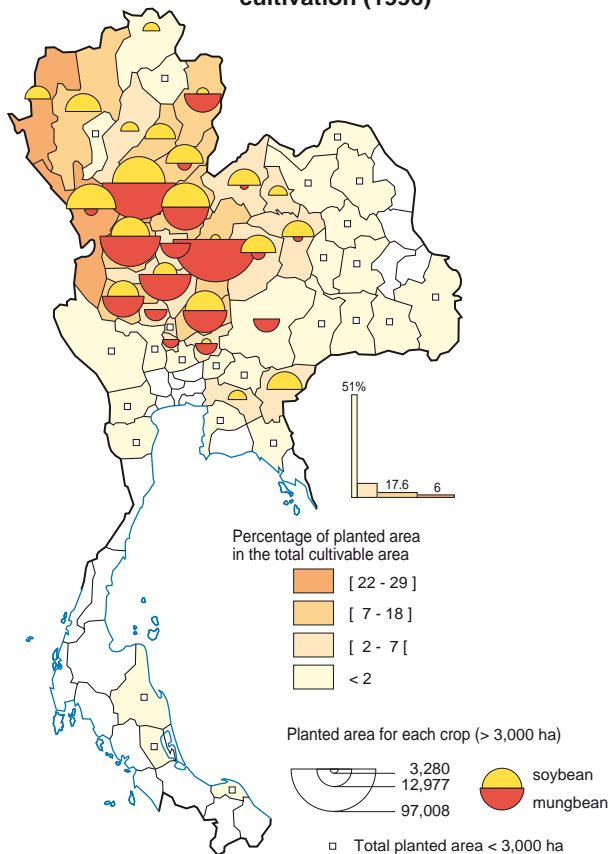
Maize cultivation (1996)



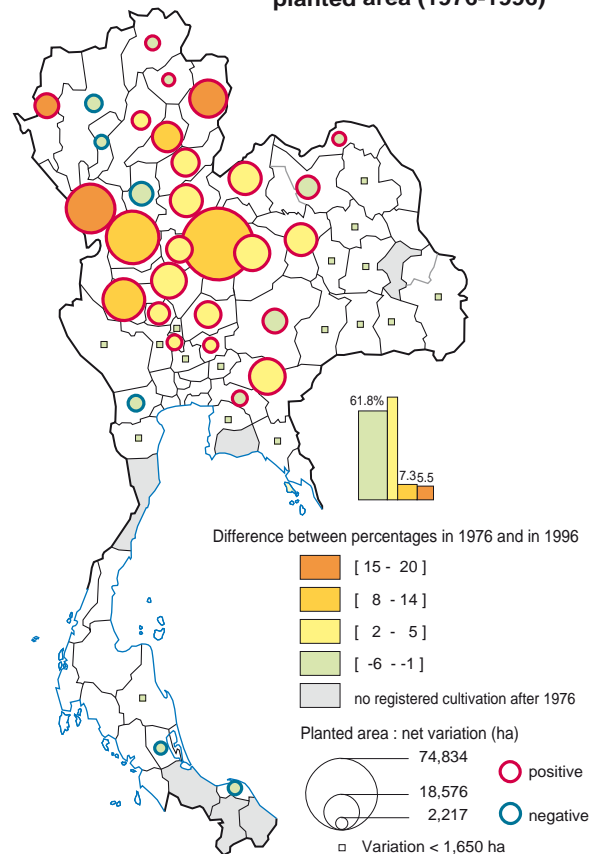
Evolution of maize planted area (1976-1996)



Mungbean and soybean cultivation (1996)



Evolution of mungbean and soybean planted area (1976-1996)



Sources : MAC, 1980, 1998

Recent development of intensive breeding activities and shrimp farming

The production of swine, chicken and shrimp, traditional farming activities, has evolved into specialized systems, and is now an integral part of the activities of the major Thai agro-industrial groups. The extent of direct involvement of these firms in all stages of production and marketing is strong even though it may vary according to the different sectors. These companies have also organized contract farming systems whereby producers are provided with all the inputs.

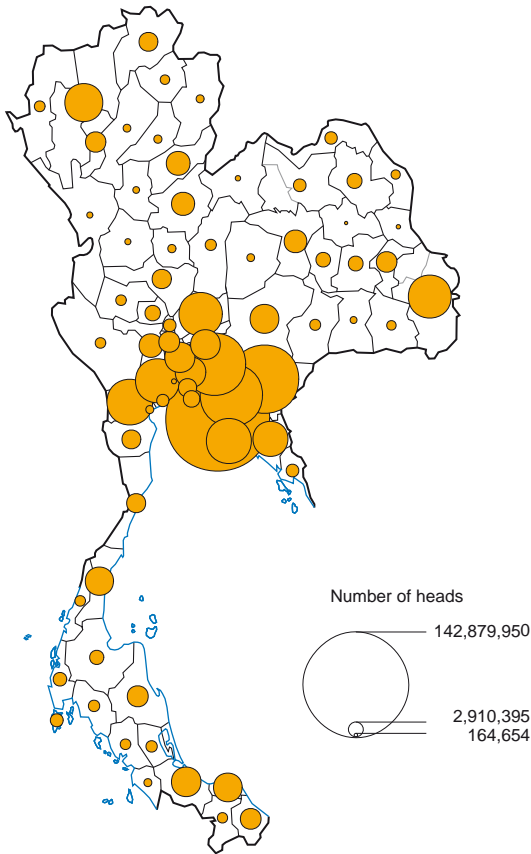
The development of broiler production was rapid from the 1970s onwards, with the importation of chicken breeds and the introduction of wage and price guarantee contracts by Charoen Phokphand, an animal feed producer. National production is now controlled by just a few agro-industrial groups. Two thirds of the total output of 1.2 million tons is destined for the domestic market. The largest production area is concentrated around Bangkok: Lop Buri, Ayutthaya, Saraburi in the Central Plain, Samut Sakhon and Ratchaburi to the west, Chon Buri, Prachin Buri, Chachoengsao and Nakhon Nayok to the east. These eastern provinces produce more than 40% of broilers. The spatial distribution of production in the peripheral regions (less than 10% each of production), differs between the North and the North-East, where production is notably greater in the urban poles, and the South where it is more evenly spread between the provinces (food habits). Thailand is the leading exporter in Asia by export value (544 million US\$ in 2001) and half of these exports are destined for Asia (especially Japan). Faced with competition from Brazil and China, the high price of feed (see plate 37 Other crops) and the increased cost of labor, agro-industrial groups are diversifying their production (from boneless parts to cooked products) and investing abroad (see plate 1 Economic relations and integration).

Commercial swine production represents about 80% of total pork production. The modernization of this sector in the 1980s, traditionally associated with rice-growing, was in response to a large increase in domestic demand (improvement of the standards of living among urban dwellers), with considerable impetus from major agro-industrial groups: vertical integration and economic concentration in swine production are nevertheless less developed than in the other two sectors. There is also a lesser degree of imbalance in the spatial distribution of this activity throughout the country, despite the fact that 40% of production is concentrated in seven provinces surrounding the

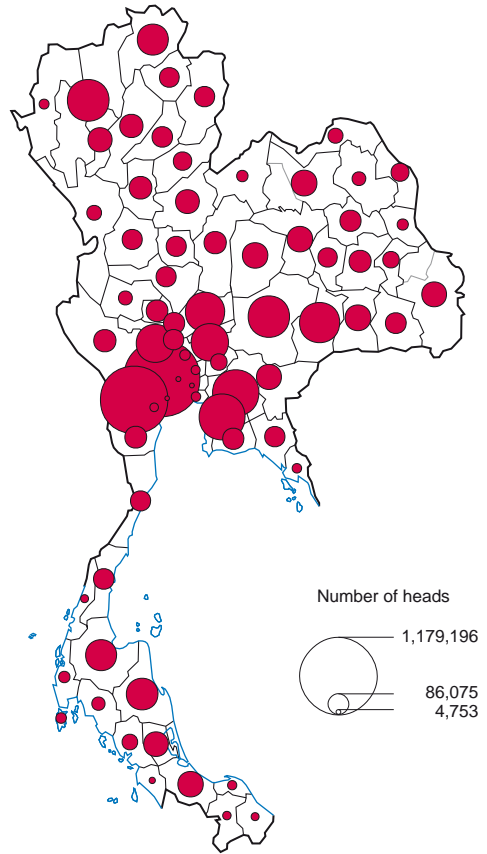
Bangkok Metropolitan Region (BMR), reflecting the influence of the urban market and the presence of major production units. The North-East (Nakhon Ratchasima, Buri Ram) and the North (Chiang Mai, Chiang Rai) both contribute about 20% of national production, while the South produces considerably less (different food habits). The fluctuations in the price of meat, like the changes in the food preferences of the middle classes (beef and broiler), lead to large fluctuations in animal numbers. Production barely covers domestic demand because of cyclical problems (indebtedness of peasant units, epidemics, cost of animal feed).

It was also in the 1980s that intensive shrimp farming techniques were developed in the coastal provinces. Between 1980 and the 1990s, the area given over to this activity increased from 25,000 hectares to more than 70,000 hectares (20,000 farms), production rose from less than 10,000 tons to 200-250,000 tons. In the traditional production areas (Bangkok, Samut Prakan, Samut Songkhram, Samut Sakhon) this type of farming is today very much in decline (pollution, urbanization), but in the provinces in the south-west and especially to the east of Bangkok and in the South, it is now increasing. Since the middle of the 1990s, the South and the eastern provinces of the BMR represent over 90% of national shrimp production, but for several reasons this figure has tended to stagnate: productivity gains have reached a plateau, shrimp farming has been abandoned in some coastal areas due to self pollution and land degradation, and the recent development of inland shrimp farming in the Central Plain was officially banned in 1998 due to opposition from rice growers (see also plate 62 Land use in the South: Pak Phanang watershed). Shrimps are the third most valuable agricultural export product (about 150,000 tons, especially in the form of frozen shrimps). The main markets are Asia, which takes more than half (Japan), the United States and the European Union. As for exports of broiler chickens, Thailand must improve sanitary conditions in its factories (traces of forbidden chemical substances), and adapt to changes in customs barriers (European Union) and increasing competition from the Asian countries (India, Indonesia) in which Thai groups invest.

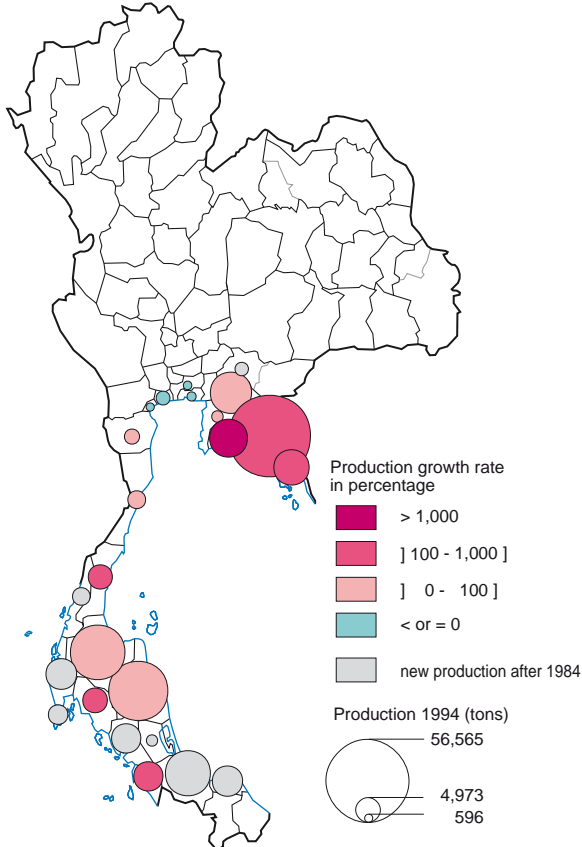
Broiler production (1995)



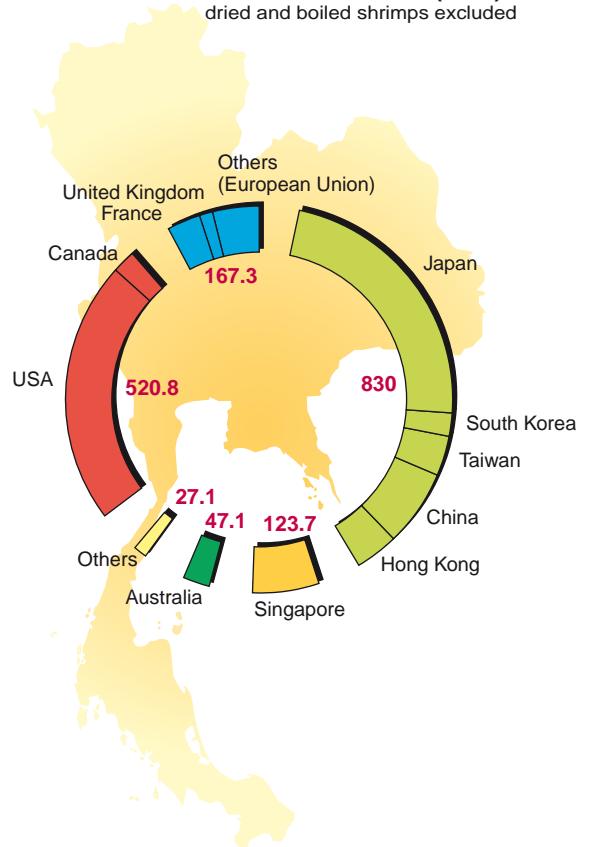
Swine production (1995)



Shrimp farming production in 1984 and evolution (1984-1994)



Exports of shrimps by country in million US \$ (1996)
dried and boiled shrimps excluded



Sources : Bank of Thailand, 2000
MAC, 1986, 1997
NSO, 1997

Clear regional specializations and socio-economic disparities for an agriculture in transition

Despite recent diversification, agriculture is marked by regional specializations in productions and by major socio-economic imbalances. After more than a century of sustained growth based on the expansion of cultivated areas, the agricultural sector today has to tackle the growing shortage of resources (water, land, labor force), the increasing threat from international competition, and the impact of poverty in many rural areas (see plate 66 Income and consumption indicators).

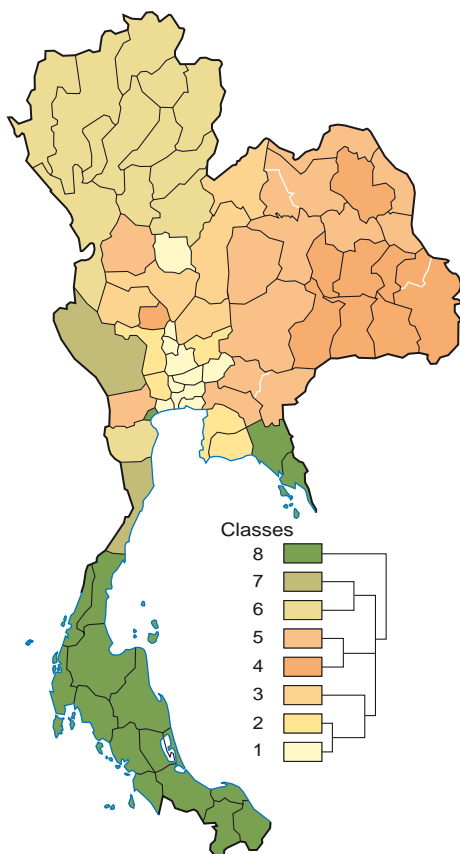
Only the most discriminating variables of the principal component analysis are shown in the legend tables. The map of agricultural specializations highlights groups of provinces that are homogeneous and affected in different ways by the modification of land use and the diversification of productions. In the Chao Phraya delta, agriculture is in competition with other economic sectors for access to resources (class 1). Irrigated rice cultivation predominates but is in decline, in favor of crops for the metropolitan market (market gardening produce, tree crops). The effects of urban growth can also be seen, to a lesser extent, in the surrounding provinces and in some provinces on the Eastern Seaboard (class 2). The proximity of export infrastructure and the size of the markets have favored the development of new productions that are highly integrated into agro-industry and are added to the more traditional crops (rice and upland crops).

The provinces in the northern Central Plain and the central mountain axis define class 3, close to the average, yet with an appreciable increase in upland crops destined for agro-industry (animal feed, oil mills). Diversification, also linked with the development of highly specialized breeding, can be found in the forest provinces in the North (class 6). The valleys and the low altitude terraces in the North-East make up the country's other major rice-growing region (class 4). The low profit to be gained from rice cultivation and the varied physical environment have been instrumental in encouraging local diversification (see also plate 61 Land use in the North-East: Sakon Nakhon province). The other part of the North-East (class 5) is dominated by upland crops: cassava, sugar cane; with sugar cane predominating extensively in the western provinces (class 7). The peninsula and the south-east are characterized by having only a small proportion of land given over to rice cultivation and a marked specialization in perennial tree crops (rubber trees, oil palms, fruit trees), which is developing steadily (class 8).

The map of the socio-economic characteristics of the agricultural sector shows clear spatial disparities linked with the different degrees of redeployment of this agriculture in transition. A first group is made up of provinces that are affected by the strong influence of Bangkok's urban agglomeration and the Eastern Seaboard (classes 1 and 2). This zone is characterized by intensive productions and attracts a large proportion of agro-industrial investment. The growing shortage of agricultural lands accompanied by land speculation have led to a definite decrease in the number of farms and agricultural workers. This decrease is accompanied by processes that are more marked than in the rest of the country: concentration of land (especially in class 1), development of land renting, conversion of land for non-agricultural use. Changes in landholding structures bring class 3 nearer to this group: farms are large in size but agriculture brings in lower incomes. Class 4, close to the national average for all the variables treated, covers a large part of the Center and the North.

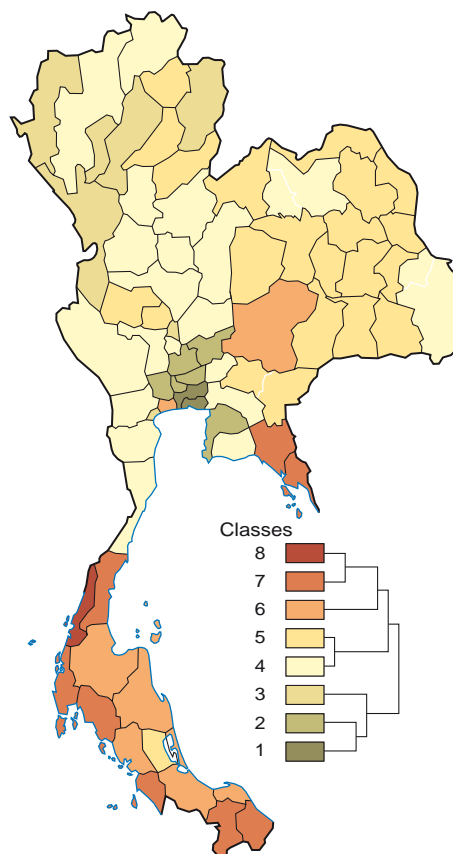
The majority of provinces in the North-East, and a few in the north and the west, form class 5 which is characterized by the increase in the number of farms, the decrease in their size, and the modest level of value added: non-agricultural income (local employment or migration) is important in order to support families in rural areas. The last three classes emerge as particularly dynamic agricultural regions. The provinces on the eastern side of the peninsula (Phatthalung excluded) and Nakhon Ratchasima in the North-East form class 6 which can be distinguished by its high agricultural product *per capita* and large contribution to the national agricultural product, linked with productions of greater value added. In classes 7 and 8 the pressure on agricultural land is not so strong (land colonization still active in the peninsula) and there is a high level of value added *per capita* (especially for Ranong the only province in class 8).

Agricultural specialization



Factors		Classes	1	2	3	4	5	6	7	8
Land use	Forest (% 1995)		-	-	=	-	=	++	++	=
	Agricultural land (evolution 1978-1995)		--	--	=	+	+	=	+	+
Agricultural land use	Paddy fields (% 1995)		++	=	=	++	=	=	-	---
	Tree crops (% 1995)		-	=	--	--	--	-	-	+++
Crops	Rice (evolution 1975-1996)		-	-	+	++	-	-	=	-
	Sugar cane (% 1996)		-	+	+	-	+	=	+++	-
	Cassava (% 1996)		-	+	=	=	++	-	=	--
	Soya / Mungbean (% 1996)		-	-	++	-	-	++	=	-

Socio-economic features



Factors		Classes	1	2	3	4	5	6	7	8
Agricultural households (evolution 1970-1990)	Percentage		--	--	=	=	+	=	+	+
	Landholdings (evolution 1976-1996)	Size	+	-	++	-	-	-	+	++
	Number		--	-	-	=	+	=	+	++
Land use (evolution 1978-1995)	Agricultural land		--	--	+	+	+	=	++	++
	Unclassified land		++	++	+	+	-	=	--	-
Agricultural Gross Product (AGP, 1996)	Per capita		-	-	-	=	-	+	+	++
	Percentage in national AGP		+	-	--	=	-	++	=	=

Sources : MAC, 1980, 1998
NESDB, 1999
NSO, 1970, 1990, 2000

Industry

The industrialization that has taken place since the 1960s has produced major changes in the economic structure and society of Thailand which, until that time, had all the characteristics of an agricultural country. Industry was in an embryonic form, based around the state, which controlled some emerging sectors, and the mainly merchant capitalists who were established in Bangkok in the middle of the 19th century.

From 1958, state policy favored industrialization through import substitution and private investment (national and foreign), and provided a stimulus for entrepreneurial industrial activity. Industry's contribution to the Gross Domestic Product (GDP) increased and, in particular, cooperation between bankers and local industrialists established the economic basis for the expansion that was to take place over the next two decades. At the beginning of the 1980s, with the country in full recession, industrial strategy turned firmly towards exports, though without abandoning import substitution. The value of the industrial product (extractive and manufacturing production) increased steadily, though with wide variations from one province to another (**plate 40 Industrial product**), thus supplanting in the GDP the value of the agricultural sector on whose dynamism industrialization was based (see also chapter 4 Agriculture). From 1985, manufactured products were diversified, with impetus from domestic demand and the world market, and became the leading export sector, accounting today for over 70% of the value of exports. The effects of the 1997 crisis and the economic slowdown which then affected Thailand's major commercial partners have had uneven repercussions, according to the sector of activity and the enterprises (fall in demand, rise in the cost of imported products, financial burden) and have given rise to recovery rates that are just as variable.

The economic regime is based on a liberal approach which draws on a partnership between the public and private sectors, combining their interests. Three types of enterprise coexist: public and military, transnational and private. Enterprises controlled by the state are mainly in the service sector (see also chapter 3 The state and the construction of the territory) and are limited in the industrial sector (oil, sugar processing, textiles, tobacco). Some private enterprises, where the Sino-Thais predominate, have seen large-scale development; they belong to powerful family-based groups who have an oligopoly over the financial, commercial, real estate markets,

are present in world markets and invest abroad. Small and Medium-sized Enterprises nevertheless make up the major part of industrial enterprises, extraction of natural resources included (**plate 41 Size of establishments**). The influence of the capitalist elite has continued to grow, especially through their alliances with high ranking officials, their ability to be organized (powerful business associations) and to make demands. They also take part in directing public policies through their presence in the administration, on the executive committees of public bodies (including planning and investment boards) and by achieving political power (Parliament, Senate, Government). Recent movements towards decentralization and democratization have provided the provincial entrepreneurial base, whose numbers have swelled with the economic growth of the last twenty years, with access to local executive bodies.

Since industrial development strategy is export-oriented and labor-intensive, factories are able to absorb a population of rural origin at a fairly rapid pace, though the scale of this transition is tempered somewhat by the ability of the agricultural sector to retain its work force (see also plate 30 Agricultural households and product). Despite some areas of progress, legal protection for salaried workers is limited, and social protection is still provided by the workers' families; apart from a few more liberal periods, the unions have been weak, divided and gagged by the authoritarian governments who politicized workers' claims on the pretext that they threatened internal security. Although state policies have actively helped maintain the system of low salaries (which have tended to increase faster than productivity, thus eroding one of Thailand's comparative advantages), they have, on the other hand, done little to help train the work force, which remains very poorly qualified, with a majority of employees having no secondary education whatsoever (see also chapter 9 Social imbalances and spatial organization).

Estimates of the numbers of industrial employees (approximately 4.5 million in 1996 or 15% of the working population) are difficult to make as they have several types of status and work in a multitude of small enterprises, though there is a concentration in the center of the country (**plate 42 Employment in establishments**). The source used here (and for the 2nd plate in the chapter) from the Ministry of Labour and Social Welfare does not systematically ignore small establishments whereas the industrial census

carried out by the National Statistical Office considers only enterprises with more than 10 employees.

Public investment incentives managed by the Board of Investment (BOI) are aimed both at Thai and foreign enterprises, and try to influence decision-making relating to their localization (**plate 43 Enterprises under the Board of Investment**). Criticism of the very complex nature of its procedures and admission criteria that has been leveled at the BOI, and measures taken to liberalize customs in the context of the general policy have limited the importance of the incentive package and encouraged foreign firms to operate outside the scope of the BOI programs. Although these investments have been very important for the expansion of the industrial structure and for exports, it is the mobilization of national capital that has been the determining factor in launching growth. Thailand has greatly benefited from the strategy of relocating enterprises from Japan and the new industrialized Asian economies (see also chapter 1 Situations of the territory): between 1986 and 1996, while quadrupling in number compared with the previous 25 years, wholly foreign-owned plants represented one quarter of BOI promoted enterprises in operation. Joint-ventures with local entrepreneurs, however, have not produced the hoped for results in terms of technological autonomy and innovation which are indispensable if Thai competitiveness is to be maintained. The orientations of the BOI are determined today, more than ever, by external constraints: bilateral and multilateral agreements on trade and investment, competition to attract foreign investment.

The scale of the need for labor force in the industrial sector (and the social repercussions that this represents for the country) justifies the choice of this variable to assess the spatial distribution of the sectors. At province level, the divergence of the different sources for the evaluation of industrial employment (from one source to another and when comparing them with estimates at national level, from the National Statistical Office or the Ministry of Labour and Social Welfare) is due to the fact that small, and even micro-establishments (especially textiles and wearing apparel, agricultural and agro-food industries) have not been taken into account uniformly, and also to the use of a different method to record seasonal and temporary employment, and home-based workers. Other factors can also handicap the perspective on changes: it is estimated that at the

beginning of the 1980s, 30% of textile factories were not registered, in order to escape the limitations being placed on the capacity permitted, as a result of overproduction. The available source at province level and by industrial sector (Ministry of Industry) may reflect the threshold (7 employees) below which enterprises are not obliged to be registered; one may also wonder whether enterprises that cease all activity are systematically withdrawn from the database. It is likely, however, that these statistical inadequacies are evenly spread throughout the provinces and do not therefore distort any comparison.

Agricultural and agro-food industries remain the main sector of industrial employment (**plate 44 Agro-based industries**); the incorporation of agricultural products into industrial transformation, and Thailand's export strength, make this a key sector. The expansion of the textiles and wearing apparel sector has been considerable, but it is cyclical (**plate 45 Textiles and wearing apparel**); this sector which benefited so much from foreign investments at the beginning of the 1970s, climbed to first place in exports before being toppled by electrical machinery and electronics. The dynamism of these last, subject as they are to the hazards of the world market, cannot detract from that of non-electrical machinery (**plate 46 Electrical and non-electrical machinery**). The activities of the chemical and plastics sectors, developed from the oil and gas transformation industries, illustrate the diversification of the industrial structure with impetus from Thai firms (**plate 47 Chemistry and plastic**). The last sector-based plate considers sectors with differing dynamisms and perspectives (**plate 48 Other industries**). Industrial development varies throughout the country as can be seen from the differing intensities of employment specialization that have been created (**plate 49 Industrial specialization**).

CONTRASTS in the INDUSTRIAL STRUCTURE

Village rice mill



Photo Alain Vergnes

In most villages, rice mills employing 1 to 2 people often represent the sole source of "industrial" activity, where the owners are also middlemen. The first rice mills were established at the beginning of the 19th century and the largest have diversified their products (different rice-based preparations).

JVC factory in the Suranaree industrial park (Nakhon Ratchasima province)



Photo Doryane Kermel-Torrès

The Suranaree industrial park, one of only a few in the peripheral regions, contains production units of this type, employing a large work force, mostly young females. Completed in 1989, it is under private management and has had the advantage of major support from local politicians, including the then Prime Minister. It is able to offer entrepreneurs a variety of infrastructures and facilities.

Wide contrasts in the distribution of industrial product

The proportion of the industrial product in the Gross Domestic Product rose from less than 25% in 1980 to almost 40% in 2000 thanks to an annual growth of 8%. This growth was greatest between 1986 and 1993 (almost 14%), reflecting an acceleration in production levels and in value added. The contribution of extracted natural resources (mining and quarrying) increased (especially natural gas). In manufacturing, the relative value of agro-industrial products decreased despite the regular increase in their value added that was possible through a diversification of productions (see plate 44 Agro-based industries). Textiles and wearing apparel, the sector with the highest value added at the beginning of the 1980s, gave way ten years later to electrical and electronic goods, and to non-electrical machinery and transport equipment: their respective contribution amounted in 1986 to 25% and 13%, and in 1996 to 15% and 28%. At slightly more than 1,000 billion Baht in 1996, the industrial product registered a 9% decrease in 1998. After this fall-off, growth resumed, but at a slower rate (2%).

The values produced and their contribution to the Gross Provincial Product highlight the industrial importance of a center encompassed by Rayong, Saraburi, Ayutthaya and Ratchaburi: 12 provinces created almost 85% of the national industrial product. The contribution of Bangkok remained large despite a decline after 1989 (see plate 58 Urban and industrial development around Bangkok). There is a notable dissymmetry between, on the one hand, the eastern and northern provinces and on the other, the western provinces where, apart from Samut Sakhon, products and the contributions of industry to the provincial product are less. Industry is the chief source of value added in all these provinces, with the exception of Bangkok, Nonthaburi and Ratchaburi. This concentration of value produced underlines, in contrast, the weak state of the peripheral regions, with the exception of some poles which stand out as a result of the importance of value added (Nakhon Ratchasima, Khon Kaen, Chiang Mai, and for oil and mineral resources Lampang and Kamphaeng Phet), and by the place of the industrial sector in the provincial product (Lamphun).

The distribution of industrial product is a result of differing levels of production, of a combination of industrial transformation value added and, as far as the industrial product share is concerned, of the value added from the tertiary and agricultural sectors. The

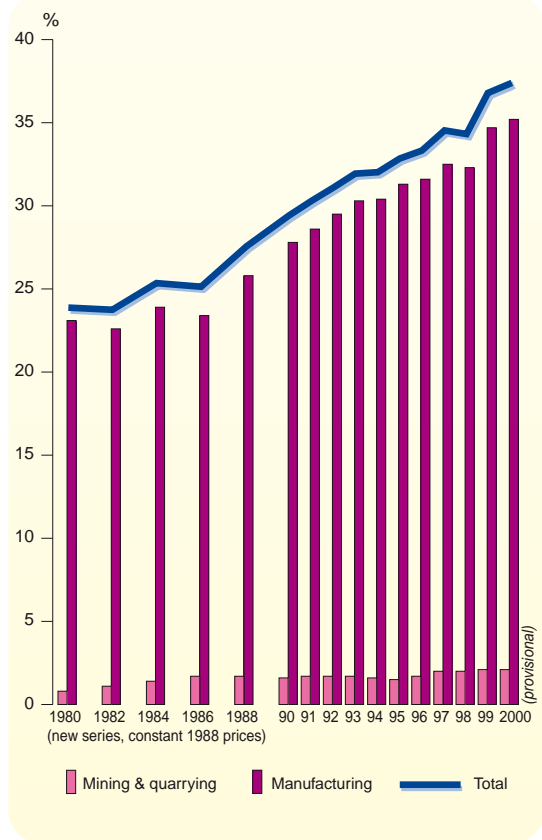
contrast observed expresses much higher densities of activity in the center and a diversification in the industrial fabric, with incorporation of those sectors said to be modern, which generate a higher value added (see plate 49 Industrial specialization). This diversification has spread to a few provinces in the peripheral regions while the others specialize in the transformation of primary resources of which the value added varies according to the products.

Provincial differences from the national growth rate of the industrial product (11% from 1989 to 1996) reflect the diffusion of growth to provinces both close to and distant from the capital, based on the industrial poles already established: Bangkok-Samut Prakan registers a level lower than the national average, whereas the Eastern Seaboard has a lower rate of growth than in previous years but still remains either higher than average (Chon Buri, Rayong) or the same (Chachoengsao). On the western and northern sides of the capital, Ayutthaya stands out, with a particularly high rate of growth, mirroring Lamphun in the North. In the North-East corridor growth tails off as one moves away from Bangkok and the Eastern Sea-board. In the South the western provinces have rates that are clearly less than average, contrary to the eastern part, where the panorama is more highly contrasted.

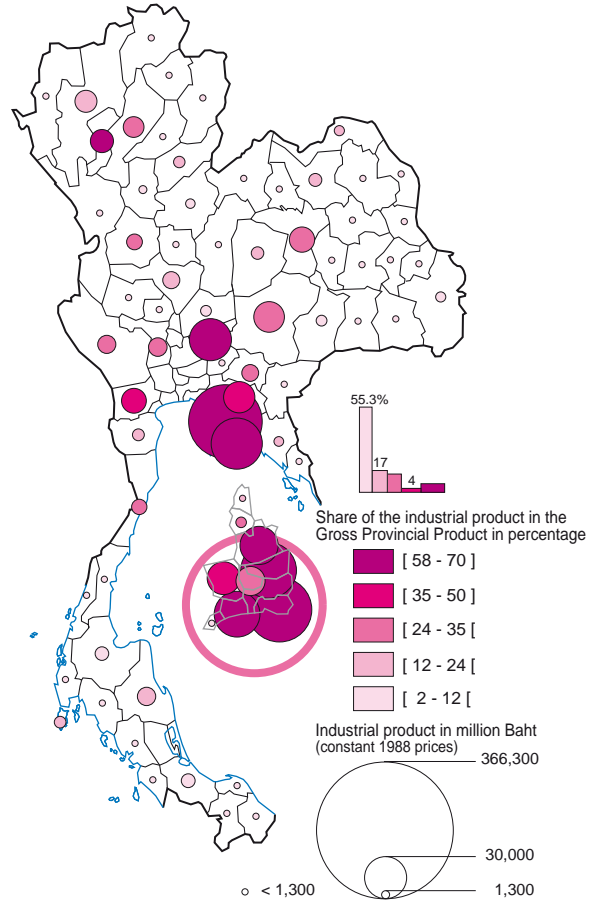
The distribution *per capita* of the industrial product highlights different levels within the central industrial area: nevertheless, all the provinces, except Ratchaburi, are clearly above the national average. The western and eastern sides as well as Nakhon Ratchasima and Khon Kaen in the North-East corridor confirm the dynamics of diffusion already observed. In the North, the ratio in Chiang Mai and Lampang is considerably less than in Lamphun. In the South, Phuket stands out with a ratio markedly higher than the regional average.

The 1997 crisis, which affected the industrial sector, did not produce any particular changes in the spatial distribution of industrial value added. Trends were confirmed: the decline of Bangkok, growth in the provinces bordering the center (Ang Thong, Suphanburi to the north-west, Prachinburi to the north-east) or in the peripheral regions (Lamphun, Khon Kaen). In the Eastern Seaboard, Rayong is particularly dynamic.

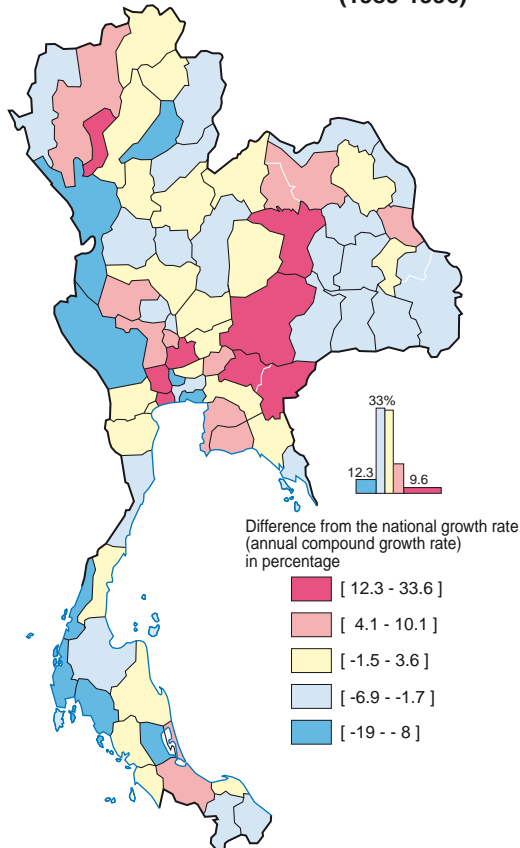
Share of the industrial product in the Gross Domestic Product (1980-2000)



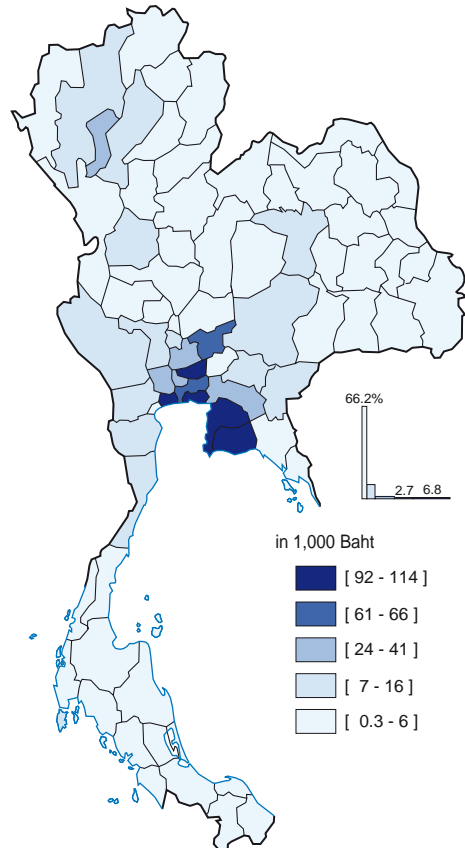
Industrial product and Gross Provincial Product (1996)



Growth of the industrial product (1989-1996)



Industrial product per capita (1996)



Sources : Bank of Thailand, 2002
NESDB, 1993, 1999
NSO, 1990, 2000

Industrial base dominated by small and medium-sized enterprises

Despite an increase in the average size of establishments since the beginning of the 1980s, more than 90% of the country's industrial base consists of enterprises with less than 100 employees, with a predominance of micro-establishments of 1 to 9 employees. These small and medium industrial enterprises, a category unanimously defined twenty years ago according to the employment criterion (fewer than 200 employees), have long been penalized by banking policies and investment incentives, and were also severely affected in their finances and export capacity by the 1997 crisis, but some of them have recently received considerable government attention. Recognition of their importance in the real economy (half of the total value of manufactured goods and exports) and their role in the country's industrial structure has led to the drafting of financial and tax measures to encourage more technologically effective subcontracting in export sectors which, although vigorous, depend on imports of intermediate products and services (processed foods, textile goods, electrical and electronic parts, automobile parts). The rapid industrial expansion is indeed characterized by a wide diversification of productions yet with no real intensification or strong development of intra- and inter-sectoral linkages which could have led to a greater growth in value added.

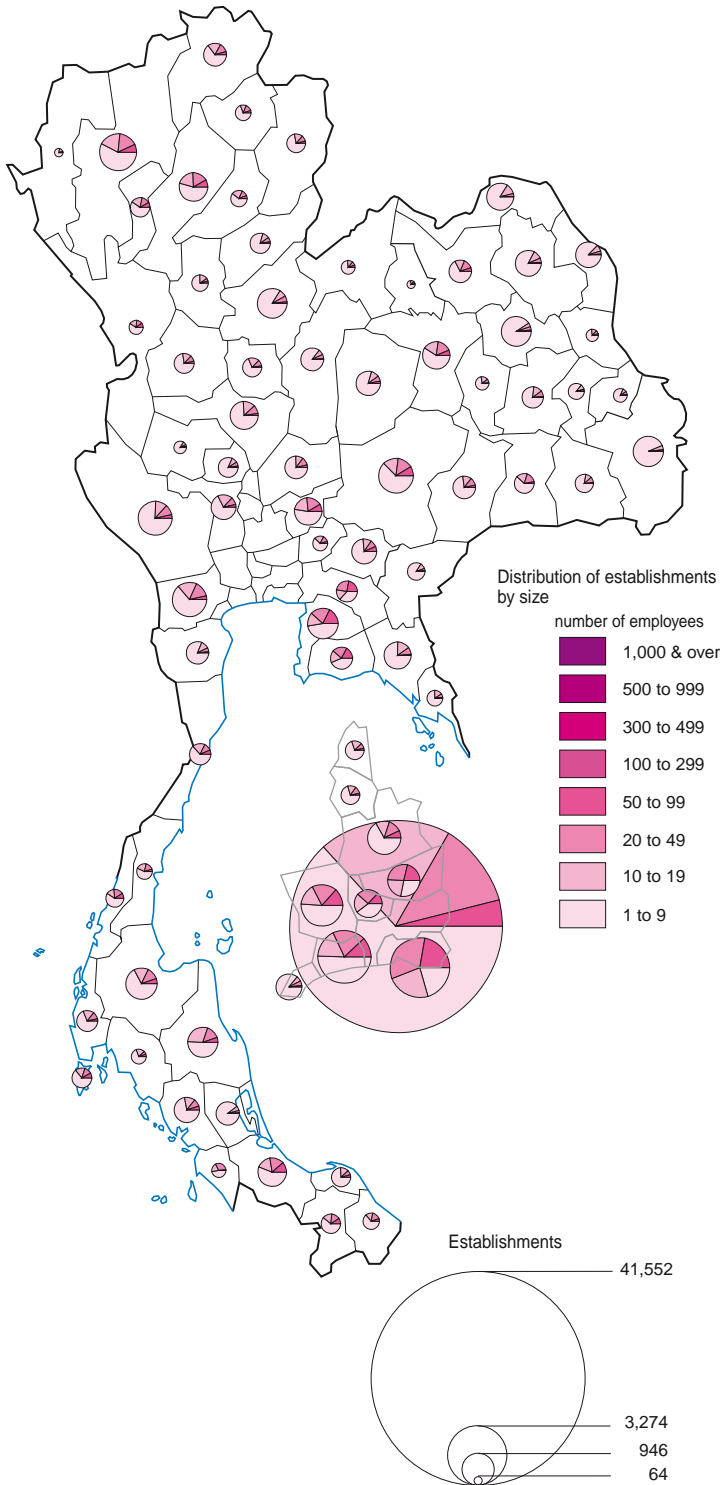
The dominance of Bangkok, which by itself accounts for about 50% of all establishments, declines as the size of the establishments increases (48% of establishments with fewer than 100 employees, under 30% of those with between 100 and 499, 25% of those with 500 to 1000 and over). The city's industrial supremacy dates back to the 19th century when the growth in international trade led to the development of transformation activities (processing of agricultural products, saw mills). The growth in exports, the expansion in infrastructure and advances in mechanization (production, shipbuilding) gave local capital based in Bangkok the opportunity to expand: from controlling certain specific activities (rice milling), it turned from the end of the 19th century to the consumption sector and import substitution.

After the introduction of incentive policies for the private sector and following the boost to industrialization through the import substitution policy introduced in 1958, investment in Bangkok continued and also extended out to the immediate periphery. In this it mirrored public investment in infrastructure, and

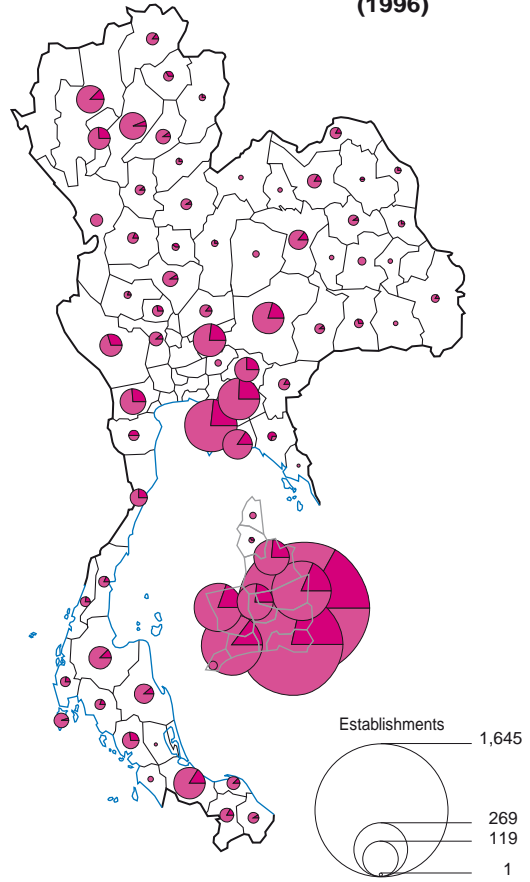
was responding to the metropolitan market, which at that time was more or less exclusive in Thailand, and adopting entrepreneurial dynamics that were firmly based in the metropolitan region. At the end of the 1970s, the increase in land prices and the traffic congestion in the Bangkok-Samut Prakan pole were the key reasons behind the spatial diffusion of large establishments out into the four neighboring provinces. Although the five provinces adjacent to the capital, with which they make up the Bangkok Metropolitan Region (BMR), contain only 10% of all establishments with fewer than 100 employees, their share in the national industrial fabric rises to 36% of establishments with 100 to 499 employees and 40% of the larger establishments.

