

6) Less Cargo Damage and Savings in Packing Cost

Better driving conditions gained with motorways dramatically reduce cargo damage compared with ordinary roads. Savings will include the cost of damaged goods as well as packing cost.

2.3 REGIONAL DEVELOPMENT EFFECTS

2.3.1 Betterment of Nationwide Development

1) Promotion of Development in Local Areas

Viewed in terms of national development planning, it is very important to promote development in local areas. Motorways play a major role toward this end by promoting several kinds of industrial sectors, and improving living conditions. This is explained below in further detail.

2) Redistribution of Excess-Agglomerated Activities in Metropolises to Other Areas

There are some countries which are suffering from excess-agglomeration of urban activities in a limited number of cities. Motorways promote reallocation of industries out of such cities to new frontiers whose locational conditions are improved by motorways.

The abovementioned two items are often highly interrelated. As a result of the two effects, the following situations can be expected;

- Betterment of economic activities distribution
- Increase in population and income in local areas
- Alleviation of diseconomy in metropolises

2.3.2 Promotion of Industries

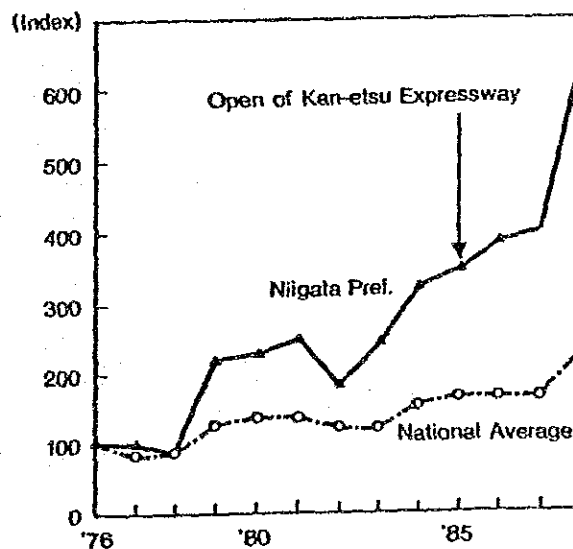
1) Manufacturing

One of the most important impacts on regional development by motorways is the location and relocation of manufacturing plants. Since the transport condition is a very important factor in plant location, most manufacturing plants are located in the vicinity of motorway interchanges.

Figure 2.2 shows the impact of a motorway on plant location in Japan. This expansion of the national capacity for plant location leads to promoting national economic growth. At the same time, local economy will be activated.

In this case, adequate investments such as for the development of industrial estates with higher service utilities are indispensable. In addition, government guidances with some regulation and preferential treatment also prove to be highly effective as in the case of the following industrial sectors.

Case of Niigata Prefecture
along Kan-etsu Expressway



Index: number of plant location
the number in 1976=100

Figure 2.2 INDUSTRIAL PLANTS LOCATION

2) Tourism

The tourism industry is also one of the most important impacts on regional development. Favorable transportation conditions, especially of land, are indispensable to promoting tourism by making the area not only fit for a one-day excursion spot but also as long-stay resort. There is a definite difference in the number of visitors between areas with and without motorways, even if the places themselves have the same level of attractiveness for tourists.

3) Agriculture and Fisheries

The importance of transportation conditions for fresh agricultural and fishery products cannot be overemphasized. With motorway development which enables faster delivery to big cities, many areas will see a shift in agricultural products grown in the area from lower priced products to higher ones. Also, productions will be increased in many districts because of the widening of market by motorways. Figure 2.3 shows an example of Japan.

—The case of Tohoku Expressway in Japan—

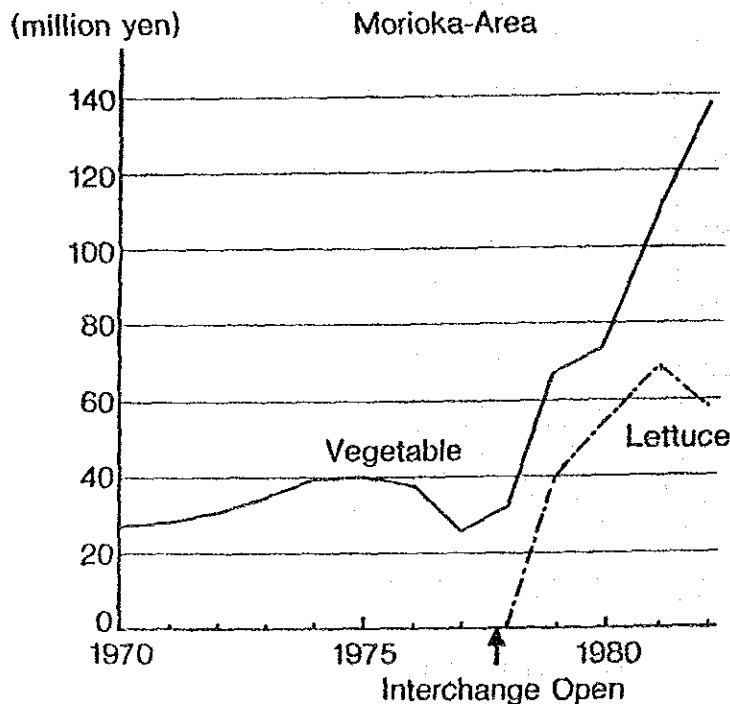


Figure 2.3 CHANGE IN THE AMOUNT OF VEGETABLE SALES

4) Commercial

Since motorway development promotes rationalization of physical distribution, commercial centers will be set up in the vicinity of some interchanges. This will induce related businesses and commercial industries to establish themselves there.

2.3.3 Improvement in Living Conditions

1) Widening of Life Opportunities

Improved mobility of people living in rural areas widen their life opportunities. They can commute to offices and schools located far from their residence. Furthermore, they will be able to enjoy shopping, theatrical performances, sports games, etc., and will also gain access to libraries, cultural centers and museums in central cities. This means that people will be offered a wider variety of life without changing their residences. It also reduces migration from rural areas to central cities.

2) Regionwide Medical Care

Establishment of medical care systems in rural areas is one of the most elemental national minimum criteria. The level of medical care services varies; high level services cannot be provided for all rural areas not only because of the cost of facilities but also due to the availability of medical experts. High medical care centers such as special hospitals for cancer, brain damage and heart diseases are invariably set up in a limited number of central cities of the region. Such inconvenience for local inhabitants can be solved through motorway development, as it will enable a larger area to be covered by such high level hospital care.

3) Recovery from Disasters

As motorway structures are generally stronger than ordinary roads, by utilizing the motorway, rescue parties will be able to reach areas hit by disasters such as floods and earthquakes in less time.

2.3.4 Other Effects

1) Higher Productivity

The introduction of a motorway system will result in raising national productivity, because savings in transportation costs will lead to lowering production costs.

2) Increase in Tax Revenues

Higher productivity will activate both national and local economies and will lead to higher income, and consequently, larger tax revenues.

3) Increase in Exports

Savings in transportation costs will make export goods more competitive in the world market, and will increase export as a result.

4) Creating Demand by Road Investment - Multiplier Effects

Since motorway construction constitutes a huge-scale investment, it creates a huge demand for relevant economic sectors, that is, multiplier effects. It promotes economic growth of the nation and generates a large number of employments in the local area where motorways are constructed.

5) Enhanced National Identity

Motorway system brings areas closer to each other across the whole national land not only because of the reduction in travel time but also because of the awareness of people that they are linked by the motorways. It will thus enhance national identity.

2.3.5 Negative Effects

The effects mentioned above are all positive effects expected to be created with motorways. But motorway development may also entail some negative effects which might be caused unless