Fewer and fewer establishments of 100 to 499 employees are to be found as we move north beyond Ayutthaya and Saraburi provinces and there are also fewer in the western provinces of Kanchanaburi and Ratchaburi than in the Eastern Seaboard and certain poles in the peripheral regions. The spatial organization of these poles varies according to the area: in the South there are, in particular, the eastern coastal provinces from Surat Thani to Songkhla, in the North the Chiang Mai-Lamphun-Lampang triangle and in the North-East the north-south corridor. At the end of this corridor Nakhon Ratchasima links up with the dynamics of the Bangkok metropolitan region and the Eastern Seaboard, thanks to its proximity to Bangkok and the Eastern Seaboard provinces, with which it has good road links (see plate 24 Transportation networks). This structure is echoed in the distribution of establishments of 500 employees and over, whereas in the Center the east/west imbalance, matching that of the distribution of the industrial parks (see plate 26 Investment promotion incentives), favors not only Bangkok but also the provinces of Samut Prakan, Pathum Thani and in the Eastern Seaboard Chon Buri, with some regional poles also emerging. The scattering of large establishments, even though they are few in number, in the more distant provinces, is one of the consequences of the investment promotion incentives launched by the Board of Investment and of the search by industrialists for labor pools; it also testifies to the dynamism of entrepreneurs in the provinces (see plate 43 Enterprises under the Board of Investment).

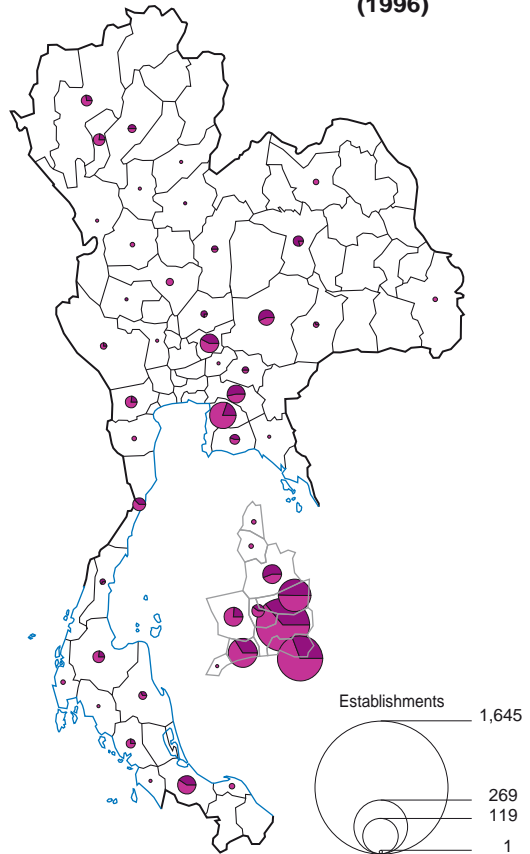
Establishments with under 100 employees (1996)



Establishments with 100 to 499 employees (1996)



Establishments with 500 employees and over (1996)



Source : Ministry of Labour and Social Welfare, 1997

Pre-eminence of the Bangkok Metropolitan Region and complex nature of industrial labor force

Bangkok and its five adjacent provinces share pre-eminence in industrial employment (65% of national employment). Their respective share, however, is in inverse proportion to the size of establishments, with the capital's main share being primarily in the fewer than 100 employees category (a little over 40% of industrial employment in the province). Because there is an imbalance between the two areas in the internal composition of this category, it still represents more than 20% of industrial employment created in the five adjacent provinces, mainly in establishments of between 50 and 99 employees. Establishments of this size also play an important role in the Eastern Seaboard and in certain provinces in the peripheral regions (Nakhon Ratchasima, Chiang Mai, Songkhla). In more than half the provinces, establishments of fewer than 100 employees have a decisive role and provide at least 60% of industrial employment.

Establishments of 100 to 499 employees are just as important at national level for job creation as those with fewer than 100 employees (a little over 30% of total employment). Spatial distribution is mirrored in the size of establishments: an east/west imbalance from Bangkok, the triangle in the North, imbalance between the two peninsula coasts, the central corridor in the North-East. Ayutthaya and Saraburi benefit from the negative factors which affect the Bangkok Metropolitan Region (BMR) (cost of land, traffic congestion and difficulty of land transport, pressure on the infrastructure and work force), and together they have 6% of national industrial employment created by establishments of more than 100 employees, with establishments of over 500 employees predominating. Despite the expansion of this type of establishment in these two provinces, and also in Chon Buri and Chachoengsao or in certain provinces in the peripheral regions, 65% of employment generated by these larger establishments is concentrated in the BMR.

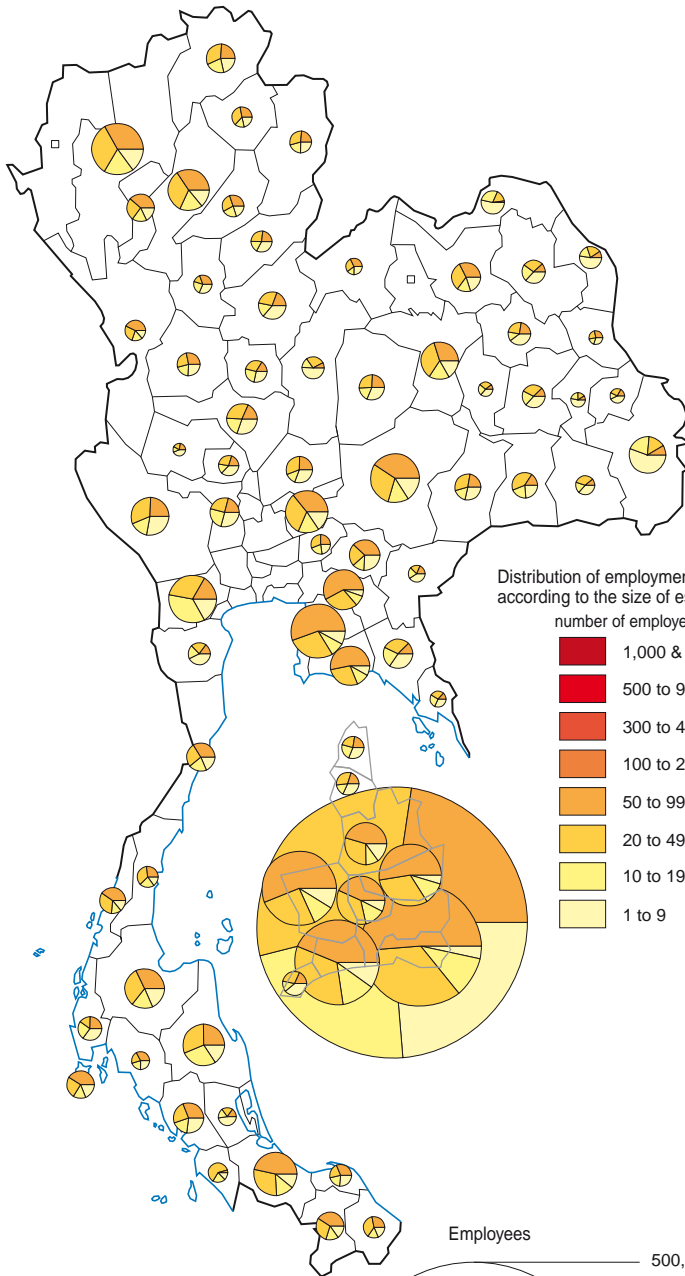
Labor force management strategies range through a wide spectrum, from paternalism to a style which resembles that of western capitalistic enterprises. As they are under constraints both to keep wages as low as possible and to fulfill their labor requirement, entrepreneurs have been obliged to multiply both the types of employment available and the methods of payment. The work force therefore contains a complex multitude of internal divisions which vary according to numerous criteria, such as location (rural, urban, metropolitan) and type of

establishment (size, production sector, public or private sector), also qualifications and status within the establishment (monthly worker, daily worker, contract employee, seasonal worker, employed on site or at home). On top of the basic wage, which is barely over the legal minimum, there may be extras such as social advantages (transport, housing) or cash incentives (overtime, year-end bonuses) which before the crisis could represent more than 30% of the pay packet and still leave the entrepreneur the flexibility to be able to make adjustments according to the business profits.

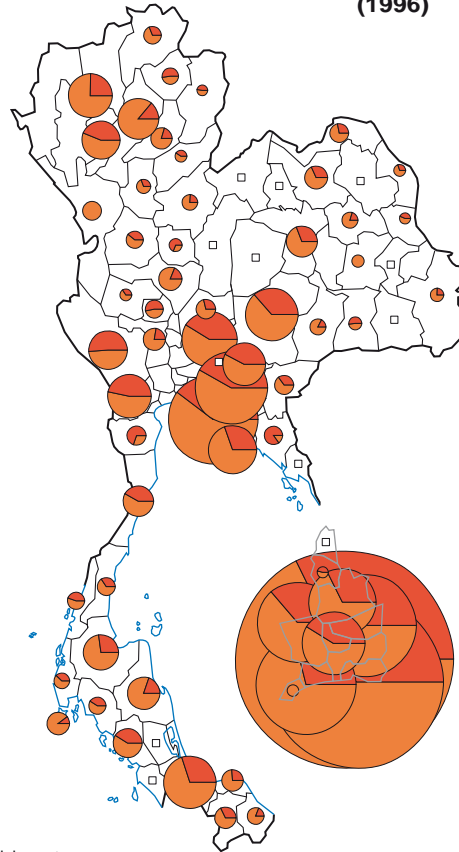
This fragmentation in the world of industrial workers, combined with its youth, low level of education and mainly rural origins are among the factors that are constantly identified as obstacles to the emergence of a more intensely felt class consciousness and a more powerful trade unionism. The creation of in-house unions was largely encouraged by the state which, from 1975 onwards, established its employment policies on tripartite institutions (representatives of the state, employers and employees) such as the Wage Committee, given responsibility in 1972 for adjustments to the recently introduced minimum legal wage, or the Labour Court, established in 1980 to resolve disputes in enterprises. With the creation in 1993 of the Ministry of Labour and Social Welfare, the state asserted its mediatory role in capital-work relations, while the banning of trade unions in state enterprises in 1991 to pave the way to privatization had considerably weakened the organized workers' movement, even though the demands of public sector employees were very different from those of employees in the private sector.

It is estimated that 5-6% of private sector workers belong to a trade union. Until the 1997 crisis, discontent over working conditions or pay could be expressed in other ways than direct confrontation: the flexibility of the employment market, as a result of the high demand for workers in all economic sectors and non-agricultural establishments, enabled the dissatisfied worker to withdraw from the factory rather than put in his claim. The reduction, or even the loss, of monetary incentives as early as 1997 and the layoffs that followed have demonstrated how little power there is in collective action.

Establishments with under 100 employees (1996)



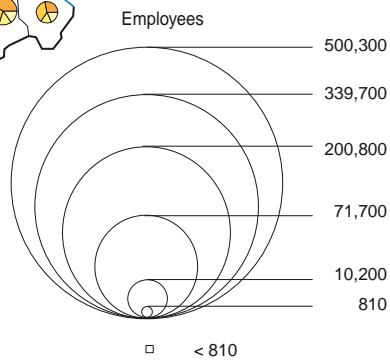
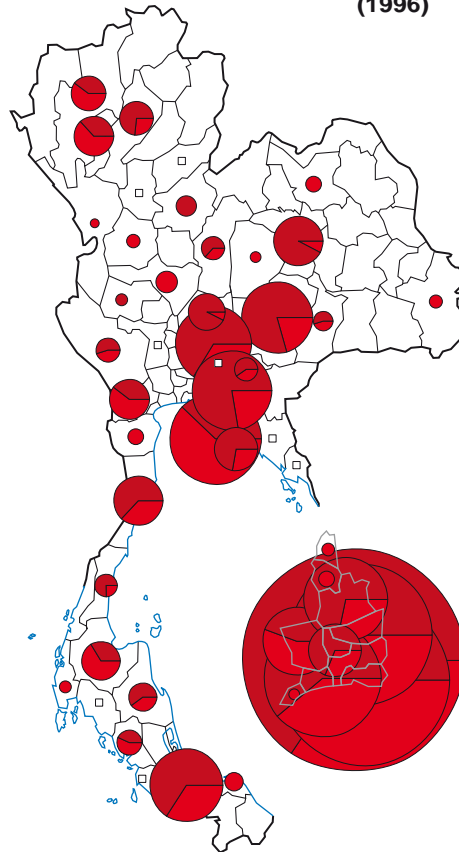
Establishments with 100 to 499 employees (1996)



Distribution of employment according to the size of establishments
number of employees

- 1,000 & over
- 500 to 999
- 300 to 499
- 100 to 299
- 50 to 99
- 20 to 49
- 10 to 19
- 1 to 9

Establishments with 500 employees and over (1996)



Source : Ministry of Labour and Social Welfare, 1997

Spatial imbalance despite adjusted investment incentives

Public investment incentives have been adjusted since the 1970s according to a division of the country into several zones (see plate 26 Investment promotion incentives). 85% of employment created by promoted enterprises are in industry. The opening up of the Board of Investment (BOI) in the 1980s to services and real estate was felt especially in Bangkok and the South.

In 1996, the promoted establishments in operation are concentrated in a center which became differentiated during the previous decade. In the ring which benefited between the 1970s and 1980s from spatial diffusion, Pathum Thani continues to register a large increase in numbers of units, unlike the other three provinces (Nonthaburi, Nakhon Pathom, Samut Sakhon). The relative position of Bangkok-Samut Prakan weakens, while a hundred kilometers away, a second ring gains in strength. There is an imbalance of growth between the west on the one hand (Ratchaburi, Phetchaburi) and the north and east on the other due to the dynamism of Ayutthaya and also to the Eastern Seaboard which up until 2000 received incentives that were as great as those enjoyed by the peripheral regions. These incentives complement other factors when the localization of enterprises is decided on: the attractive factors of distant provinces (infrastructure and other externalities) and the repulsive factors of the capital (congestion and operating costs). The peripheral regions are affected to varying degrees by the increase in the number of units which in 1986 were mainly established in the South where the intra-regional imbalance is less marked. In the other two peripheral regions, the North-East corridor as far as Nong Khai, and the northern triangle, marked by the growth of Nakhon Ratchasima and Lamphun, are set apart from new or more firmly established localizations.

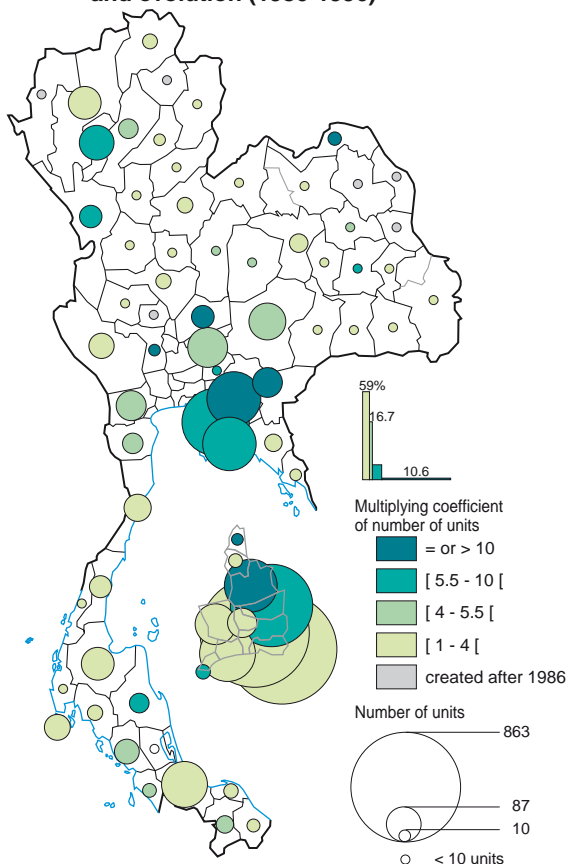
Employment has grown steadily in the Rayong-Chachoengsao-Ayutthaya ring. This produced a dissymmetry in employment per promoted unit between the Eastern Seaboard (Rayong, Chon Buri, Chachoengsao) and Saraburi, Ayutthaya, where the higher ratio puts them into the same class as Nakhon Pathom and Samut Sakhon. One third of employment is in these seven provinces. The great increase in employment at the beginning of the 1990s scattered enterprises where average employment figures can be significant out to the peripheral provinces (Nong Khai, Buri Ram, Kamphaeng Phet).

These dynamics reflect an industrial strategy that is turned towards exports and the search for pools of cheap labor. Nevertheless, the general configuration mirrors that of the spatial distribution of the units, demonstrating their propensity to settle close to the regional poles (availability of infrastructure, ability of entrepreneurs to invest or to enter partnership with foreign companies).

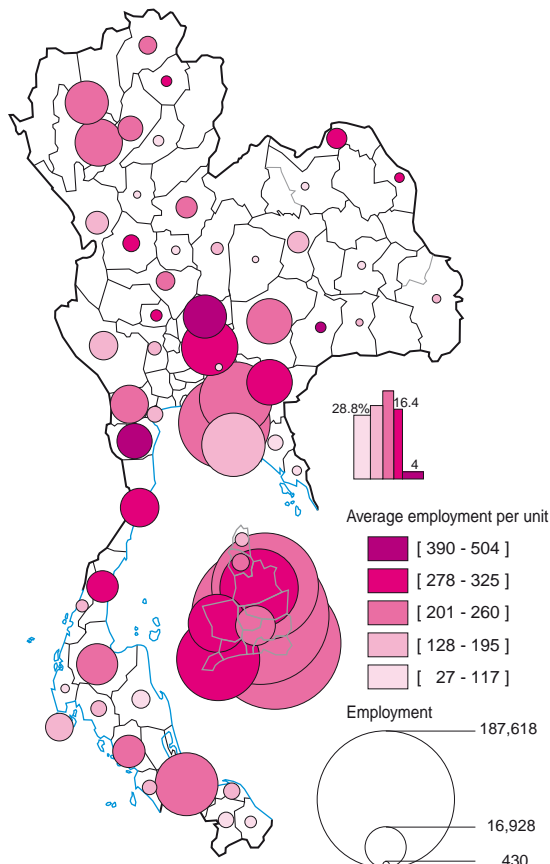
The distribution of investment capital displays the same spatial configurations as employment, though with the relative positions reversed. In the second ring of the Bangkok-Samut Prakan pole, the eastern provinces can be distinguished by the scale of the total capital and average capital: the position of Rayong can be accounted for by the weight of the petrochemical units. In the North-East and the South, Khon Kaen and Nakhon Si Thammarat have supplanted the other provinces. The declared aims of increasing exports, especially for their role in employment, and of encouraging the use of intermediary technologies led the BOI to promote large-sized enterprises. Since the crisis of 1997, however, they have tended to give priority to small and medium-sized enterprises, to support their recovery and assist their integration into world networks.

The sector-based distribution of employment is available by statistical regions defined by the BOI. In those regions that received 80% of employment created between 1989 and 1996, subsidies have strengthened the traditional sectors (agro-based, textiles) and promoted new sectors, some of which are concentrated into specific areas: metal industries in the East and Samut Prakan, non-electrical machinery construction (with car manufacturing benefiting from special conditions) in the East. While the North and the North-East have seen a degree of diversification, agro-based specialization in the South has been reinforced (see also plate 65 Industry in North-East and South). Japan is the main investor to benefit from BOI incentives, followed by the European Union (Germany especially). The criteria linking the level of incentives, sectors of activity and location have recently been relaxed to facilitate intra-sectoral linkages and the development of more efficient subcontracting. The regulations governing access for foreign investors have also been relaxed, this is because of increased competition from other Asian countries to

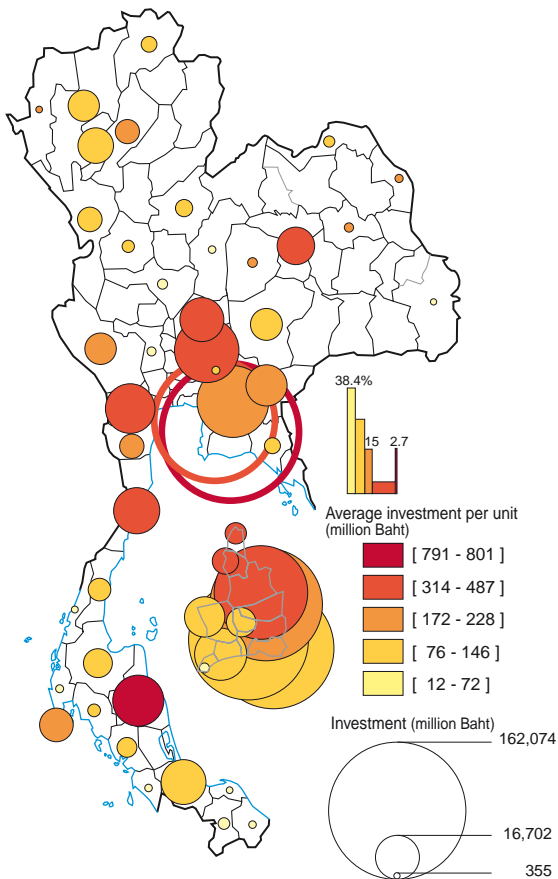
Enterprises in operation in 1996 and evolution (1986-1996)



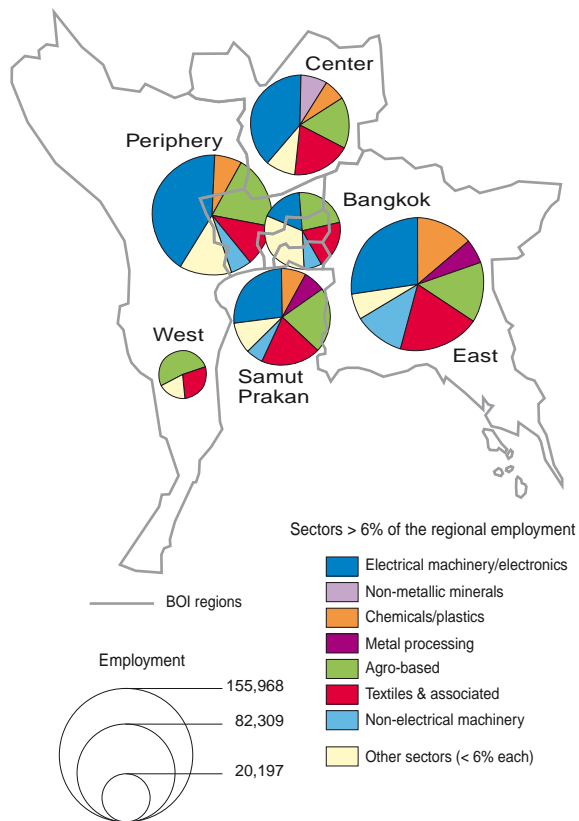
Employment in the enterprises (1996)



Investment capital in the enterprises (1996)



Employment by industrial sectors in selected BOI regions (1989-1996)



Source : BOI, various years

Wide diversification of agro-based industries

Agro-based industries remain the mainstay of industrialization in Thailand, with 30% of employment in the industrial sector overall, and rates of 60% and over in half the provinces. In the South, the percentage is homogeneous, with 70% of industrial employment. In the North and North-East (50% and 40%) percentages are still high, and contrast with those in the Chiang Mai-Lamphun-Lampang triangle, the Nakhon Sawan-Sukhothai axis or the Nakhon Ratchasima-Udon Thani corridor. With about one third of agro-based industry employment, rates in Bangkok and the neighboring provinces are amongst the lowest: the east/west imbalance continues with a proportion of less than 50% in the Eastern Seaboard provinces (Chachoengsao, Chon Buri, Rayong) whereas in the west levels reach 60% and over, with the exception only of Ratchaburi.

The wide diversification in food production which began in the 1970s reduced the role of rice mills in employment. It has thus benefited from the expansion in the food packaging sector (fruits and vegetables, produce from the sea and aquaculture, meat from poultry and pig farming), government support policies (sugar), entrepreneurial initiatives (cassava) and an increase in domestic consumption (beverages) and in demand for intermediate products (animal feed). This development led to the growth of transnational firms which at first carried out the simple processing of agricultural produce (rice, cassava), but then diversified their activities into agro-based industries and have now invested in other sectors. The Bangkok Metropolitan Region contains a very diversified pattern of medium-sized units, the eastern provinces too, with a major canning industry and sugar and cassava processing (Chon Buri, Chachoengsao). The North-East is still marked by the processing of cassava, as are Kanchanaburi and Ratchaburi by the transformation of sugar cane (see Chapter Agriculture) and the Chiang Mai-Lamphun-Lampang triangle by the canning of fruit and vegetables. The South, with the Songkhla pole, specializes in the packaging of fruit, produce from the sea and from aquaculture.

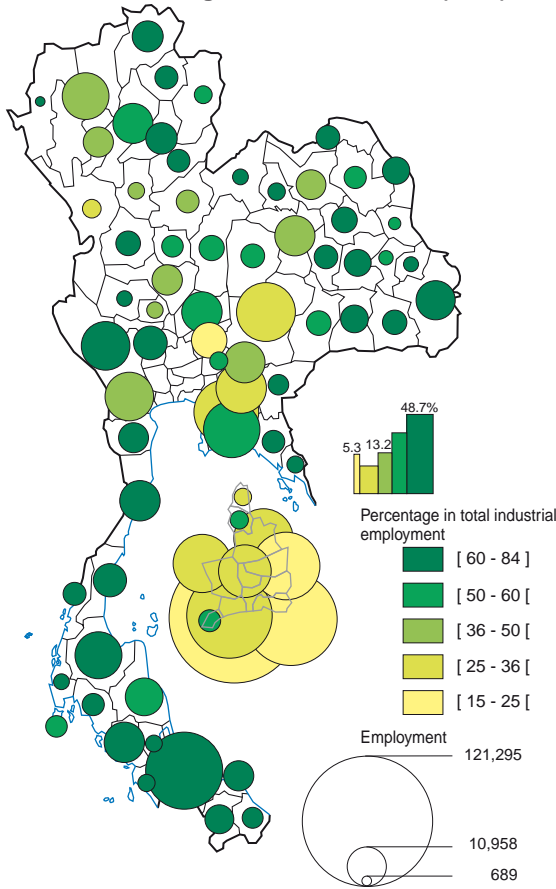
Employment in the wood and wood by-products sector differentiates groups of provinces according to the type of activity that predominates: paper manufacture from Samut Prakan to Ayutthaya in large factories, furniture production in Bangkok and the Eastern Seaboard provinces, timber workshops in the South, or smaller units for the production of

handicrafts in the North (except for Chiang Mai, Lampang and Songkhla where furniture manufacture has developed). A reduction in national resources has forced industries to resort more to imports and to use local species which are not considered noble (see plates Forest and Inter-regional trade). The distribution of units in the leather and tobacco/natural rubber sectors is in clearly defined areas. Leather production is concentrated in the center and the eastern provinces: in these provinces, and also Ayutthaya (important collection center for hides), the most polluting operations of the process are now located, rejected by Bangkok and Samut Prakan. 60% of employment in the tobacco sector is concentrated in the North and more than 30% is in Bangkok, in the state-owned company. The South contains almost 50% of employment in natural rubber processing, the Bangkok Metropolitan Region with Ayutthaya has about 40% and the eastern provinces more than 10%. The units in the South which have succeeded in diversifying rubber-based products are, on average, larger than those in Rayong and Chon Buri.

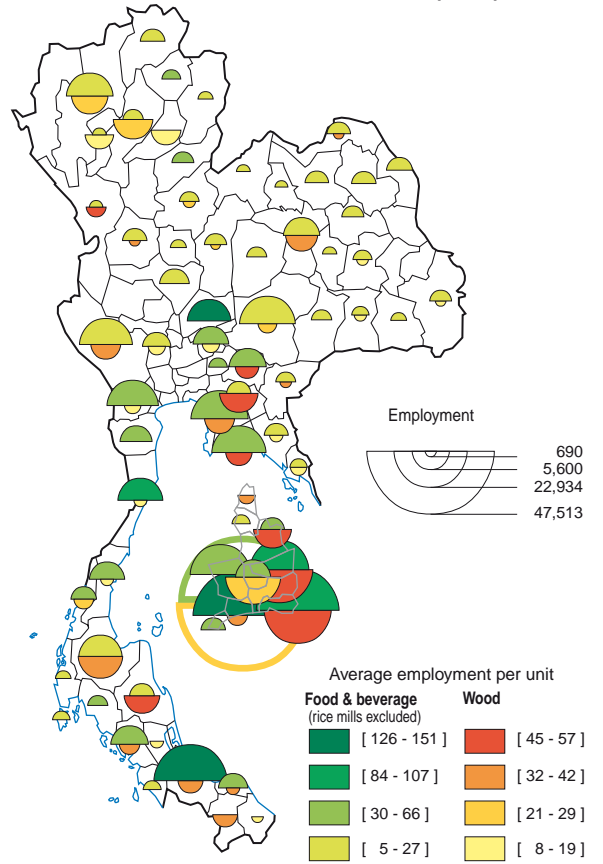
By classifying employment into three sectors, areas that form specific groups or are limited to a single province (North-East) can be defined. Almost half the provinces belong to class 1 where the food sector predominates, with the importance of rice mills varying considerably. Class 2 (predominantly wood) concerns a scattering of provinces, except in the South and the extreme East. Class 3, where tobacco/rubber is on the increase, forms larger areas, notably the South, while class 4, where these sectors predominate, covers three isolated provinces. The importance of wood in class 5 brings the North to the fore.

Through diversification at the production stage, exports have now become products of higher added value: the food sector with its key products (fruit and vegetable packaging, frozen shrimps and broilers), wood and leather, rubber products that are more sophisticated than before, and a decline in primary exports (see Chapter Agriculture). The strength of the country's agro-based industries and the corresponding exports (25-30% of manufactured goods value), combined with the dynamism of its firms have resulted in Thailand becoming a "Newly Agro-Industrializing Economy" (NAIE).

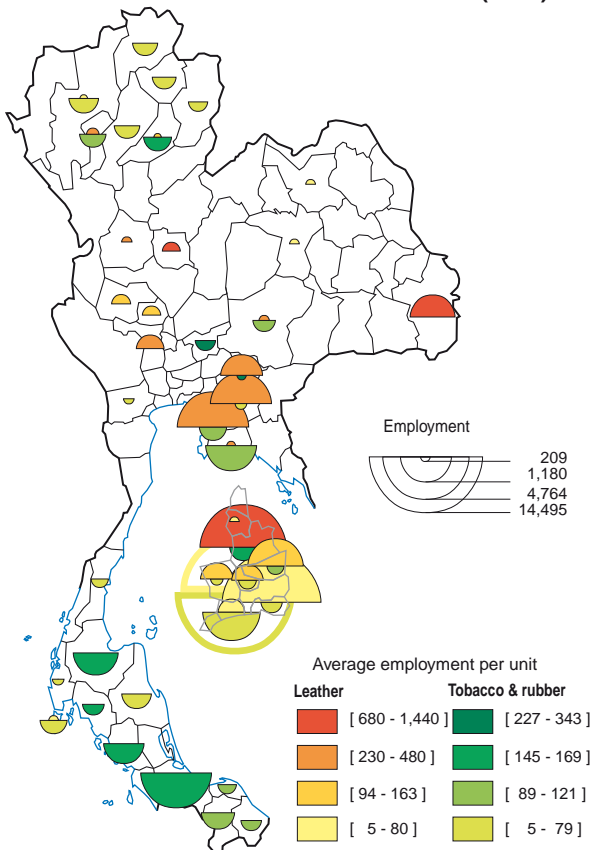
Employment in agro-based industries (1996)



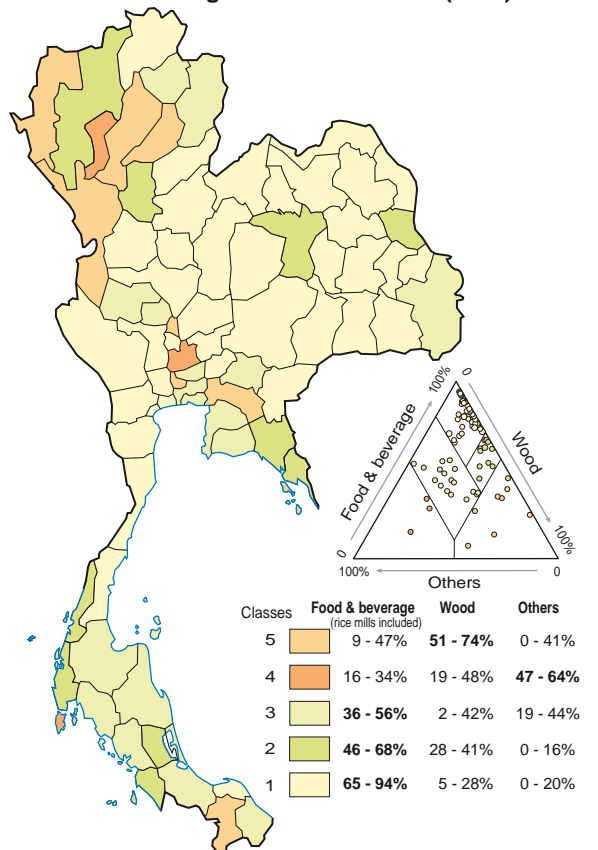
Employment in food & wood sectors (1996)



Employment in leather & tobacco / rubber factories (1996)



Profile of employment in agro-based industries (1996)



Source : Ministry of Industry, 1997

Greater growth in wearing apparel than in textile manufacture

The development of the wearing apparel sector between 1986 and 1996 has been much more marked than textiles, as can be seen by the multiplying coefficients of the number of units (8.8 and 3.8) and of employment (4.6 and 2.2). Precise analysis of this evolution is nevertheless hampered as there are specific statistical difficulties for this sector (home-based workers, unregistered small workshops, sensitive period during the 1980s).

The increase in the number of textile units (spinning, weaving) highlights the provinces of Chon Buri and Chachoengsao and some regional poles (Nakhon Ratchasima, Chiang Mai). The net creation of units in thirty or so provinces has had a minimal effect on employment, with the exception of Prachin Buri. The share of Bangkok, overwhelming in terms of number of units (more than 40%), is more modest in terms of employment (one quarter), barely more than in Samut Prakan, notably because the enterprises are smaller in size. In the distribution of employment, apart from the mass of the Bangkok Metropolitan Region (BMR), there is a clearly distinguishable North-East corridor with poles that have been able to develop new market segments (synthetic fibers, fishing nets) while still relying on traditional products (silk). In other peripheral provinces there still exist large units associated with a traditional raw material (cotton in Phitsanulok and Nong Bua Lam Phu) or with downstream activities (packaging for the cement works at Saraburi). In the South the number of units is minimal, and this region does not appear as registered employment is under 356 employees per province.

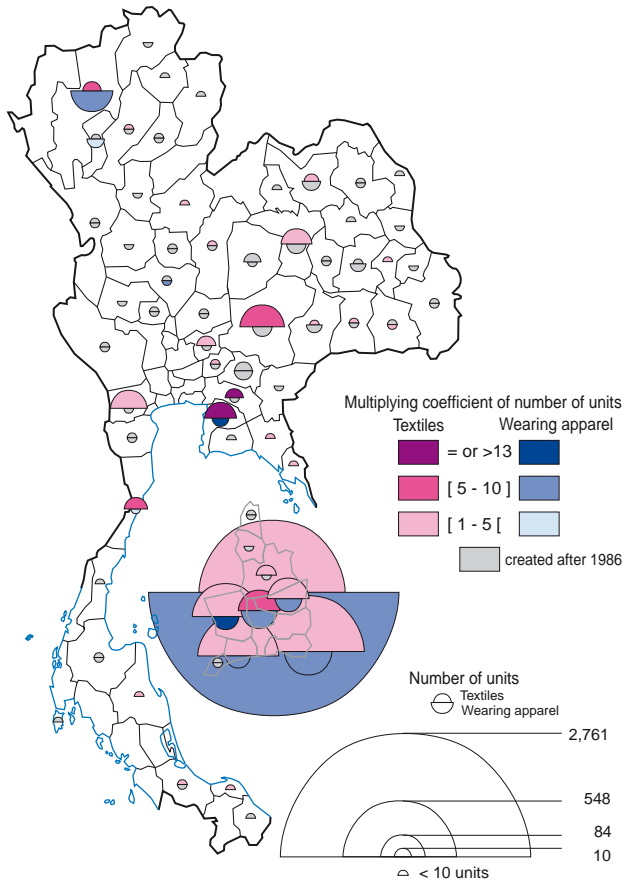
With the exception of the South, the evolution in the number of units producing wearing apparel has meant net creation in many provinces, a very large increase in Chon Buri and Nakhon Pathom and it has strengthened traditional poles of activity (Bangkok-Samut Prakan, Chiang Mai). However, it is possible that the registration between 1986 and 1996 of units already in production beforehand is in part responsible for this dynamism. It is also due to the setting up in regional capitals or peripheral provinces of units that have been created or established from partial or full relocation from the Center: the key elements in this relocation are the search for a work force supposed to be abundant and covered by a lower legal minimum wage (see plate 26 Investment promotion incentives), and the possibility of developing flexible working methods

(subcontracting, homework). Employment distribution shows the predominance of Bangkok (almost 70%) in small units, a much more restrained situation in the North-East, while the North is distinguished by its larger size units.

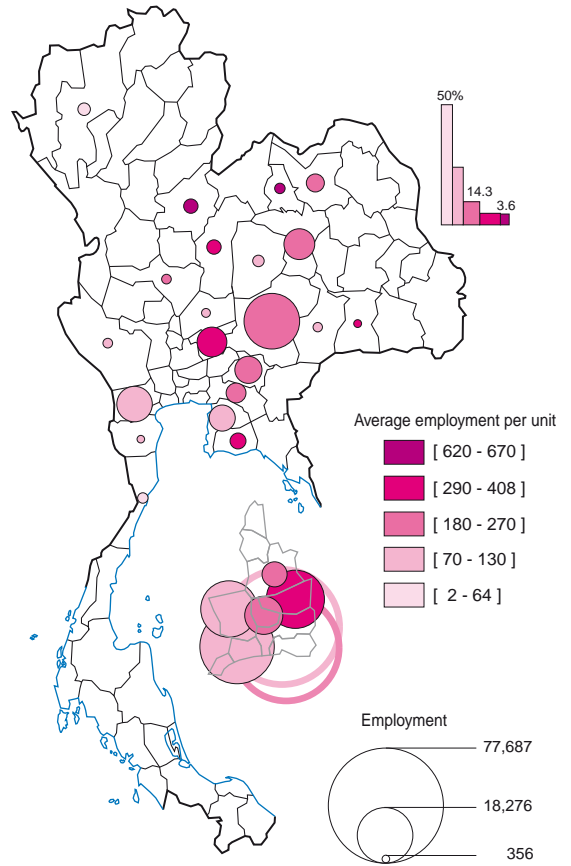
The heterogeneity of the industrial structure is considerable: it can be seen in the size of the enterprises, the quality of the products, labor force management methods and also access to markets. The most capital-intensive are the spinning mills working synthetic fibers, in partnership with firms from Japan and Hong Kong. At the other extreme, the garment factories have a low investment/worker ratio and use mainly simple technology: these factories can range in size from 10 sewing machines or less to several thousand workstations. Because of the erosion of competitiveness on the world market, contractual employment has been developed to contain the costs of the labor force (homework), or to increase productivity (piecework). Outdated technology and the mediocre quality of goods would appear to be factors that will limit growth in this sector, even though improvements have been made in some companies to meet the requirements of foreign buyers.

Exports have increased greatly since 1985. Garments have been the segment leader since 1975, with more than half of production being sent abroad (not counting the non-recorded items that pass across into bordering countries): since 1994 they have achieved on average 60% of the export value for this sector. Although fairly severely affected in 1996 and 1997, exports rallied with the devaluation of the Baht, but their share in the total exported manufactured goods is decreasing. For garments, the United States and the European Union make up the most important markets in the context of the Multi-Fiber Arrangement (MFA), despite the efforts made by exporters to win markets in countries outside the quota in Eastern Europe and the Middle East. The sector is faced with the prospect of increased liberalization of world exchanges. The dismantling of the MFA, the establishment of the AFTA (Asean Free Trade Area), the decrease in the country's tariff protection are all factors which tend to make it more

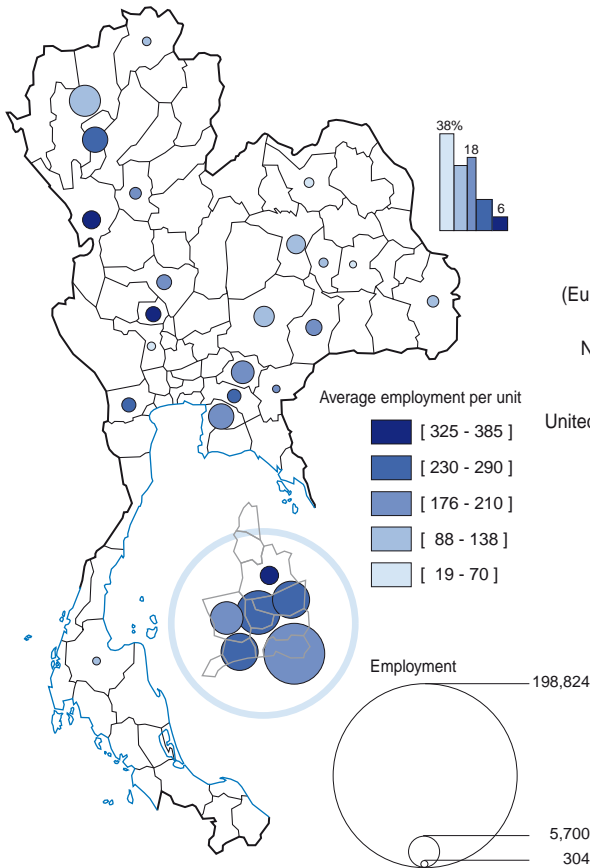
Textiles and wearing apparel units in 1996 and evolution (1986-1996)



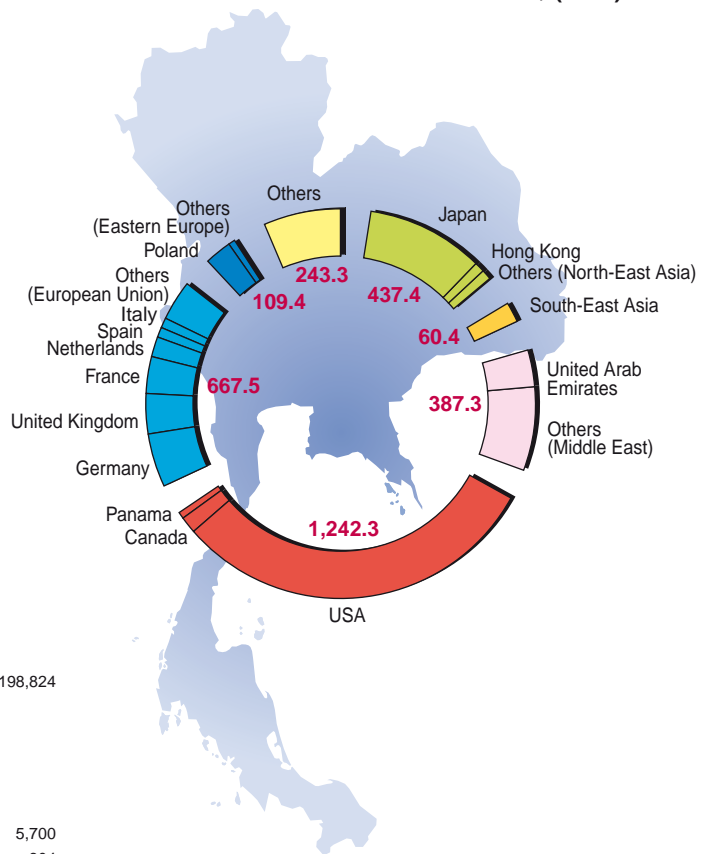
Employment in textiles sector (1996)



Employment in wearing apparel sector (1996)



Exports of garments by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
Ministry of Industry, 1997
NSO, 1997

Dynamic electrical and non-electrical machinery sectors

The growth in the electrical and non-electrical machinery sectors recorded between 1986 and 1996, more vigorous in the case of the former, reveals a high multiplying coefficient for implantations (4.5 and 3.4) but especially high for employment (5.4 and 4.5), which represents an increase in the average employment per factory.

There has been a large increase in the number of electrical machinery units in Chon Buri and Chachoengsao in the Eastern Seaboard. In the Center, only Pathum Thani has experienced a similar rise, higher than that of Nakhon Pathom, Samut Sakhon and Ayutthaya. Nakhon Ratchasima has benefited greatly from the spatial diffusion of this sector, characterized by the net creation of small units in more than twenty provinces, though their impact on employment totals is negligible (less than 200). In 1986, the Bangkok Metropolitan Region (BMR) and Ayutthaya accounted for almost 95% of employment in this sector, but this has fallen to barely 70% in 1996 with the emergence of Pathum Thani as the second important pole for employment. A third of all employment is still concentrated in Bangkok in smaller units whereas in Ayutthaya and to a lesser extent Pathum Thani the units tend to be larger. Larger units are also to be found in the provinces of Chon Buri, Chachoengsao and Nakhon Ratchasima, which group together a total of almost 25% of employment in this sector.

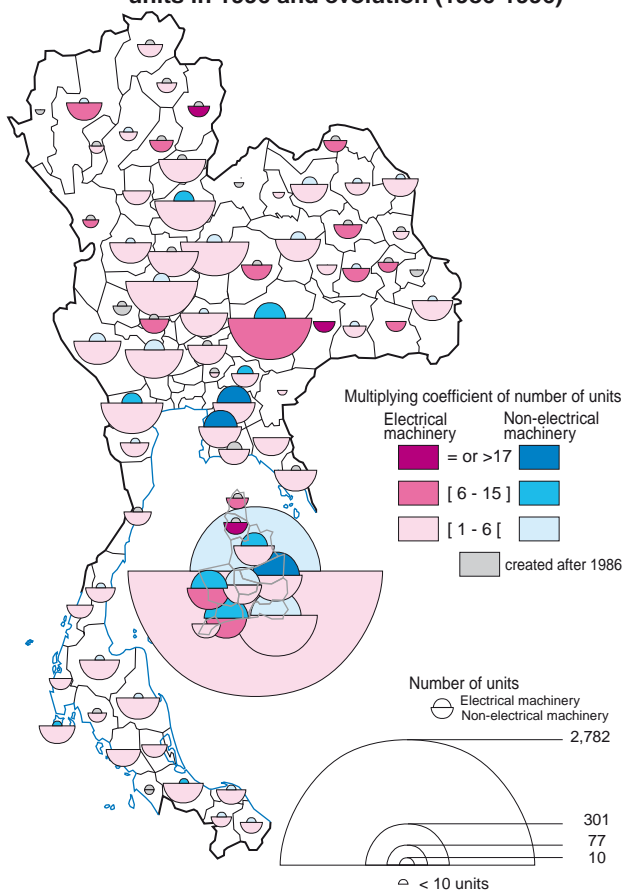
The units involved in non-electrical machinery, on the contrary, covered the entire territory in 1996 with a greater and less unbalanced spatial effect on employment. Apart from the provinces that had a very small number of units in 1986, the largest increases have been in Nakhon Pathom, Samut Sakhon and Nakhon Ratchasima with a varying effect in terms of total employment and of average employment per unit: Nakhon Ratchasima has shown a considerable increase in employment, bringing it almost to the level of Pathum Thani and above Ayutthaya in terms of establishments that are considerably smaller in size. The proportion of employment in the Bangkok-Samut Prakan-Pathum Thani-Ayutthaya group has decreased from over 70% to 55% of total employment. Although it has a similar volume of employment to that created in Chon Buri and Chachoengsao, Prachin Buri differs in that the average size of units is much larger even than those in Samut Sakhon.

Apart from the production of consumer goods, the growth in electrical machinery has in fact centered

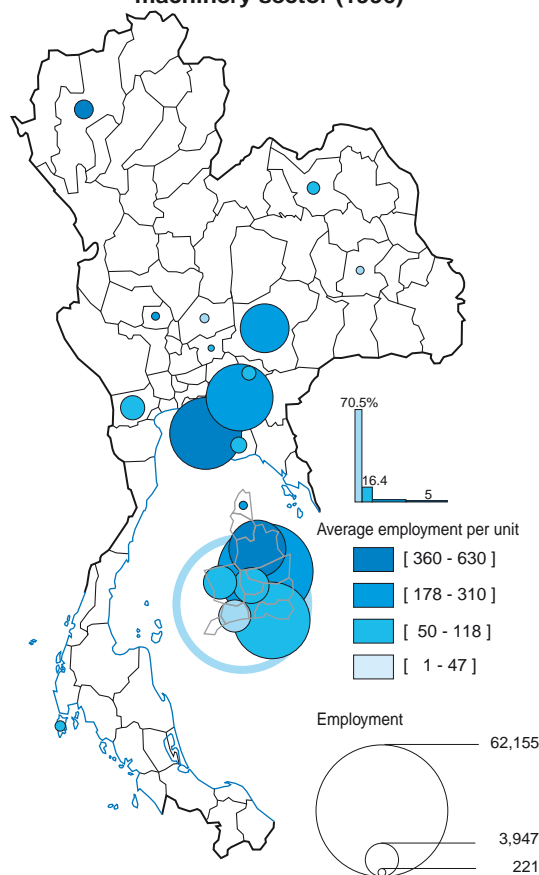
on the electronics sector. This in turn has given the impetus to other sectors, such as non-electrical machinery, also stimulated by the manufacture of agricultural and industrial equipment in response to domestic demand. The rapid expansion in electronics is closely linked with the presence of foreign companies. The sector was first developed in 1961 when Japanese firms joined with Thai enterprises to supply the national market. In 1971-1972 it turned to exports and diversified production with the arrival of subsidiaries of multinationals from the United States and Europe, from Japan and Taiwan (these were large in scope and in number from 1986), and from new industrialized Asian economies (Singapore, Hong Kong). The foreign subsidiaries concentrate for the most part on foreign markets, while the Thai enterprises are aiming at a well protected domestic market.

Progress has been made in producing parts and components with a higher value added: these have been mainly due to Japanese subcontractors based in Thailand in the wake of the multinationals. Manufacture is dominated by assembling and is dependent on imported intermediate products: these occupy between 60 and 90% of production in the electronics sector, thus reducing the true export values. Exports of electrical and electronic goods represented almost 30% in 1996, 40% in 2001 of the total value of exports of manufactured goods. The flow of integrated circuits, the major production item, reveals the intra-company exchanges that characterize the electronics industry. The main sources of imported components are the United States (more than 50% in 1996) and Japan (about 30%): the assembled integrated circuits are exported for the most part to the countries of Asia (about 60%) where Singapore emerges as the hub. Exports to multinationals in the United States represent about 30% while the Netherlands remains the main destination for goods into the European Union. The cyclical nature of the electronics industry was evident during the 1997 crisis: the sharp deterioration in prices in 1996 was a factor that severely weakened the economy, and their rise in 1999 played an important part in the recovery.

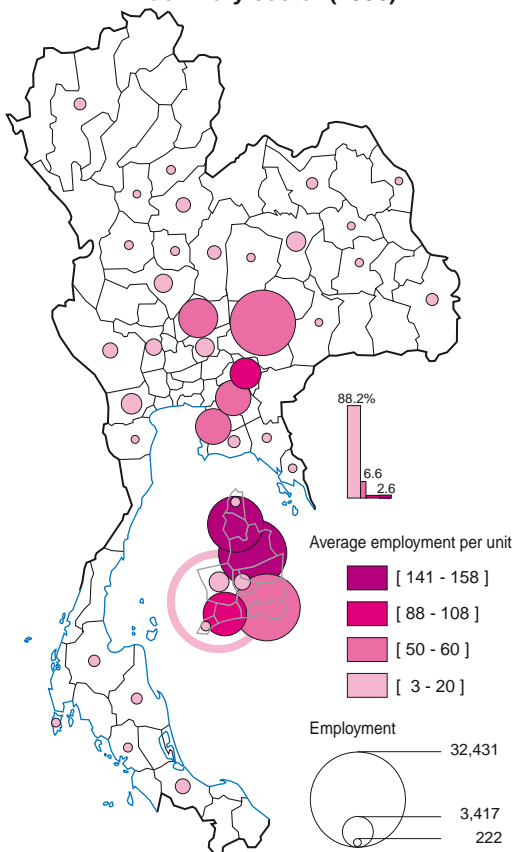
Electrical and non-electrical machinery units in 1996 and evolution (1986-1996)



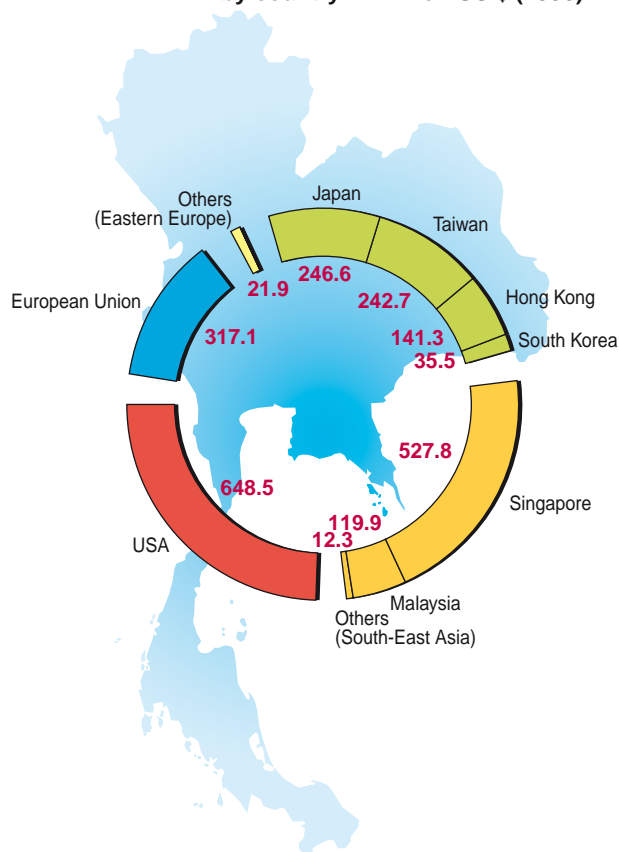
Employment in electrical machinery sector (1996)



Employment in non-electrical machinery sector (1996)



Exports of integrated circuits and parts by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
Ministry of Industry, 1997
NSO, 1997

Limited spatial deconcentration of the chemical and plastic industries

The plastic sector has seen the greatest multiplying coefficient both in terms of the number of units and in employment (5.2 and 4.3 respectively), ahead of the chemical industry (2.5 and 2.2).

The increase in the number of chemical units has been greatest in Rayong and Chachoengsao while the modest rate of growth in Bangkok and Samut Prakan coupled with the large number of existing units confirms the importance of this sector here since 1986. The semi-ring running from Pathum Thani to Samut Sakhon has consolidated its strong base. Almost 70% of employment in this sector is concentrated in Bangkok, Samut Prakan and Pathum Thani, and the units in these last two provinces are markedly larger than those in Bangkok. In a wider semi-ring, employment in Saraburi, Ayutthaya and Ratchaburi results partly from the transfer from the Bangkok Metropolitan Region (BMR) of factories producing agricultural inputs, while it has been boosted in the Eastern Seaboard provinces by the petrochemical industry that has developed from the natural gas fields in the Gulf of Thailand. Rayong has most of the upstream factories, including gas separation plants (see also plate 25 Energy infrastructure and networks), far outnumbering those in Chon Buri. Since 1994 it has been compulsory for these units to set up in industrial estates, and this has strengthened the position of Rayong, which now has a wider range of downstream transformation industries and the greatest average number of employees per enterprise. The amount of employment created in the peripheral provinces (Chiang Mai, Khon Kaen, Songkhla) in small packaging units, mainly fertilizers to supply the rural areas, remains limited.

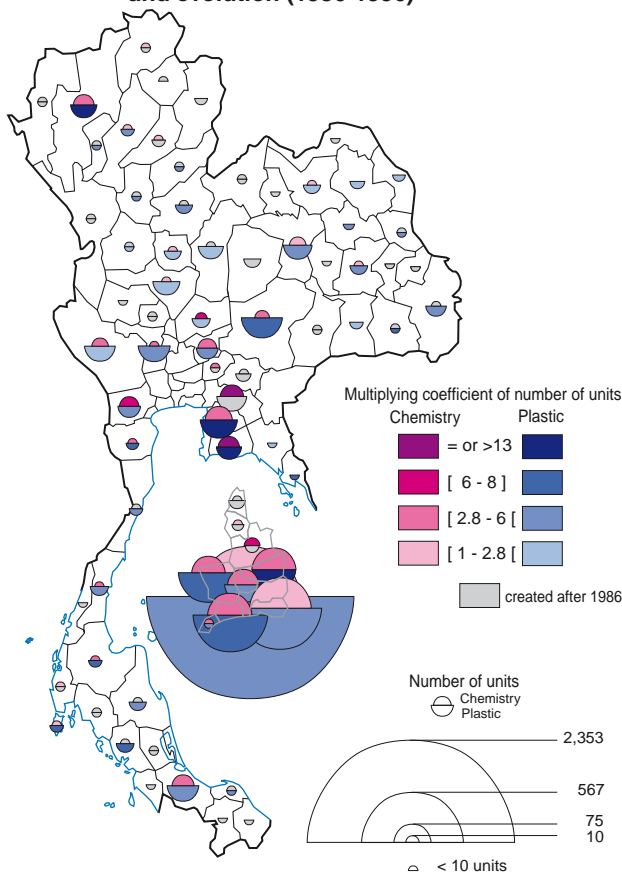
The plastic sector has experienced the greatest spatial expansion. In 1996 it was present in all the provinces due to the creation of micro-units using simple technology and a modest amount of investment, with varying effects in terms of job creation. Whereas Chiang Mai has a very high multiplying coefficient, in Nakhon Ratchasima, where many enterprises have relocated from the center, there has been a large increase in employment in much bigger factories. In the provinces, where the creation of enterprises has been greatest, Chachoengsao, thanks to its proximity to the oil and gas industries in Chon Buri, has received more enterprises than Rayong and of similar size. There has also been a large increase in the number of units in these last two Eastern Seaboard provinces and in Samut Sakhon, Nakhon Pathom and Pathum

Thani: not far from the petroleum transformation industry and the port facilities in Bangkok, the amount of employment created in medium-sized factories is 25% of the total for the sector, whereas in Bangkok and Samut Prakan it still represents 50%.

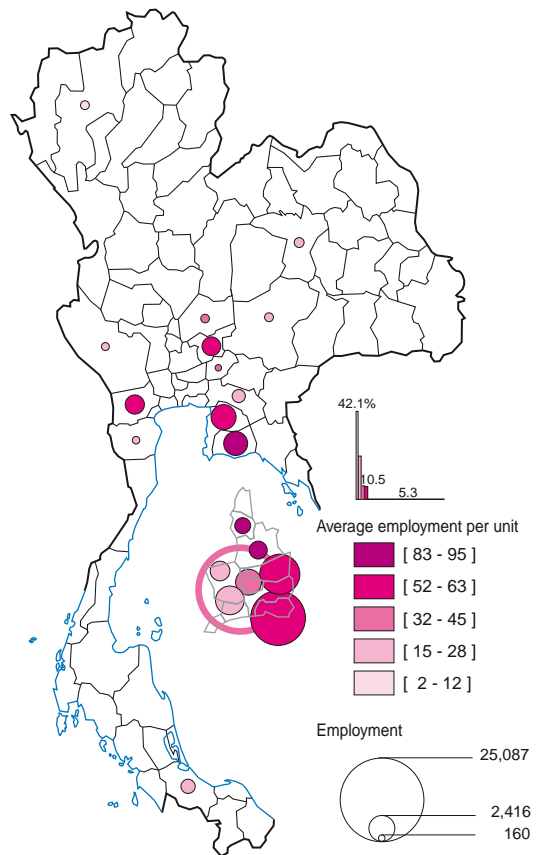
The petrochemical industry has relied heavily on the government's highly protectionist policies in this sector and on investment promotion in order to reduce the country's dependence (see plate 26 Investment promotion incentives). The sector has developed considerably since 1989 when the first specialized industrial estate was completed in the Eastern Seaboard, the result of a public/private partnership (National Petrochemical Complex-NPC I). The sector was further strengthened in 1994 with a clear diversification of upstream products in NPC II, which was also established in Map Ta Phut (Rayong). Some of the largest Thai companies have formed major conglomerates. The great names of the petrochemical industry, from South Korea, Japan, United States and Germany, are operating in Thailand through licensing and engineering. Although severely affected by a fall in demand during the 1997 crisis, exports began to take off again in 1999 mainly to China, Indonesia and the Philippines.

The development of the petrochemical industry in Thailand has had an important role in the growth of the plastic industry, just as progress in the local machinery industry affected the transformation of plastics. The demand from other industrial sectors (electronics) and from domestic consumption encouraged this sector which, though only just beginning to develop in the 1970s, has been considerably modernized since the 1980s. Production, however, is still not sufficient to supply the demands of downstream industries and there are major imports of some intermediate products. Some of the largest Thai companies in the petrochemical sector are also major plastics manufacturers: they produce a wide variety of products (toys, household goods, filaments) generating a stream of exports, 70% of which are destined for the Asian market. After a collapse in 1996, the value of exports returned to its pre-crisis level by 1998.

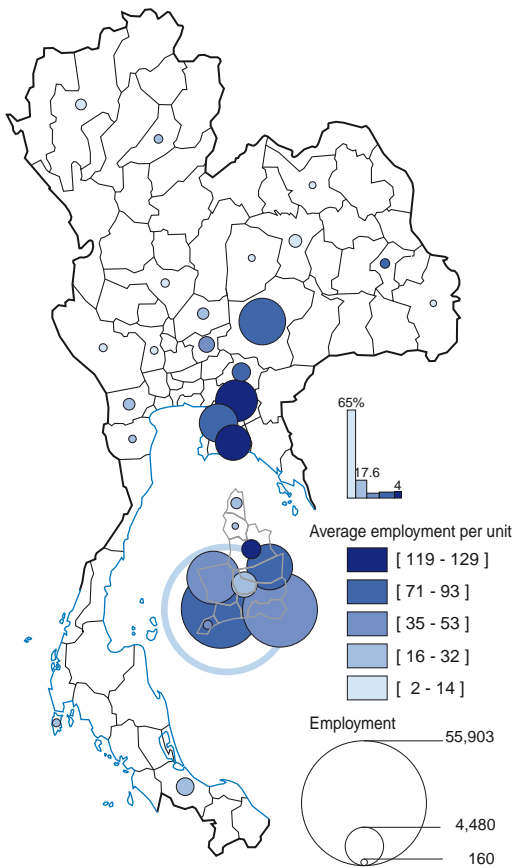
Chemistry and plastic units in 1996 and evolution (1986-1996)



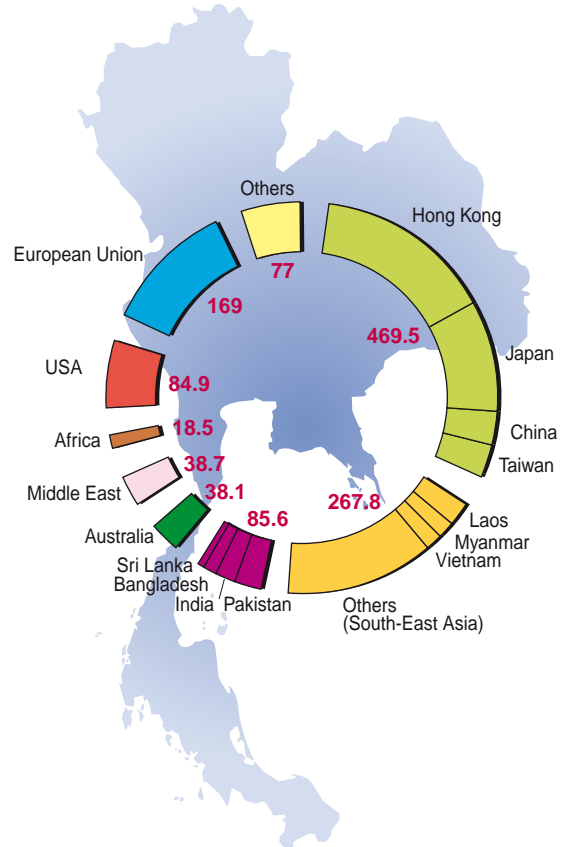
Employment in the chemical sector (1996)



Employment in the plastic sector (1996)



Exports of plastic products by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
Ministry of Industry, 1997
NSO, 1997

The metal, mineral and transport equipment industries

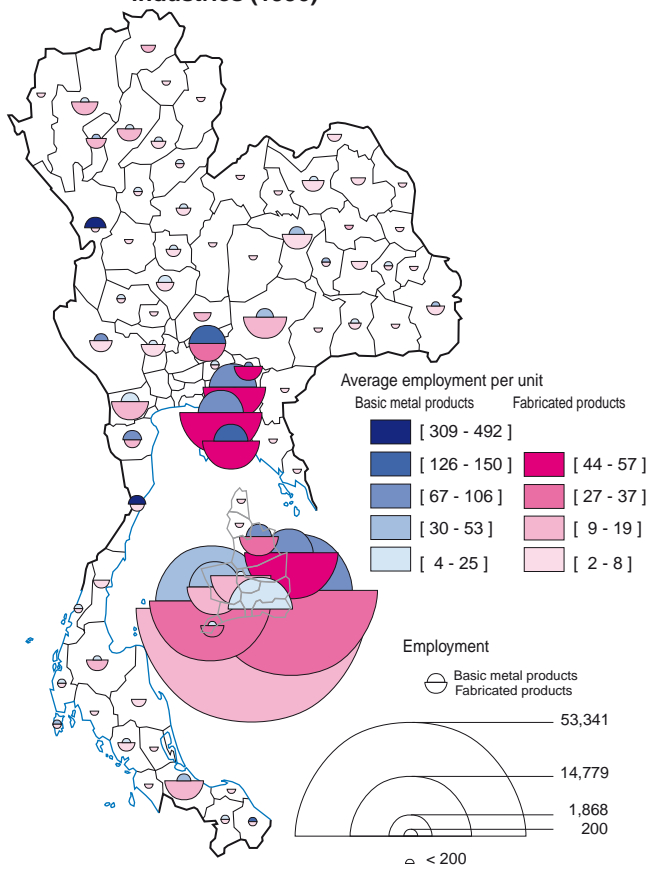
Two intra-sector segments determine employment distribution in the metal sector. Manufacturing of metal products has been established in micro-units in all the provinces and regional poles can be clearly distinguished (Chiang Mai, Nakhon Ratchasima, Songkhla) where units are larger. The processing of basic materials is carried out in a few provinces, with the recycling of metals (Nakhon Ratchasima, Khon Kaen) or the treating of local metal resources generally realized in small or medium-sized units: tin (especially Songkhla and Phangnga), lead (Kanchanaburi), iron (Prachuap Khiri Khan), zinc (Tak). These two segments are closely associated in the Eastern Seaboard and the metropolitan region (except Bangkok and Nonthaburi) with the largest units, especially on the eastern side of the capital: the proximity of the port facilities strengthens the close links with the user industries. The steel industry expanded considerably at the beginning of the 1990s with the establishment of production for import substitution, a boom in the construction sector and in the demand for capital goods and consumer goods. The industry is still reliant on imports of raw materials and scrap metal. As a result of the difficulties the sector has experienced from 1998 (fall in domestic demand, decrease in the world market, dumping by Eastern European countries) a few enterprises have been able to strengthen their hold.

About thirty non-metallic mineral resources are exploited throughout the country. Saraburi has the largest units with almost 15% of jobs concentrated here, ahead of Bangkok, in producing building materials. This sector predominates in Bangkok and in four neighboring provinces (cement, glassware) while Ratchaburi specialises in ceramics. In the North, where a variety of mineral resources are to be found (excluding lignite), half the employment of the entire region for the sector is grouped in Lampang and Tak, and in Chiang Mai the production of traditional handcrafted pottery has developed. The size of the units in Nakhon Ratchasima (marble, granite) contrasts with the very basic saltworks in the rest of the North-East. Production of non-metallic mineral resources is constantly declining, with the exception of building materials where in some cases Thailand appears to be competitive (largest cement producer in South-East Asia). This sector has been affected particularly badly since 1997 as a result of the drop in demand from the domestic market and the shrinking of the ASEAN market.

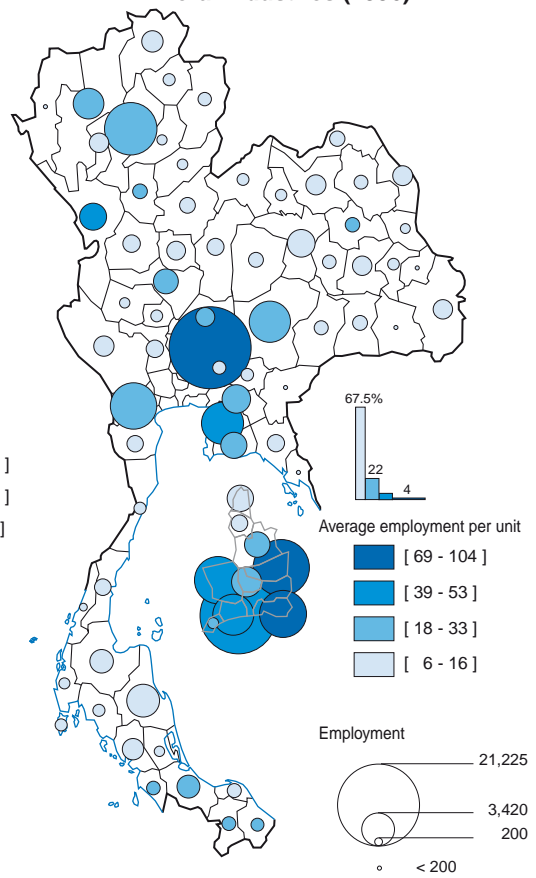
The geographical distribution of employment and the average size of firms supplying the transport equipment sector (excluding repair workshops) reveal two clearly contrasting groups of provinces. The first covers over three-quarters of the provinces, with small-sized units creating little employment and producing generally in a rather unsophisticated way (boats in the South, rural utility vehicles in the North and North-East): in a few provinces, slightly larger units can be seen to supply a mainly local demand (in the Central Plain, Khon Kaen). The group of provinces formed by the Bangkok metropolitan region (Ayutthaya and Ratchaburi included), the Eastern Seaboard and Nakhon Ratchasima contains 90% of employment in larger size firms, with a notable imbalance between the west and the east. In Samut Prakan and Ayutthaya the largest automobile assembly units can be found. The position of Rayong has been strengthened since 1996 with the establishment of European and American manufacturers which have tended to erode Japanese domination (90% of the market).

In the automotive sector, the production of parts and components and also vehicle assembly have developed, heavily protected by favourable import duty regulations. The local content requirement, of which the share was reinforced constantly between 1972 and 2000, has resulted in a strengthening of links between local and Japanese parts manufacturers: nevertheless, the latter play a key role through their parts suppliers and assembly plants. Thailand is the leading ASEAN market and has become the main production center for Japanese manufacturers, and the regional hub for the production of parts and components. Between 1996 and 2000, while the domestic market was in total stagnation, the value of exports increased almost 5-fold, thanks to vehicle assembly and automobile component manufacture. Exports to Cambodia, Vietnam and Myanmar have been stable, while those to the European Union (Portugal), Australia, Japan or New Zealand have expanded considerably: some are integrated into the supply networks for Japanese firms. The recent liberalization measures and the proposed reduction in import tariffs in the context of the regional free-trade area (AFTA) represent important stakes for this sector.

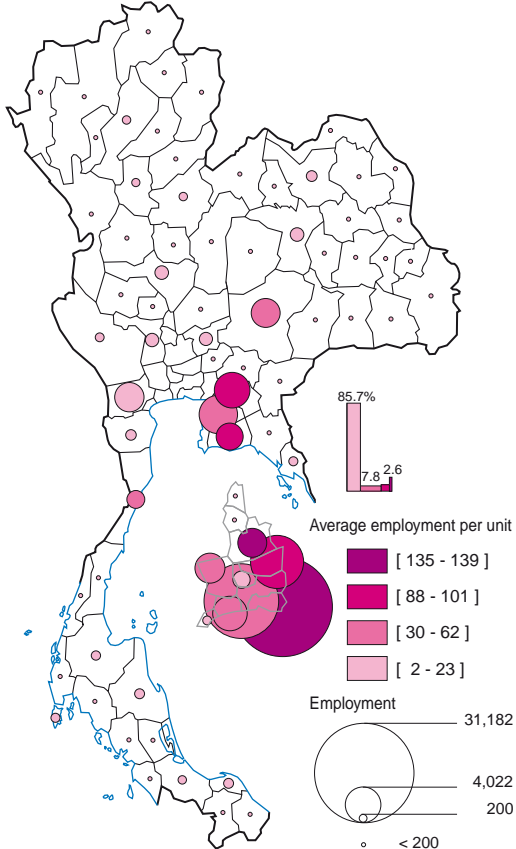
Employment in metal industries (1996)



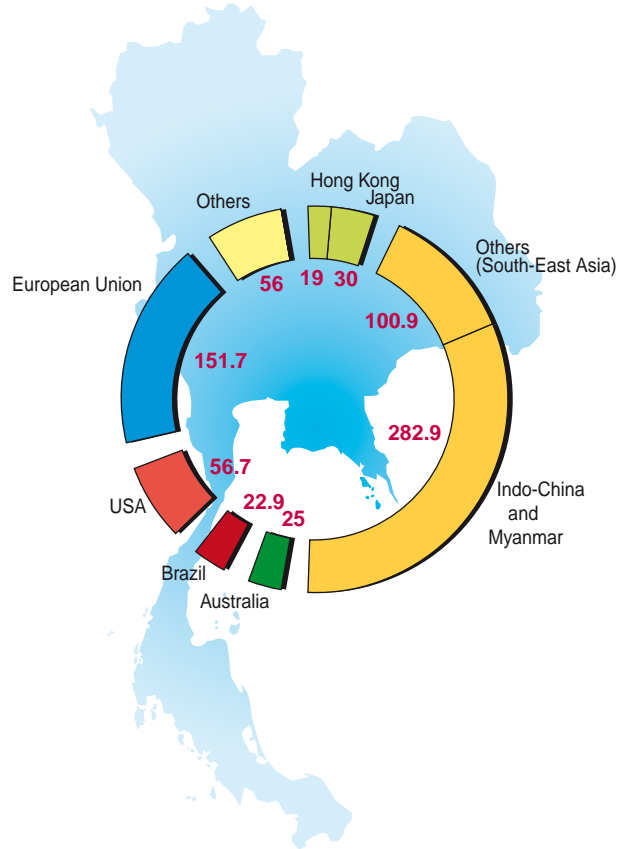
Employment in non-metallic mineral industries (1996)



Employment in transport equipment sector (1996)



Exports of vehicle parts and accessories by country in million US \$ (1996)



Sources : Bank of Thailand, 2000
Ministry of Industry, 1997
NSO, 1997

Marked specializations in industrial employment

For the last two decades, the country's industrial structure has become more diversified. The movement has particularly affected the sectors of electrical and non-electrical machinery (with the rise of the electronics sector), plastic and transport equipment. The more traditional branches have also continued to develop (textiles and wearing apparel), diversify their products and increase the value added of their finished products (agro-food and agricultural industries). In conjunction with this dynamic, the process of rapid growth has weakened the traditional centralizing role of Bangkok with firms and branches of activities more scattered throughout some provinces. The imbalances in the scale and sector orientation of this expansion have nevertheless given rise to varying degrees of regional employment specializations.

The principal component analysis is based on the distribution in relative value of employment at national level in 12 sectors. The classification of each province in relation to this average gives 11 types of employment specialization. Their geographical layout gives rise to groups and is very rarely limited to two provinces (type 4): unlike the North, the South is relatively homogeneous, the North-East is organized around a few types of specialization, and in the provinces bordering Bangkok east and west are clearly differentiated. The sector specialization of a zone of employment reveals a differentiation in its structure especially since wide variations from the average national profile can be seen in most types (the most extreme in types 1, 4, 7 and 9). The model that is closest to the average is type 6 (five provinces, of which Bangkok and its three neighboring provinces to the west). The degree of specialization of one zone of employment reveals its dependence on one or a few sectors: a high degree of specialization is characterized by the over-representation of a single branch (types 2, 3, 4 and 7) which may lead to situations close to mono-industry (type 1).

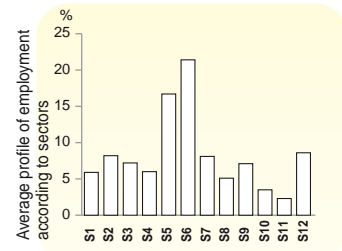
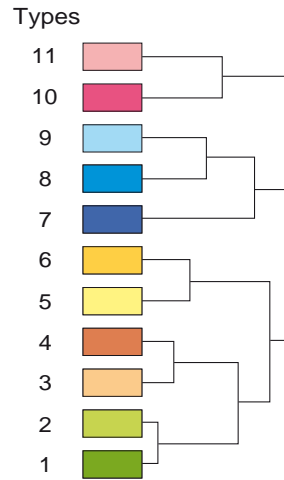
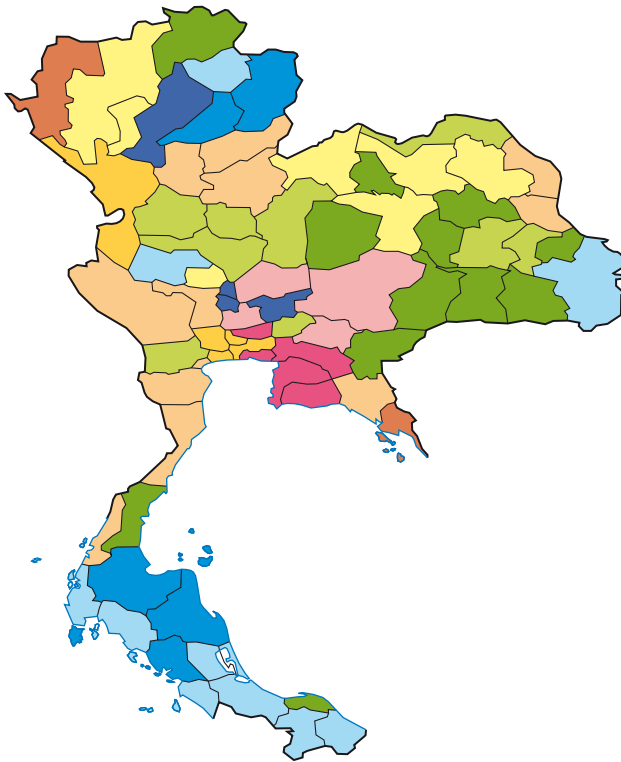
Type 1 covers peripheral provinces, three-quarters of them in the North-East: 60% of employment for this group is concentrated in the agro-food industries and this generates local intra-sector specializations, according to the produce processed. Although weaker in types 2 and 3, which form adjacent geographical groups, this sector still predominates (almost half of employment): the role of other primary resources can be seen (minerals, wood). Their importance is clearly shown in type 4 with the over-representation of wood, wood furniture and paper:

this covers only two outlying provinces. The degree of specialization decreases slightly in type 7 which brings together three provinces close to the capital and where the exploitation and transformation of non-metallic minerals predominate over the agro-food and the wood sectors. Types 8 and 9 correspond to less specialized structures where the same branches of industry are to the fore, but in a different order of importance: wood, agro-food (contributing to the subdivision of the South) and agriculture (rubber in the South, tobacco in the North, leather in Ubon Ratchathani).

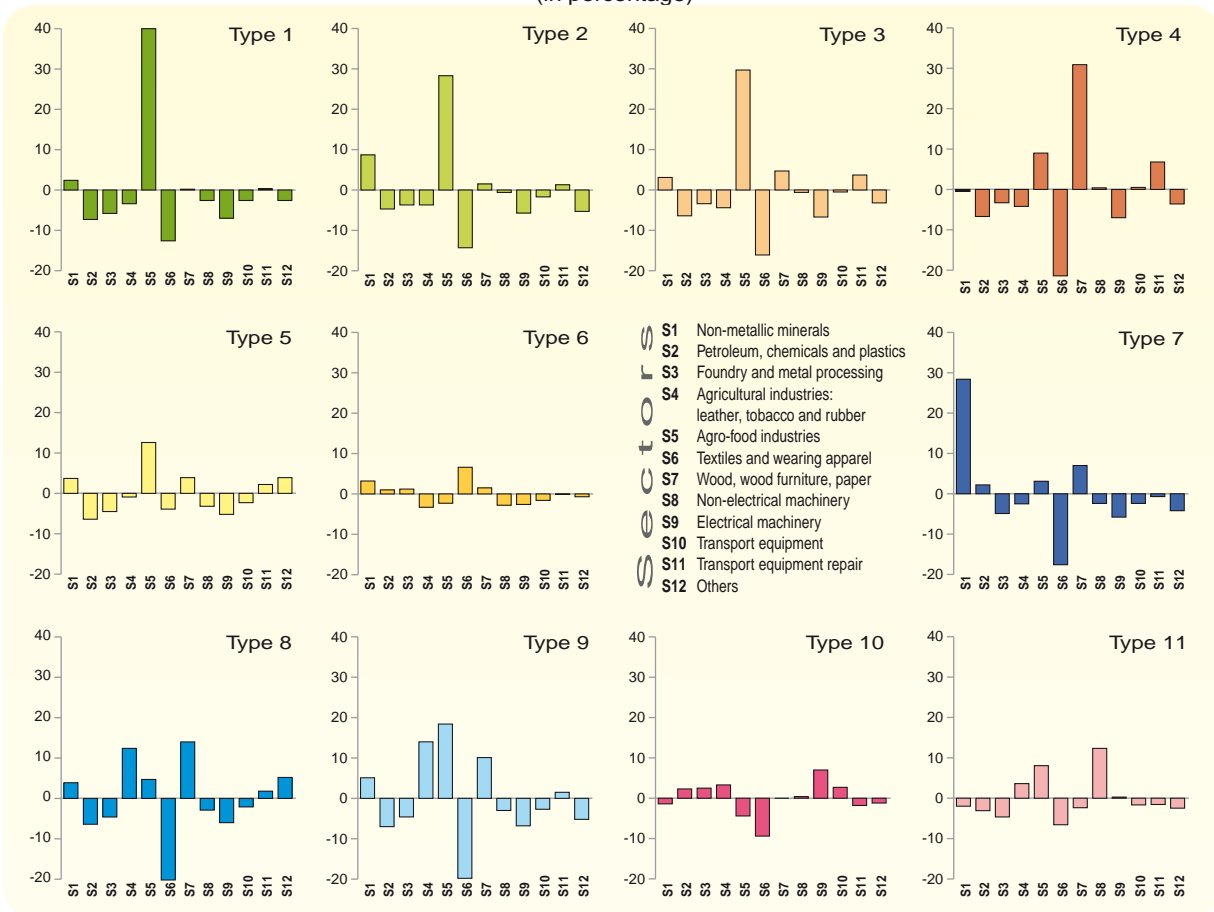
The other profiles correspond to structures that are specialized to only a modest degree, with the presence of several activities in proportions slightly above the national averages. Type 5 combines agro-food with the wood industry and non-metallic minerals and is concentrated in the North-East. In type 6, a dual pole of activities in Bangkok and along its western side associates a low level of specialization in the textile and wearing apparel sector and in non-metallic mineral industries. The last two types combine a modest degree of specialization in durable goods (electrical machinery for type 10 and non-electrical machinery for type 11) with several other branches: other durable goods industries in provinces in the Bangkok metropolitan region and the Eastern Seaboard; agro-food and agricultural industries in a group of provinces in the north and north-east of the capital.

The spatial organization clearly shows a higher degree of specialization as one moves further out from a center formed by the Bangkok metropolitan region and the Eastern Seaboard. However, the regularity of the whole is disrupted: there is a semi-ring which has only a modest degree of specialization from Ayutthaya to Prachin Buri, groups that are only slightly more specialized around Chiang Mai and Khon Kaen, and the South is less specialized than other groups of provinces in the peripheral regions. Here, the high degree of specialization is not exclusive: these groups have been able to benefit to a certain extent from the diversification of the industrial structure.

Types of industrial specialization



Differences from the average profile (in percentage)



Source : Ministry of Industry, 1997

Tertiary sector

The growth of the tertiary sector, which consists of construction and services provided by enterprises or by the state, is part of the expansion of non-agricultural activities and income that has defined Thailand for forty years.

The period between 1980-1996 is characterized by the stability of the tertiary sector share in the Gross Domestic Product (GDP) (about 55%) and, within it, by the growing importance of the financial sector (associated for statistical purposes at provincial level with insurance and real estate) and construction (**plate 50 Product of tertiary sector**). The doubling of the contribution from the financial sector was the result of efforts at the very beginning of the 1990s to encourage domestic savings and then to attract foreign capital through a few Sino-Thai financial conglomerates, via a network of commercial banks developed from the 1950s and subsidiaries consolidated in the 1970s (finance and securities companies). It also illustrates the spreading throughout the country of other financial institutions in both the public (agricultural cooperatives or savings cooperatives, Government savings banks) and private sectors (pawnshops). This upward trend continued until 1996, under the effect of an accelerated liberalization of the financial system; the aim behind this was to maintain economic growth, by supporting industrialization and developing infrastructures, and the political ambition was to make Thailand a subregional financial hub, especially for the reconstruction of the countries of Indo-China. The subsequent inflow of short-term capital from abroad (especially via the Bangkok International Banking Facility, established in 1993 with provincial ramifications) generated a high level of financial, stock market, and real estate speculation, and low-return investment projects: between 1993 and 1996, 30% of loans were channeled into the real estate sector and construction, 25% into consumption, compared with 14% into the manufacturing sector and 2% into infrastructure.

When the speculation bubble burst in 1997, coinciding with a commercial deficit and the over-evaluation of the currency, the result was a financial crisis that revealed the scale of the foreign debt (more than 70% of the GDP, of which 40% was in the form of short-term debts and more than a third from the private sector) and the large amount of bad loans. Between 1996 and 2000, the value added dropped 65% for financial activities, 35% for insurance and real estate, and 55% for the construction sector which had

been boosted since 1987 by the frenzy of major urban property projects (offices and luxury apartments). The crisis laid bare a series of institutional failures due to the absence of any rules or regulations to safeguard the opening of the financial system or any supervision of operators' activities. Their numbers had grown as a result of the euphoria of the first half of the 1990s and there were many more financial institutions independent of banks. They were protected by the state, they were favored by the political and bureaucratic apparatus, and what were at first appreciated as elements of economic success, have since been denigrated in the name of corruption, inefficiency and lack of transparency. The image of the central bank, the Bank of Thailand, suffered from accusations of imprudence in its management of liberalization and of poor assessment of monetary risks. The country called on the International Monetary Fund for assistance, and in the meantime measures were taken to help establishments restructure their debts and financial institutions recapitalize (creation notably of the Asset Management Corporation): non-performing loans were reduced from about 50% to 10% by the beginning of 2002, total foreign debt decreased to 50% of the GDP.

Apart from the importance of its contribution to the GDP, the tertiary sector provides 70% of non-agricultural employment and 35% of employment overall. The four sub-sectors, selected for their significance in relation to employment as well as to the GDP, and defined by the Ministry of Labour and Social Welfare, do not lend themselves to any internal subdivisions and they do not all correspond to the categories used to constitute the GDP (**plate 51 Employment in four tertiary sub-sectors**). In order to give a better understanding of the phenomenon of urbanization, the maps combine the masses of employment with employment structure according to size of establishment, as defined by classes of employees. Since Bangkok accounts for such a large proportion of employment (60% on average), as a result of its exaggerated metropolitan functions, to represent such proportions accurately would make it difficult to produce a legible map covering the other provinces. For this reason Bangkok is not shown here.

In the period immediately after the crisis, the tertiary sector suffered a reduction in employment which it is difficult to evaluate due to the structural characteristics of the sector: importance of informal activities in some sub-sectors (trade, hotels and

restaurants, transport), scattering in a multitude of small enterprises, insertion in multi-activity. Some services (trade, street food vending) have absorbed workers laid off from industry or other tertiary sector activities that were particularly affected by the crisis (real estate, construction) and were put under restructuring (finance). Measures taken to recapitalize and settle debts have led to the closure of about sixty finance companies and changes have occurred in the control of banks and acquisition of holdings: the banking sector, despite greater participation by foreign banks, still remains a closed oligopolistic market. In the construction sector, although employment was severely affected by the collapse of the real estate sector and postponements of major infrastructure projects, there are now signs of recovery thanks to the upturn in the middle class residential market and completion work on unfinished buildings. Major retail distribution has asserted its position by the opening of supermarkets, large stores and shopping malls which are threatening the survival of small shops in urban centers: these have recently benefited from government aid to organize their supplying systems. The cash flow problems of national groups have led to increased stake-sharing with groups from abroad.

Due to its importance in the GDP (6%) and in employment, leisure and business tourism is fortunate in being the focus of attention by the state, which aims to make Thailand the heart of the Asian tourist industry. In 2002, it appointed a new ministry responsible for coordinating private and public operators, and for creating policies to take into account the increased regional competition (Vietnam, Indonesia, Malaysia) and the risks involved in the world tourist market. The Tourism Authority of Thailand continues to focus on promotional campaigns for customers abroad but which are also aimed at Thai nationals: leisure tourism within Thailand is booming, with Thais travelling not only to the same destinations as the international tourists, but also to other preferred destinations (**plate 52 Hotel trade**). Tour operators and public authorities are keen to develop the country's tourist image and to attract an international clientele with a wide variety of aspirations and tastes, so they are diversifying available attractions and opening up new destinations to help spread tourism throughout the entire country (**plate 53 Main tourist destinations**). In order to do this and to increase the value added from tourist activities by reaching out to a rich clientele, operators have no qualms about building luxury accommodation on sites that until now had the

protected status of national parks (Ko Chang close to Cambodia, see plate 8 Environment and natural resources).

The demand from tourism has helped to open up domestic air routes, and to extend international air routes for Bangkok and a few provincial airports. The capital is the major hub for air travel in Asia, and the crossroads for domestic passenger journeys whatever the mode of transport (**plate 54 Passenger traffic**). However, the very wide variety of modes of transport can in no way disguise either the radial configuration of the air, road and rail networks, or the predominance of the use of road transport for passenger journeys and the carriage of goods (**plate 55 Commodities traffic**). Rail use is limited, however, by the structure of the rail network; coastal shipping has brought activity to the ports on the Gulf of Thailand and the canals serve mainly a few provinces in the Central Plain: for all these modes of transport, Bangkok remains the focal point for the movement of goods and passengers. Inter-regional exchanges of goods (according to a regional division used by several public bodies) confirm that production like demand, both from industry and from consumers, has undergone a spatial diffusion right out to the peripheral regions, through some poles (**plate 56 Inter-regional trade**). The nature of these movements shows that they are not limited to traditional regional agricultural specializations.

The development of the very heterogeneous tertiary sector has led to very contrasting spatial configurations of activities and their value (**plate 57 Tertiary sector facilities and activities**). Alongside the aim of integrating some of the long marginalized peripheral regions and facilitating economic growth, the state has also had to cope with rapid urbanization: here too the appeals to the private sector have resulted in marked spatial differentiations in the provision of facilities. Some variables, processed analytically in chapter 3 The state and the construction of the territory, are incorporated into the principal component analysis.

The RANGE of SERVICES to the POPULATION

Street vendors on a Bangkok sidewalk



Photo Alain Vergnes

From small villages to large cities, small traders can be found, either ambulant or with a stall, selling a wide variety of products and providing a source of income for many people. Generally considered informal, these activities have absorbed many laid off workers, victims of the 1997 crisis. In the larger cities, some urban authorities are trying to limit their physical extension and frequency.

Bus station in Nakhon Ratchasima



Photo Alain Vergnes

Road transport predominates in the carriage of passengers and goods, thanks to the extensive road network. Public buses or buses run by private enterprises are widely used for inter-provincial journeys by those who cannot afford their own vehicle. The number of road accident victims is constantly on the increase.