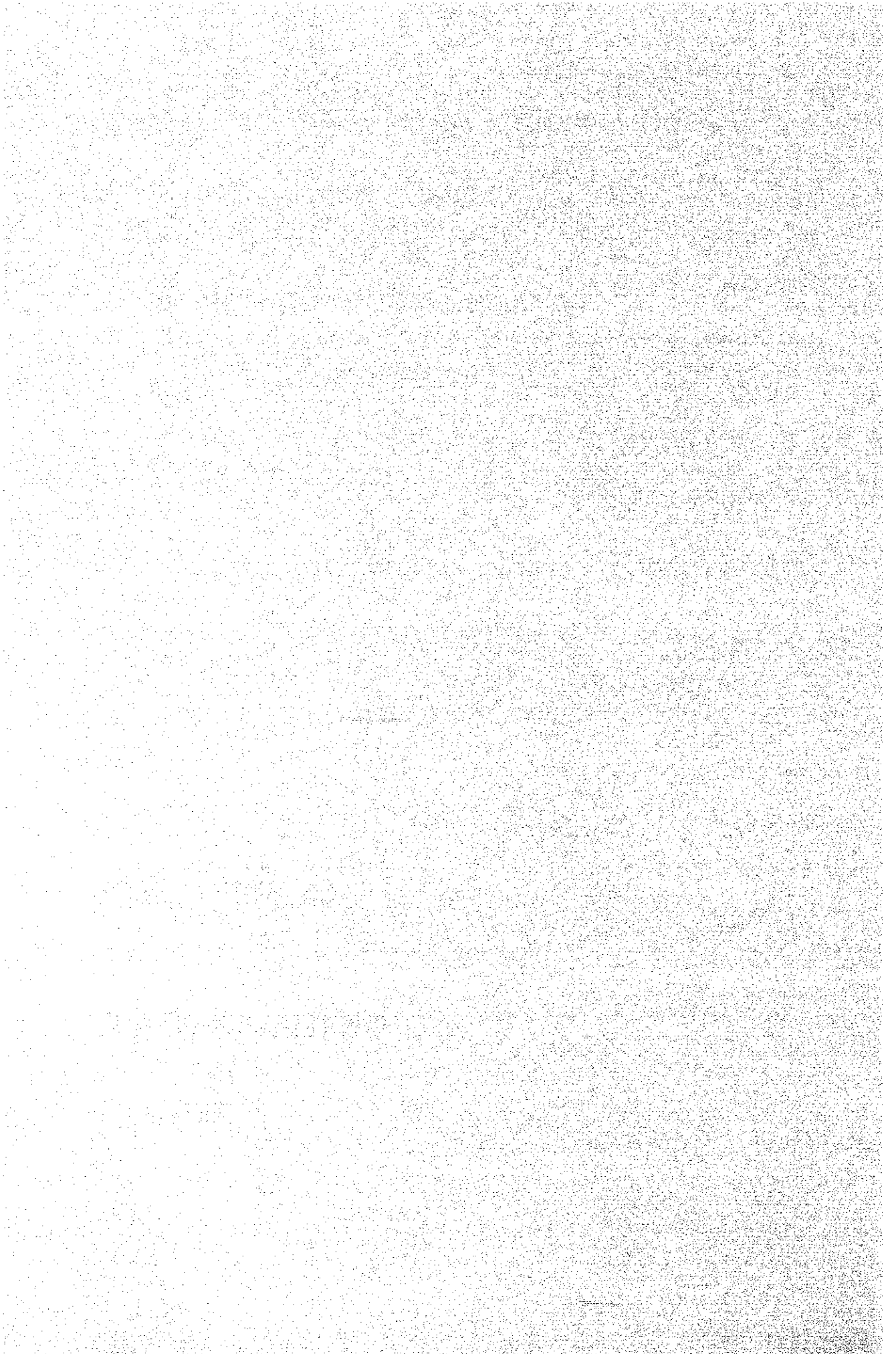
appropriate considerations are given.

One of the typical negative effects on the surrounding area is the environmental problem such as noise and air pollution caused by traffic. Furthermore, damages caused on the natural environment by motorway construction may give rise to ecological problems, while undesirable route selection of motorways may divide existing local communities.

Naturally, all possible measures should be taken to minimize such negative effects.

CHAPTER THREE

**CURRENT CONDITIONS
IN
THAILAND**



CHAPTER 3

CURRENT CONDITIONS IN THAILAND

3.1 LAND CONDITIONS

The Kingdom of Thailand with an area of some 513,115 square kilometer is situated in the center of the Southeast Asian mainland between latitude 5° and 20° north and longitude 97° and 105° east. The countries bordering on Thailand are Laos, Myanmar, Kampuchea and Malaysia.

The land of Thailand is divided geographically into four (4) main regions; Northern, Northeastern, Central and Southern, and in socio-economic base into seven (7) regions.

Northern region is mainly structured by the mountainous basins which are born from the up-stream branches of Chao Phraya River. The geographical features of Northeastern region and Central region are the typical plateau and the alluvium, respectively.