The heterogeneity of the tertiary sector as a contributory factor to urban differentiation

The contribution of the tertiary sector to the Gross Domestic Product (GDP) remained stable over the period 1980-1996, at around 56%, due to an annual growth of 8%. The finance-insurance-real estate, transportation-communication, and construction sub-sectors recorded strong growth from 1989 (between 11% and 16% per year) and increased their contribution to the value added of the tertiary sector. Within the group made up of trade and transportation-communication, which was stable over this period, the pre-eminence of trade was eroded (from over 70% of the product of the sub-sector in 1980 to 65% in 1996) while transportation-communication consolidated its position. The contribution of "services" weakened between 1990 and 1998: almost half of the value added of this sub-sector derives from hotels-restaurants, 25% from education, 10% from health services. The sub-sector labeled "others" followed the same trend, but with a specific internal modification: from 1995, the value added of energy and water supply reached the same level as that of public administration and ownership of dwellings. From 1,700 billion Baht in 1996, the value of the tertiary sector fell to 1,500 billion in 2000 as a result of the severe recession (-20% per year after 1996) in the construction and the finance-insurance-real estate activities at the heart of the 1997 crisis.

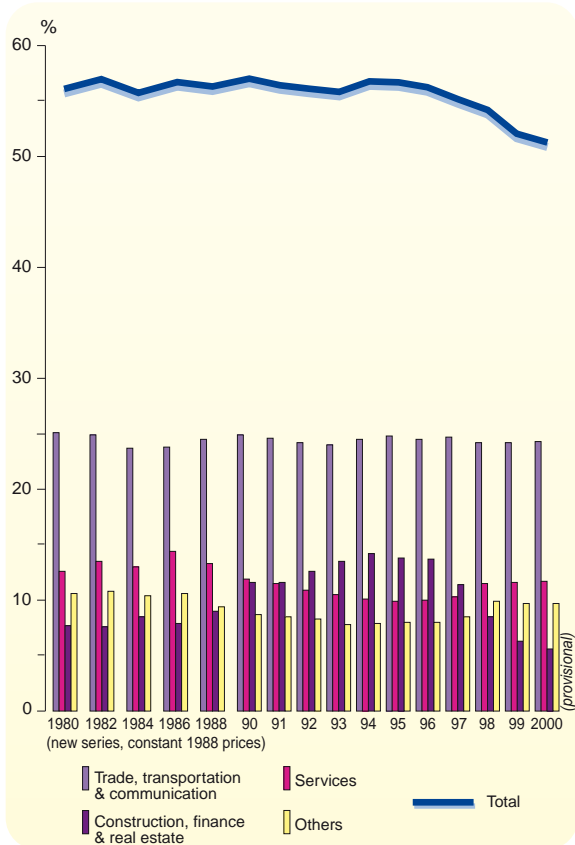
Bangkok, where almost 70% of the Gross Provincial Product (GPP) derives from the tertiary sector, monopolizes almost 50% of the national product of this sector. In the surrounding provinces (except Nonthaburi) and as far as Ayutthaya-Saraburi to the north and the Eastern Seaboard, the tertiary sector contributes less than 40% to the provincial value added for products that represent at most 5% of that in Bangkok (Samut Prakan and Chon Buri): here industry is the primary source of value added, just as in Lamphun in the North. Everywhere else, the tertiary sector is the predominant contributor to the provincial product, with the exception of the western provinces of the peninsula and Pattani. Higher values produced and lower contributions distinguish certain regional poles (Nakhon Ratchasima, Khon Kaen, Songkhla) whereas in the North, where the tertiary product is just as high, Chiang Mai registers a high rate of participation in the GPP by the tertiary sector, as a result of tourism-associated activities.

The spatial distribution of the product of the tertiary sector results from a combination of the value added of activities which are extremely het-

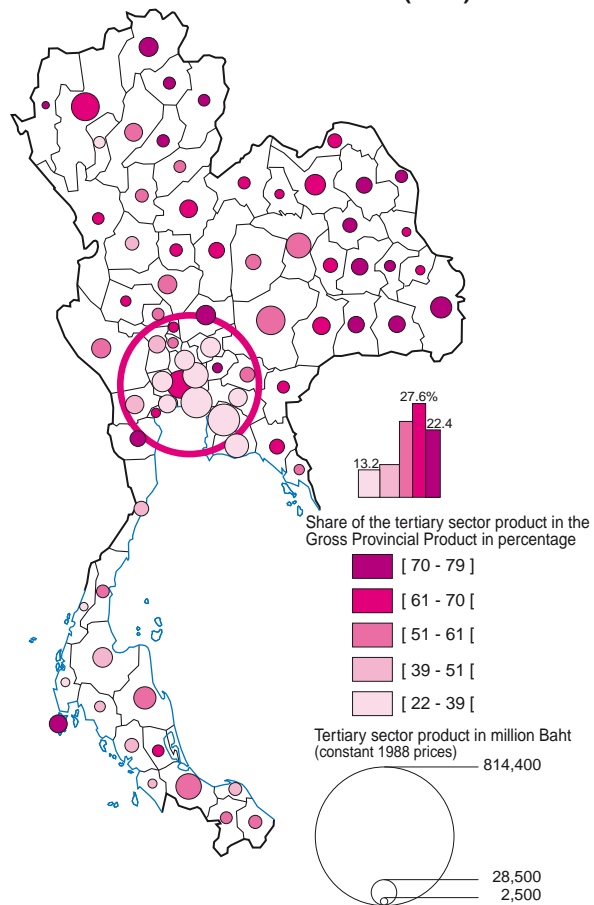
erogeneous within the sector and which provincial data does not always allow us to differentiate (especially "services"). The principal component analysis enables us to define 8 classes of spatial structures of the product. The first three classes are characterized by a concentration of activities sensitive to the demographic and economic size of the urban market and to the internationalization of exchanges, and by a relative weight of commercial activities and public administration which is lower than average. They are limited to the central provinces and part of the Eastern Seaboard (except Chon Buri). At the heart of this area, Bangkok and some of the neighboring or more distant provinces, are differentiated by the relative importance in class 1 of transportation-communication, finance-insurance-real estate, energy and water supply. The contribution of this last sub-sector increases in the surrounding area and this is accompanied by a relative weakening of the first two in class 2. This trend continues in Pathum Thani and Nonthaburi (class 3) which register a large contribution of construction.

Class 4 relates specifically to the provinces with a pole where urban functions are carried out on a regional scale: the contribution to the provincial product of transportation-communication enterprises, financial and real estate institutions and especially "services" is of major importance. As well as the educational and health services that are considerable everywhere, there is the probable importance of tourism-associated activities in Chiang Mai and Phuket, services to enterprises in Chon Buri. "Services" play an even more decisive role in the three provinces that make up class 5. Classes 6 and 7 are similar as they both include commercial activities. However, the provinces in class 6, bordering the Bangkok metropolitan region and in the peninsula, show a contribution of public administration which is less than in the very rural provinces of class 7. The relative weight of this sub-sector is as great in class 8, but is less than that of construction: in these provinces in the North and the North-East, activities linked with transportation-communication, and finance-insurance-real estate are clearly less significant.

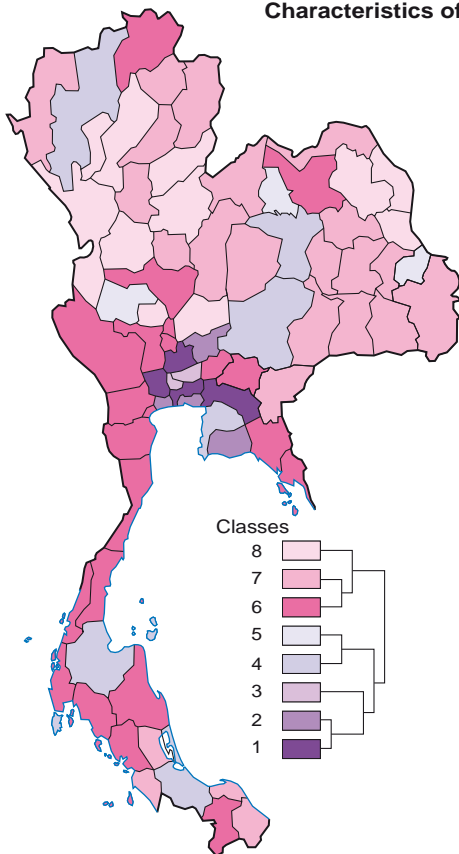
Share of tertiary sector product in the Gross Domestic Product (1980-2000)



Tertiary sector product and Gross Provincial Product (1996)



Characteristics of the tertiary product (1996)



Factors	Classes	1	2	3	4	5	6	7	8
Wholesale & retail trade		-	--	---	--	--	+	+	=
Transportation & communication		++	+	=	+	--	=	=	-
Finance, insurance & real estate		++	+	=	+	--	=	-	-
Services		=	-	-	++	+++	=	=	=
Public administration & defence		--	--	---	-	=	=	+	+
Construction		--	--	+++	=	+	-	=	++
Electricity, gas & water supply		++	+++	+	=	-	=	=	=
Ownership of dwellings		-	--	-	--	=	=	+	=

Sources : Bank of Thailand, 2002
NESDB, 1999

Urban functions shown by size of establishments in the tertiary sector

The classes of establishments have been defined according to the profile of each sub-sector. Trade-restaurants-hotels (hereafter referred to as “trade”) and construction are characterized by the presence of large establishments from class 2 onwards, whereas for transport-storage-communication (“transport”) and finance-insurance-real estate-services to enterprises (“finance”) there is a very clear contrast between the first three classes and the last two. Bangkok has not been shown for reasons of legibility. In employment terms the capital represents 50% for “trade”, 40% for construction, 75% for “finance” and 65% for “transport”.

The distribution of employment throughout the country reveals different configurations. “Trade” and “transport” represent two extremes, with the former having a less marked inter-provincial imbalance due to its internal heterogeneity and to vigorous commercial activity across the entire country. In classes 4 and 5 in the “trade” sub-sector we see provinces with urban centers on a regional scale (see plate 16 Municipalities), cumulating commercial wholesale and retail functions, while some also have a large part of their activity associated with tourism (Chiang Mai, Chiang Rai, Phitsanulok, Chon Buri, Phuket; see also plate 52 Hotel trade). Around Bangkok (class 4) and in the largest towns in the peripheral regions, the evolution that has occurred in retail distribution, from the popularity of supermarkets and shopping malls, has brought the structure of employment towards medium-sized and large establishments. Some provinces, where the urban centers are somewhat dependent on primary produce markets, can be differentiated from their neighbors as they include enterprises of over 299 employees (Nakhon Sawan, Buri Ram, Surin, Ranong, Trang). Everywhere else, small enterprises predominate (class 1) with amounts of employment that can exceed those of the larger urban centers (Kanchanaburi, Roi Et, Sakon Nakhon). Petty retail trade, which can be carried out all year round at the place of residence, traditionally plays an important role in the multi-activity of the rural population.

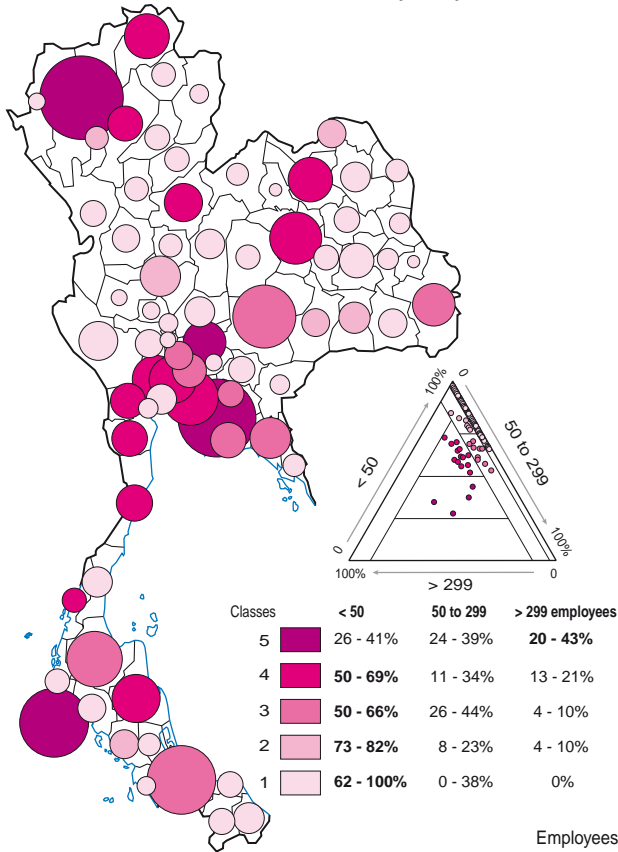
The masses and structure of employment in the construction sub-sector bring to the fore (class 5) the Eastern Seaboard, some central provinces and Phuket where large enterprises can be found in major infrastructure or tourism projects. It is in this sub-sector that the capital has the smallest share (class 5). Classes 3 and 4, which are opposite for the share of small and medium-sized enterprises, highlight the

coastal axis along the eastern side of the peninsula, the North-East corridor, Chiang Mai and Lampang, some provinces to the north and west of Bangkok where residential housing for the middle classes represents a large market. The improvements in housing, right down to village level, made possible as a result of increased incomes, generate employment in small enterprises which, during the agricultural off season, represents an income supplement.

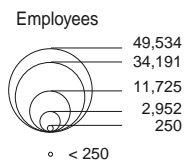
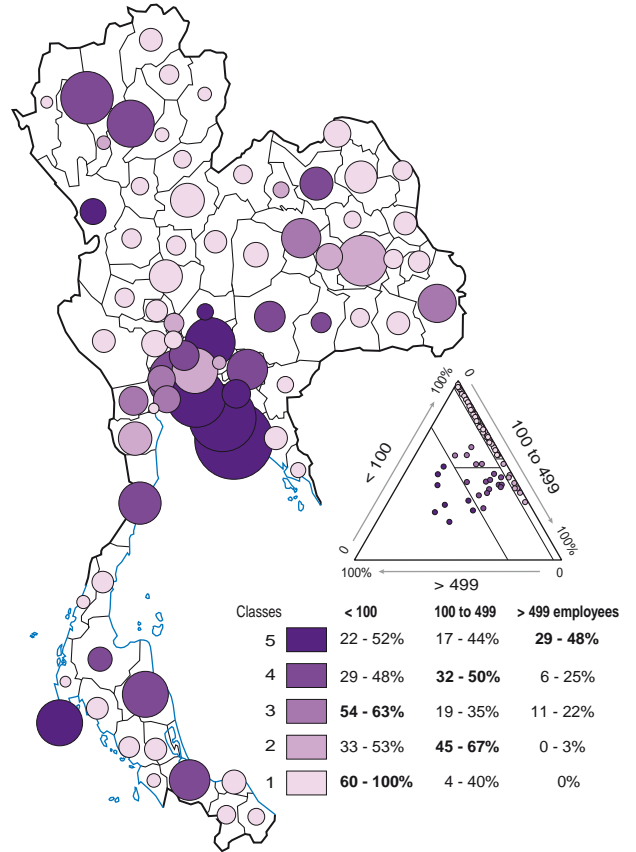
The “finance” sub-sector reveals a concentration which appears relative for employment (30% without Bangkok) but which is high for the largest enterprises in four provinces of the metropolitan region and Chon Buri. In the different segments of the sub-sector, the role of the capital (where half of employment is in establishments of more than 299 employees) has not been compromised by the scattering of banks throughout the entire country or by the development of services to enterprises in some of the adjoining provinces, the Eastern Seaboard or the peripheral regions. With the exception of Phuket (importance of tourism), these are characterized either by a larger proportion of small enterprises (Chiang Mai, Phitsanulok, Ayutthaya, Rayong, Songkhla in class 4) or by small enterprises exclusively (Nakhon Ratchasima, Nakhon Sawan and the western provinces of the capital in class 3).

The major imbalance between provinces in the “transport” sub-sector can be explained by the fact that employment is concentrated in two provinces and by the proportion of the largest establishments (40% without Bangkok in Nonthaburi and Samut Prakan and up to 95% in enterprises of over 299 employees). The capital’s share confirms its supremacy in domestic and international communications. Certain poles can be clearly seen, also belonging to class 5, but ranking far behind for the amount of employment in the peripheral regions (Khon Kaen, Chiang Mai, Nakhon Sawan, Songkhla), and the Bangkok metropolitan region (Pathum Thani, Saraburi), while others in the same regions show a decrease in large enterprises in favor of small ones (Nakhon Ratchasima, Nakhon Pathom, Ayutthaya, Prachuap Khiri Khan, Chumphon in class 4). Everywhere else, small establishments predominate.

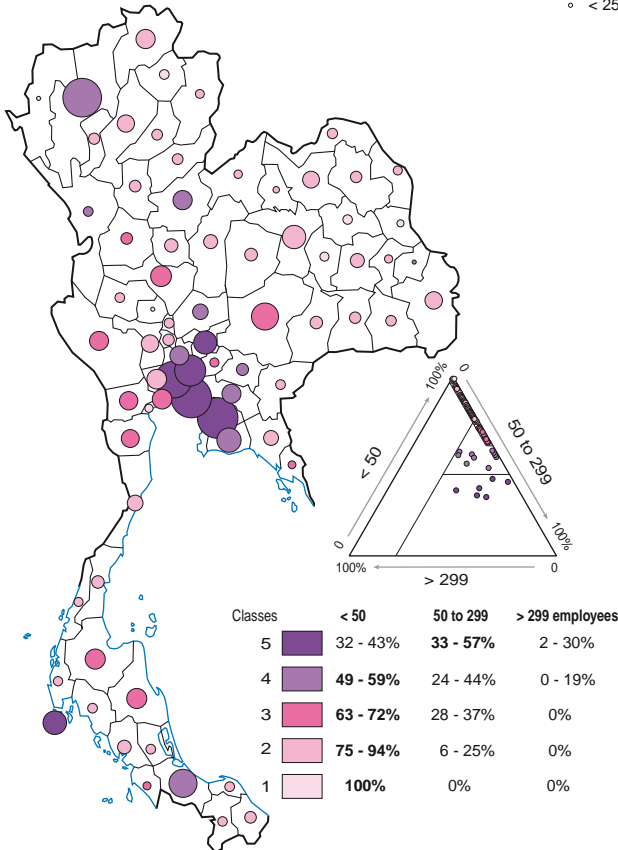
Wholesale and retail trade, restaurants and hotels (1996)



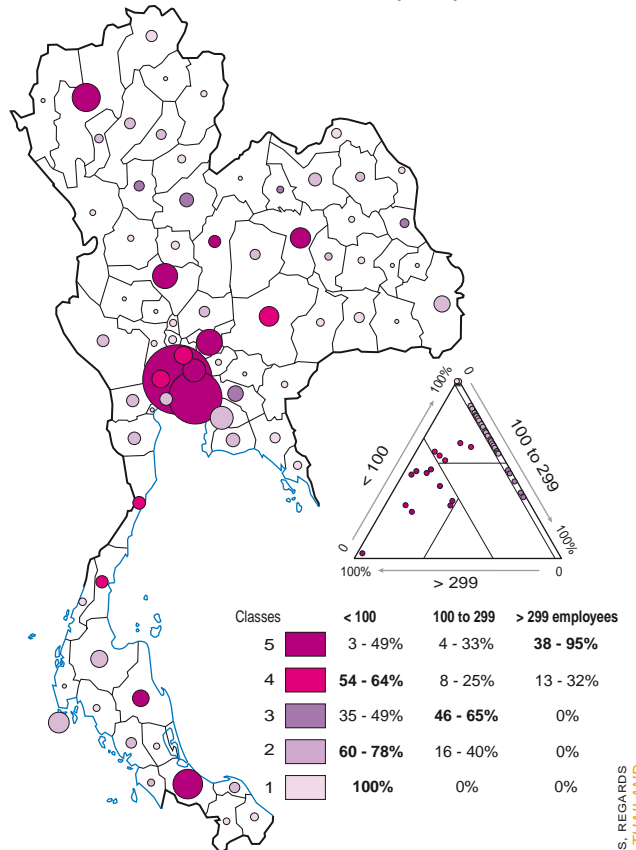
Construction (1996)



Finance, insurance, real estate and business services (1996)



Transport, storage and communication (1996)



Source : Ministry of Labour and Social Welfare, 1997

The growth of domestic and foreign tourism

Since the 1970s, tourism, whether for business, conferences or pleasure, has played a major role in Thailand's economic growth (see also plate 2 Foreign and Thai travelers), with international tourism providing the country's main supply of foreign currency, and generating a great deal of employment, either directly or indirectly (in the service sector, but also in handicrafts). The tourism industry has been massively supported by the Tourism Authority of Thailand (TAT), and also by the Board of Investment (BOI), which provides both national and foreign investment incentives in the tourism sector, especially in the hotel industry, and today this sector represents 6% of the country's Gross Domestic Product.

Thailand has become a major destination for mass international tourism, thus also stimulating domestic tourism, as the country's economy and infrastructure provision improve. The Thais have traditionally been very mobile, for economic and family reasons, but also to attend the many Buddhist, Chinese or Animist festivals (*songkran*, *loi kratong*) or to visit religious shrines (see also plate 11 Religions). To these have now been added new types of mobility, tourism for pleasure, either in trips abroad or cultural visits and resort holidays in Thailand itself, following the trends of international tourism. Such trips are now much more accessible to the Thais as their standard of living is higher than before and communication has improved considerably. The increased turnover from the hotel industry in some provinces in the North-East (Nakhon Ratchasima, Khon Kaen, Nong Khai, Ubon Ratchathani), where domestic tourism predominates, is a clear sign of this trend.

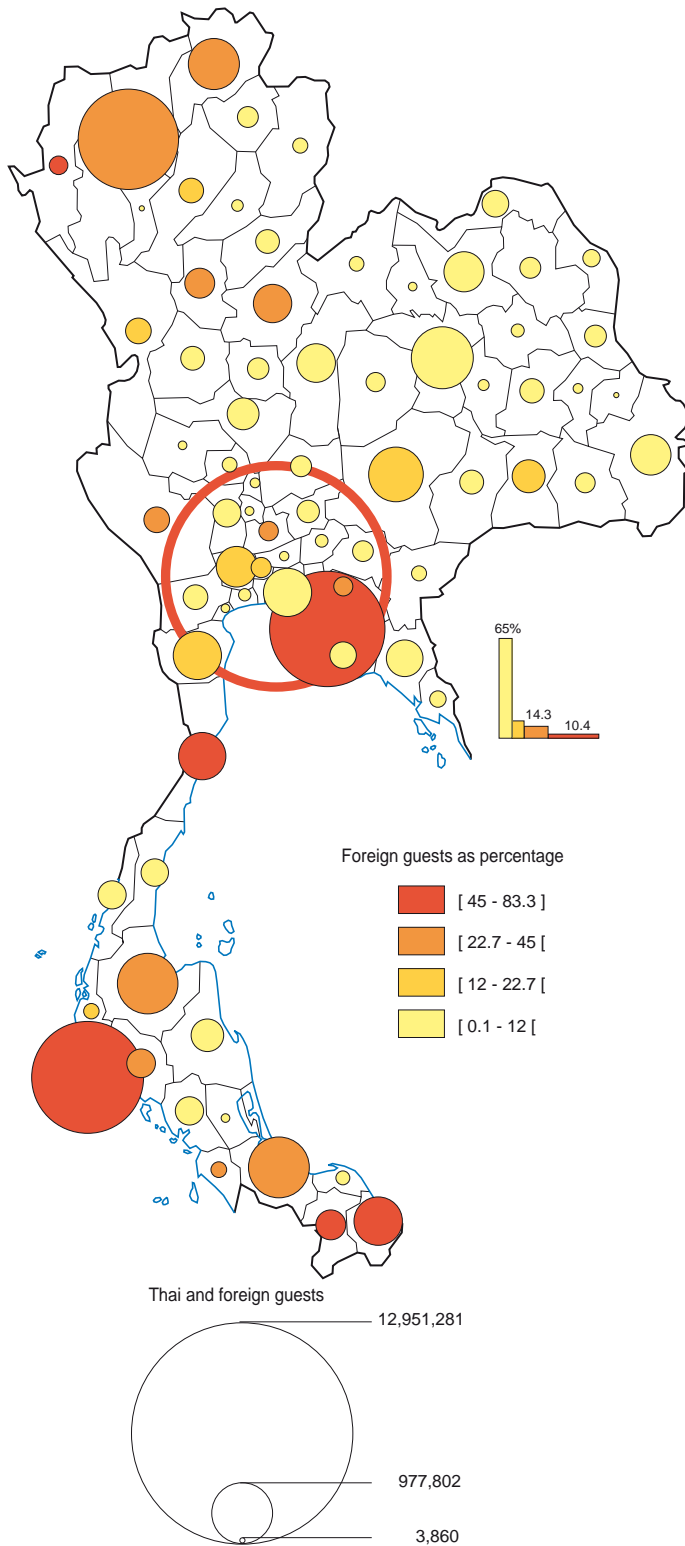
International tourism is still the driving force behind this sector. As well as the foreign currency he brings in, the foreign tourist also usually spends more than the Thai tourist. Moreover, since the end of the 1970s, the increase in tourism revenue has exceeded the increase in numbers of visitors entering the country, due to the wider selection of tourist destinations now offered and the increase in business travel and conference facilities, which generate considerably more income.

Through its widening appeal and diversification, international tourism encourages the development of new sites and promotes investment in the hotel sector and the development of communication

infrastructure and services. Today, tourism involves almost the entire country, even the North-East, which until now had been somewhat left behind; coverage varies in the degree and type of facility provided, of course, but the tendency is generally to play down the country's authentic and exotic features, as presented in the tourist brochures of the 1970s and 1980s, in favor of more elaborate and sophisticated facilities and activities (historic and archeological sites, natural parks). The result is that Thailand has now become the gateway to newly emerging and more "authentic" neighboring tourist regions, such as Yunnan, the Shan plateau in Myanmar, Laos, now much more accessible since the construction of the Friendship Bridge in 1994, and Cambodia. Direct air routes link the Asian capitals and tourist centers to Bangkok and also to several Thai provincial centers.

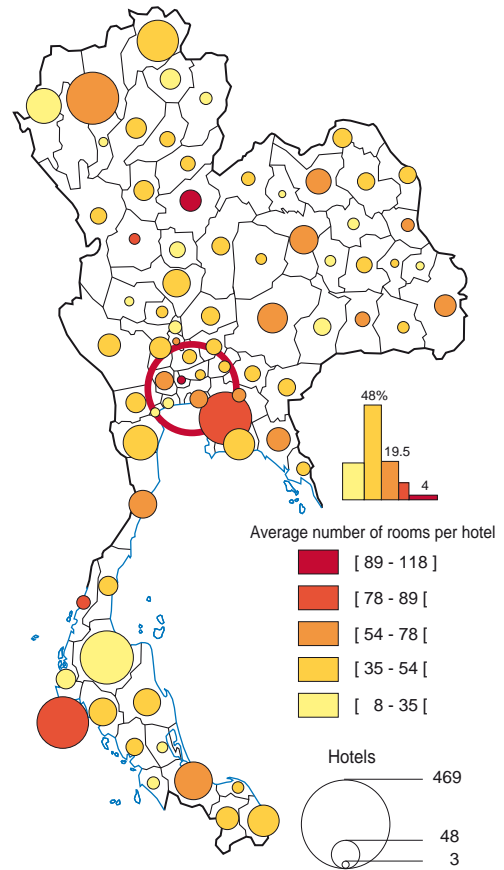
In 1996, foreigners represented 45% of hotel room occupancy. Numbers are considerably greater in certain target destinations, promoted by the professionals of the tourism industry, where the income from hotels is also highest. Bangkok first of all, principal point of access for international tourists, practically all of whom arrive by air, with the exception of the Malaysians; next the coastal resorts in the east and the south (Chon Buri, Prachuap Khiri Khan, Phuket, Narathiwat); then the cultural and eco-tourism destinations in the north. With the exception of the northern part of the Central Plain and the North-East corridor linking Nakhon Ratchasima and Nong Khai, a domestic tourist destination, the high proportion of foreigners correlates positively with visitor numbers. In the longest established tourist destinations for foreigners, major international hotels, developed by Thai chains (Amtel, Dusit Thani, Imperial, Central) or foreign chains (Novotel, Sheraton, Ramada), have gradually supplanted the smaller establishments owned by local entrepreneurs. Those destinations that have more recently been opened up to international tourism, however, such as the island of Ko Samui in Surat Thani, or Chiang Rai and Mae Hong Son to the north, have not yet completed this process of development and small hotels still predominate here. Once again, the North-East corridor is in this respect atypical, as it does have some major hotels, though these are still few in number, and cater mainly for Thai visitors.

Hotel guests (1996)

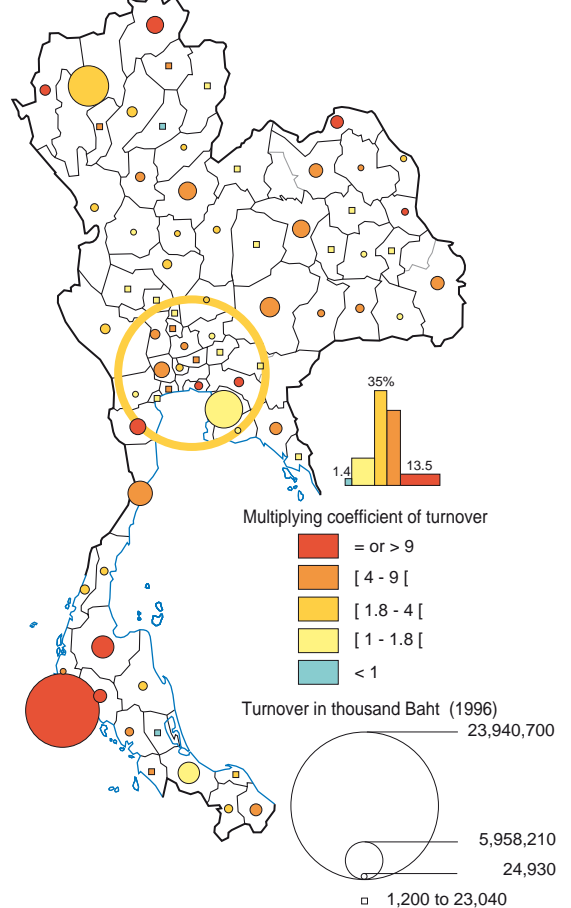


Sources : NSO, 1986, 1996

Hotel capacity (1996)



Hotel turnover in 1996 and evolution (1986-1996)



Tourism extends through the entire country

For a long time, tourism was confined to a line running from north to south, focusing on Bangkok, and based on a limited number of destinations, Chiang Mai, Bangkok, Pattaya, Phuket; today it covers the entire country, from the main points of access provided by international air lines.

Bangkok, at the center, remains the main entry point for the international tourist and is also an important destination for domestic tourism (see plate 54 Passenger traffic). It is also the regional hub for air travel to continental South-East Asia, giving access to neighboring countries. Major efforts have been made to improve the tourist image of the city (about 30 % of its budget) and extend the average stay of visitors to the capital, which is currently less than 2 days. Close to Bangkok are the coastal resorts of the Eastern Seaboard, limited for a long time just to Pattaya, but now they are more numerous. Pattaya is situated close to the former air base at U-Tapao and quickly developed in the 1960s into a "Rest and Recreation" station for American soldiers, from where the image of Thailand as a center for sex tourism. This development happened far too quickly, with no thought given to environmental planning and this, combined with the town's somewhat dubious reputation (gambling, prostitution, crime), did not help its image. It has been on the decline since the end of the 1980s as a result of competition from other sunshine destinations along this coast or on the neighboring islands from Chon Buri to the Cambodian border. There are also holiday resorts along the other coast of the Gulf of Thailand, such as Hua Hin, an old resort, fashionable with the elite in the 1960s, or Cha-am, a more recent development, but these destinations are more popular with the Thais.

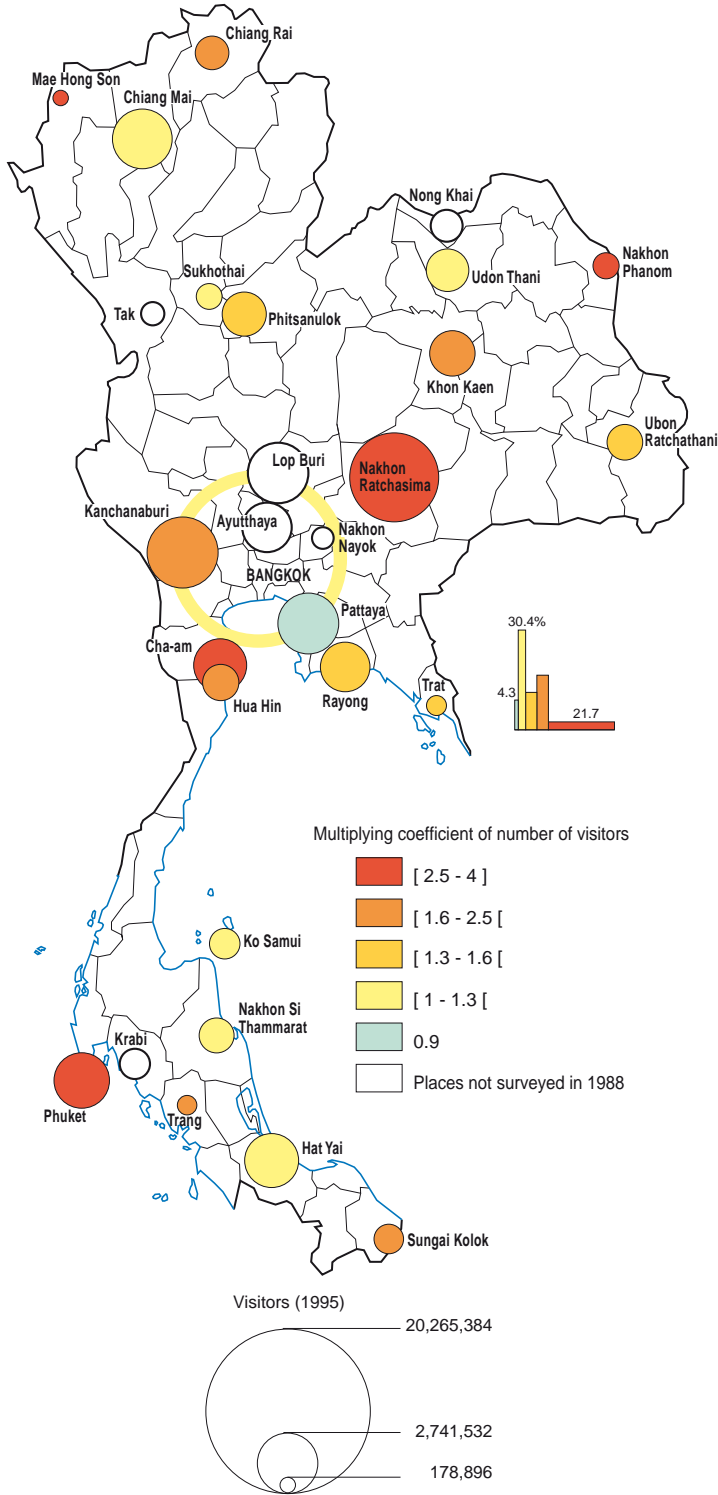
Another area where tourist resorts have become established is the island of Phuket, on the peninsula, which has enjoyed a remarkable tourist boom since the 1970s with a gradual "colonization" of the island by the major hotel chains, offering a range of services and activities which are more and more varied and sophisticated. Tourism has spread from Phuket towards neighboring destinations, which in the past were more protected, like the islands off Krabi (Ko Phi Phi) and as far as those off the coast at Satun (Ko Tarutao), which mark the southern limit of the expansion of leisure tourism in Thailand. On the east coast of the peninsula, a similar process has occurred, although to a lesser degree, marked by the spread of tourism from Ko Samui into the adjoining

islands where expansion has been limited due to the protected marine reserves located there. This surge in tourism into the south of the country has met up with the influx of tourists from Malaysia, stopping at the frontier towns of Sungai Kolok or Betong further to the west, with the town of Hat Yai and its gaming houses being particularly popular.

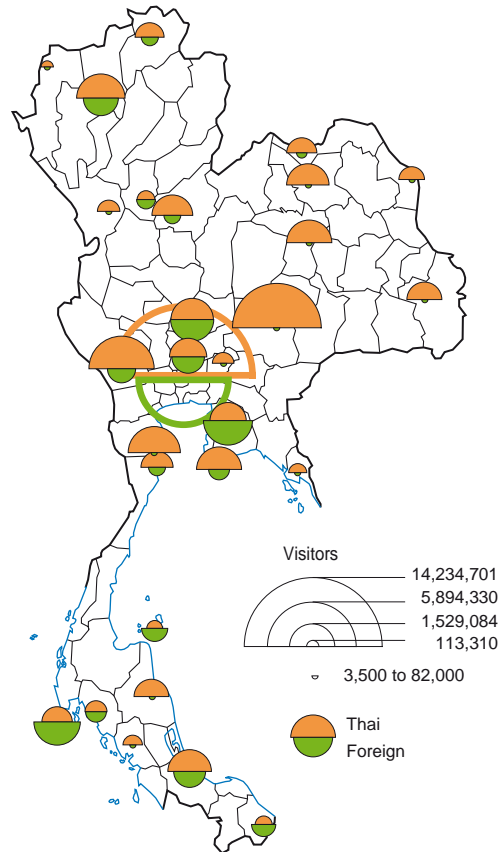
In the north, Chiang Mai is a destination based on culture and handicrafts, the starting place for trekking holidays into the mountains and to the minority populations who live there (see plate 10 Main ethnolinguistic groups). The city provides eco-tourism, sharing the influx of foreign tourists, and of Thais too, with other similar northern destinations, such as Chiang Rai, Mae Hong Son and to a lesser extent Tak. Linking these focal points on the north-south axis, are new destinations, some more cultural and historic or promoting "countryside" tourism, to complete the tourist landscape and also bring in many Thai visitors. Sukhothai and Ayutthaya, ancient capitals, are a good example of this. West of Bangkok, Kanchanaburi is the starting point for excursions to the bridge on the river Kwai and beyond this, the Three Pagodas Pass into Myanmar. Finally, the North-East, with its many Khmer temples, has also benefited from attempts on the part of the Tourist Authority of Thailand (TAT) to disperse tourism throughout the country, with the promotion of festivals and countryside tourism in the national parks (see plate 8 Environment and natural resources). The axis linking the main towns of the North-East appears to be developing apace, catering mainly for domestic leisure tourism and conferences (the World Tech fair in 1995 brought a 3-fold increase in visitors to Nakhon Ratchasima): hotel capacity has almost reached a state of saturation.

The list of major tourist destinations will surely expand in the future, as long as new initiatives emerge and promotion by the TAT of Thailand as a tourist destination becomes more focused. Tourism already extends to the country's borders in all directions, so cooperation with neighboring countries is already established, whether through institutions or in the form of Thai investments in the hotel and tourism sectors.

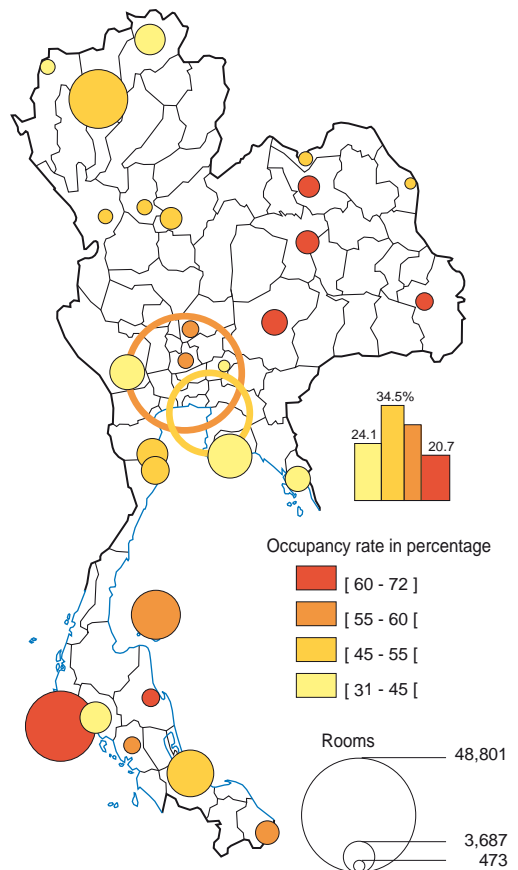
Visitors to tourist destinations surveyed by the TAT in 1995 and evolution (1988-1995)



Visitors' origin (1995)



Hotel capacity (1995)



Sources : TAT, [circa 1889, 1996]

Rail and air services radiate from the center

The road has overtaken all other modes of passenger transport: rail accounts for about 5% and air about 2% of the total, all distances combined. Facilitated by the social prestige afforded those who own a vehicle and boosted by the improvements in the standard of living of part of the population, as well as meeting a real need, private vehicle ownership rose by 16% per year between 1991 and 1997, to reach almost 5 million cars and 12 million motorcycles. Statistics relating to inter-provincial journeys by private car are not available. Although the majority of people still use public transport, its importance is steadily declining despite the modernization of privately owned buses which have increased in number almost three times faster than those in the sector as a whole. Commuters from the Bangkok suburbs, or neighboring provinces where there are navigable waterways, use the public boat service, which plays an important role. Nevertheless, the traffic jams at certain points in the capital, which accounts for more than 40% of the cars in the entire country, are extreme at certain times of day.

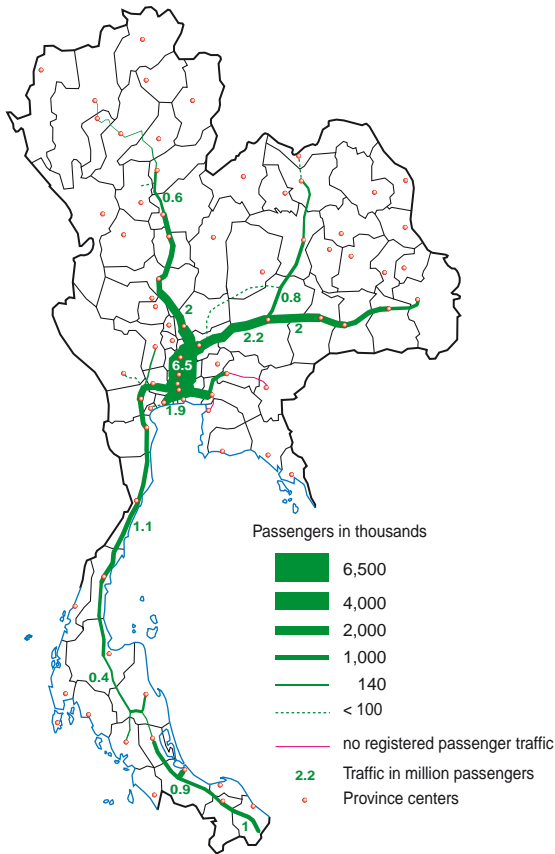
The framework of the railway network is very basic: the North-East branch is the only one to divide at Nakhon Ratchasima, with greater passenger numbers on the service to Ubon Ratchathani. Other lines branch out either from Bangkok (Prachin Buri with 900,000 passengers and slightly fewer for Suphan Buri) or from branch lines in the peripheral regions where only lines in the South, which are very short, have over 100,000 passengers. Further from Bangkok, the three major branch lines gradually thin out due to the decrease in inter-province relations, the exception being the line to the South: passenger numbers are increasing from Phatthalung to the frontier with Malaysia, in particular because this part of the line is used by tourists. Traffic within the provinces, which is added to journeys between the province centers, is proportionally greater in the South and on the line which runs through the southern part of the North-East region. The use of the train for local journeys is also reflected in the less regular decrease in total traffic. With 45% of passengers, the traffic core is concentrated between Ayutthaya and Bangkok due to its central position in the rail network but also because of the 12 million commuters per year who travel to and from Bangkok.

About 400 km around Bangkok, beyond Nakhon Sawan, Nakhon Ratchasima and Prachuap Khiri Khan, the train cannot compete with the road or

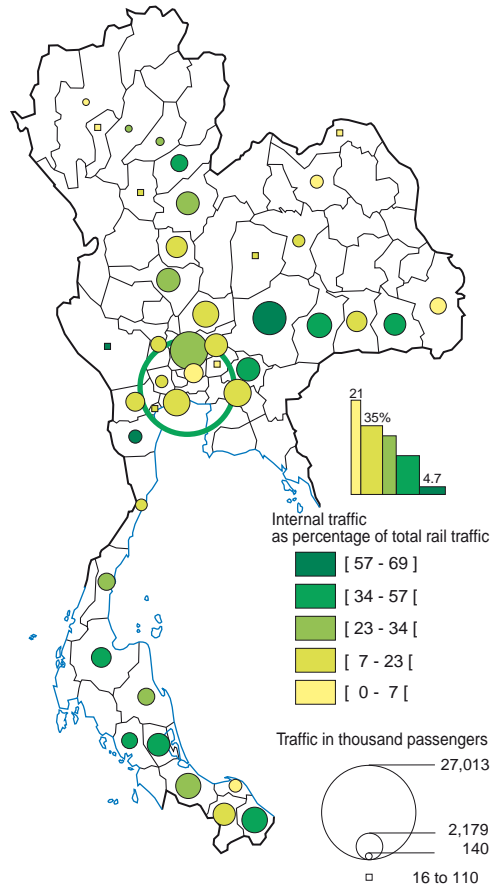
the plane in providing services to the capital for the well-off social classes. In the South and the North, the plane is beginning to play a role in regional organization, around the main airports at Chiang Mai and Phuket, with impetus from the mainly international tourism. Apart from these as yet sketchy regional air sub-networks and the Phuket-Hat Yai or the Phuket-Chiang Mai tourist services, the map of domestic air traffic consists solely of the routes spreading out from Bangkok. Several inter-provincial services have disappeared since the middle of the 1970s in the North and the North-East as the road network has gradually been improved.

Chiang Mai, Phuket and, to a lesser extent, Hat Yai are distinguished from the purely domestic airports by their higher levels of traffic. These three international provincial airports (Chiang Rai has been open to international traffic only since 2001 and U-Tapao operates only charter flights) have each a particular profile. International traffic is on a smaller scale than internal traffic, and more so in Chiang Mai than in Hat Yai. Difference is also due to the different proportion of flights to South-East Asia (60% and 88% respectively) and specific services. Whereas Chiang Mai airport provides services to Myanmar (14%) and North-East Asia (34%), Hat Yai looks mainly towards Singapore and Malaysia (87%) with a few services to the Middle East and South Asia. The variety of countries served and the relative size of the traffic flow with Europe, South-East Asia, Japan-Korea and other countries in North-East Asia give Phuket airport a similar character to Bangkok, although international flights represent only one third of total traffic in Phuket compared with three quarters in the capital. Bangkok airport receives more than 90% of all the country's international passengers: since 1974 it has been one of the largest hubs for air travel in the world and one of the major nerve centers of Eastern Asia. Its near saturation, for passengers and freight alike, despite several expansion phases, will inevitably result in the opening of a second metropolitan airport under construction in Samut Prakan province: Nong Ngu Hao airport is planned to open in 2005.

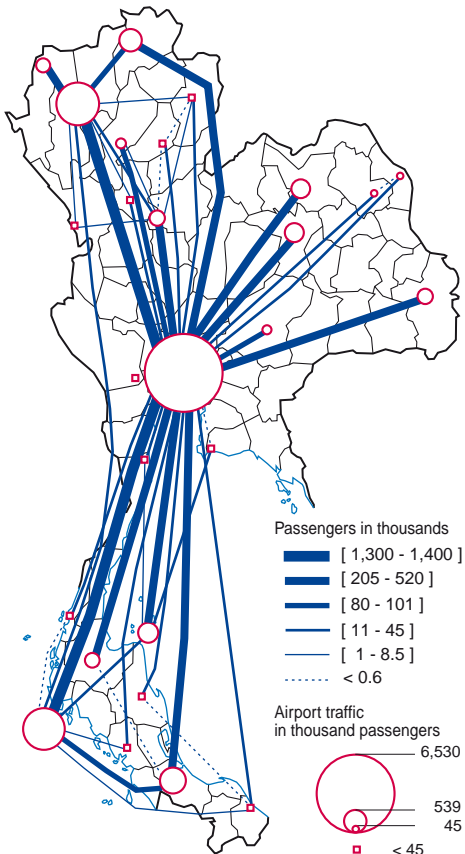
Inter-provincial rail traffic (1996)



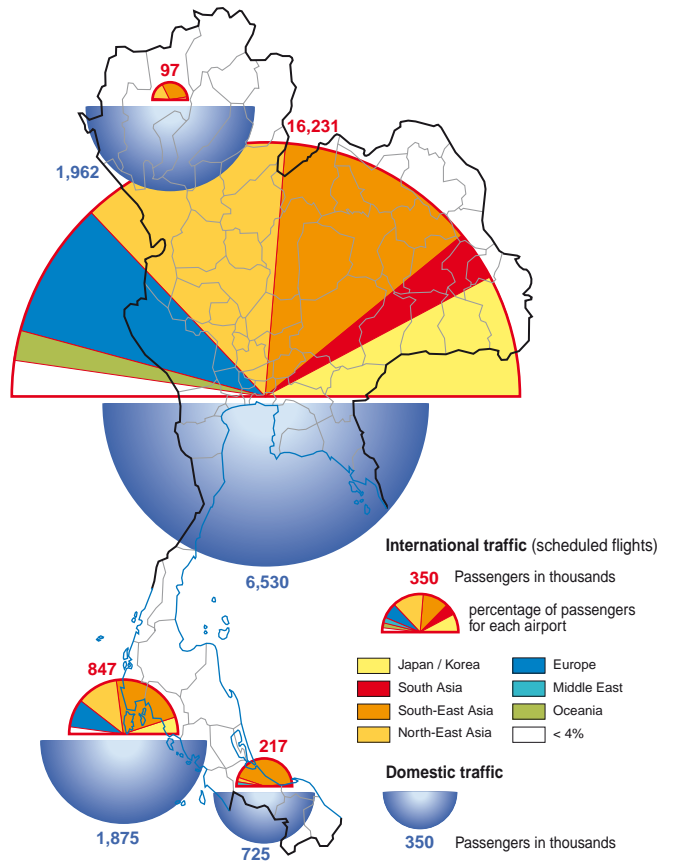
Rail traffic within the provinces (1996)



Domestic air traffic (1996)



International air traffic (1996)



Sources : Ministry of Transport and Communications, 1998a, 1998b

The predominance of road transport in the movement of goods

Because the country has an extensive road network, and because of the low cost and flexibility of road transport, this is the preferred mode for transporting just over 90% of the 470 million tons of goods carried between the province centers with a fleet of heavy goods vehicles that grew by 10% per year between 1991 and 1997. The canals, the traditional way of communication in the 18th and 19th centuries when almost all exports derived from the Central Plain, now contribute only 4% of the total, coastal shipping 2%, and rail also 2%. The movement of petroleum products by pipeline for industry has increased since 1994 (1%) while air freight remains very limited. Most coastal shipping involves Bangkok, where there is a major imbalance between the volumes going in (more than 17 million tons) and those going out (less than 1 million): the flow of goods from Chon Buri, crushing in scale, and from Rayong consists mainly of petroleum products. Inland waterway transportation, where the volumes of traffic are recorded only for the Central Plain, the main area concerned, carries heavy products (sand, gravel) over short distances: 90% of tonnage are carried within the provinces and accounts for the low level of this mode of transport in inter-provincial movement.

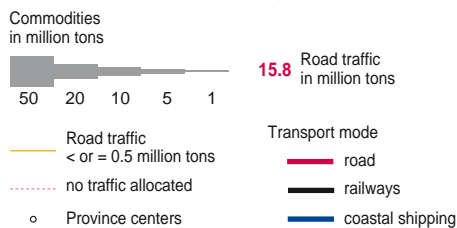
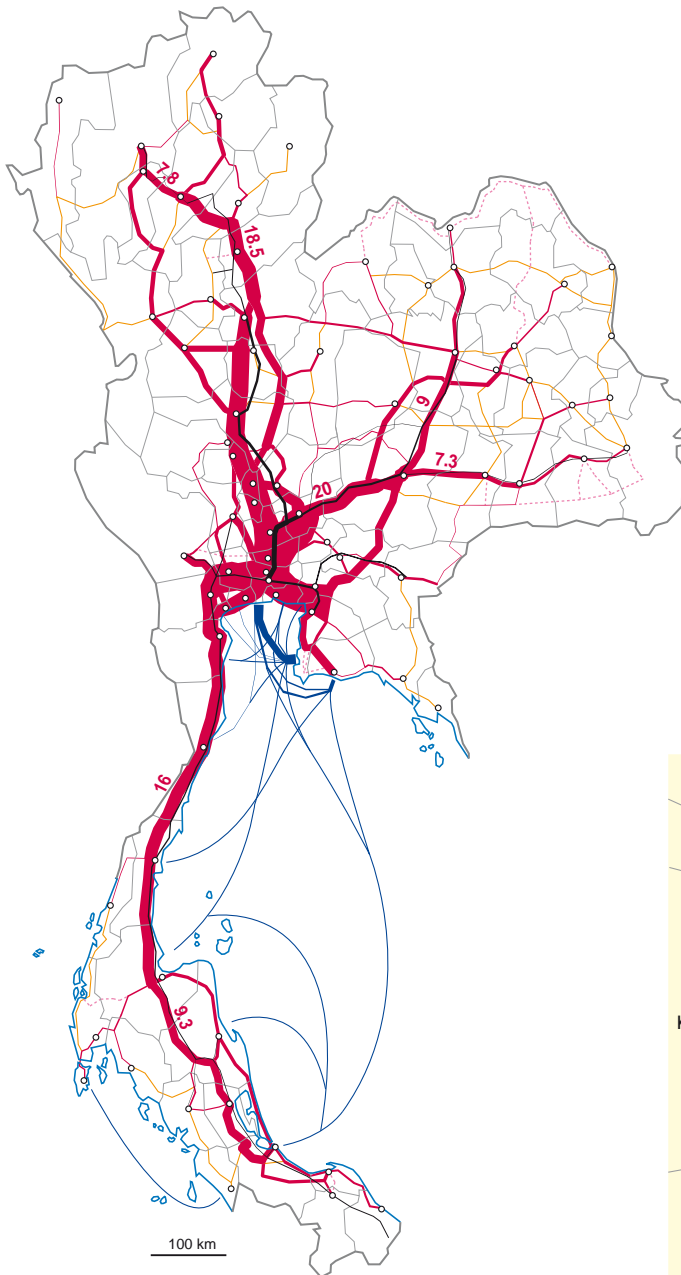
Produced from flow matrices between the province centers, the map showing goods traffic clearly highlights the scale of the flow of goods and the comparative position of the focus points, but nevertheless it does not give an exact picture of the use made of the network. Firstly, internal traffic in the provinces is not considered and secondly, as we do not know the actual itineraries taken by the road transport companies, the method of measurement consisted of adding the flow on the sections of road network which constitute the shortest route, though other criteria will enter into the equation when drivers actually decide on their route. So it is probable that, because of the improvements carried out on the section of highway between Lampang and Nakhon Sawan via Kamphaeng Phet and Tak, a proportion of traffic will be drawn away from the other two branches.

The general shape of north-south traffic spreads out in a tentacle formation from the delta, though direct road traffic between Chon Buri and Nakhon Ratchasima disrupts this pattern to some extent. Volumes carried on cross-country routes, such as those between the North and the North-East, are reduced and the major imbalance between the two sides of the peninsula reflects their demographic and

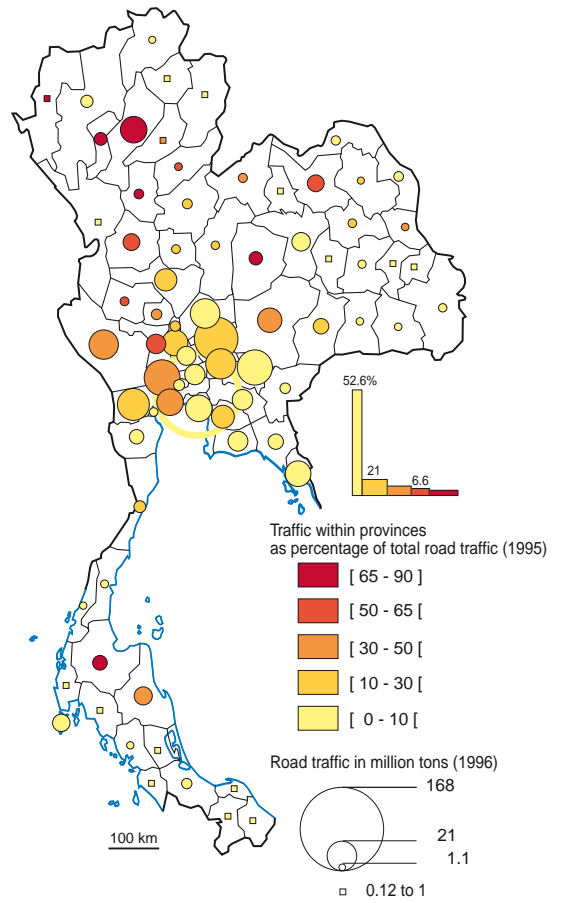
industrial dichotomy. The pressure on the road infrastructure within the Ratchaburi-Saraburi-Chon Buri triangle is extreme, given the density of traffic and the nature of the goods being transported. Unending streams of overloaded trucks transporting very heavy goods such as 30 million tons of sand and gravel into Bangkok, are sufficient in themselves to account for the massive imbalance between the flow of goods into and out of the Bangkok Metropolitan Region (BMR). The scale of road traffic between Bangkok and Ayutthaya is also due to the 12 million tons of rice imported by the BMR, between Bangkok and Chon Buri-Rayong, to the 9 million tons of imported petroleum products and an equivalent amount of exported waste material. The flow of trucks entering and leaving the BMR carries more than 20% of total national traffic. The provinces of Ratchaburi, Ayutthaya, Saraburi, Chachoengsao and Chon Buri also have to cope with large amounts of traffic on the major roads linking them with the BMR: when combined with traffic movement within the BMR, this makes up 95% of total national traffic. This expansion in the road traffic network is an indicator of how production activities have spread away from the BMR and, in the case of Chon Buri, the transport of large amounts of goods exported to the international market since 1992-1993 from the deep-water ports on the Eastern Seaboard, especially Laem Chabang.

More than 150 km from Bangkok, the northern branch carries the heaviest annual road traffic load, due mainly to the transport of coal from the mines in the North to the cement works in Saraburi. The road in the South carries lorries laden with wood and in the North-East, cassava and rice. On average, one third of goods traffic by road is within the provinces and over fairly short distances. Road transport within the provinces, which is not recorded for the BMR, has to be added to inter-provincial traffic in order to assess road use. The movement of proportionally large volumes of goods in the total traffic contained within the province indicates the proximity of major plants for the processing of raw materials: sugar mills in Kanchanaburi, Chaiyaphum and Udon Thani, for example, rubber processing plants in Surat Thani and coal in Lampang.

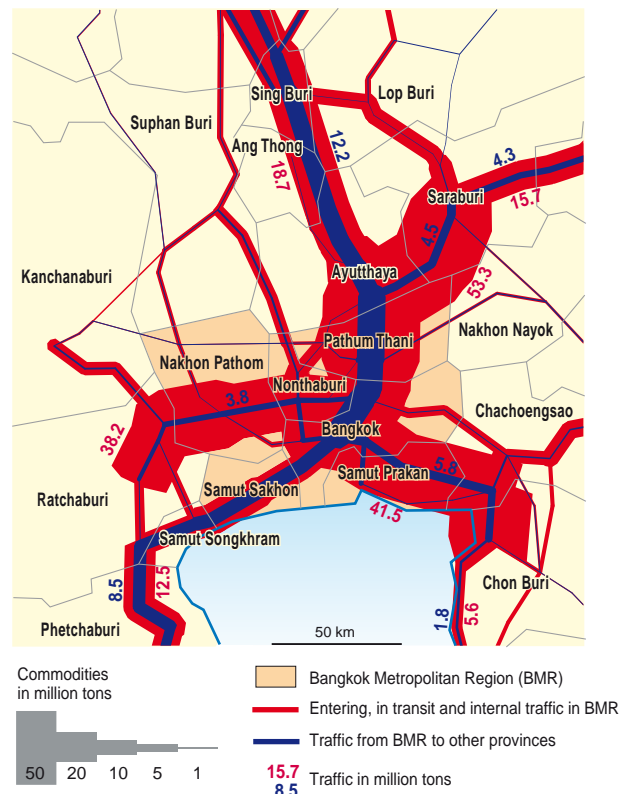
Inter-provincial traffic (1996)



Road traffic within provinces



Bangkok Metropolitan Region (1996) : inter-provincial road traffic



Sources : Ministry of Transport and Communications, 1996, 1998a

An imbalance in inter-regional trade

These maps show exchanges of four types of goods between seven major regions that derive from several provinces taken together. They are based on the flow of goods between province centers, all modes of transport combined, but do not show movement within these major regions: so, the proportion of inter-province flow that is not represented is 9% for manufactured goods, 14% for timber and wood products, petroleum products and solid fuels, 20% for agricultural products. What can clearly be seen is the concentration of demand, both for industry and for consumption, in the Bangkok Metropolitan Region (BMR) along with regional specializations due to the location of raw materials. However, the limitations of this pattern are also clearly shown in the development of agriculture beyond the delta region, the emergence of poles of consumption and industrial processing plants in the peripheral regions. The East, the Upper Center and to a lesser extent the West, are differentiated by the dynamic created by their proximity to the BMR, with the East also specializing in industry and opening up to international links with the initiatives taking place within the scope of the Eastern Seaboard.

Transport of wood, timber and by-products is important from the South, which now supplies most of the nation's requirements, both in the so-called noble species and also in raw materials like rubber trees, bamboo, coconut palm or other fruit trees. Almost half of the goods dispatched from this region are destined for the BMR to be transformed in the large furniture or paper pulp factories, mainly in Samut Prakan and Pathum Thani, or they are re-exported, chiefly to the furniture and handicraft industries in other regions. The North, which was once a major producer, now also leans heavily on the South for its supplies. The use nowadays of a variety of species has also made it possible to exploit the production potential of other regions, such as the East.

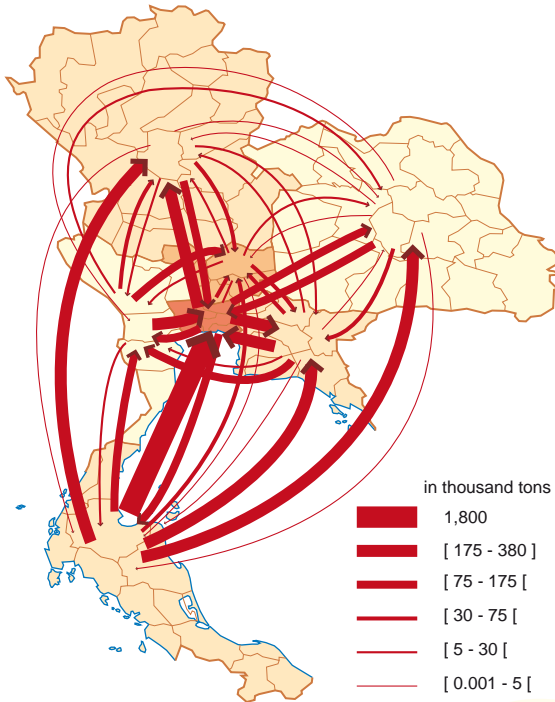
The largest movement of agro-food products is from the North and the North-East towards the BMR, and also towards the Upper Center and the East. These are mainly rice (white rice and glutinous rice), which makes up two thirds of the tonnage from these two regions, and cassava which undergoes an initial processing mainly in the North-East, and is then taken to supply the factories of Chon Buri in the East. To these products can be added large quantities of sugar for the North-East and maize for the North. Goods dispatched from the South to the

BMR make up the majority of traffic to leave this region: they consist of rubber and live animals, whose feed is supplied by factories in the Center. The South is more autonomous than the other two peripheral regions regarding international exports of agro-food products, a proportion of which are shipped directly from the deep-water ports at Songkhla and Phuket: the scale of the region's intra-regional traffic gives an indication of this. The volume of goods sent from the BMR into the other regions is low but it does involve higher value added products, processed food and drink or feed for livestock.

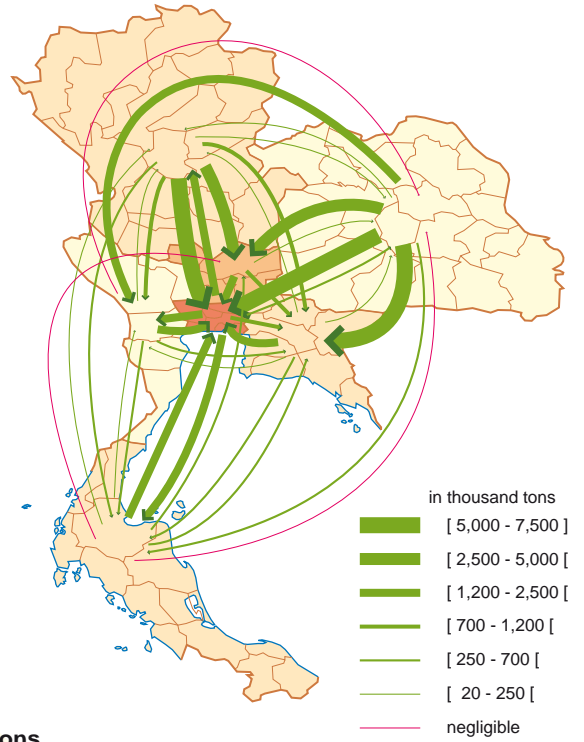
The East and the North are the two major regions for energy provision. Petroleum products from the Gulf of Thailand are sent to the refineries at Rayong and Chon Buri where some of the oil and gas produced are used on site and the rest sent to the BMR that is an important center of consumption and processing (see plate 25 Energy infrastructure and networks): in 1996 the peripheral regions, the South excepted, received more of their petroleum products from Bangkok than from the Eastern Seaboard. The North sends lignite to the Upper Center where it is processed and used in Saraburi in particular.

Even more than for the products already mentioned, exchanges of machinery, transport equipment and manufactured goods illustrate just how many places of production and consumption there are. It is in this very varied category of goods that relations between the regions are most strongly developed, even though the movement of goods between the peripheral regions has a long way to go before reaching the scale of exchanges with the other four regions or between these four regions. Exchanges between the BMR with the Upper Center, the West and the East are less unequal than one might suppose, despite the considerable amount of exchanges originating in the East. The BMR remains at the heart of this movement of goods since this region monopolizes two-fifths of all exchanges, while the West, taking advantage of the growth dynamics of the center, emerges as a pole of some importance.

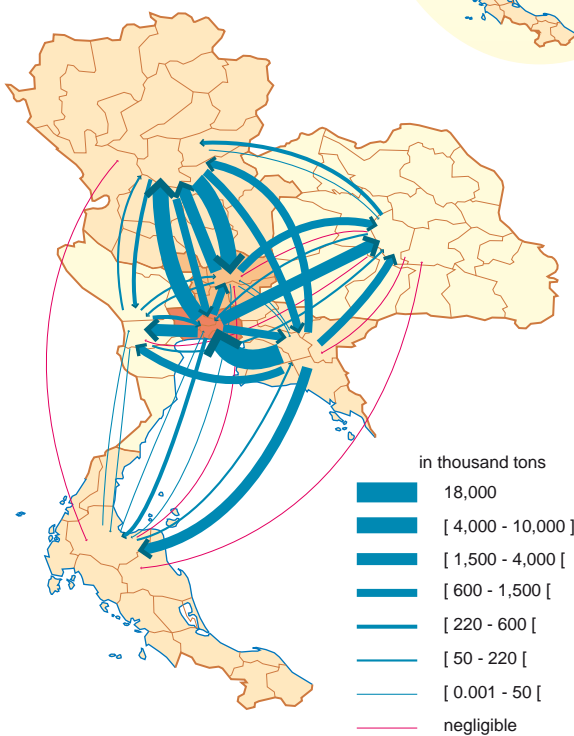
**Timber and wood products
-bamboo and firewood included- (1996)**



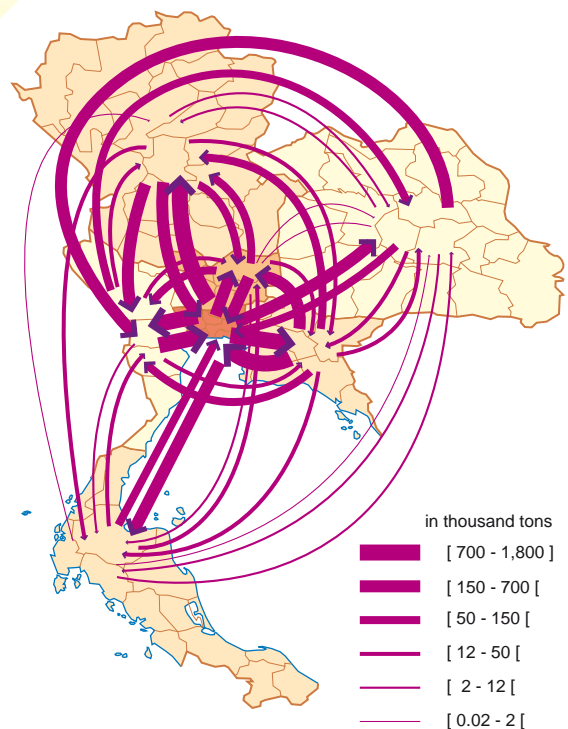
**Agricultural products
-animals included- (1996)**



**Petroleum products and
solid mineral fuels (1996)**



**Machinery, transport equipment
and manufactured products (1996)**



Source : Ministry of Transport and Communications, 1998a

Facilities and activities in the tertiary sector: variations between areas

In a context where budgets are inadequate, and where publicly funded amenities in the peripheral areas are unable to redress the balance in reducing regional inequalities, new opportunities are opening up for the private sector to develop tertiary activities, especially facilities and services.

In the legend tables, only the most discriminating variables of the principal component analyses are shown. For facilities, the classification takes evolutions into account, evidence of the public authorities' ability to respond to increased demand; transport infrastructure is incorporated in the form of an index. For activities, the employment structure index covers the smallest enterprises (energy and water are excluded because of their atypical behavior).

The map of facilities highlights the Bangkok Metropolitan Region (BMR) where, even if the level is good overall, there are some public sector shortcomings as a result of urban growth. Bangkok itself stands out, with its high level of facilities (piped water, very good transport infrastructure, high telephone, medical and banking ratio) and well developed hotel amenities with large establishments; however, since the middle of the 1980s, the number of schools and post offices has not been sufficient, given the level of activity and population. In the five adjoining provinces (class 2, with similar characteristics, apart from the hotels), more facilities have been provided and the level of school provision is now higher than in Bangkok and the provision of telephones, health amenities (private sector especially) and banking is only slightly lower; there are still not enough post offices, however. Class 3 groups together provinces with a sizeable regional pole; they have a better postal service, an older established network of hospitals, a good level of hotel and transport infrastructure to match the level of tourist activities. A second ring of provinces around Bangkok, several provinces in the North and the North-East corridor (including the poles of Nakhon Ratchasima and Khon Kaen) form class 4, and these are close to the national average, or only very slightly below (telephones, hospitals).

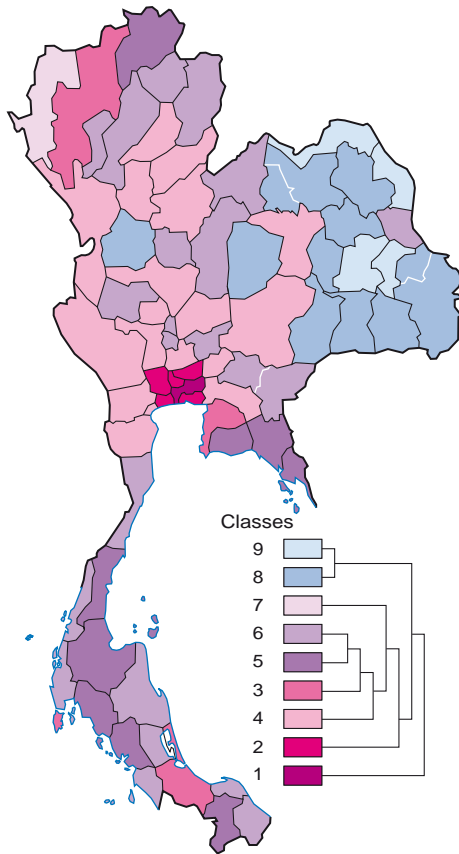
Some provinces in the North and the Center and most of the provinces in the South can be found in classes 5 and 6; the amount of public piped water decreases, with more private wells, and the rate of rural electrification is below average, the number of schools matches the average and postal equipment is good; the main differences lie in hotel facilities

and the proportion of private hospitals. The province of Mae Hong Son is notable in class 7 as it has the lowest rate of electrification in the country and very contrasting facility provision. Classes 8 and 9 are limited to the North-East where water and electricity equipment have benefited from public programs but where investment in telephone provision, health amenities (reluctance of the private sector) and banks has not yet been sufficient to compensate for the initial poor development.

The map of activities shows a central area that expands towards the north and the east to include two of the three provinces of the Eastern Seaboard: the internal organization is modified when incorporating variables other than the provincial structure of the tertiary sector product (see plate 50 Product of tertiary sector). Bangkok stands out with its strong hotel industry, a high contribution to the Gross Provincial Product and the national tertiary sector product. The situation in relation to these variables is the opposite in class 2 which shows up provinces where, despite a high rate of growth, the tertiary sector product remains below the industrial product. In Pathum Thani and Nonthaburi (class 5), the even more vigorous growth of the tertiary sector is linked with construction and power and water supply. In these three classes, enterprises are medium to large in size. Phuket is the only province in class 3 (activities characteristic of tourism, often in large enterprises). Class 4 is represented by provinces that include a regional pole, where financial and real estate activities and "services" play an especially important role; small enterprises are more important here.

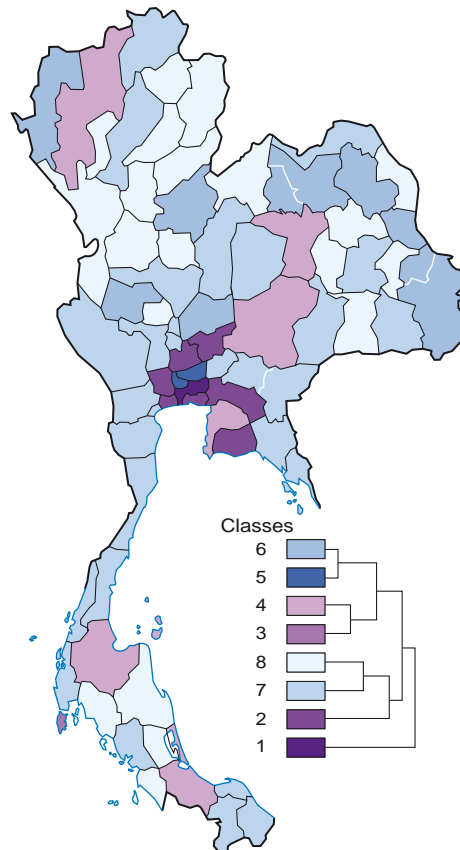
Class 6 covers provinces, grouped together more in the North-East than in the North, where construction boosts the contribution of the tertiary sector to the provincial product. A group of provinces around the Bangkok metropolitan region is close to the national average and forms class 7. Their hotel industry activity and higher growth in the tertiary sector product differentiate them from the very rural provinces of class 8 which are also conspicuous by their limited activity in the financial and communication sectors. Small enterprises predominate.

Facilities



Factors	Classes	1	2	3	4	5	6	7	8	9
Water supply sources (% household users, 1995)	Piped water	+++	++	++	=	-	-	++	--	--
	Public wells	---	---	--	=	--	-	=	+++	+++
Communications, health, schools	Telephone lines / 1,000 inhabitants (1996)	+++	++	++	-	=	-	--	---	---
	Inhabitants / post office (1996)	=	++	---	=	---	--	---	+++	++
	Inhabitants / hospital bed (1995)	---	-	--	-	-	=	-	++	+++
	% Private hospital beds (1995)	++	+++	++	=	+	--	---	--	---
Hotels	Evolution hospital beds (1987-1995)	---	+++	--	-	++	--	=	++	-
	Pupils / class (1996)	+++	++	+	=	=	=	---	=	=
	Hotel rooms (1996)	+++	---	++	-	=	---	-	---	---
Commercial banks	Rooms / hotel (1996)	+++	+	++	=	=	-	---	=	-
	Inhabitants / bank (1996)	---	--	--	=	--	=	-	+++	+++
	Evolution inhabitants / bank (1986-1996)	++	=	=	++	-	=	=	=	---

Activities



Factors	Classes	1	2	3	4	5	6	7	8
Hotel trade	% in national turnover (1996)	+++	-	++	=	--	-	-	--
	Transportation & communication	+++	++	++	=	=	=	=	-
Share in tertiary product (%, 1996)	Finance, insurance & real estate	+++	++	+	+	=	-	=	--
	Services	=	-	+++	++	-	=	=	=
	Construction	--	-	-	=	+++	+	=	=
Tertiary product	Electricity, gas & water supply	--	+++	=	=	+	-	=	-
	% in Gross Provincial Product (1996)	++	--	++	=	-	+	=	=
	Growth (% 1989-1996)	+	++	=	=	+++	=	=	-
Employment structure	% in national tertiary product (1996)	+++	=	-	=	=	-	-	-
	small-sized establishments (% 1996)	--	--	---	-	--	=	=	+

Sources : Ministry of Labour and Social Welfare, 1997
 NESDB, 1993, 1999
 NSO, 1990, 1996, 1997a, 1997c, 1997d, 1997e, 1997f, 1997g, 2000
 Tera International Co., 1990

Bangkok and the Bangkok metropolitan region

Also known under its shortened Thai name of Krung Thep Maha Nakhon, Bangkok was for a long time a secondary city, but it is now one of the most important in the world (see plate 6 Networks in Eastern Asia). Between 1950 and 2000, its urban population increased from 700,000 to 8,000,000 inhabitants (this figure represents the total population of districts within Bangkok and contiguous districts, where the population density is greater than 1,000 inhabitants per km²). In this, the Thai capital has followed the pattern of many southern cities, though it stands out in the crushing demographic weight placed on the country's urban network.

This domination is not only demographic. It is also political, administrative and economic. The Bangkok Metropolitan Region, made up of six provinces, produces more than half the country's wealth (**plate 58 Urban and industrial development around Bangkok**). The centers of command, commercial headquarters and above all financial activity, are all concentrated in the business districts of Bangkok: in the second half of the 1990s, 60% of all funds deposited in the entire country were in Bangkok province alone. It is possible, of course, to detect some weaknesses in the capital's supremacy, especially in the area of politics. In recent years, the democratization of Thailand has produced a diffusion of political power away from Bangkok and hence the increasing influence in Parliament of representatives from the provinces. Any loss of power by the Bangkok elite is still fairly limited, however, as the administrative machinery remains extremely centralized. Moreover, recent trends in world economy have tended to reinforce the economic strength of what it is now a mega-urban region where a large proportion of the country's industrial infrastructure is concentrated. In terms of port and airport facilities, Bangkok remains unrivalled and is therefore the only city in Thailand able to take a leading role in the development of the South-East Asia corridor.

This primacy is not a new phenomenon. The city was designated capital of the Kingdom of Siam at the end of the 18th century, after the sack of Ayutthaya by the Burmese army, and it rapidly became not only the country's demographic heart, but also its economic lungs and political head. This role is partly due to its advantageous geographical position. Situated as it is in the Central Plain, the country's rice-growing heartland, Bangkok was the chief gateway to the country. The mouth of the Chao

Phraya was a strategic location, close to sea trading routes and also at the crossroads of internal routes due to the use in the 19th century of canals (*khlong*) through the Central Plain for virtually all transport. Bangkok also owes its development to the creation of what was in fact an aquatic civilization, whose inhabitants cultivated a specific variety of floating rice and lived on rafts or in houses built on stilts, thus enabling them to adapt to the floods that inundate the delta every year. With such assets, Bangkok formed an ideal base for the constitution of an absolute monarchy. The Chakri dynasty, whose family history has been linked with the Siamese capital since its inception, was thus able to extend its power over all the kingdoms and principalities that did not fall under the control of the colonial powers (see plate 21 Formation of the nation-state territory).

For most of the 20th century, the sources of the capital's supremacy remained the same. Bangkok remained a focal point for exchange networks and rice exports continued to feed the economic growth. Although the river and canals have had to compete with rail and road transport, the erosion of their influence has in fact been very slow. There were only 5,000 motor vehicles on the streets of Bangkok at the end of the Second World War. The waterways had already had time to make Bangkok into a trading hub and especially the undisputed political center of the still emerging nation, which Siam then was. The transport networks built throughout the country in the 20th century (railways from the 1890s, major roads from the 1950s) thus all radiate from the capital, and this has only strengthened the city's pre-eminence (see plate 24 Transportation networks).

The mass of funds that have been drawn to the capital by the insertion of Thailand into the global economy have profoundly changed the landscape of the former "Venice of the Orient" over the last decades (**plate 59 Bangkok metropolis development patterns**). Siamese traditions and culture are still very visible, but Bangkok is committed to physical and functional changes that will bring it ever closer to the major cities of the developed countries. The high-rise buildings in the business districts are the clearest sign of this convergence, but the rapid and massive growth of an urban middle class also forms a solid basis for the movement towards modernization in which the Thai capital is engaged. Beyond the appearance of frivolity and consumerism, a truly urban, cosmopolitan and modern culture is being

created. Changes in the content of electoral debates and the growing influence, via the press, of the urban public sphere are proof of this.

In addition to the extremely rapid increase in the urban population, these transformations are accompanied by many serious problems. The Thai capital is now paying in kind for years of neglect when the city grew unchecked by the authorities until the mid-1980s. The position of Bangkok as the center of the manufacturing, trade and services sectors was exacerbated at that time by the structural change of the Thai economy, with the balance of growth shifting from the primary sector to manufacturing. The major problems of congestion and lack of infrastructure then became one of the government's urgent priorities as economic globalization was putting a high premium on the competitiveness of major cities. To make up lost time, Bangkok became one of the biggest construction sites in the world: two mass transit lines and one hundred kilometers of expressways have been opened to traffic since 1987 and one subway line is also expected to open soon. Yet the impact of billions of dollars of investment has been greatly reduced by the absence of any real planning policy and through political interference in the workings of the city's bureaucratic machinery. Any coordination of public action is hijacked by competitiveness, which is rife in the different administrative departments. For the politicians who govern them, the fact that they have been assigned to these departments for the public good seems of minor importance; they are interested mostly in the additional sources of income that their responsibilities can provide.

The legal and administrative means for a better planning system do exist, but it is rare for a public official to dare to use them to oppose any person of influence, or supposedly of influence. The means are also lacking for recruiting qualified people. For these reasons, the application of existing land and building laws is hesitant. The first major plan for the agglomeration was drawn up at the end of the 1950s, but it was not until 1992 that a document of this type was approved by ministerial decree. Yet still no specific plan has been drawn up to enable this general plan to become operational.

Here more than in any other city, however, urban and regional planning was indispensable. Contrary to what usually occurs, Bangkok's periurban fabric has not been shaped by a pre-existing rural

framework. First, the roads that serve the outskirts of Bangkok have only recently been created, where nothing existed before. Roads have been superimposed on the waterway network, yet there are no links between the two. As outlying villages are almost all located on canal banks, the advance of urbanization has simply engulfed them. Second, these villages were of recent construction, and they were scarcely able in themselves to form an urban nucleus. At the end of the 19th century, just a few kilometers from the capital, malaria decimated the population and it was not unusual to see elephants trampling over the paddy fields. A few decades later, urbanization began to destructure the rural fabric, which had been so painstakingly created, with only a few small hamlets developing. The particularly anarchic growth of the road system, and thus the traffic problems that the Thai capital suffers today are in part the result of these features of the rural fabric (**plate 60 Road system and motorization in Bangkok**). Satellite towns, often linked with industrial areas, were tentatively created by the authorities from the end of the 1970s. Their role has remained a very modest one, however, as they were too far away to become metropolitan subcenters yet too small to become regional centers.

The democratization of Thailand and the ever-increasing political involvement of the citizens in the problems that affect their daily lives should lead the administration and political leaders to a more rational management of the city. In this respect, even though public opinion would seem to be particularly concerned with problems of traffic, pollution and flooding, it must be stressed that housing remains a constant problem. Since the Second World War, the slum population has fluctuated between one fifth and one quarter of the city's total population.

BANGKOK: a PRIMATE CITY

Skytrain viaduct and Phrom Pong station on Sukhumvit avenue

The two overhead lines cover 27 km, with trains running above the existing roads, thus confirming the scale of the transformations that have taken place in a capital famous for its traffic jams. Urban motorways, an underground metro (due in 2004) are just some of the "mega projects" launched by public enterprises with the input of foreign capital, and run by private companies.



Photo Eric Charmes

Hyperblock near Sukhumvit avenue



Photo Eric Charmes

Behind the screen of tall buildings (hotels and condominiums) attracted by the proximity of the major transport axes, the built-up density is still low and there are many detached houses, occupied by rich families. The densification of residential zones close to the city center has been accompanied on the periphery by the development of private housing estates for the middle classes.

The extension of Bangkok's area of influence: the creation of a metropolitan region

Historically, the first rivals of the Chao Phraya and its tributaries, the railways, have not been very influential in the development of the Bangkok metropolitan region. This development was centered for the most part around the three main national roads, construction of which was begun in the 1930s: Sukhumvit, Phahon Yothin and Peth Kasem (see also plate 60 Road system and motorization in Bangkok). These major axes were strengthened by the presence of the Don Muang international airport in the north and of the port of Khlong Toey in the south-east. The northern provinces of Pathum Thani and Nonthaburi and the seaboard province of Samut Prakan in particular have benefited from the proximity of the capital, and Greater Bangkok was created from this entire area (4,717 km²). The western provinces of Samut Sakhon and Nakhon Pathom, which together with Greater Bangkok make up the Bangkok Metropolitan Region (7,758 km²) have also been influenced by the capital, but for various reasons, their urban and economic development have been limited. The city's historic center is on the eastern bank of the Chao Phraya and when the city turned towards *terra firma*, the river represented a major obstacle: the first railway bridge was opened only in 1926 and the first road bridge six years later. The advance of the urban front was hindered to the west by the high price of the land, cultivated under market gardening, and the more fragmented layout of plots.

Globalization and the influx of foreign industrial investment have in no way altered the preferred directions of development of the metropolitan region; on the contrary, these have been strengthened by the proximity of the port and airport infrastructure which are of international standard. Thus when the major influx of foreign investment began in the second half of the 1980s, a large proportion was concentrated around Bangkok. Major manufacturing plants were set up in the urban fringes and sometimes beyond the limits of the metropolitan region itself, in the industrial estates established at the instigation of the authorities.

The policy of industrial deconcentration has particularly benefited the coastal strip to the south-east, the Eastern Seaboard. Chon Buri province lies about 100 km from Bangkok and is linked by major motorways. With its industrial parks and two deep-water ports (the main one being Laem Chabang where the traffic is greater than in the Bangkok port), the

province now contributes 5% of the national wealth, although it contains only 1.7% of the population. This strong focal point to the east and south-east of Bangkok is set to be strengthened by recently completed and underway infrastructure (Nong Ngu Hao international airport at Samut Prakan, new Laem Chabang container terminals), all to be connected or already connected to Bangkok by expressways and motorways. The Chachoengsao and Chon Buri provinces are now integrated into the orbit of the capital just as much as the less distant provinces of Samut Sakhon and Nakhon Pathom. The definition of what specialists used to call the Extended Bangkok Metropolitan Region, now termed Bangkok's Mega-Urban Region, remains a little vague, however, with some including the province of Rayong further along the Eastern Seaboard, or even provinces such as Ayutthaya to the north and Ratchaburi to the west.

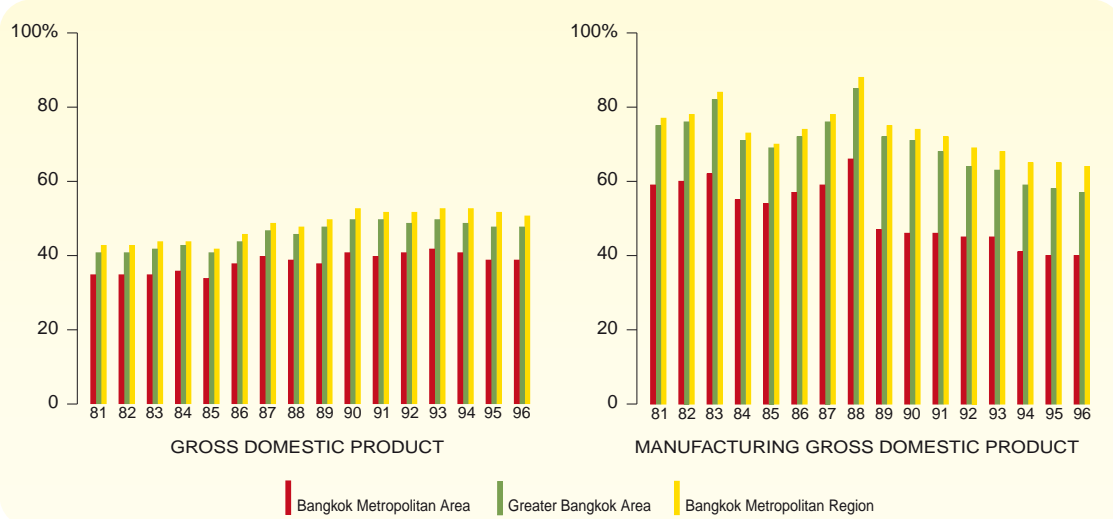
With the exception of the Bangkok Metropolitan Area (BMA), the Greater Bangkok Area and the Bangkok Metropolitan Region are not represented or managed by any elected body or specific administrative entity. They are significant only for the planners. The only competent authority in the field of regional planning is the state, via the Department of Town and Country Planning (DTCP) and the National Economic and Social Development Board (NESDB). The province of Bangkok (BMA) has an unusual status, in that under pressure from the Bangkok middle classes, the government has democratized control of the Bangkok municipality and the Governor, elected by direct universal suffrage since 1985, has an ever-increasing degree of autonomy.

Inside the municipal body, a Department of City Planning was created in 1995 which prepared quite independently a general plan, in force since July 1997. In terms of regional planning, however, the impact of this plan remains fairly limited, mainly because the urbanized area extends considerably further than the limits of the BMA, even though, after merging with Thon Buri in 1972, the Bangkok municipality gradually expanded to cover the entire province, an area of 1,569 km². In this type of matter, conflicts of interest between the municipality and the state will surely have a more and more marked effect on the future of the metropolitan region.