The shape of the Southern Region composing the end of Malay peninsular is slender and its land gets between Andaman Sea on west and Gulf of Thailand on east.

The capital, Bangkok, has been a center of the transportation between Europe, Middle East and Asia as well as the political and merchant activities in Thailand for couple of centuries.

The Kingdom of Thailand plays an international role in the Southeast Asia Region as a center of the transportation and merchant activities.

3.2 SOCIO-ECONOMIC CONDITIONS

3.2.1 Population

1) Total Population

Thailand had a total population of 54,960,917 or 107.1 persons per square kilometer in 1988. The average annual growth rate during the periods 1975-1980, 1980-1985 and 1985-1988 was 2.1%, 2.0% and 2.0%, respectively as shown in Table 3.1.

Table 3.1 POPULATION BY REGION

REGION	Population in Thousand Persons				Annual Growth Rate %			Density in 1988 (persons per Sq km)
	1975	1980	1985	1988	1975-1980	1980-1985	1985-1988	
WHOLE KINGDOM	42,390.5	46,961.0	51,777.7	54,960.9	2.07	1.97	2.01	107.1
NORTHEASTERN	14,533.7	16,088.1	18,061.1	19,254.2	2.05	2.34	2.16	114.0
NORTHERN	8,912.9	9,587.4	10,391.1	10,731.6	1.47	1.62	1.08	63.3
SOUTHERN	5,225.5	5,823.4	6,441.4	6,861.1	2.19	2.04	2.13	97.0
EASTERN	2,544.9	2,883.7	3,300.4	3,595.2	2.53	2.74	2.89	98.5
WESTERN	2,577.7	2,813.5	3,098.4	3,217.4	1.77	1.95	1.26	74.7
SUB CENTRAL	2,428.3	2,537.6	2,663.5	2,791.9	0.88	0.97	1.58	168.3
BMR	6,167.5	7,227.3	7,821.8	8,509.5	3.22	1.59	2.85	1,096.8

Source: Registration Division, Department of Local Administration, Ministry of Interior.

2) Population by Region

The Kingdom of Thailand is divided into seven Regions and 73 Chang-wats (Provinces) as shown in Appendix 3.1.

Table 3.1 and Figure 3.1 show population growth by Region, while Figure 3.2 shows the regional distribution of population in 1988. Northeastern Region has the biggest population of 19,254,200 persons with a share of 35 percent of the total population. Population density in Bangkok Metropolitan Region (BMR) shows the highest of 1,096.8 persons per square kilometer. The lowest population density is 63.3 persons per square kilometer in the Northern Region. The highest population growth rate shows 2.9% in BMR and Eastern Region during 1985-1988.