Bangkok and region



Bangkok and neighboring provinces in the national economy (1981-1996)



Sources : BOI, 1995
NESDB, 1994, 1999
NSO, 1995

The changing Bangkok landscape: vertical expansion and suburban sprawl

Since the 1980s the population density in the areas surrounding the historic heart of Ratanakosin has been decreasing. This area has always been dominated by rows of long, narrow shophouses where the ground floor consists of a shop or workshop and the upper storeys are used for living quarters. As floors were added and vacant areas filled in by slums, some very high population densities were reached (almost 90,000 inhabitants per km² in 1980 in districts like Pom Prap Sattru Phai), leading to a very great deterioration in the quality of life. The well-off populations were the first to leave, followed by the middle classes. These areas, which for a long time made up the economic heart of Bangkok, have also lost their pre-eminence. As it was impossible to renovate the fabric of the Chinese shophouses, because of a very fragmented plot layout and congestion on the main streets, the much larger constructions associated with the modernization of Thailand have been built to the north-east and the south-east of the city, where the homes of well-to-do families have been built on large plots of land. These areas, like those served by Silom, Ploenchit and Witthayu avenues, which formed the original city suburbs, have undergone massive renovation. They are now Bangkok's Central Business Districts (CBDs) where shops and office blocks have taken the place of the detached houses.

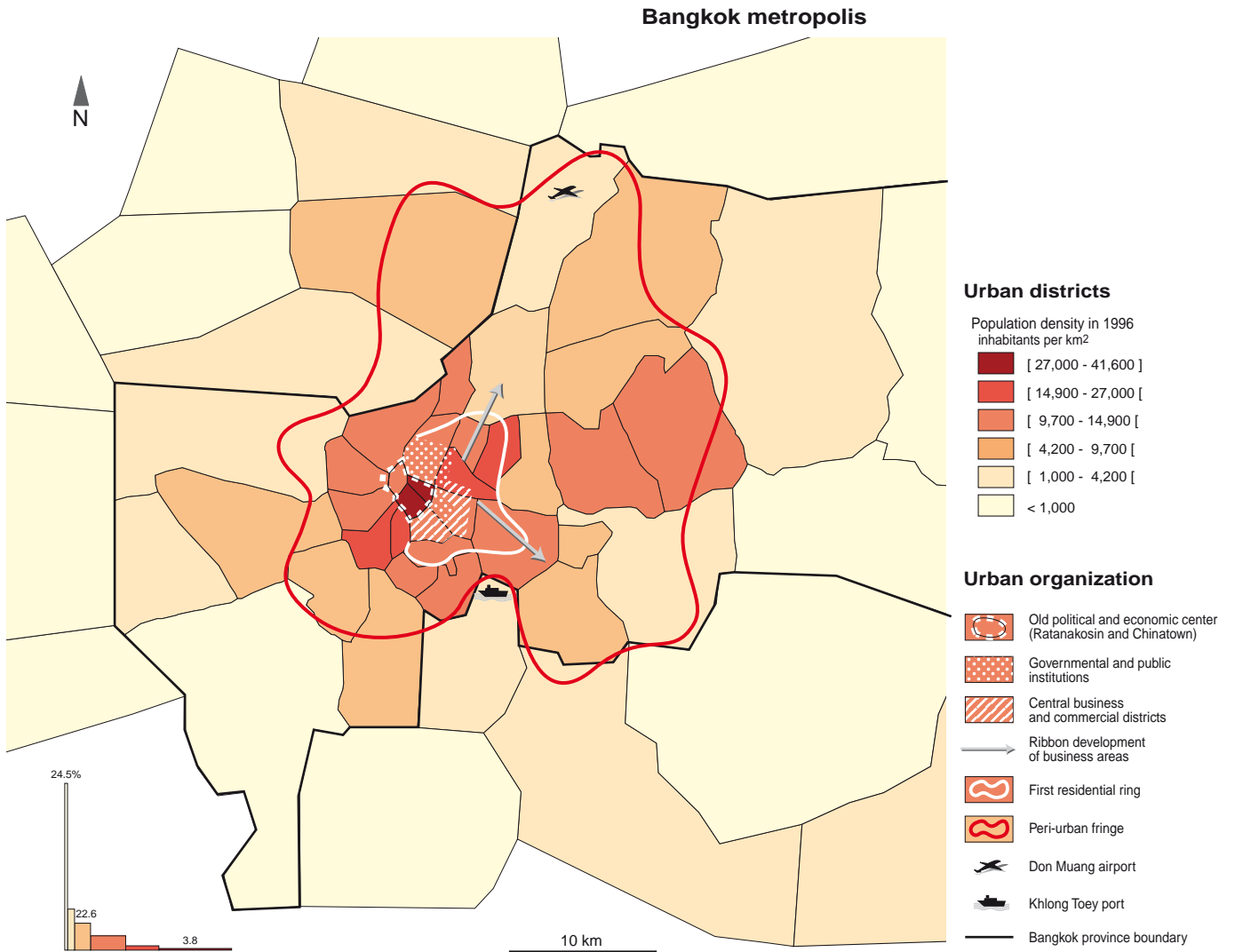
The business quarters also stretch out in corridors along the main traffic routes. These have a pronounced power of attraction, with Bangkok's water-bound past making road access and frontage precious commodities. Far to the north, around the complex of roads and motorways that lead to the airport (see also plate 60 Road system and motorization in Bangkok) high-rise company headquarter buildings pierce the skyline and the imposing mass of the many shopping malls is in evidence. The landscape is the same in the area around Sukhumvit avenue, and to a lesser degree along the rest of the main highways.

Behind these major roads today there are vast expanses of residential areas, whose inhabitants are taking advantage of the more widespread use of the car. These suburban residential communities (*muban jatsan*) are now developing in the peripheral districts of the Bangkok Metropolitan Area (BMA) and in the neighboring provinces, which have recently enjoyed the greatest population growth. Traffic problems, however, have restricted this spread and the pressure on land has also increased around the CBDs. From

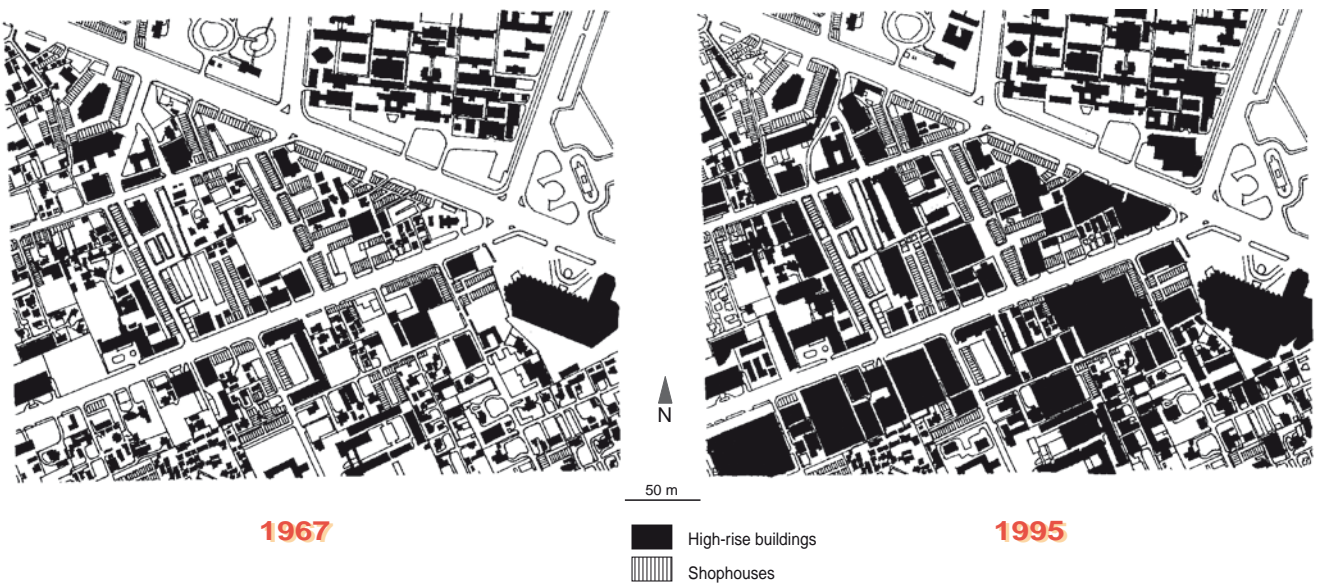
the end of the 1970s, in the residential areas around Sukhumvit and Sathon avenues, the population began to grow more dense; town houses and condominiums began to take the place of traditional detached houses.

The outskirts of Bangkok are still far from resembling a dormitory town. In the absence of any monitoring of land use, factories are often located close to houses, and workshops and small businesses are sometimes set up inside houses in the middle class areas. Along secondary roads the traditional rows of shophouses also create local centers of activity. The functional specialization of urban space is, however, on the increase. More and more shopping malls have appeared since the middle of the 1980s, located at intersections on the suburban road network. For an ever-increasing proportion of Bangkokians, the commercial streets and markets have now given way to air-conditioned shopping malls and huge super-markets.

The opening up by the private sector in the 1980s of the market for low-cost condominiums made up in part for the lack of public housing provision, but given the very high rate of population increase in Bangkok, the number of people still in poor housing remains very high. These living conditions are both the downside and one of the sources of Thailand's "economic miracle", which relied very heavily on low-cost labor. Far from being a simple product of growth, the economic integration of this pool of low-cost labor has been favored by the spatial distribution of the slums. Apart from the Khlong Toey slum, close to the port (with several thousand inhabitants), the slums are all fairly small (about a thousand inhabitants on average) and very scattered. Many are close to areas of employment, despite the fact that their location is subject to the centrifugal force of land market pressures. The large amount of land left inaccessible by road and the ability of the Thais to mix together while yet maintaining their social distances have played a key role in this opening up of urban land to the poor. Spatial and social segregation are at work, however. Although the phenomenon may be much less pronounced than in the Philippines, gated communities, reserved for very specific social categories, are increasingly to be found.



**Evolution of Silom- Rama IV area
(1967-1995)**



Sources : BMA, 1998
 Davisi Boontharm, 2001
 Ministry of Interior, 1997
 NSO, 1995, 2000

Massive but inadequate investment in transport

During the rush hour, in the streets of the business districts, cars move barely as fast as the pedestrians. It has been estimated that cars in the capital city spend on average 44 days a year stuck in traffic jams. People who use one of the 10,000 buses provided by public and private companies (one of the largest fleets in the world) are scarcely better off. For those who want to go fast, motorcycles and moto-taxis are the most efficient means of transport, though they are uncomfortable and dangerous. In order to reduce the amount of time lost every day, some executives rent apartments in the center of town close to their work-place, spending the weekends with their families in their suburban houses. Others convert their car into an office and deal with everyday business matters on their portable telephone. These are stopgap measures however, only available to the better-off, and they are not sufficient to prevent hundreds of millions of dollars of work time being lost. The economic cost of this congestion is such that it threatens the competitiveness of the Thai capital. The people of Bangkok are suffering on a daily basis from this situation: the time lost in travelling to and from work is in fact taken out of leisure time and household chores. Children probably suffer the most: absent parents, long rides in crowded buses, mealtimes disrupted. A study has also shown that their intellectual development is impaired as a result of the effects of the lead contained in exhaust fumes.

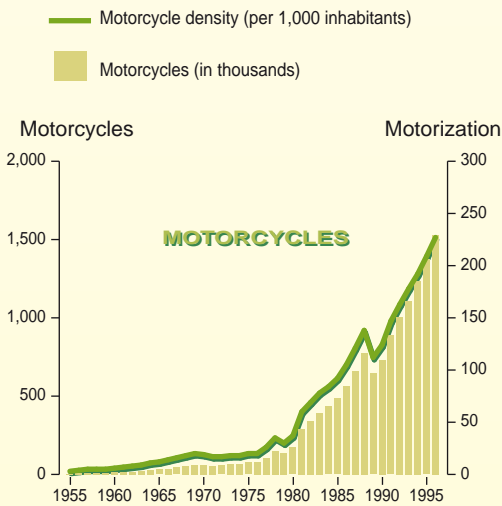
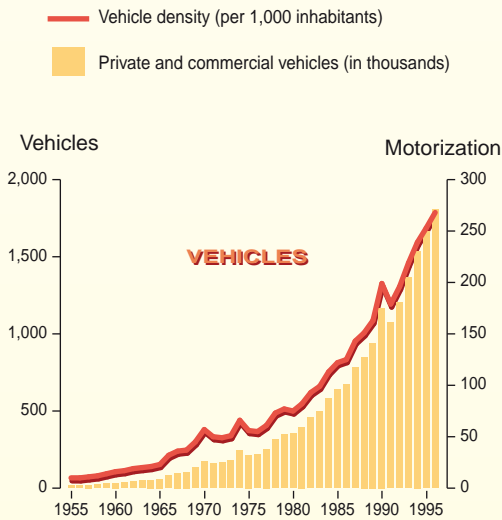
Since the mid-1980s, the government, under pressure from businesses and Bangkok public opinion, has indicated that this matter was giving them cause for concern. With the support of private foreign funds attracted by Thailand's economic miracle, Bangkok has been transformed into one vast construction site. Some important features, however are still lacking. The city has survived right up to the end of the 20th century without a mass transit system, and the 23 kilometres of overhead rails opened in December 1999 are still largely inadequate. Also, although the expressways which now circle over the city make long distance travel easier, long lines always build up at the entrances and exits. The traditional public road network, difficult to privatize and therefore unable to benefit from foreign funds, remains not able to cope with the steady streams of vehicles.

Partly because of the capital city's aquatic past, the surface area covered by the public road network is very limited. It represents in some central districts no

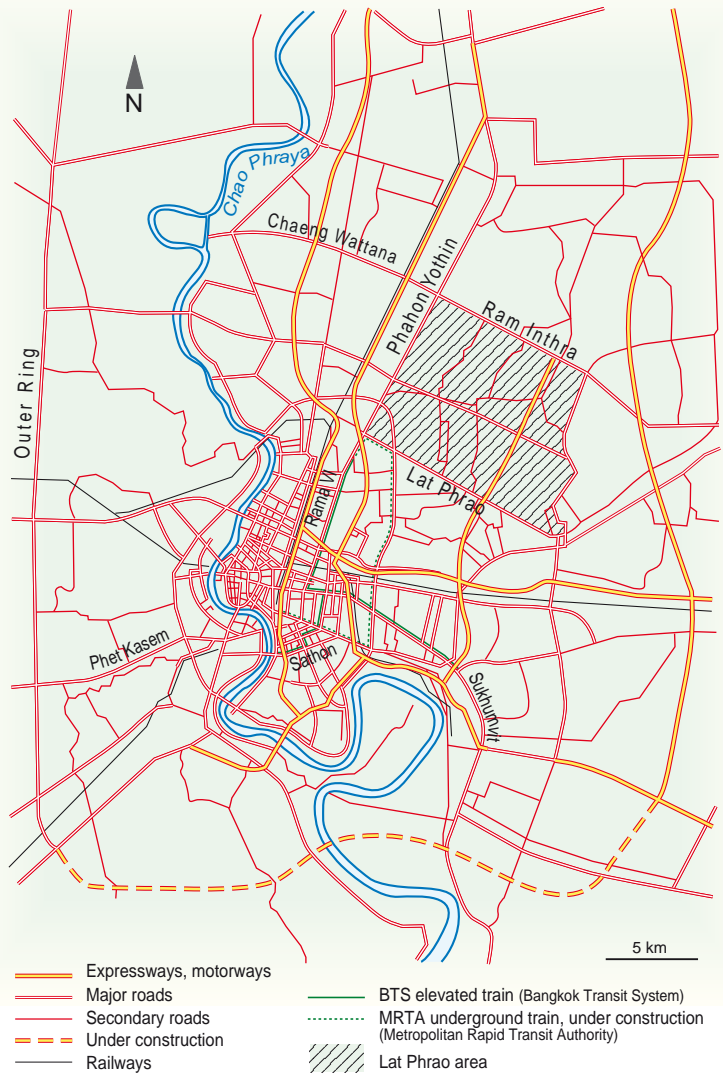
more than 6 to 7% of the urbanized area, compared with 20 to 30% in most western metropolitan centers. Moreover, in the absence of any planning provision, it has taken on a very haphazard form. Apart from the major roads (*thanon*), the streets (*soi*) have developed without monitoring by any public body; they are linked one with another according to the whim of building operations and agreements between property owners to obtain a right of passage, and they very rarely link two major roads together. Moreover, the canals have blocked expansion in a number of cases. Inside the gaps in the major road network, which on the outskirts of the city can be as great as several dozen square kilometres, urban expansion is organized around interlacing residential streets, many of which are cul-de-sacs. The case of Lat Phrao superblock speaks volumes. This is a suburb of approximately 70 km², developed from the 1950s almost exclusively through a combination of initiatives by local farmers and private developers, yet no major road was built through this residential area until 1996, by which time the population had reached nearly half a million.

What is more, the number of vehicles on the roads is increasing at a very fast rate and each new road provided is almost immediately saturated. After half a century of very rapid growth, the number of privately owned vehicles registered in the province of Bangkok alone is now almost two million. This growth is probably far from over, as the rate of private vehicle ownership is still low and varies considerably over the different social strata, with a high level of multi-ownership among the better-off households.

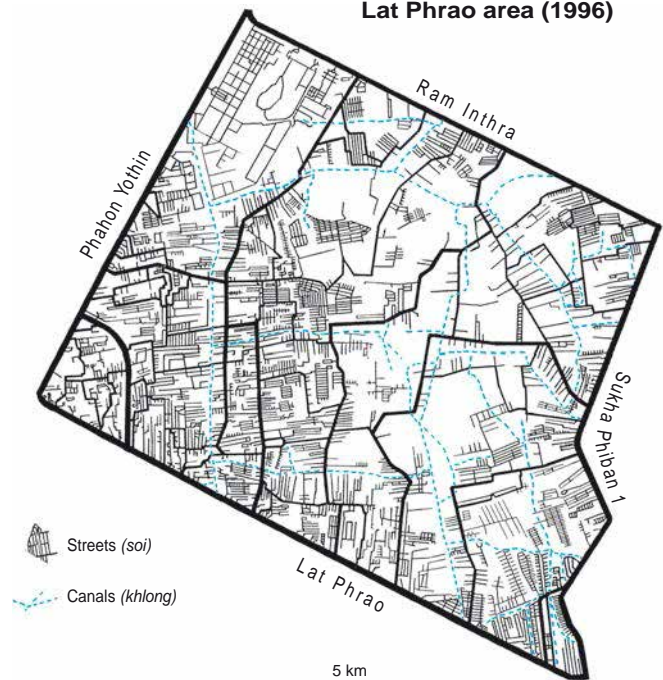
Motorization evolution (1955-1996)



Main roads in Bangkok and outskirts (2000)



**Secondary road network in suburbs :
 Lat Phrao area (1996)**



Sources : Charmes E., 2000
 NSO, (various years)

Two peripheral regions: the North-East and the South

The North-East (*Phak Isan*) and the South (*Phak Tai*) are two of Thailand's three very distinctive peripheral regions. The North-East is synonymous with the Khorat plateau, a remarkable natural unit of almost 170,000 km² bordered to the north and the east by the Mekong, to the west by the Phetchabun Range and to the south by the Dangrek Range. This is the largest region in the country, a little more extensive than the North but much more densely populated (almost 21 million inhabitants compared with 12 million), in fact one third of the country's total area and population. The South is the smallest of the three peripheral regions, with almost 71,000 km² (14% of the total national area) and little more than 8 million inhabitants (14% of the national total). This region extends over 600 km, from the very narrowest part of the Thai peninsula between the Gulf of Thailand and Myanmar, to the Taluban Range.

In the way these two frontier regions are populated and in relations with their own culture and with the Thai nation, they still retain traces of their own histories closely linked with those of the neighboring countries. Although their histories have been different, they coincide at the key points that resulted in the later integration of these regions into the Kingdom of Siam. Today, these two peripheral regions are in a position to connect together several areas at the level of continental and maritime South-East Asia (see plate 6 Networks in Eastern Asia).

Under the influence of the Dvaravati civilization before the 11th century, the North-East came within the sphere of influence of the Khmers and the Empire of Angkor, which declined in the 13th century, leaving behind outposts and religious sanctuaries in the southern part and an established population south of the river Mun (see plate 10 Main ethno-linguistic groups). In the 14th century, Buddhist populations from Laos were established to the north of the plateau and there were outposts from the Lan Chang kingdom in the center (see plate 21 Formation of the nation-state territory). The influx from Laos of opponents to the wars between kingdoms increased at the end of the 17th century and spread into the plateau as a result of the expanding power of the Champassak principality on the north bank of the Mekong. In 1778, the kingdoms of Laos recognized Siamese suzerainty which was at that time confined to the south-west edge of the plateau. The allegiance of the external provinces (*hua muang*) to the Kingdom of Siam was then through Khorat (Nakhon Ratchasima, city with a

population made up of Khmers and Siamese speaking Tai Khorat) or the principalities of Vientiane or Cham-passak. At the beginning of the 19th century, Bangkok's control over *Isan* was threatened and this led to terrible wars with Vientiane which resulted in the deportation of a large proportion of the Lao population on the plateau (and as far as the center of the country). The Kingdom of Siam then had sovereignty over the territories of the former Lao kingdoms which it later lost to the French colonial empire (see plate 20 Changes in boundaries and frontiers (18th-20th century)).

The Siamese penetrated earlier into the South (13th century), via Nakhon Si Thammarat, a flourishing local center and outpost in the Malay world, established as a province with a fairly high degree of autonomy. The current eastern provinces of Pattani, Narathiwat, Yala and part of Songkhla correspond to what was at that time the Malay sultanate of Patani, an important center of Islam in South-East Asia, which also included Kelantan and Trengganu, today in Malaysia. Linked with Malacca, Patani was a flourishing, cosmopolitan port that succeeded in fending off attacks by the Siamese in the 17th century, before giving in and recognizing the suzerainty of Bangkok in 1786. Rebellions occurred sporadically, especially at the turn of the 19th century, which resulted in Muslims from the region being installed by force in Bangkok and hundreds of Siamese families being settled in Patani. The constant tension led Siam to divide Patani into seven distinct principalities each with a Malay ruler appointed by the King, before grouping them into four, then three provinces with Siamese governors. The Anglo-Thai treaty of 1909 legitimized the incorporation of Patani into the Siamese nation at the same time as it created, on the western side, the province of Satun, henceforward separated from the Sultanate of Kedah which had passed into the hands of the British.

At the beginning of the 20th century, the application of the provincial administration system *thesaphiban* to the North-East and the South, placing the entire country under centralized control, gave rise to local resistance, sometimes violent, as was the case, for instance, in the five predominantly Islamic southern provinces (see plate 12 Islam and Christianity) in relation to other measures including the "thaisation" of education. From the 1920s, the policy of integration of these five provinces has varied according to the governments and their view of international relations

(especially with Malaysia) and their assessment of the scale of resistance movements made up of those who call themselves the *Melayu*. The ethnic and religious identity, the awareness of a former political independence, also make the South peninsular region a particularly sensitive area. The denigration of distinctive cultural traditions took on other forms (subordination of the local *sangha* to Siamese monks at the beginning of the 20th century) in the North-East, suspected of separatist intentions and where, in the 1960s and 1970s, communist guerilla movements brought fears that a front was opening up in Thailand. The backwardness in infrastructure provision and in the economy, the poverty, all show another dimension of the “northeastern problem” that robust rural development programs intended to alleviate: Accelerated Rural Development, widely backed by the USA who had military bases in the region; at the end of the 1980s, *Isan Khiao* (Green North-East), launched by the army to reforest and install agricultural village infrastructure. At the same time, the raising of the level of education, the confrontation with the outside world (especially as a result of emigration) has helped construct a regional identity for those who consider themselves *Khon Isan*.

The physical environment also contributes to the very clear individuality of the two regions (see also plates 7 Relief and hydrographical system and 8 Environment and natural resources). The North-East is a hard environment with soils that are poor and of variable fertility according to topography and vulnerable to salinity, rainfall that is uneven and irregular over time, causing flooding for several weeks (in the valleys) and extreme drought for the rest of the year. In the South, which has a high rainfall and is widely open to the sea, the low eastern coastal side with its alluvial plains contrasts with the rocky, indented western side. The agro-ecological landscapes that express the relationships between units of the biophysical environment and the social groups that exploit them are the subject of case studies: one on the Sakon Nakhon basin, one of the two physical sub-regions of the North-East (**plate 61 Land use in the North-East: Sakon Nakhon province**); the other on the eastern side of the South region, between Nakhon Si Thammarat and Phatthalung (**plate 62 Land use in the South: Pak Phanang watershed**). Mapping here is the result of a classification of information from satellite images validated by direct observation. When an analysis is carried out on two dates, differences in interpretation of details can make validation delicate,

yet do not affect the significance of the whole.

The last three plates concern district level (*amphoe*). This scale level is better suited than the one used at province level to present the modalities of population distribution or specific agricultural and industrial features in more detail. For industry in particular, it shows the duplication of the center-periphery phenomenon already observed between provinces, but now seen between districts within the provinces. For each theme, the map bases have been adapted (generally by grouping districts together) to adjust the statistical mapping to the administrative units used by the body responsible for the data collection. Population distribution within the provinces (**plate 63 Population in North-East and South**) bears witness both to the attraction of the urban areas and to the spread of settlement as the result of agricultural colonization that has marked the history of the country since the middle of the 1950s (see plate 19 Population distribution and demographic features). Crops have been selected both for their importance in each region studied and for the availability of statistical information at district level (**plate 64 Agriculture in North-East and South**). Fruit trees and oil palm trees are some of the perennial crops, other than rubber, typical of the South (major or even exclusive production at national level). Rice (white rice or glutinous rice) is an important crop in the North-East which has strengthened its position as producer (see plate 33 Rice). The duplication within the provinces of the spatial imbalances of industrialization refers to a certain number of factors, among which are the unequal availability of equipment and facilities, the geographical position of the district, notably its distance from the center of the country, and the role of local entrepreneurs (**plate 65 Industry in North-East and South**). These entrepreneurs, alone or with Thai or foreign participation, have been able to reach out to national and international markets, not limiting their operation to local or regional markets.

REGIONAL SPECIALIZATIONS in the NORTH-EAST and the SOUTH

Production of silk hanks (Chaiyaphum province)

The North-East has acquired a reputation for its silks with motifs from Laos and Siam. Mulberry leaves are harvested during the rainy season to feed successive generations of silk worms. Weaving is made mainly during "free time" in the dry season. Traditionally carried out by the women, silkworm rearing, depending on the localities, is either a family activity or is integrated into a manufacturing process.



Photo Doryane Kermel-Torrès

Rubber sheet workshop (Phangnga province)



Photo Doryane Kermel-Torrès

The production of natural rubber, 90% of it from the South, is mainly carried out by small farmers. The rubber tree begins to produce after six years and yields depend on several factors, including tapping techniques. The natural rubber is commercialized in three different forms: sheets, compacted into blocks, fresh and liquid. The sheets are hung out to dry for 7 to 10 days.

A mosaic of intense land use

The province of Sakon Nakhon in the far north-east, with an area of 9,606 km², illustrates the form of agro-ecological landscapes in the North-East that have resulted from the agricultural land colonization and the gradual diversification of cash crops. The map represents the situation after the rainy season (May to October), and enables us to appreciate how farmers make the best use of the land's diversity, according to its position in the toposequence, which conditions the nature of the soils and their moisture-holding capacity.

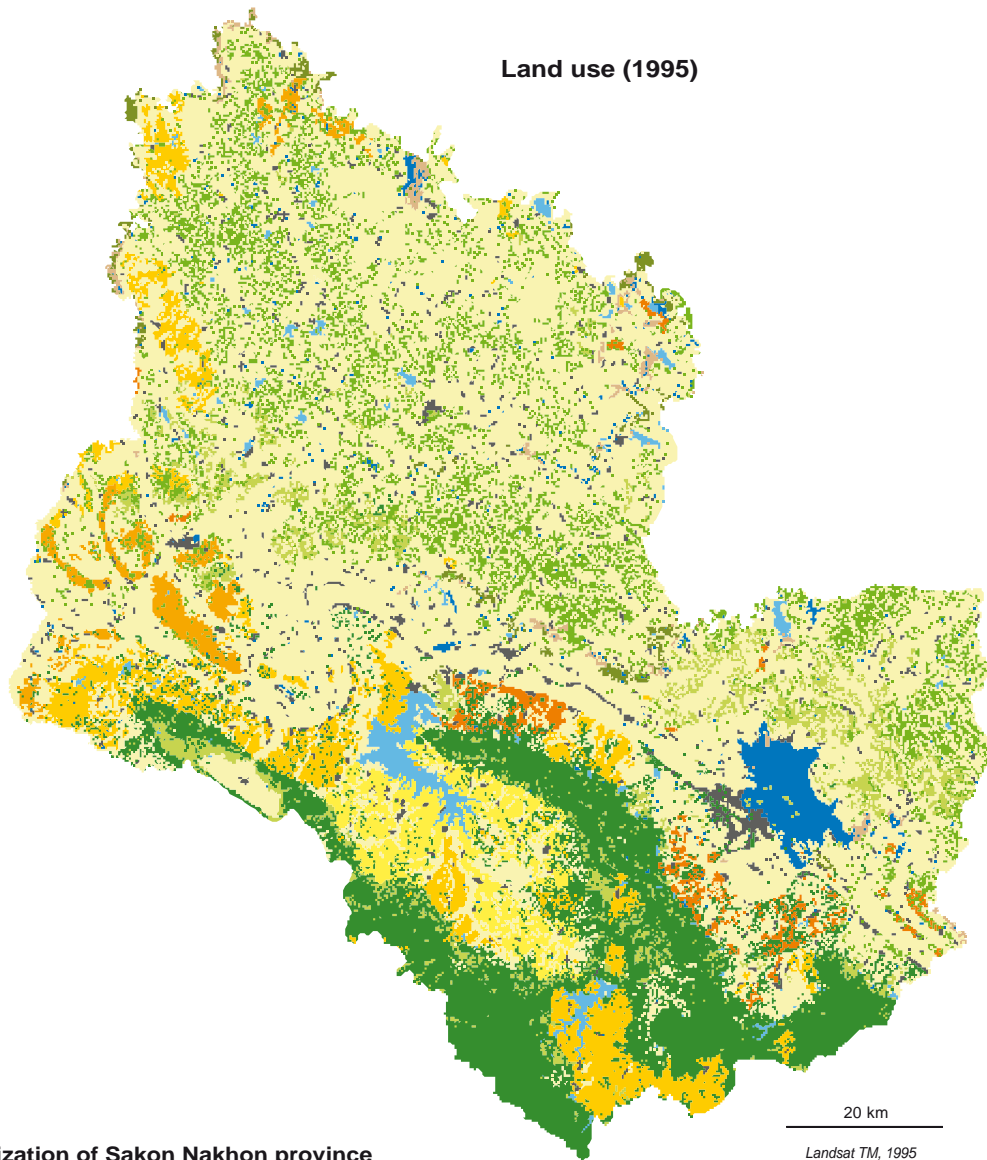
Two main types of physical environment can be observed. In the south, the Phu Phan Range, with forest, reaches its highest point in the extreme south-east of the province at 666 m. A national park has been established here, which also extends over the cultivated zones: as elsewhere (see plate 23 Deforestation) there is a divergence between the conservationist logic and the survival of the rural populations (crops already established, collection of firewood and plants that traditionally form part of the diet). The rest of the area is occupied by the Song Khram basin. The main course of the river passes to the north-east of the province, flows directly into the Mekong, and collects in the province the two main tributaries (Lam Nam Yam and Huai Nam): their valley is recognizable by the density and homogeneity of the paddy fields and by the large numbers of swamps and small tanks. The largest reservoir (Nam Un) was created on the river Huai to regulate water supplies to the paddy fields downstream, while the Nam Pung dam in the south-east serves hydro-agricultural purposes. The built-up areas are scattered across the middle and low terraces, they also form strings along the communication axes and are grouped together in small towns, the largest of which have municipality status: in 1999 Sawang Daen Din in the east has 11,000 inhabitants, Wanom Nivat in the north has almost 10,000. The provincial center, with over 50,000 inhabitants, is next to the natural reservoir of Nong Han.

Four agro-ecological landscape units can be seen on this scale. The first two occupy the area to the south of the diagonal formed by the Sakon Nakhon-Sawang Daen Din road axis, bordered by built-up areas. The forest unit consists of a mixed deciduous forest on the highest areas and a clear forest, mainly of dipterocarps. This natural landscape has been encroached upon by pioneer crops on the borders (cassava) and at the center, in small depress-

ions (rainfed rice). The second unit consists of cash crops or field crops (cassava, sugar cane, and others such as maize, and kenaf in the past) in fields with scattered trees on the well-drained pediment slopes or middle terraces: the gentle undulating topography allows for paddy fields in the valley bottoms or on some slopes, creating a very delicate mosaic of different crops and trees; on pasture-lands cattle rearing is possible. A transition zone between these clearly agricultural areas and the first unit can be seen on the slopes of the Phu Pan Range where the forest has been degraded by tree felling in order to put in cash crops: these coexist with forest remnants in clearings strewn with charred stumps and tree trunks.

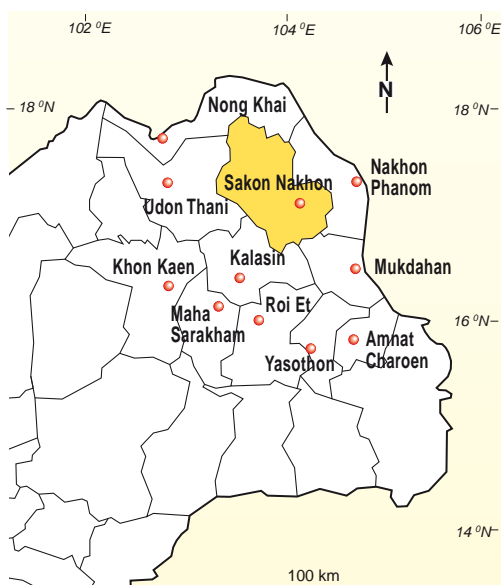
The third unit, at the junction of the middle and low terraces, is characterized by rainfed paddy fields with tree cover; density is high to the north of the road axis, and cash crops can be established above them in open fields. In the rainy season rice is the main crop, while in the dry season tanks allow diversification into small areas of vegetables and legumes (see also plate 64 Agriculture in North-East and South). Lastly, the fourth unit, the flood plain and the low alluvial terrace concentrate paddy fields with no tree cover (or with just a few sugar palms): here the principal crop in the rainy season is glutinous rice and irrigation of some fields makes it possible to produce a cycle of white rice or a vegetable/legume crop in the dry season. The highest rice yields are obtained in this area but they can be affected by salinity, especially on the low terrace. This zone also has the longest established population and is the most densely populated (over 100 inhabitants per km²).

At first, farmers took advantage of the great variety of landforms to increase the cultivated areas: paddy fields, then from the 1950s, the slopes and uplands. Since the beginning of the 1990s, their strategy has consisted mainly of increasing intensity of land use, by adopting seasonal crop rotations or diversifying agricultural activities (cattle rearing) to increase the productivity of family work and spread the work more evenly throughout the year.



Landsat TM, 1995

Localization of Sakon Nakhon province



- Paddy fields
- Field crops
- Sugar cane
- Cassava
- Degraded forests and cassava
- Mixed deciduous forests
- Dry dipterocarp forests
- Bamboo forests
- Bushes and shrubs
- Swamps
- Built-up areas
- Natural water resources
- Built-up water resources

Source : Khon Kaen University, Division of Environmental Information, 1998

Forests under threat: spatial expansion of aquaculture and rubber cultivation

As a result of the wide diversification of primary sector products in Thailand there have been correspondingly significant changes in land use. The Pak Phanang watershed illustrates the evolution that has occurred in rural areas in the South, with the development of aquaculture (especially shrimp farming) and rubber tree cultivation. Between 1988 and 1995, the spatial expansion of these two productions, major users of manpower and important foreign currency earners (see also plates 36 Rubber and 38 Recent breeding and shrimp farming activities), resulted in the advance of the agricultural front causing damage to the forests, and in crop substitution.

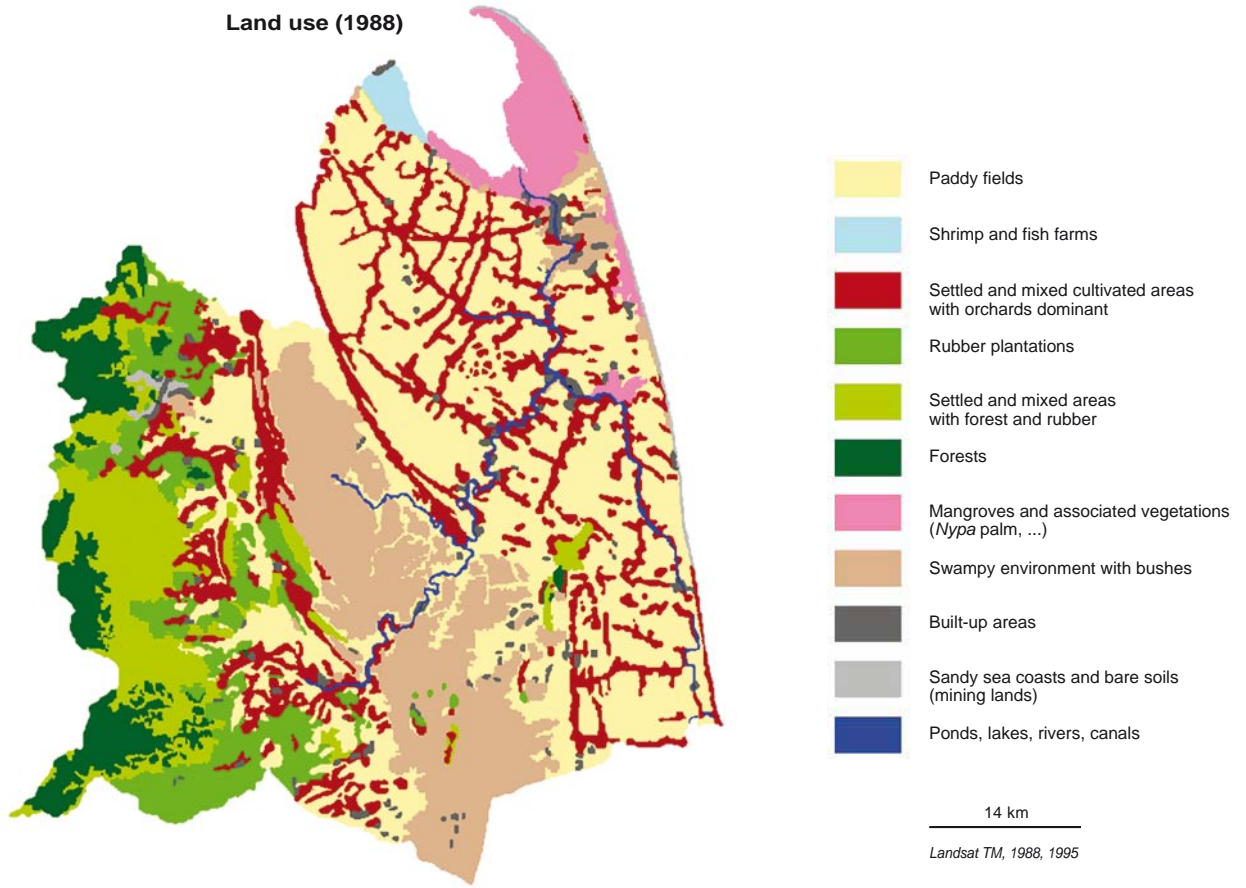
Extending from a clear indentation on the eastern coast of the peninsula to the mountain ranges (up to 1000 m) in the southern part of the Nakhon Si Thammarat province, this tiny region is organized into three main units of agro-ecological landscapes. The west, consisting of mountains, low and medium hills, is the area of evergreen rainforests, rubber plantations and, in the flattest parts of the watershed, paddy fields. In the east, the area formed by the coast and the lowland plain is covered by a mangrove forest, paddy fields and aquaculture, and is crossed by rivers. These two units also contain strips of settled and mixed cultivated areas. In the center, forming a buffer zone, lies a swampy plain with bushes. The changes that occurred between 1988 and 1995 produced very different trends in these three major units: homogenization in the west, the opposite effect in the east, with the center remaining stable despite some encroachment at the edges by paddy fields and mixed crops.

In 1995, the rubber plantations in the western part encroached on the forests, of which now only a few traces remain. Whereas in 1988, the plantations were situated on the lowest part of the watershed, they took over in the mixed zones (forest and rubber) which formerly covered a large surface area. These mixed areas still remain as small formations adjoining some paddy fields. During this period, rubber monoculture did not encroach much on the paddy fields, but it gradually eroded all the zones characterized by the association of housing and fruit tree plantations. While the spatial expansion of the rubber plantations is undeniable between these two dates, the rate at which it advanced, in the Pak Phanang watershed as elsewhere in the peninsula, slowed from the middle of the 1980s.

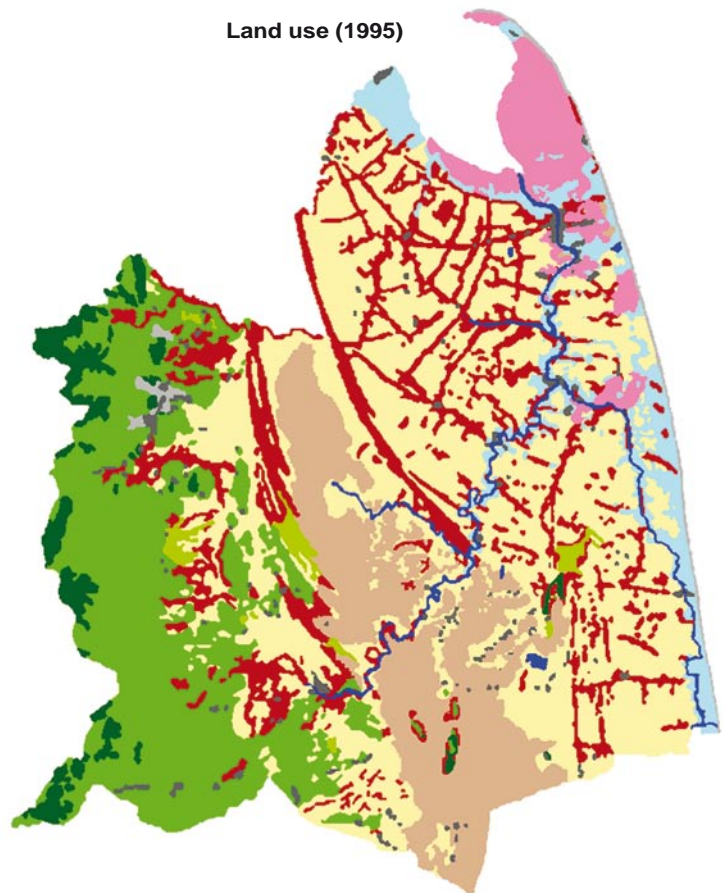
Aquaculture experienced a boom from 1988 onwards, which brought Thailand into the world shrimp market. Although on the face of it intensifying farming techniques led to a reduction in the amount of land used, in fact the installation of shrimp and fish farms was the main cause of the destruction of the mangrove and the transformation of agricultural land. In 1988, aquaculture was restricted to the end of the western promontory of Pak Phanang bay, but in 1995 it took over part of the mangrove forest at the bottom of the indentation and also assimilated coastal areas along the Gulf of Thailand and land areas along the main rivers: in the latter areas, farmers attracted by the prospect of large, quick profits substituted paddy fields or orchards for ponds. Some fairly large areas of mangrove remain between the shrimp and fish farms and the bay, whereas formations in the south, and especially around the small town of Pak Phanang, are dominated by other plant species (*Nypa* palm). The installation of ponds in the middle of the mangrove is a foretaste of future destruction in the eastern promontory.

The spatial expansion of rubber cultivation and aquaculture was accompanied by considerable intensification of culture practices, mainly by small or medium producers with help from the state and large private firms. Aquaculture, for example, was a traditional activity, an extensive system for farming a variety of species of fish, crustaceans and molluscs. The transition in the 1980s to poorly controlled intensive systems resulted in an impoverishment of the species farmed, as well as the felling and degeneration of the mangrove, pollution (discharged water full of toxic waste) which has harmful consequences for coastal aquaculture and for other users (farmers practising rice cultivation, market gardening or orchards, non-farming fishermen). The resulting conflicts between users, the problems associated with the consumption of drinking water, are symptomatic of an inability to manage the coexistence of a new production system with the other systems already in place. Moreover, farmers in aquaculture whose farms are affected by pollution and the epizootic diseases that occur when the density of larvae is too high, are forced to abandon this activity which, despite the high level of quick profit that it can provide, does involve a considerable degree of risk.

Land use (1988)



Land use (1995)



Localization of Pak Phanang watershed



Source : Chao Yongchalermpchai, Danupon Tonnayopas, Anan Khampeera, Suchada Yongsatisak, 1998

Regional settlement and specific population density patterns

According to preliminary results from the 2000 census, the North-East and the South have 20,759,899 and 8,057,518 inhabitants respectively, or 34% and 13% of the country's total population. These proportions have remained stable for over five decades, with a slight drop in the North-East and a similarly small increase in the South, which accurately reflect their respective demographic growth rates between 1947 and 2000: 2.3% and 2.5%, for a national annual average of 2.4%. Somewhat different demographic (see plate 14 Demographic characteristics) and migratory behavior patterns (see plate 17 Inter-regional migrations) account for the difference in the rates for the two regions. In the 1990s, growth in the North-East was lower than the national average, although it had been higher between 1960 and 1980, whereas the growth rate in the South remained higher than the national average, and this difference has become more marked since 1970.