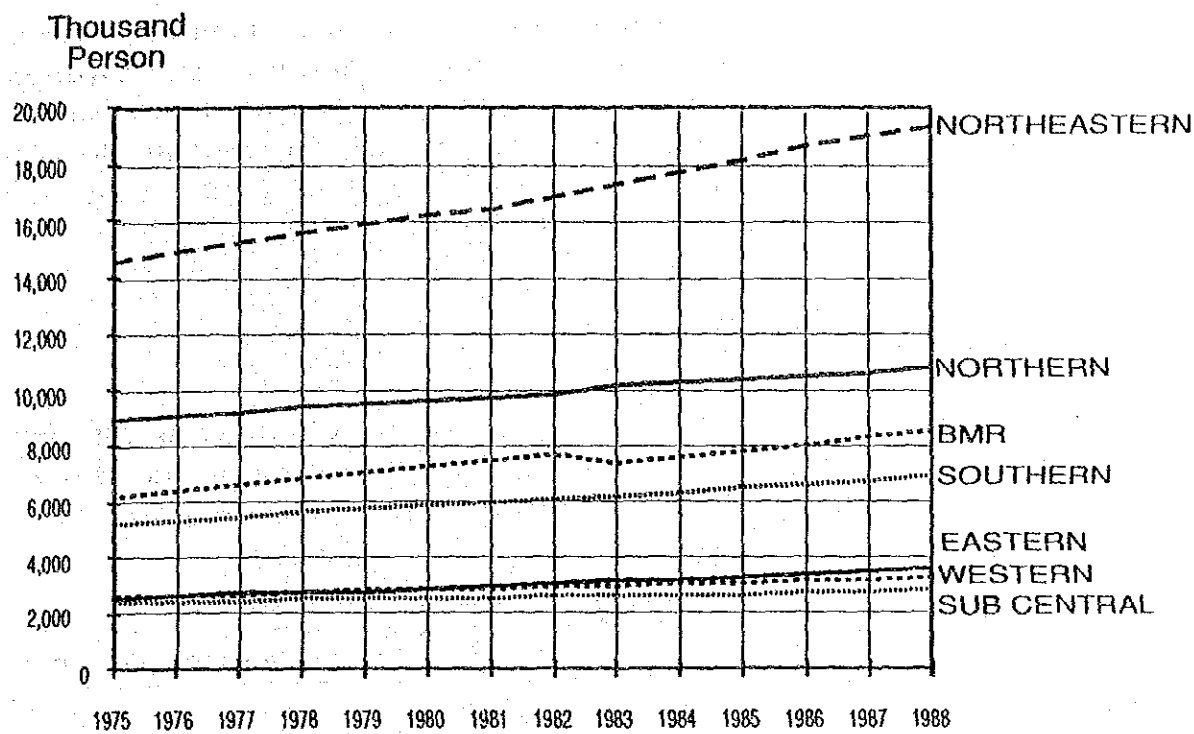


Figure 3.1 POPULATION GROWTH BY REGION

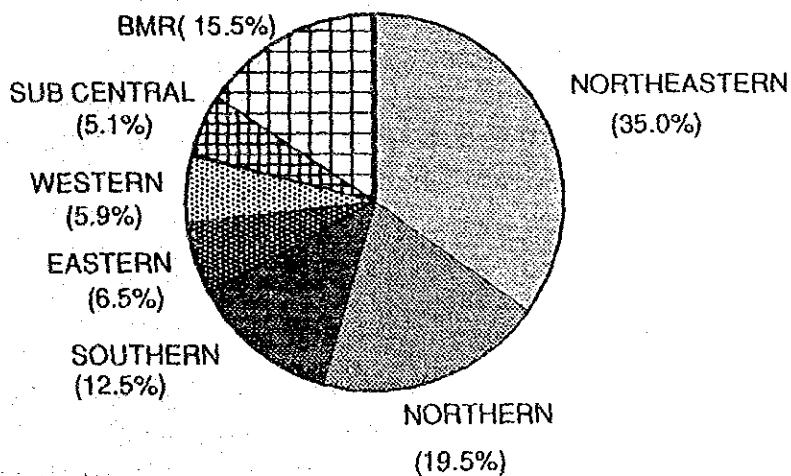


Figure 3.2 POPULATION DISTRIBUTION - 1988

3) Population by Changwat

Population by Changwat is presented in Appendix 3.2 in detail. Bangkok Metropolitan Administration (BMA) shows the biggest of

5,717 thousand persons. In terms of population density, BMA shows also the highest density of 3,652.4 persons per square kilometer followed by Nonthaburi at 958.2, Samut Prakarn at 785.9 persons per square kilometer. Mae Hong Son in the Northern Region shows the lowest population density of 13.1 persons per square kilometer. These are illustrated in Figure 3.3.

4) Urban Population

Urban population of the Kingdom in 1988 reached at 9,949,400 persons with a share of 18.1% of the total population, as shown in Table 3.2. The number of municipalities is counted at 132.

Table 3.2 URBAN POPULATION BY REGION (Thousand Persons)

REGION	1986	1987	1988
NORTHEASTERN	1,079.1	1,118.0	1,115.3
NORTHERN	828.6	828.7	830.2
SOUTHERN	852.2	861.2	876.3
EASTERN	366.3	370.8	375.5
WESTERN	310.4	313.1	317.2
SUB CENTRAL	272.7	275.6	279.6
BMR	5,723.2	5,866.5	6,155.3
TOTAL	9,432.5	9,633.9	9,949.4

Source: Registration Division, Department of Local Administration, Ministry of Interior.

Remark: Figures in parenthesis show the composition ratio.