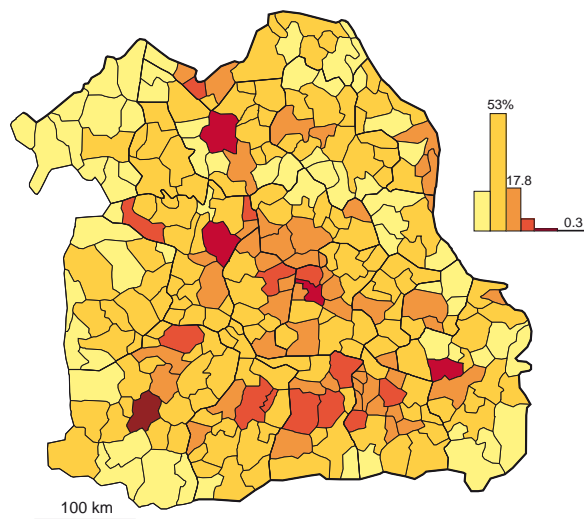
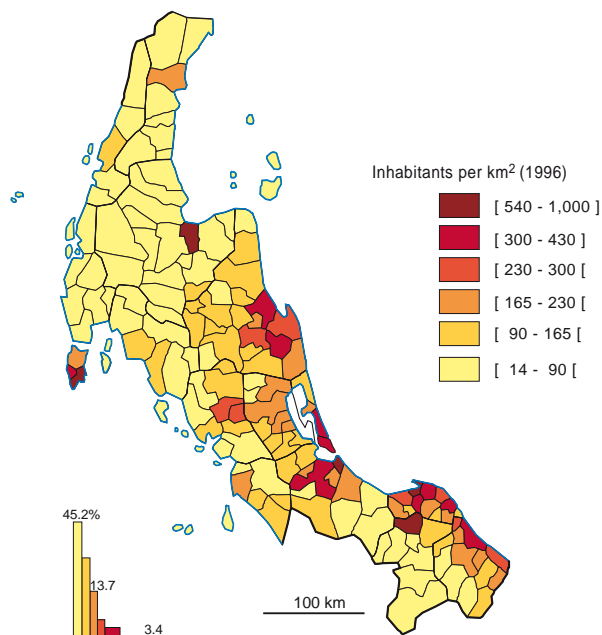
With 122 inhabitants per km², population density in the North-East is higher than the national average of 110 inhab/km², whereas the South, with 108 inhab/km² is much closer to it. In both regions densities are very uneven between districts, reflecting the relationship between population distribution and the physical environment, the duration of land development and the size of the administrative meshes. The spatial distribution of these densities is thus based on configurations specific to each regional space. A comparison of the extreme density values reveals a much higher occurrence of these in the South, reflecting the much wider disparities between settlement levels here. Hence five districts with provincial centers (*amphoe muang*) belong in class 540 to 1,000 inhab/km² (Pattani in first position), all situated on the eastern side, except Phuket (in-migration linked with tourism), while in the North-East, Nakhon Ratchasima is the only one, but with a population in absolute terms four times that of Pattani. Both regions have the same number of districts (65) with a density lower than 90 inhab/km², yet these represent 45% of mapped districts in the South and only 22% in the North-East, where more than half the districts are in the 90 to 165 inhab/km² class.

The South has a double dissymmetry in its settlement pattern: contrast between the north and the south, and between the eastern and western sides. North of a diagonal running from the island of Ko Samui to the bay of Krabi, densities are no greater than 90 inhab/km² except in the *amphoe*

muang of Ranong and Chumphon, and they reach their highest in Surat Thani (600 inhab/km²); here the mountains (Phuket Range in particular) have limited the demographic impact of agricultural colonization and fruit tree plantations (see also plate 64 Agriculture in North-East and South). South of the diagonal, the east/west contrast predominates. From the frontier with Malaysia to Pattani, from Songkhla to Hat Yai and around Nakhon Si Thammarat, the continuum of high densities in these eastern districts, especially on the coasts, bears witness to a long-established settlement (rice-growing) and nuclei that have been active historically (port trade, political influence in the penin-sula in some cases: Pattani, Nakhon Si Thammarat). In the west, despite settlement linked with the rubber plantations, densities are still below 165 inhab/km² except around Trang.

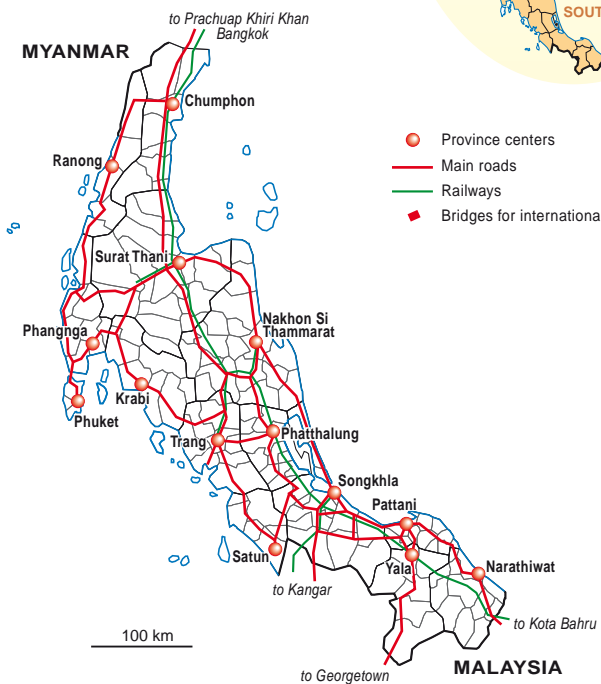
In the North-East, a different spatial configuration contrasts the area surrounding the Khorat plateau, where densities are lowest, with a more densely populated central zone with a pronounced hierarchy in density levels. This picture has to be adjusted slightly, however, as in some districts there are densities (excluding the *amphoe muang*) of over 90 inhab/km² along the Mekong (effect of population deportation from Laos in the 19th century) and on certain southern edges of the plateau; conversely, we note some low densities in some of the inland districts (Phu Phan Range, west of Udon Thani). From the 1950s, following the possibilities opening up for cultivating the high and middle terraces (cash crops), the population spread in an uneven fashion from the center of the plateau and the rice-growing valleys of the Mun (from Kalasin to Yasothon) and the Chi (from Ubon Ratchathani to Nakhon Ratchasima). The size of the administrative meshes, which cover population zones with settlement densities ranging from dense to low, accounts for the very variable densities in the valleys. Today, the communication routes are the determining factor in accounting for the densities of 230 to 300 inhab/km² that can be seen in the corridor in the south of the plateau and in the north-south corridor where several *amphoe muang* stand out: Nakhon Ratchasima, and also Khon Kaen and Udon Thani (over 300 inhab/km²), where growth is strong.

Population density



- State frontiers
- Province boundaries
- District boundaries

Road network



Sources : Michelin, 2000
Ministry of Interior, 1997, 1998
NSO, 1980, 1995
Roads Association of Thailand, 1997

Specialized productions of two contrasted patterns of regional agriculture

In the South, the contrast in the distribution of fruit and oil palm trees is very clearly defined and expresses the duration of agricultural land use. Following the major lines of population density (see plate 63 Population in North-East and South), the fruit trees are concentrated on the east side, in the low, flat coastal districts from Chumphon to Surat Thani, from north of Nakhon Si Thammarat, and from Pattani to the border with Malaysia. On the other side, some of the districts of Ranong and Phuket stand out. If other fruit trees were taken into account, in addition to those represented here (e.g. rambutan, longan, mango-steen, coconut, cashew, durian), this would confirm the east/west imbalance, while still emphasizing the role of tree cultivation in certain districts: Songkhla (orange trees), Nakhon Si Thammarat (lemon trees). Of the rich variety of fruit that benefit from the peninsular climate, rambutan and mango-steen, both fresh and processed, are exported. Co-operation between the Ministry of Agriculture and industrialists has largely contributed to the development of this type of production and processing, with the result that trees are now concentrated into veritable orchards, whereas production was traditionally as varied as it was fragmented, in a multitude of farms (except coconut plantations).

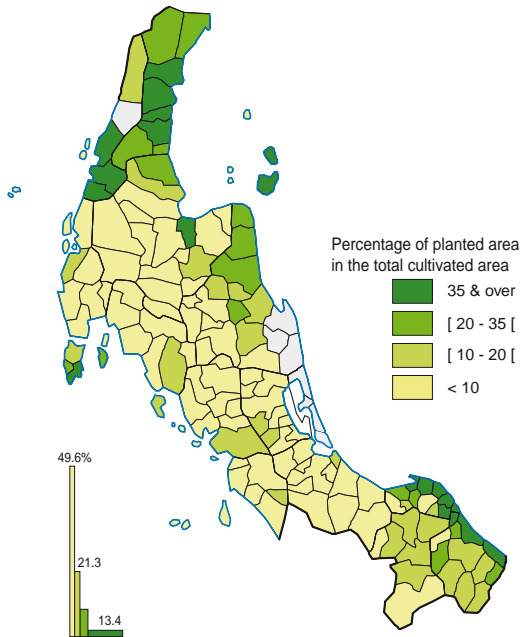
Oil palm tree cultivation has developed on the western side as far as Satun, extending into the provinces of Chumphon and Surat Thani where it becomes fairly dense around the reliefs. Densities are highest in the same physical environments to the north and west of Krabi; they decrease in the coastal districts, especially on the slopes of the Nakhon Si Thammarat Range and pick up again in the northern districts of Satun. The oil palm, exclusive to the South, has expanded since the middle of the 1970s in the context of agricultural colonization, particularly after forest clearing or as a substitute for rubber trees, which are less profitable. In addition to small peasant farms, large palm plantations and oil refineries have been set up by local companies or with associated foreign capital. Production is supported by the state (investment promotion, price support, tariff protection), but does not meet domestic demand and is very vulnerable to trade liberalization: such low productivity exposes it to competition from Malaysia in the context of AFTA.

In the rainy season, rice is planted in all districts in the North-East with acreages varying considerably. Densities are highest in the alluvial plains, irrigated

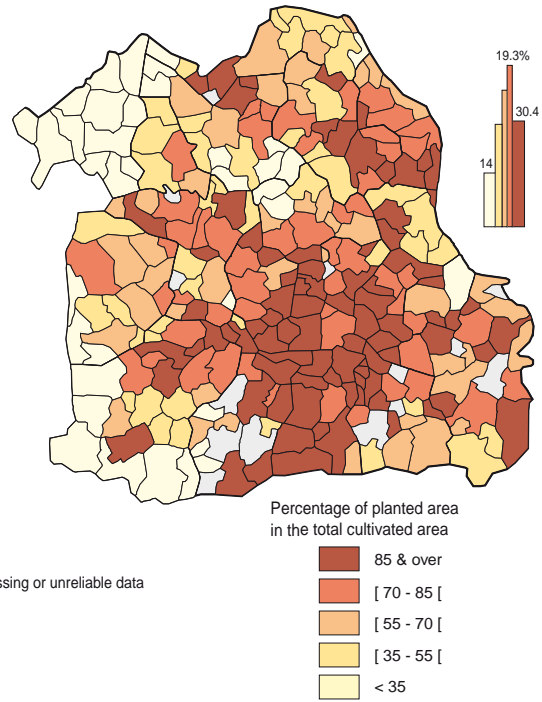
or irrigable in some parts, of the Mun and the Chi and their tributaries, from Ubon Ratchathani to Maha Sarakham and Nakhon Ratchasima, the very heart of rice cultivation. There are other areas where densities are as high, though across a less extensive area and linked to the potential of irrigation (see plate 32 Irrigation), around Nong Khai to the north and Sakon Nakhon to the north-east. The lowest densities are found on reliefs of over 200 m in the vast Loei unit. The intermediate densities can be found on the relief slopes and on the western side of the plateau. Farmers make use of the tiniest patches in the micro-reliefs to plant rainfed paddy fields where productivity is necessarily precarious; they attempt to make up for any shortage of rainfall by controlling water with individual pumps. Planting methods are adapted both to the natural environment and to the shortage of labor at village level: direct seeding, sometimes along with transplanting, has developed since the beginning of the 1990s. Depending on the local water supply, market gardening crops are cultivated on small plots of paddy fields in the dry season.

At regional level, about half of the area is planted with glutinous rice ("Japonica" varieties): the contrast between the south, planted with white rice ("Indica" varieties), and the rest of the plateau reflects food habits inherited from a different established population, as the Lao traditionally eat glutinous rice (see also plate 10 Main ethno-linguistic groups). The cultivation of white rice advanced from the end of the 1970s, at the expense of acreages under glutinous rice, especially in zones that benefited from irrigation. Improved yields increased the production of glutinous rice destined particularly for family consumption, and thus a larger area was planted with white rice which is sold to meet the farmers' monetary needs. Glutinous rice combined with grilled chicken and papaya salad may have become popular in the rest of Thailand and be exported in small amounts, but it remains a limited market compared with that of white rice, which is also eaten more than before by the city dwellers of the North-East.

Fruit trees (1995)



Major rice (1995)

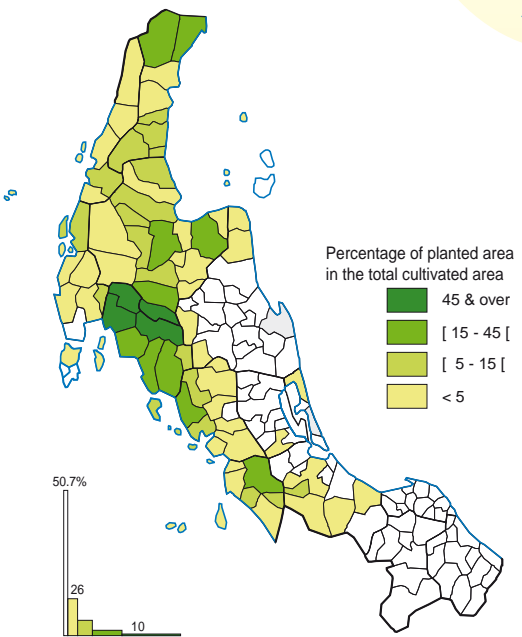


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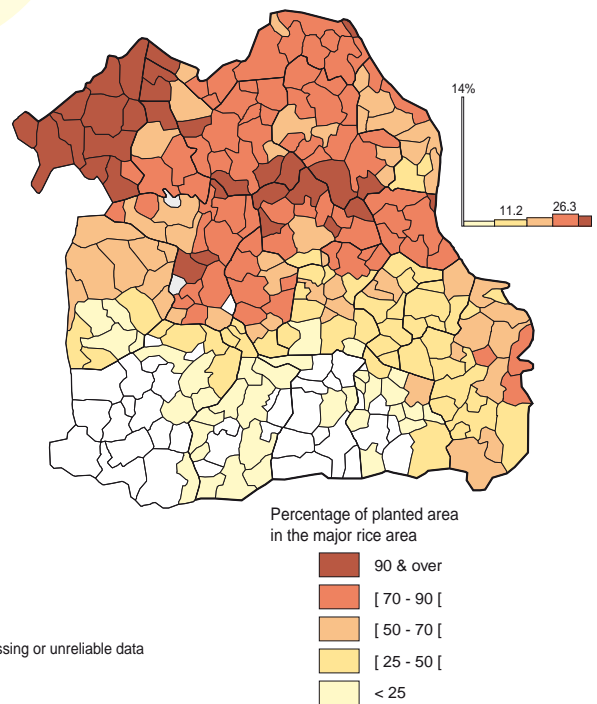
— State frontiers
— Province boundaries
— District boundaries

Oil palm trees (1995)



nil
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Glutinous rice (1995)



Sources : Ministry of Agriculture, 1995
NSO, 1980, 1995

Intra-provincial imbalances in industry

The distribution of industrial employment by province reflects the considerable spatial imbalances revealed in industrialization in the peripheral regions.

Some central provinces emerge as a result of the attraction of infrastructure availability and investments in some major regional poles. The imbalance appears to be less in the South where half of regional employment is to be found in the three provinces of Songkhla, Surat Thani, Nakhon Si Thammarat compared with only two provinces in the North-East: Nakhon Ratchasima, close to the Bangkok metropolitan region, and Khon Kaen.

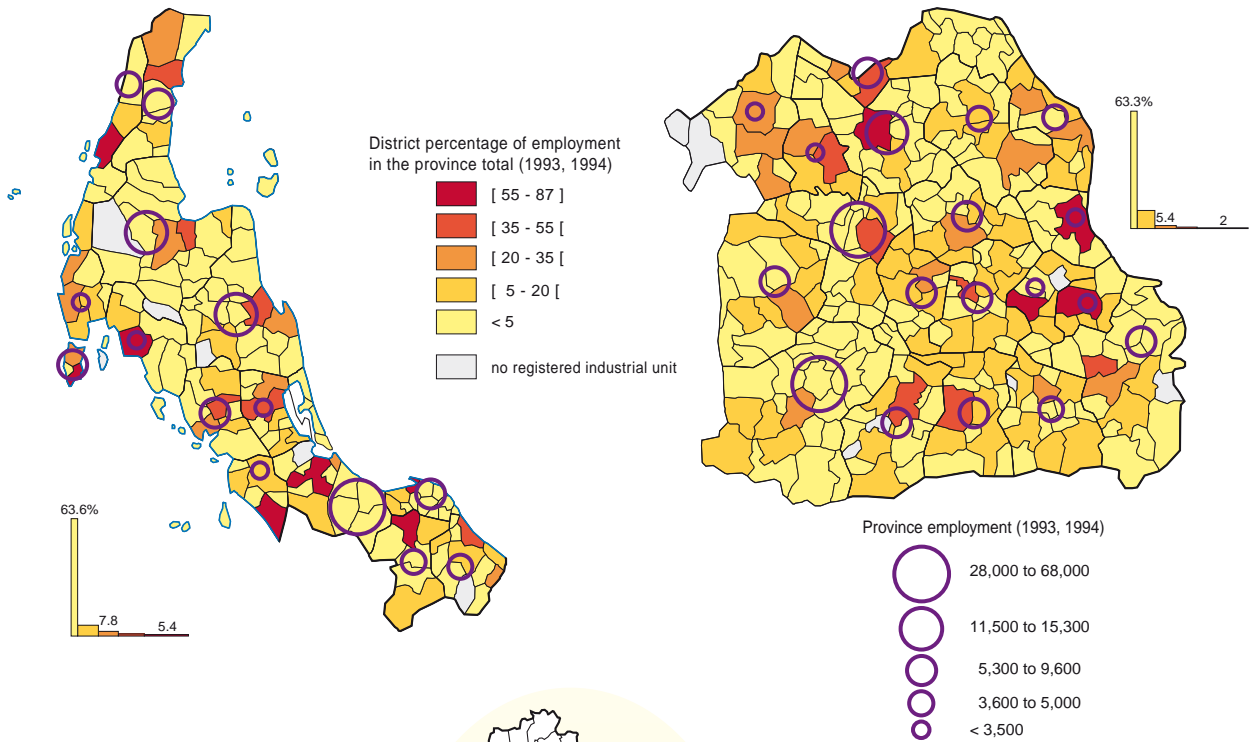
In the provinces, "empty" districts are juxtaposed with districts where there is a concentration of industry. The proportion with less than 5% of provincial employment is the same in both regions but it is higher for the 55-87% class in the South (5.4% for 2% in the North-East). Generally speaking, the districts of the province centers (*amphoe muang*) have the highest ratio: a third have over 55%, 40% have 35 to 54% and a little under 30% are in the 20 to 34% class. The concentration of employment in these districts where the facilities are better, and which are administratively and economically central, appears stronger in the South where 40% are in the highest class, whereas in the North-East this proportion relates to the 20-35% class. The highest concentrations are to be found in province centers where industrial employment levels are low, limiting the true impact of employment in these districts: over 80% in Mukdahan in the North-East and in Satun in the South.

Conversely, the rates for Nakhon Ratchasima and Khon Kaen, for Surat Thani and Nakhon Si Thammarat, with 30 to 50% of provincial employment, convey both the importance of employment in the central districts, given the mass at province level, and the spread of industrialization into one other or several other districts (Nakhon Ratchasima), generally adjoining. Two cases are the exception to the rule of the primacy of the province center district, for different reasons. Almost 60% of employment is concentrated in Hat Yai, whereas the proportion in the central district of Songkhla is only 20%: this is a very small district and enterprises have to settle in the neighboring district. Concerning employment figures that are clearly much lower, the proportion in Phangnga is only half that of the other two coastal districts, a result of their more labor-intensive industrial specializations.

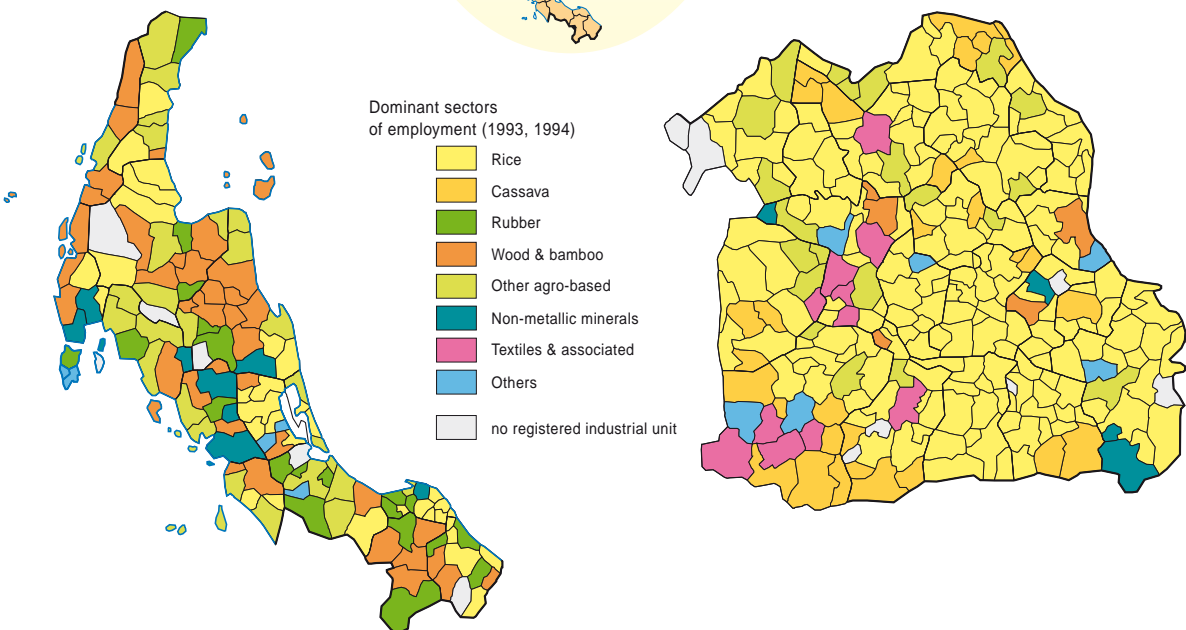
In terms of the comparative advantages of these two regions, the transformation of raw materials is important: agricultural products and wood, non-metallic minerals, and produce from the sea for the South. The map showing the dominant sectors of employment reflects in part the district specialization, by focusing on the dominant sectors. Rice mills predominate in the North-East, whereas they are of more limited importance in the South (eastern side). In the North-East, the importance of the cassava processing plants gives an image that is the reverse of that of the paddy fields (except Loei; see plate 64 Agriculture in North-East and South). In the South, rubber processing is vital for employment. Other agro-based industry covers a wide range of fields: in the South there are the oil mills in Krabi, Trang, Chumphon where there are also fruit canneries, units for packaging produce from the sea and from aquaculture at Songkhla/Hat Yai; in the North-East, there are fruit and vegetable packaging plants at Chaiphum, Khon Kaen and also sugar mills at Nakhon Ratchasima, Udon Thani, canneries and agricultural product processing (cotton, tobacco, leather) at Nong Khai, Ubon Ratchathani. The wood sector touches a large number of districts in the South, whereas in the North-East it predominates in only a very few districts (paper manufacture at Khon Kaen). The exploitation of non-metallic minerals also touches districts in the South more (tin at Phangnga) while the North-East has developed the textile sector by relying on traditional productions (silk, and to a lesser extent jute) and expanding into new areas (synthetic fiber spinning, fishing nets; Nakhon Ratchasima, Khon Kaen).

Whereas industry in the South remains largely dependent on primary resources, the basis of industry in the North-East is more diversified; this is clearly seen from the predominance of the other sectors in certain districts and is masked by the importance of the dominant sector in other districts. New, strongly labor-intensive sectors (electronics, machinery, plastics) have been developed, especially with support from the Board of Investment. In the South, the Board has given its support to a diversification of products within sectors that were already established (products

Industrial employment



Industrial sectors



Sources : Ministry of Industry, 1993, 1994
NSO, 1980, 1995

Social imbalances and spatial organization

At the dawn of the 21st century, in the world classification of countries by Gross National Income *per capita* in Purchasing power parity, Thailand (at over 6,000 US\$) is in the middle income group (see also plate 4 Population and human development in Eastern Asia), a long way behind Singapore (almost 23,000 US\$) and Brunei, behind Malaysia (about 8,000 US\$), but nevertheless a long way ahead of the other ASEAN countries. Still according to the World Bank, Thailand is on a par with Malaysia with 2% of the population living below the international poverty line, clear evidence of the beneficial effects of economic growth and of some of the policies conducted in the country. The inequality in income levels, however, is greater than in a number of South-East Asian countries and in a world context Thailand ranks high. According to national estimates, the income share of the poorest 20% of households is barely 4% of national income compared with 60% for the richest 20%.

There has been sustained improvement in income levels from the middle of the 1980s: with annual growth rate at about 15%, income *per capita* for the whole Kingdom almost tripled between 1987 and 1996. The general increase has spread but with major disparities which the map of income levels by province demonstrates in spatial terms, although the picture is only partial since intra-provincial areas (municipalities, sanitary districts, villages) cannot be differentiated (**plate 66 Income and consumption indicators**). Household incomes are shown (cash income and income-in-kind), determined by the National Statistics Office (NSO) based on socio-economic surveys on a sample of the population. This source seems to be a more appropriate indicator for representing levels of household or individual income than the Gross Provincial Product *per capita*, an indicator that shows overall economic achievements by giving the value added of production. Among indicators of consumption levels, residential electricity consumption is interesting since there is a good electricity supply in both urban and rural areas.

Despite the differential effects of increased incomes in space and in society, the incidence of poverty has declined, wherever the poverty line is set. The first poverty lines were defined in 1974 when the Thai government wanted to use some cut-off income level to determine a minimum legal wage and assess the degree of poverty in the country. Poverty lines defined by the World Bank were used extensively

from 1976; they were then revised in 1994 by the NSO to take into account changes in the consumer price index, population structure, nutritional needs and consumption patterns. The new lines reveal a higher incidence of poverty, though without contradicting the general downward trend: for the Kingdom as a whole, the proportion of the population below the poverty line fell from 29.9% in 1988 (23.7% according to the former line) to 14.3% in 1994 (for 9.6%). Estimating incomes and poverty still comes up against certain obstacles: unsatisfactory definition of "urban", over-registration of the population in rural areas, under-recording of remittances received from emigrants, difficulty in assessing the situation of in-migrants in the Bangkok metropolitan region. Reducing inequalities is a theme that is regularly brought up at the planning stages but few redistribution policies have actually been implemented. While the public authorities see poverty as an essentially rural problem, reducing regional disparities is seen in terms of urban-based industrial development and stimulating provincial growth, in addition to the provision of basic infrastructure (see chapter 3 The state and the construction of the territory).

The magnitude of the social impacts of the 1997 crisis is difficult to evaluate. A study carried out by the Thailand Development Research Institute (TDRI) between mid-1997 and 1999 identified as the main reasons the inadequacy and poor quality of social observations made beforehand (which would have made before and after comparisons possible), the time lag between the economic upheaval and its effects, which may only be felt in the longer term. The aggregated indicators for poverty or income level reveal no major change between 1996 and 1998 (14% and 14.3% of the population respectively below the poverty line) but the repercussions of underemployment and unemployment are clearly differentiated between socio-professional groups and areas. The incidence of poverty that touches the rural population gives a rate of 18%; poverty has increased in all regions (including Bangkok) with the exception of the North: the North-East is always in first position (24% of the population below the poverty line) followed by the South (18%). Economic modernization has not generally been accompanied by the establishment of mechanisms for social solidarity. In the wake of the crisis, some emergency measures were taken (health, education, job creation), with aid notably from the World Bank and the Asian Development Bank, to cushion social impacts and the effects of the 1998 and

1999 budget cuts on public health, social services, education. As a result of the social decline experienced by some groups, other populist programs have been launched more recently: moratorium on debt repayment for farmers, universal coverage healthcare, village revolving funds.

Among the immediate effects of the crisis observed in the TDRI study are the numbers of young people leaving the school system, visible phenomena of social distress but which cannot disguise the shortcomings endemic in the public education system. Although the literacy rate of the population is a clear success (the highest rate in South-East Asia), the education system has seen a significant drop-out rate in school attendance after primary school (corresponding to the 6 years schooling that were compulsory until 1999) with many giving up their studies at the first level of secondary school. Thus Thailand is lagging behind all the other countries of South-East Asia for levels of enrolment in secondary education. In addition to this overall characteristic there are specific spatial differentiations (**plate 67 Education at primary and secondary levels**). Confronted as it is with spatial imbalances, due in part to the location of teaching establishments and employers, the higher education system, universities and vocational institutes, has been unable to adapt to the rapid changes that have come about in society and the economy, and in particular it has not responded to the demand for professional qualifications (**plate 68 Higher education**). This problem of qualifications lies at the heart of the education system reform promised in the 8th plan (1997-2001). The Education Act of 1999, and the Vocational Education and Training Act, should provide a new basis for vocational education and further education by emphasizing links with industry. At the same time, compulsory schooling has been extended to 9 years and the minimum legal age for work has risen from 13 to 15 years old. By comparing two age groups, a clearer picture emerges of the changes that have occurred in secondary and higher education. The definition of the younger age group has reconciled those normally eligible for the different study levels with the age brackets for which information is given in the 1990 census results; the 35-44 group corresponds to individuals who are still working.

The spatial dimension of the major and rapid changes that Thailand has experienced during the last three decades is written into a territory that has been

marked by a long history. The permanence of inequality, whether in economic activities, infra-structure, social services, or even individual incomes or value added, has shaped a country in which Bangkok, in the middle of the 19th century, was already the place where activities and wealth were concentrated. The durability and disproportion of its pre-eminence, the contrast with the peripheral regions, have given rise to depictions which, though not without foundation, are nevertheless exaggerated in what they concealed of the dynamics at work and the transformations underway. New regions have emerged; the structuring of the territory into three major peripheral regions continues, but their varied dynamics and their internal organization are proof that there is a diffusion of change and growth, although indeed spatially uneven. The primacy of the central region is confirmed, however with its outlines expanding and poles and corridors of development emerging in the peripheral regions; the highly unbalanced urbanization pattern remains obvious, despite the expansion of municipalities along the communication axes. Agricultural diversification and intensification have led to inter- and intra-regional specializations which bring pockets of prosperity into close contact with areas that lag behind, and where the future of the rural population is no longer inexorably and exclusively associated with agriculture. Development in Thailand remains uneven in the spatial dimension, as it is in society, but the inequality has become more complex. The last two plates present an assessment of this spatial complexity and inequality based on analysis of the atlas maps. The first (**plate 69 Spatial organization**) relies on a cartographic interpretation while the second (**plate 70 Spatial model**) is a synthesis that suggests the dynamics of the way in which the structure of the national territory has developed. The different graphic representations match and complement each other.

Emptying a pond (bo) before the first rains (Nakhon Ratchasima province)



Photo Doryane Kermel-Torrès

Enjoying the last days of respite before the ground has to be prepared for the sowing season, a family has got together in the open air to harvest and enjoy the fish from their artificial pond. The intensification of contacts with the outside world (development of communications routes and the media, emigration, exchanges through trade) and the improvements in education have altered the rural dwellers' knowledge of the world, and particularly of city life.

Photo session at a graduation ceremony (Bangkok)



Photo Alain Vergnes

The system is very elitist, obtaining a higher education diploma is considered by the families as a sign of great social advancement. Education enjoys prestige and a high position in a society which also values rich businessmen. The wealthiest families send their children to study abroad: thus many Sino-Thai entrepreneurs have obtained their management diplomas in the United States.

Sustained growth and inequalities maintained in income levels

In Thailand, a sustained increase in incomes (almost 10% per year in the 1990s) has been a reality since the second half of the 1980s. It was stimulated for the most part by the economic growth associated with the 1987-1996 boom, and it is getting moving again after the slowdown of the 1997 crisis. While the urban population was the first to enjoy this general increase in incomes, the rural population also found their situation improved and consolidated in a trickle-down effect of economic expansion, especially at the end of the 1987-1996 period. This decline in rural poverty can also be explained by higher prices of the main agricultural products (rise in world prices, removal of domestic tax on rice production), control over inflation and the effects of investment and industrialization policies in the peripheral regions which have provided opportunities in non-agricultural employment.

National averages mask major disparities both between regions and also within regions between urban and rural areas. In 1996, the national average monthly income *per capita* is about 2,900 Baht, but the figure is 6,900 for Greater Bangkok (Bangkok, Nonthaburi, Pathum Thani, Samut Prakan), 3,000 for the Center, around 2,500 for the North and South, and 1,850 for the North-East. In the cities of the four regions, it fluctuates between 4,700 in the South and 5,400 in the North, and varies between 2,600 in the villages in the Center and 1,600 in the villages in the North-East. Throughout the 1990s, the annual income growth in the peripheral regions was higher than the national rate of 9%: 11% for the North-East and the Center, 10% for the North and the South.

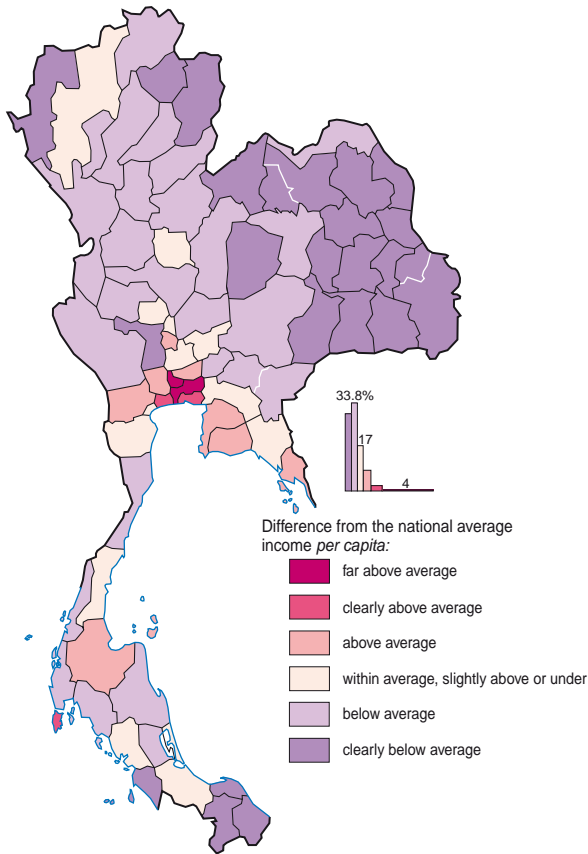
Although the maps do not convey intra-provincial differences, especially between municipalities, sanitary districts and villages, they do give an indication of these disparities. The map of income levels *per capita* clearly shows the differences from the national average income. For incomes above average, we find a large part of the Bangkok metropolitan region (the two upper levels), then the peri-metropolitan ring, which includes the Eastern Seaboard; also in this group are a few provinces like Phuket, Surat Thani and Trat (mainly due to tourism). For the lowest incomes, these can be found throughout almost all the peripheral regions, especially the entire North-East because of the large rural population who occupies the lowest two levels, and in the majority of the border fringes in the North and the South. In these latter two regions the more diversified economic dynamics

and the influence of regional capitals (Chiang Mai, Songkhla) bring some provinces up to an income level within the national average. The map of saving deposits confirms the situation presented in the earlier one, and indeed emphasizes it even further: 9 provinces are in the three highest levels and 27 in the lowest level, compared with 3 and 22 respectively. Greater Bangkok, with Phuket, is once more set apart, likewise the peri-metropolitan ring, in the top two levels; the grouping of 52 provinces in the lowest two levels indicates the low saving capacity of the middle and low income groups; immediately above them we find the urbanized provinces of the North and the South and the metropolitan peripheral area.

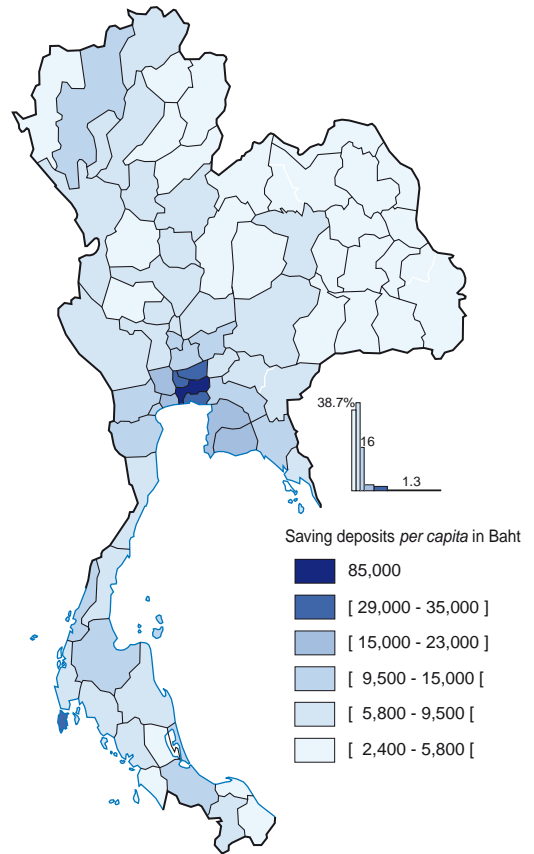
For residential electricity consumption, Greater Bangkok, and Phuket, then the Eastern Seaboard, remain, as is to be expected, in the lead in the top two levels. The intermediate level contains 15 provinces where the relatively high consumption can be explained by the frequent presence of family-run workshops, businesses or services (Chiang Mai, Songkhla, central region around Bangkok). The low domestic consumption in the bottom two levels is a feature of the rest of the country; it is particularly low in the North-East and some provinces on the border fringes in the North and the South.

Lastly, the map of motorization densities introduces some interesting variations on the earlier general picture. While Phuket and Bangkok are still at the top with the highest level, the other provinces of Greater Bangkok and the first peripheral ring fall into the lowest two levels, below the Eastern Seaboard and the rest of the central region which are in the two intermediate levels; this apparent paradox is due to the fact that motorbikes have the predominant role in calculating the index (the map of private cars is different). The motorization density in the rest of the country appears to be very varied, with the provinces distributed widely across all levels except the highest (32 provinces in the intermediate levels). The widespread use of motorbikes and pick-ups, which is one of the effects of modernization, is proof of the improvement in consumption levels in small towns and in some rural areas where activities are diversified and dynamic.

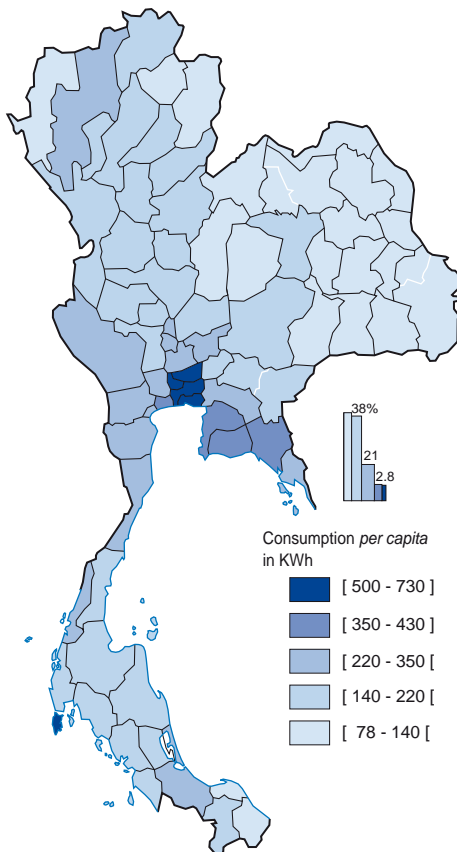
Levels of income *per capita* (1996)



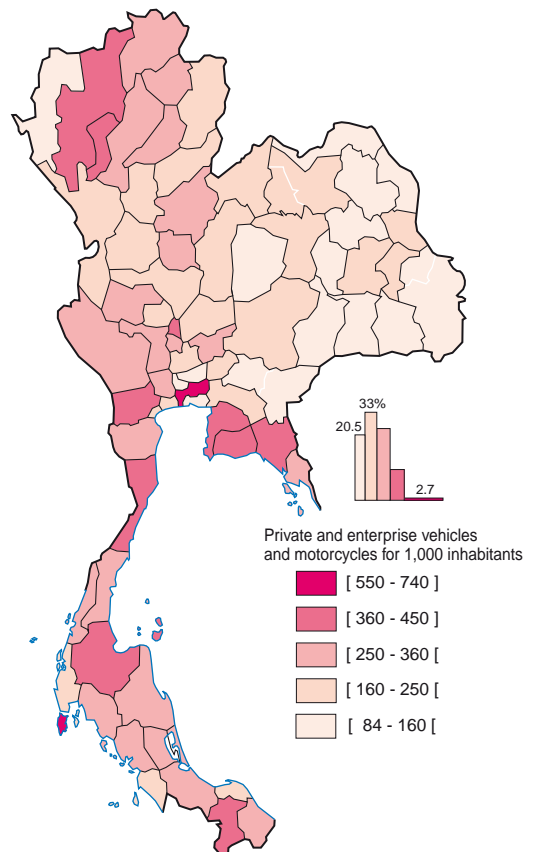
Savings (1996)



Residential electricity consumption (1995)



Motorization (1996)



Sources : NSO, 1995, 1996a, 1996b, 1996c, 1997a, 2000

Shortcomings in secondary education despite improvements in literacy

The illiteracy rate in 1990, 6.9% for the population as a whole, is the result of a solid system of compulsory education (since 1960 the rate of attendance at primary school has been more than 80%) and an effective policy against illiteracy, in particular the work carried out since the 1970s by the Department of Non-Formal Education with adults from ethnic minorities and underprivileged groups. The numbers of adults having completed the first four years of primary education (Grade 4) and who are able to read and write simple Thai reached 94.2% in 1995. There remain, however, 2.5 million adults who are illiterate, of whom 70% are women. Despite programs like the Hill Area Education Project or the educational role conferred on the Border Patrol Police, the mountain provinces on the border with Myanmar (Chiang Rai, Mae Hong Son, Tak) and the mainly Muslim provinces bordering Malaysia (Pattani, Yala, Narathiwat) have a much higher illiteracy rate than the rest of the country.

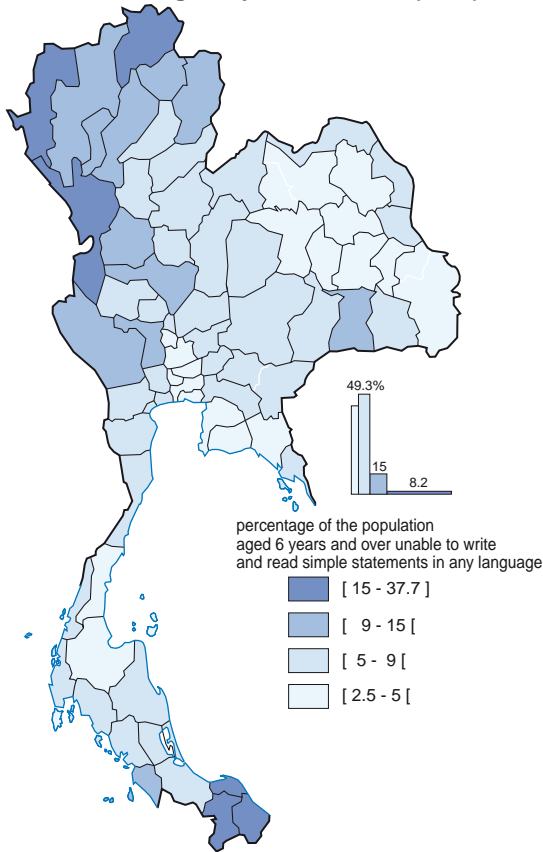
Schooling at primary level is now well-established, both in numbers attending and across the country. According to the National Statistical Office, in 1990 the primary level of education was attained by 90.8% of the total population aged 10 years and over: distribution into two age groups testifies that this was not a recent achievement: 96.1% for 18-29 year-olds, 93.2% for 35-44 year-olds. In three-quarters of the provinces at least 90% of inhabitants have attended primary school. Only the extreme south of the country and the mountainous regions of the north fall below these figures, reaching the lowest level in Mae Hong Son province where almost 50% of the population have not attended school. These are the regions that are the least well integrated into the Thai socio-economic system, with firstly the northern provinces with the mountain-dwelling ethnic groups and their many refugees. The remarkable situation in the North-East, with the highest rates of primary schooling in the country, culminating in Yasothorn with 97.6% of the population, has to be seen in the light of the development programs implemented in the 1960s and 1970s to combat communist uprisings; mastering the Thai language was an integral part of this policy.

The collapse in school attendance between primary and secondary school remains a major problem. In 1990, only 21.8% of the population aged 14 and over had attended secondary school. Despite the fact that the proportion of 18-29 year-olds is now

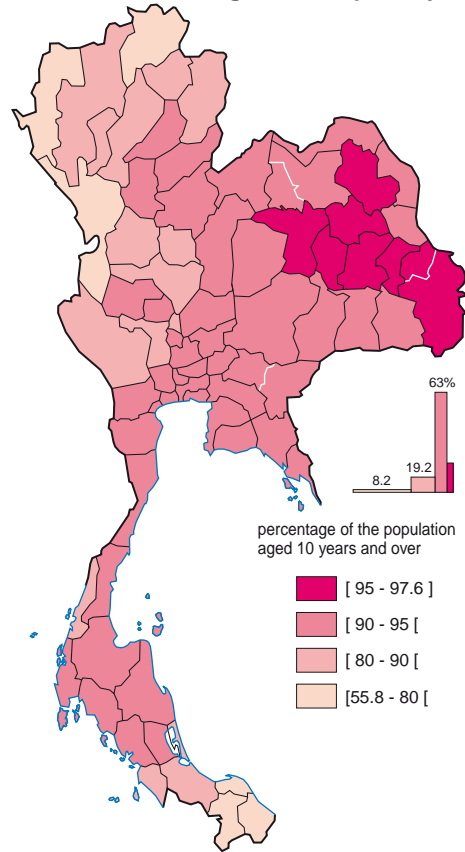
double that of 35-44 year-olds (31.9% compared with 15.4%), these figures are still modest. In the 1980s, there was no major improvement in secondary education attendance and it was only from 1992 that we can see numbers rising (rates of schooling stabilize at around 29 to 30% between 1980 and 1990, then rise to 57% in 1996; see graph plate 68 Higher education). For the 35-44 year-olds there is a great divide between Bangkok-Nonthaburi and their surrounding provinces and a similar split with the rest of the country where those who attended secondary education are concentrated in the urban centers (Chiang Mai, Songkhla/Hat Yai and Phuket and to a lesser extent Khon Kaen and Nakhon Ratchasima). The South stands out with its higher than average levels which are not confined to the most urbanized provinces. The low levels in the North-East are very noticeable, where provinces have 90% of the population attending primary school, yet less than 15% carrying on into secondary education.

Access to secondary education for young people aged 14 to 18 has improved considerably throughout the country. However, strong regional differences remain. The dominance of Bangkok is strengthened and extends to part of the central region. In the North, the Chiang Mai-Lampang center predominates, while the low levels in the North-East are more and more obvious. These variations between provinces according to the degree of urbanization are very clear. The cost of education remains a major limiting factor for passage from the primary into the secondary level for young rural inhabitants. The focus placed by the state on primary education since the 1950s and then on higher education between 1970-1980 has left secondary education as the poor relation of the educational system. This situation limits fundamentally the number of people able even to acquire a professional qualification and thus weighs heavily on the country's ability to modernize. The demand for extensive reforms in the educational system is becoming more and more loudly expressed. The fact that the 1997 Constitution included the right of every individual to a "minimum of 12 years of good quality schooling" is an indication of the awareness of the need for a broader-based, universal schooling system.

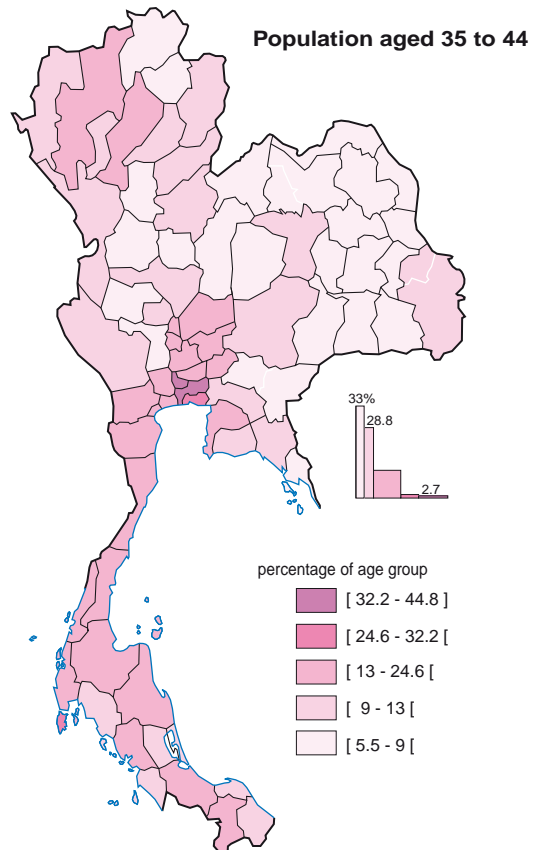
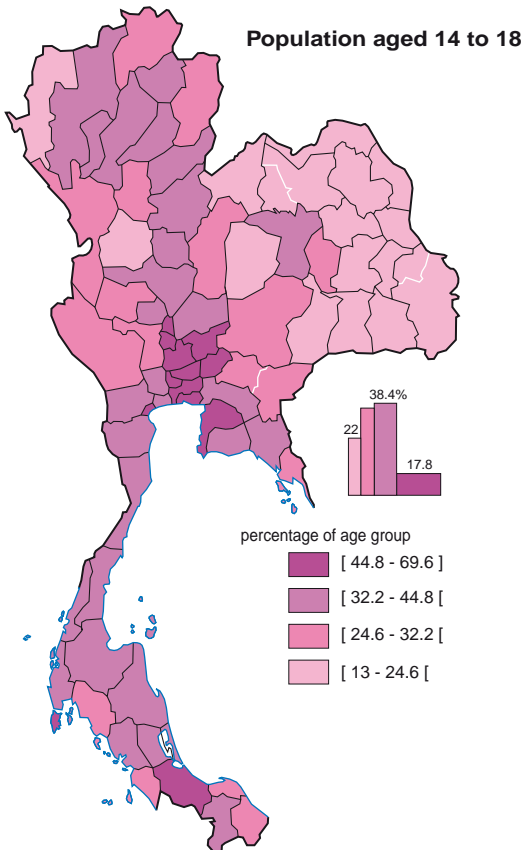
Illiteracy of the population aged 6 years and over (1990)



Population aged 10 years and over having attended primary school (1990)



Population having attended secondary school (1990)



Source : NSO, 1990

Adapting higher education to today's economic and social climate

In 1996, 855,000 students were enrolled in universities overseen by the Ministry of University Affairs, of whom 20% were in the private sector. In all higher educational establishments under the Ministry of Education, including institutes for professional qualifications, there are a total of 1,330,000 students, 24% in the private sector. The growth in access to higher education is a recent achievement: there were 1,284 students per 100,000 inhabitants in 1980, 2,009 in 1985 and 2,096 in 1995. The sharp rise in the number of students between 1970 and 1985 brought the rate of university education up from 2 to 19%. This coincided with the creation in 1971 and 1978 of two Open-to-all Universities, which require no entrance exam and do not limit their numbers, and thus access to university education expanded rapidly: in 1996 these universities had a total of 477,000 students, or 70% of public sector students. However, the elitist university tradition, characterized by a high level of selection and limited numbers of entrants in the traditional universities, is still very much present. The steady increase in the rate of students in higher education was not maintained in the 1990s.

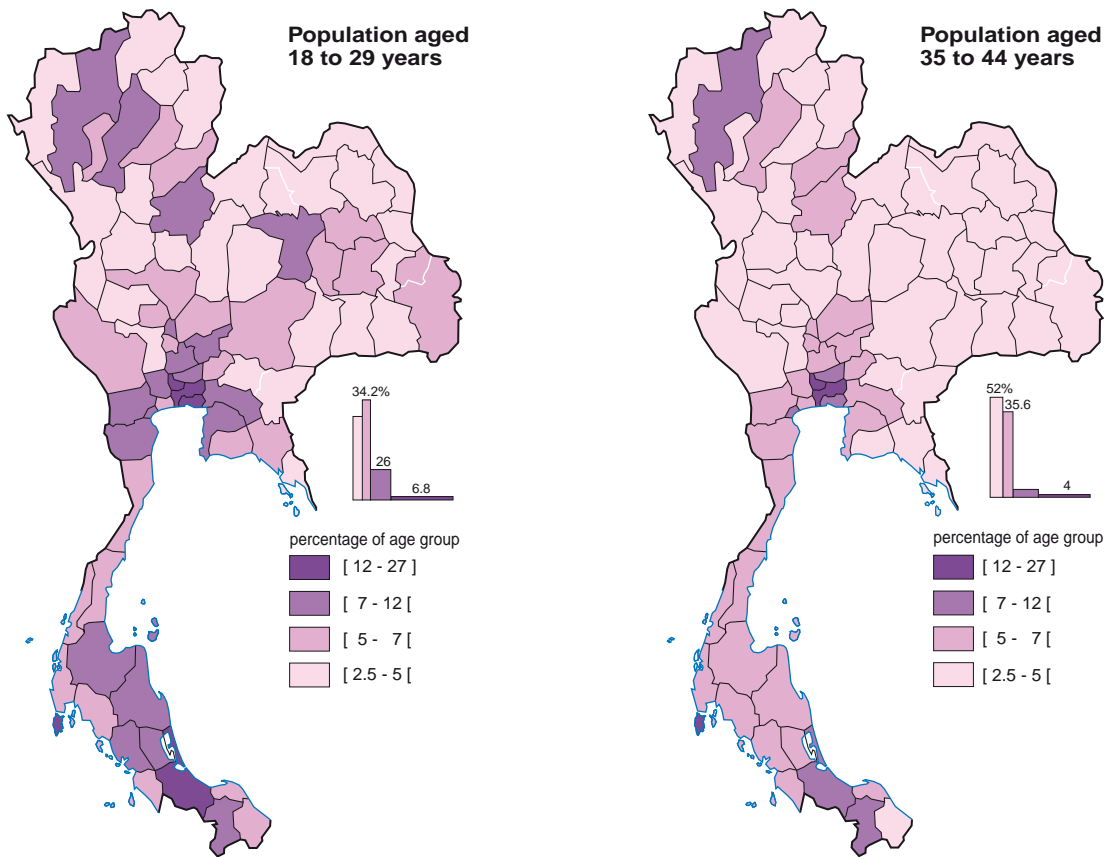
Regional differences confirm the inequalities observed for secondary schools (see plate 67 Education at primary and secondary levels). The dominance of Bangkok is increased and extends to all the provinces of the metropolitan region: 27% of young adults aged between 18 and 29 have attended higher education in Bangkok, compared with 7 to 12% for provinces with main regional cities and less than 5% in most rural provinces in the North and the North-East. However, the urban centers and regional universities, chiefly Songkhla/Hat Yai and Phuket, then Chiang Mai and Phitsanulok are asserting themselves. In the North-East, Khon Kaen stands out in a region where few obtain higher diplomas. This is the result of university decentralization in the 1960s and, to a lesser extent, of the later move to create provincial universities and scatter campuses away from the principal universities (see plate 27 Schools and health facilities). A comparison of the two maps shows the trend of the improvement: whereas the two lowest percentages of the population to have received higher education relate to 65 provinces for the 35 to 44-year-olds, they cover 49 provinces for the 18 to 29-year-olds. All the provinces that remain in the lowest category have nevertheless seen their ratios improve.

The improved access to higher education has

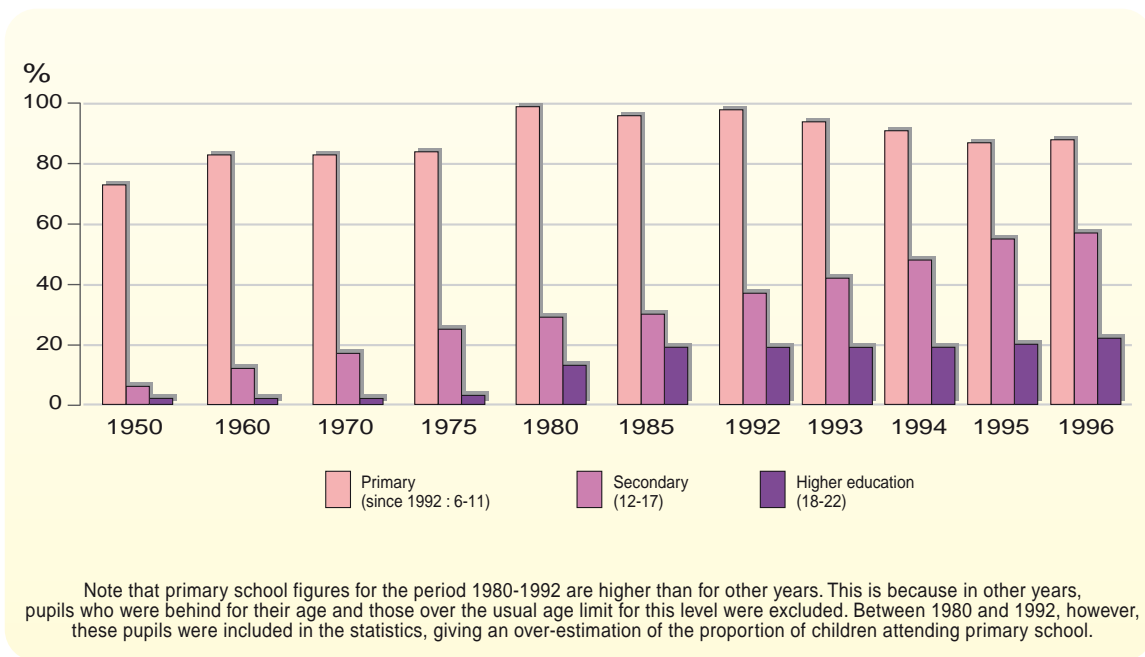
not been matched by the development of a sufficient number of suitably adapted routes into the work market. Standards of technical teaching still vary considerably and there are too few students qualifying in science and technology. Although the number of qualified engineers has doubled in 10 years (7,700 in 1996), there are still not enough to meet the country's needs. Improvements in secondary education have done little to develop professional qualifications at intermediate level, as there are not enough suitable courses and because most of the students prefer to study at university level. Industry in particular is suffering from an acute shortage of technicians: in 1999, only 12% of salaried workers had training up to school-leaving or technician level. Ongoing debates on the reforms needed in the education system relate to changes in teaching methods, which are too firmly based on rote learning, and to reforming university entrance exams. This concern for change obviously presupposes the need to improve teacher training, and the status and pay of teachers, but also inevitably comes up against strong budgetary limitations. In response to this problem, the state envisages an increased degree of autonomy for universities and is encouraging the private sector to invest more heavily in the education sector.

For those in employment, there is still little opportunity for vocational training, as there are no legal obligations on companies to provide this. Existing incentives for companies and salaried workers are not often taken up. This type of further education, organized by the Ministry of Education and the Ministry of Labour, concerns about 700,000 people per year. Non-Formal Education, on the other hand, with priority given to underprivileged social groups and ethnic minorities, is a very well developed sector. This applies to a growing number of people (nearly 5 million in 1996), thanks to the existence throughout the country of Non-Formal Education Centers and numerous offers of training schemes: mainly Adult Continuing Education, with the aim of helping adults to catch up on elementary and secondary level education that they may have missed out on, also vocational

Population having attended higher education establishment (1990)



Schooling rate (1950-1996)
(proportional to each age group)



Sources : NSO, 1990
UNESCO, 1999

Diversity of the territory and heterogeneity in growth dynamics

The diversification of Thailand's territory is the result of the long history and the uneven spatial diffusion of recent vigorous growth associated with the country's integration into the world-system.

1- **Center** (density of population and activities very high). Primacy of Bangkok since the 19th century; dynamic of growth towards Samut Prakan then into contiguous areas of the other provinces at the end of the 1970s. Very strong economic growth in the western provinces from 1989 to 1996; growth dynamics average or stable in provinces already industrialized (development of the tertiary sector).

2- **First peri-central ring**. Very strong urbanization and industrialization dynamics, but with east/west imbalance. Vigorous industrial growth in the arc from Ayutthaya-Saraburi (major communication axes and crossroads) to the coastal area of the Eastern Seaboard (deep-water ports, industrial estates).

3- **Second peri-central ring** (population density high). Industrialization and urbanization underway. Intensive and diversified delta agriculture: irrigated rice predominates, tree crops, market gardening produce and breeding (for the metropolitan market), sugar cane (agro-industry). Growth average to dynamic, according to importance of industry.

4- **Non-deltaic Central Plain** (population density average to low). Rice-growing and upland crops with very variable growth dynamics; on the fringes, cleared between the 1950s and the 1980s, cash crops (tree crops, sugar cane, maize, soybean, cassava). Rurality split by the development of industry and services in the poles and the north-south corridor from Phitsanulok to the Center and in the south-east (Eastern Seaboard effect) with more dynamic growth.

5- **Mountain areas** (population density low to very low). Encroached forests and extensive crops; low growth dynamics throughout most of the North, along the border with Myanmar and some reliefs in the North-East and South. To the north and the west, irregular modification of cropping systems by ethnic minorities (penetration of market economy and programs to substitute poppy cultivation). Insecure border zone (Burmese issue).

6- **Basins in the North** (population dense and long-established). Intensive, diversified crops (vegetables, soybean, tobacco, tree crops) to supply agro-industry. Rural cottage industries revived and tertiary sector developed in the towns as a result of the growth in tourism. Chiang Mai-Lamphun, the principal pole, linked to Lampang to form corridor; axis with Chiang Rai with high development potential (opens into neighboring countries). Growth from low

to very dynamic (especially Lamphun for industry).

7- **Two zones of unequal area size in the North-East** (population dense and long-established). Dominant rice-growing in diversified agriculture with low growth dynamics. Population and crops spread out from the heart of the southern zone from the middle of the 20th century. Variety of physical environments: market gardening produce on the lowlands, upland crops (cassava, sugar cane, cattle rearing) on the terraces supplying urban areas and agro-industry.

8- **Uplands on the Central Plain and North-East fringes** (population density average to very low). Dominant upland crops in diversified agriculture with heterogeneous growth dynamics. Areas of more recent colonization, with uneven dynamics of diversification and intensification (productions integrated into the industrial sector). Growth in agriculture stronger in northern part.

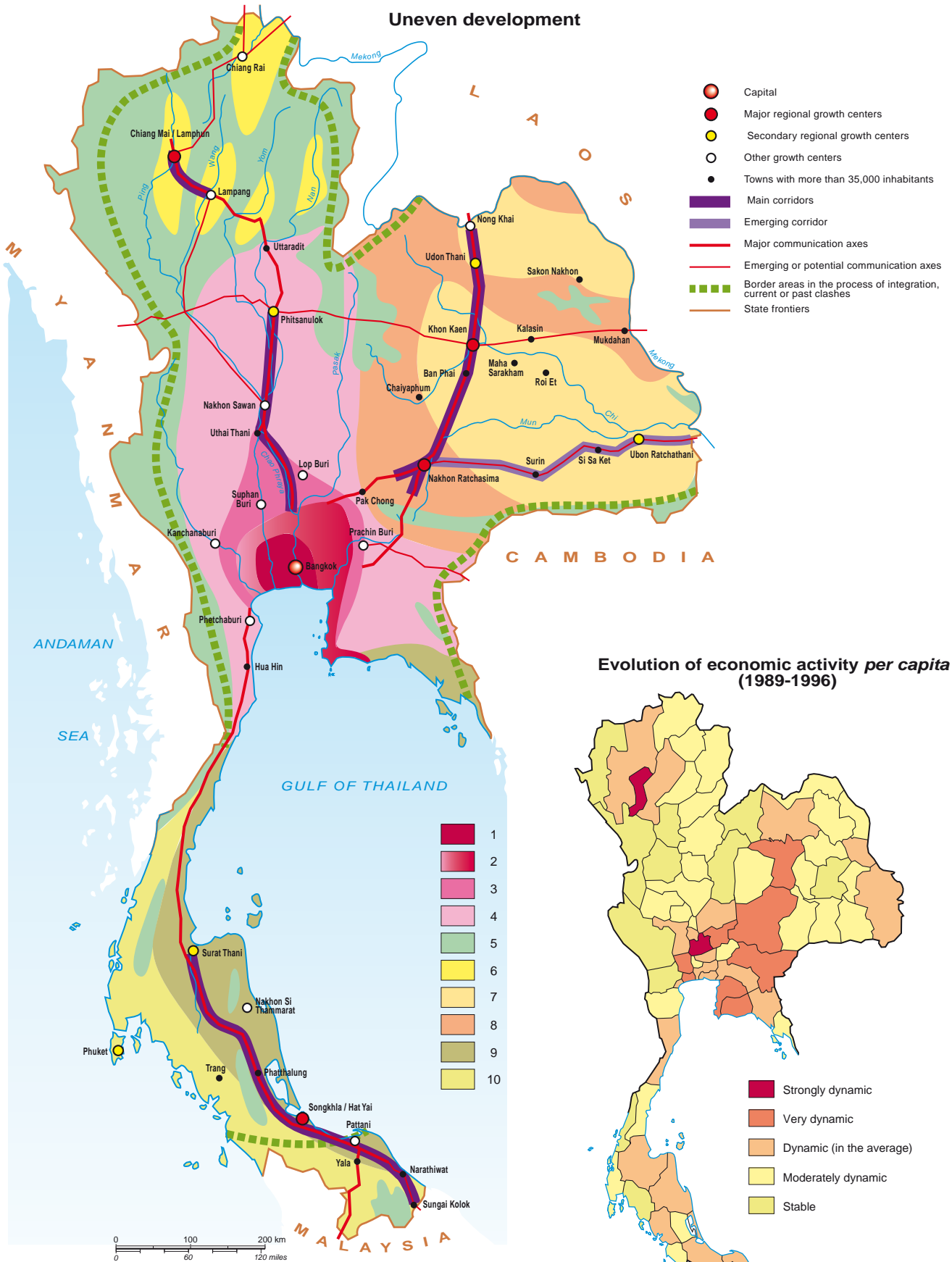
More dynamic economic growth in the main north-south corridor opening into Laos, developed under pressure from the Center and the Eastern Seaboard, strengthening the position of the two main poles. Another corridor emerging to the south (small towns and secondary pole at Ubon Ratchathani) and transverse axis further to the north with good development potential (exchanges with neighboring countries).

9- **Eastern side of peninsula** (population dense and long-established). Dominant tree crops (fruit and rubber trees for industrial units) and shrimp farming highly developed, both with very strong growth dynamics; limited rice cultivation in the coastal alluvial plains. Corridor disconnected from the Center but open to Malaysia with urban poles of varying importance. Growth dynamics within the average (more industrial in Songkhla/Hat Yai; tourism in Surat Thani).

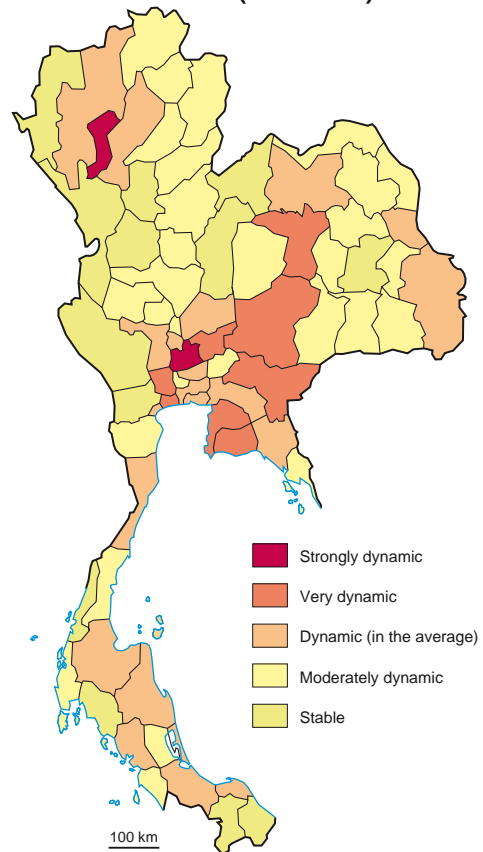
10- **Western side** (population density low). Predominant tree crops (little rice cultivation, peasant plantations of rubber trees and oil palms) with strong growth dynamics; shrimp farming developing. Recent active colonization. Very small scale urban network; industrial activities and revenue from tourism concentrated in Phuket. Growth rates variable.

Strong contrast between the two sides, coupled with differentiation between north and south (delayed integration, sporadic clashes over the cultural identity of border areas).

Uneven development



Evolution of economic activity per capita (1989-1996)



Five basic models showing the structure of the national territory

The choice of a semi-circle as the basic figure for the graphic model emphasizes two hypotheses relating to the role of the core-periphery dynamics and the fact that the country is closed to the west, yet open onto Indo-China and the South China Sea.

Two basic models (choremes) are combined to form the main components of the structuring of the territory: an organization of concentric rings around a powerful center and a division into "regional" quarters. Three more models qualify or diversify this overall framework: the organization of urban gravity, the effect of dissymmetry, and the corridor effect; and to complement this, the action of barriers and synapses between Thailand and the neighboring countries.

The organization of the territory into concentric rings and according to the core-periphery model corresponds to a combination of two distinct shapes of significance and period of time. The first, inherited from a time long ago, reveals the power relations and the organization of the Kingdom of Siam in the 19th century (a royal domain under direct administration and two concentric rings where there was a gradation in the autonomy of the administrative units). The second, functional and contemporary, is a traditional example of the core-periphery model of political and economic organization from the second half of the 20th century, in a context where the nation-state is consolidating itself, where urbanization and industrialization are spreading (with specific emphases introduced by the wide opening up of the country to the outside world or the effect of urban primacy). Around a core region largely dominated by the metropolitan region of Bangkok and its immediate periphery, the rest of the country forms a vast peripheral ring which includes all the other regions; certain territorial marches (frontier effect, presence of ethnic minorities, periods of local insecurity) form a second ring of limited and discontinuous extension.

The division of the country into four regional quarters is based primarily on characteristics of the physical environment (specific physiomorphemes): the drainage basin of the Chao Phraya (valleys and mountainous periphery); the plateaus and valleys of the North-East along the Mekong river; the southern peninsular region and the two coastal sides; the Gulf of Thailand (specific economy, opening onto international shipping). The socio-cultural and economic dimension is also present: the great valley in the North

represents the cradle of power of Siam, the place from which historically, the capital was transferred down-stream towards the delta; the opening of the North-East onto neighboring Laos; Malay and Muslim influences for the peninsula; the Gulf of Thailand as "*mare nostrum*".

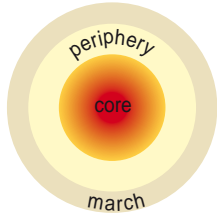
The urban network is organized according to the urban gravity model with its orbital arrangement. The largest cities form two main orbits. The one which is further from Bangkok corresponds to the regional capitals: Chiang Mai (and Lamphun), Khon Kaen, Songkhla/Hat Yai; the second, which is closer to Bangkok, brings together cities with a strong dynamism, with the role of intermediary centers: Nakhon Sawan, Nakhon Ratchasima, Surat Thani and Nakhon Si Thammarat. Other centers form regional orbital arrangements: towns in the North-East, in a peripheral situation around Khon Kaen; towns in the south of the peninsula, around Surat Thani. Physical factors (large valley, coast) or a corridor effect give rise to a linear axial arrangement.

The dissymmetry of Thailand's core region, on either side of the axis formed by the river Chao Phraya, derives from the autocorrelated effects of several dynamics: in the west, a narrow, predominantly rural area, closed along the frontier with Myanmar; in the east, a predominantly urban and metropolitan area, the Eastern Seaboard effect (industry and port), opening up towards the north-east and the Indo-Chinese peninsula.

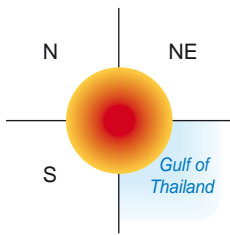
Corridor phenomena of differing size and complexity emerge, with the largest mainly rooted in the central region, as a result of the structuring effect of the major communication axes combined with the role of the strings of hierarchized towns to which they give rise. This is the case in the lower valley of the Chao Phraya, upstream from the delta, along the Chiang Mai-Lampang axis, along the Bangkok-Vientiane axis and, in the North-East, in the corridor that is currently emerging towards the south of Laos and towards Cambodia; the coasts of the Eastern Seaboard and of the south-east of the peninsula can also be seen to have clearly defined characteristics. Synapses (cols and passes through the mountain ranges, bridges over the Mekong), dotted at intervals along the frontier, are focal points for international communications with neighboring countries.

Basic models (choremes)

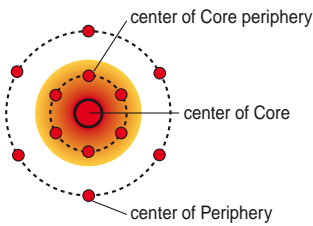
Core-periphery model in concentric rings



Model of quadripartite division



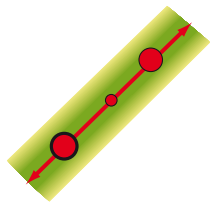
Urban gravity model



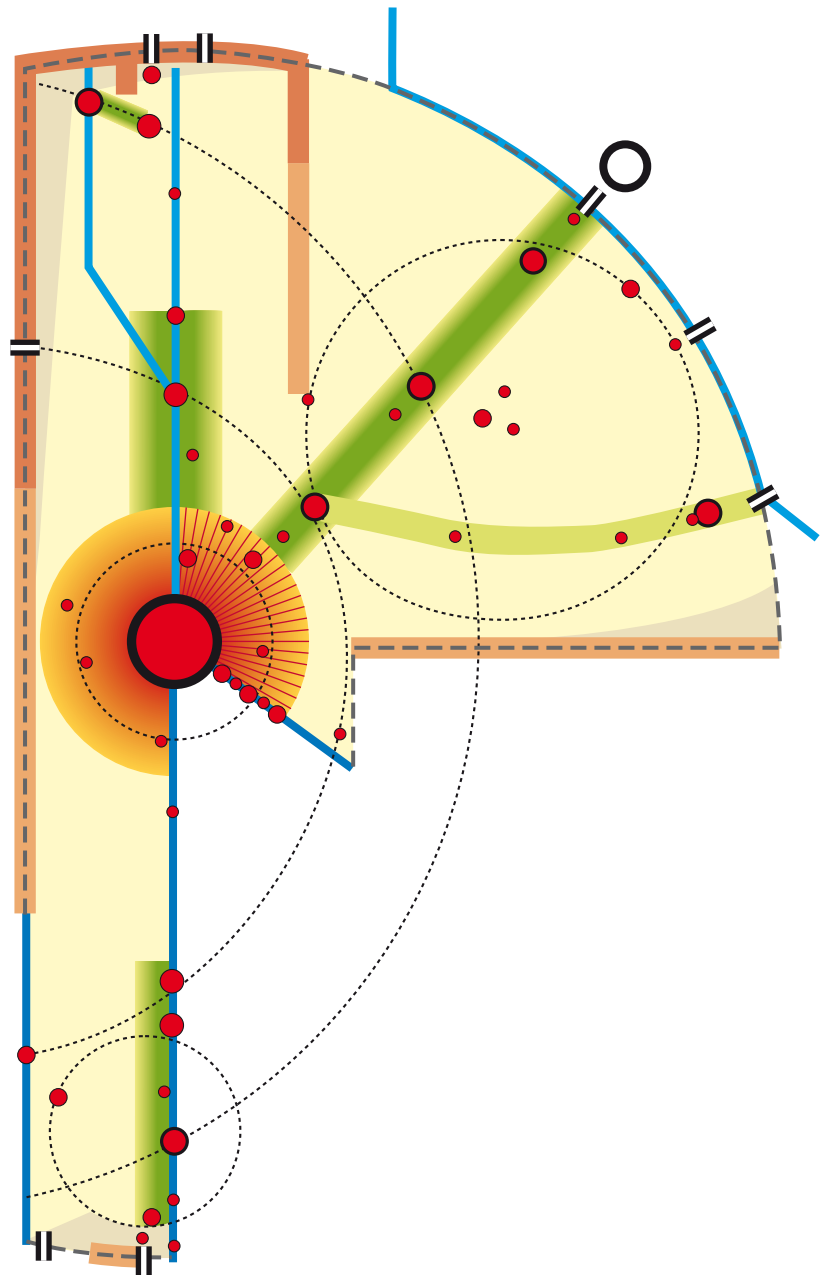
Dissymmetrical model of land use and spatial organization of core region



Corridor model



Specific spatial model of the national territory



Urban network	Elements of physical and political environment	Dynamics of the territory
Capital	Mountain range	Core region
Regional center, main city	Coastline	Area of stronger economic and urban development
Medium-sized town	Main river	Main corridor
Small town	State frontier	Emerging corridor
Other town	Synapsis	March
Orbit of gravitation		

Methodology appendix

The base maps of the provinces and the districts

When studying the spatial organization of Thailand, the politico-administrative unit that we primarily used was the province. In 1992 the number of provinces increased from 73 to 76. With most provincial statistics we were able to include these three most recent creations and produce maps of 76 provinces for 1996 or 1995. The older 73-province mesh was adopted systematically in three instances: maps in the Population chapter, based on population and housing figures from before the 2000 census; most of the maps that show evolution between two dates, whatever the statistical sources used, and lastly maps showing ratios based on the number of inhabitants from population and housing census figures (population density, level of facility provision, income and consumption indicators *per capita*,...). The difference in the base maps (according to the statistics) is indicated by a different outline: in black, when the statistics specify the three provinces of Nong Bua Lam Phu and Amnat Charoen in the North-East, Sa Kaeo in the east; grey when these three provinces are statistically associated with their province of origin (Udon Thani, Ubon Ratchathani, Prachin Buri respectively).

So as not to lose too much information by referring to even older provincial boundaries, three provinces created in the 1970s were the subject of specific treatment relating to population dynamics between 1970 and 1990: Phayao, Yasothon and Mukdahan created from Chiang Rai, Ubon Ratchathani and Nakhon Phanom respectively. While the population of each, in absolute terms, is shown for 1990, the rate of population growth between 1970 and 1990, shown by shading in the circles, refers to the rate in their original province. The same system was used for Mukdahan on the maps of agricultural evolution which were based on 1976 data.

At district level, within the same region, the territorial demarcation for statistics differed according to the different themes (population, agriculture, industry) due to the delay in producing data for the last districts created. We opted to produce a map that was adjusted to the statistical data, by grouping districts together, usually 2, to form a single spatial unit that was older but corresponded to the area covered by the statistics.

Given the concentration of industrial activities in the central provinces, which are the smallest spatial units, a separate inset in chapter 5 on Industry presents 10 of these provinces in such a way that the symbols are legible.

Processing and cartographic representation of the statistical information

This atlas obeys the rules of cartography. Absolute values are represented by symbols and relative values by shading patterns, with graded series from pale to dark as the phenomenon intensifies. The size of the symbols is usually proportional to the measurement or count at a particular point or, less frequently, organized into classes: each size of symbol then corresponds to a defined range (e.g. Evolution of forest areas on plate 23 Deforestation).

Concerning relative values, the series of spatial data were split into classes. Thus, different methods of discretization were used, according to the hypotheses that were put forward and the spatial structures that it seemed relevant to highlight. This is a complex and delicate operation, since the mapping has to be not only an exact restitution of the phenomena but also a legible representation of the reality being analyzed; to facilitate the process we used the statistical mapping software Cabral, developed by scientists at the IRD. Principal component analyses were carried out using SPSS software. Maps showing flow were produced with MapInfo.

In order to inform the reader as to the choices that were made when dividing statistical data into classes, all the maps are accompanied by an explanatory figure, a histogram or a ternary diagram (see plate 71 Examples). The synthesis maps, based on a principal component analysis, are accompanied by a linkage tree and a legend table.

1 - Histograms

These appear on the analytical maps and refer to the discretization of a variable. There is one column for each class created. The width of the column indicates the extent of the class and the surface is proportional to the number of spatial units that make up the class. The percentages show the proportion of units from each class in the total number of units. Three values are given: the class with the most spatial

units, the class with the fewest spatial units and an intermediary class. The distribution given by the histogram is that of the complete statistical series even when the map has been cleaned up from symbols below a certain threshold which are too small to be easily legible.

2 - Ternary diagrams

These appear on some structural maps to assess groups that are straightforward but significant. The diagram combines three variables with the total representing 100% of the phenomenon under analysis. Each side of the equilateral triangle is allotted to one variable and is graduated from 0 to 100% by lines parallel to the preceding side. Each spatial unit (the small circles) is pinpointed according to the coordinates of the three variables that define it. Classes are created according to the groups that are formed. In the legend, a table gives the ranges of percentages for each class: to facilitate reading, the values of the predominant variable or variables are shown in bold.

3 - Synthesis maps

These combine a large number of variables, some that have been represented in the atlas (on analytical maps) and others that have not. One synthesis map can be found at the end of most chapters as a conclusion or for some specific themes (Main religions, Characteristics of tertiary product, etc.). They represent characteristic territorial structures and dynamics for every aspect of economic and social life in the country. Most of these analyses cover 73 provinces, rather than 76, as it is difficult to use missing values in this type of data processing.

As a general rule, a principal component analysis (PCA) was carried out, followed by a hierarchical classification in order to define clusters of provinces. The PCA defines factors determined to best illustrate the selected variables (on average 75 to 85 % of the total variance). By synthesis analysis, the provinces are then defined by their coordinates in relation to these factors, according to the variables that they illustrate. In this way similarities and differences, associations and oppositions between variables can be determined. The hierarchical classification is based on these principal components.

Linkage trees were prepared using Ward's

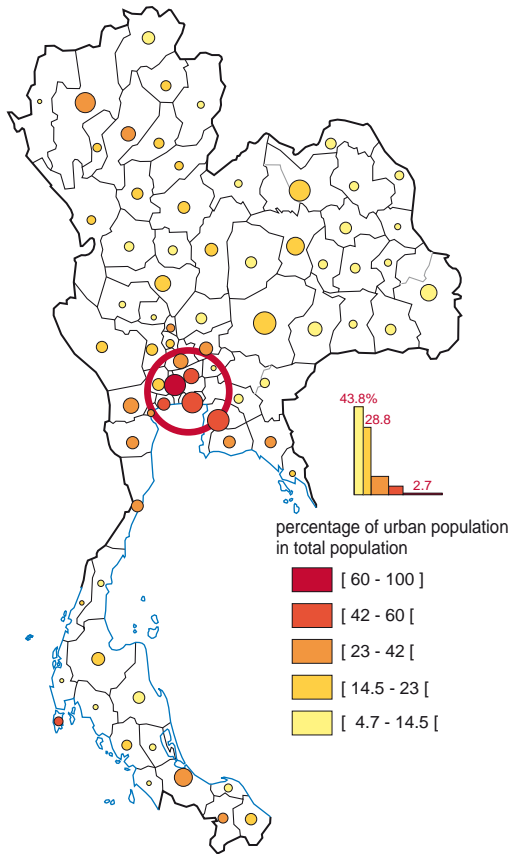
method (ascending hierarchic classification). The aim is to identify classes that are relatively homogeneous based on characteristics (the variables) defined by an algorithm which begins with each observation (the provinces) in a separate class and groups the classes together until only one remains. Ward's method is a method of hierarchical classification based on analysis of the variance to evaluate the distances between the groups formed, seeking to minimize the sum of the squares of the distances within each possible group. It is considered to be effective, tending as it does to create groups that are small in size, which can then be mapped directly. In the example on plate 71 (from plate 57 Tertiary sector facilities and activities), the classes that are closest together are 8 and 9: they would form a single class if we decided to present only 8 classes in all. The subsequent grouping concerns classes 5 and 6, then class 3 which attaches itself to this last group, then class 4 which joins the cluster (3, 5, 6), then 7, then 2. The two clusters (8, 9 and 2, 3, 4, 5, 6, 7) then join together. The last stage groups together class 1 (Bangkok) with all the other classes; this gives some indication of the very unusual features of this province.

The legend tables were produced by analyzing class averages for the most significant variables. They present in schematic form the relative values of these averages, compared with the average for all the provinces. In the example, access to water supply via a public well is very much lower than the average for all the provinces in classes 1 and 2, a great deal lower in classes 3 and 5, and even in 6, equal to average in 4 and 7 and very much higher than average in 8 and 9. The “+” signs are not a mechanical indication of the development. Thus, the number of inhabitants per post office is very high for classes 8, 9 and even for 2, average for 1 and 4 and very low for classes 3, 5, 6 and 7, which are thus the best equipped in this matter.

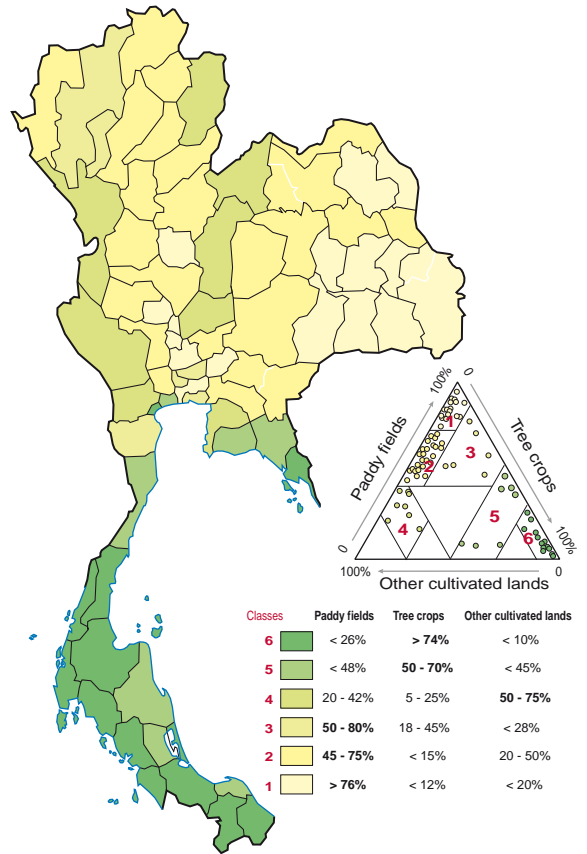
4 - Graphic models

The purpose of a graphic model is exactly the same as that of spatial analysis based on statistical data processing. It is produced to understand the organization of a given area and the rules that structure its spatial differentiation. The premise of the method is that the geographical space is produced, organised and structured by society (though without ignoring the role that physical conditions have to play). It is therefore possible to define elementary

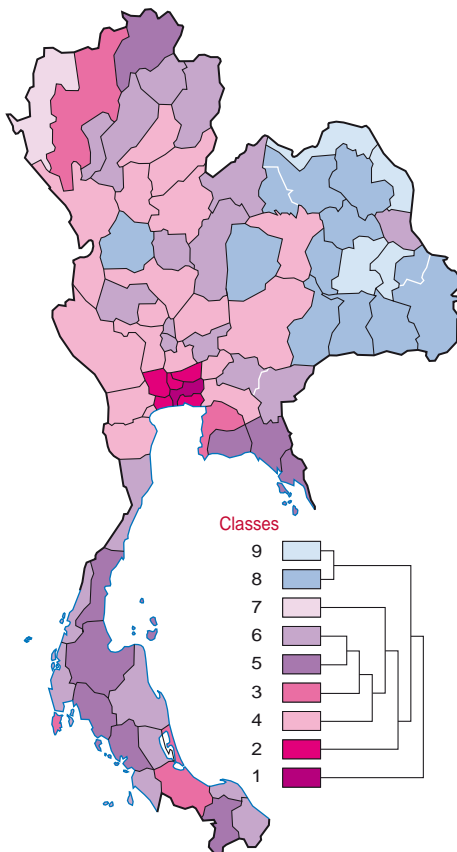
Histogram



Ternary diagram



Linkage tree and legend table



Factors	Classes	1	2	3	4	5	6	7	8	9
Water supply sources (% household users, 1995)	Piped water	+++	++	++	=	-	-	++	--	--
	Public wells	---	---	--	=	--	-	=	+++	+++
Communications, health, schools	Telephone lines / 1,000 inhabitants (1996)	+++	++	++	-	=	-	--	---	---
	Inhabitants / post office (1996)	=	++	---	=	---	--	---	+++	++
	Inhabitants / hospital bed (1995)	---	-	--	-	-	=	-	++	+++
	% Private hospital beds (1995)	++	+++	++	=	+	--	---	--	---
	Evolution hospital beds (1987-1995)	---	+++	--	-	++	--	=	++	-
Hotels	Pupils / class (1996)	+++	++	+	=	=	=	---	=	=
	Hotel rooms (1996)	+++	---	++	=	=	---	-	---	---
Commercial banks	Rooms / hotel (1996)	+++	+	++	=	=	-	---	=	--
	Inhabitants / bank (1996)	---	--	--	=	--	=	-	+++	+++
	Evolution inhabitants / bank (1986-1996)	++	=	=	++	-	=	=	=	---

structures or choremes (Brunet, Roger. 1980. "La composition des modèles dans l'analyse spatiale", *L'Espace Géographique*, n°4: 253-265) and examine how they combine together; in other words, find the structure of the structures.

The choreme is a dual figure:

1) it is a fundamental arrangement of objects in a given space, an elementary structure like, for instance, the gravitation of secondary centers around a main center (conceptual dimension);

2) it is the representation of this concept by a hierarchy of points and an orbital circle (graphic dimension). The graphic representation of the choreme is the layout of the conceptual structure and not a simplified map.

In graphic modeling, an experimental method governed by a series of hypotheses, we must decide in a rational manner how to represent as clearly as possible a spatial organization as a combination and composition of elementary structures or choremes. There are five stages:

1) look for the significant elements in the complexity of reality;

2) analyze them and see how they inter-relate;

3) control the representation techniques;

4) suggest a logical and coherent whole;

5) reach a degree of generalization so that a comparative analysis can be carried out.

Calculations and conversion rates

Population growth rates were calculated using a formula specific to this field:

$$(((J21^{(1/20)})^{(I21^{(-1/20)})})-1)*100.$$

Here, for the growth rate between 1970 and 1990 and the province with the code 21, J21 represents the population in 1990 and I21, the population in 1970.

Using population growth rates between the two censuses of 1990 and 2000, the 1996 population was extrapolated using this same formula: it is used for all calculations involving a ratio per inhabitant or *per capita*. The true growth rate was probably not regular between these two dates but this method appears to be more reliable and coherent than using figures from the Ministry of Interior based on estimates of

registered provincial populations (voluntary formality by residents). These estimates are by no means perfect, and the same is true for the censuses, since for example, migrants working and living away from home in another province declare their residence to be in their village of origin.

The multiplying coefficient of the number of industrial units between 1986 and 1996 was calculated as "the number of units in 1996 / the number of units in 1986". This ratio seemed clearer than a proportion for expressing the spatial dynamics of industrialization.

The conversion rates used were:

- for areas, from *rai* into ha: n rai x 0.16

- for money, the exchange rates from Baht into US\$ established by the Bank of Thailand for the

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This atlas portrays Thailand's spatial structures and presents the country's social and economic development in a territorial context. The Kingdom of Thailand has undergone many changes throughout its long history, and most recently during its vigorous growth from the middle of the 1980s. The maps and text give a comprehensive interpretation of Thailand's internal dynamics as well as its regional and global integration.

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The volume brings together experts in a variety of fields and methods. It will be a valuable tool for teachers and students, planners and entrepreneurs - indeed, for anyone eager to understand recent changes and prepare future diagnoses.

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