Figure 3.4 and Appendix 3.3 show the urban population by municipality. Urban population in BMA is the biggest of 5,717,000 persons with a share of 10.4% of the total population. Except BMA, the municipalities show that more than 100,000 persons are in the following seven cities: Nonthaburi at 218,000 persons, Nakhon Ratchasima at 205,000 persons, Chiang Mai at 164,000 persons, Hat Yai at 138 thousand persons, Khon Kaen at 131 thousand persons, Nakhon Sawan at 105,000 and Ubon Ratchathani at 100,000 persons.

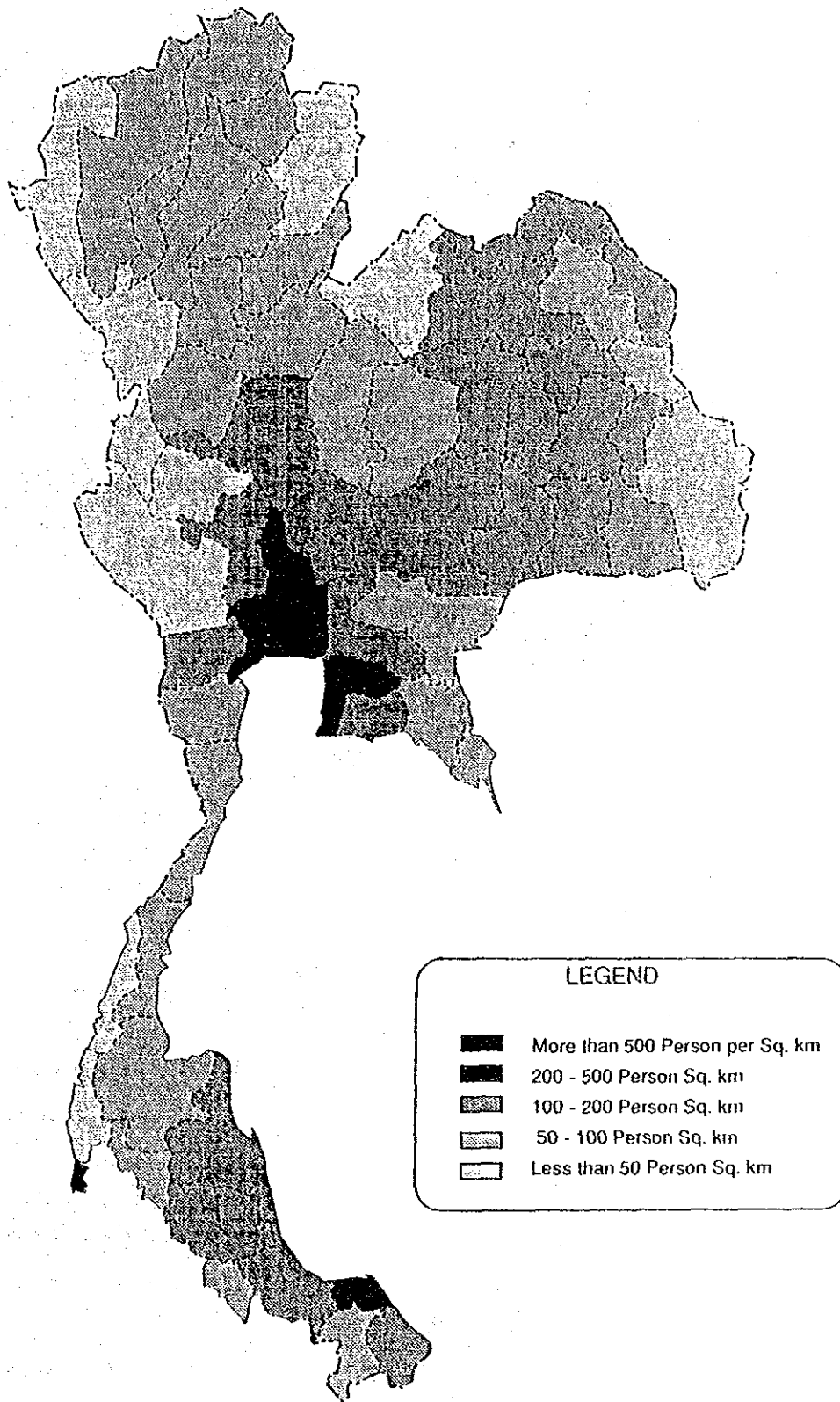


Figure 3.3 POPULATION DENSITY BY CHANGWAT — 1988

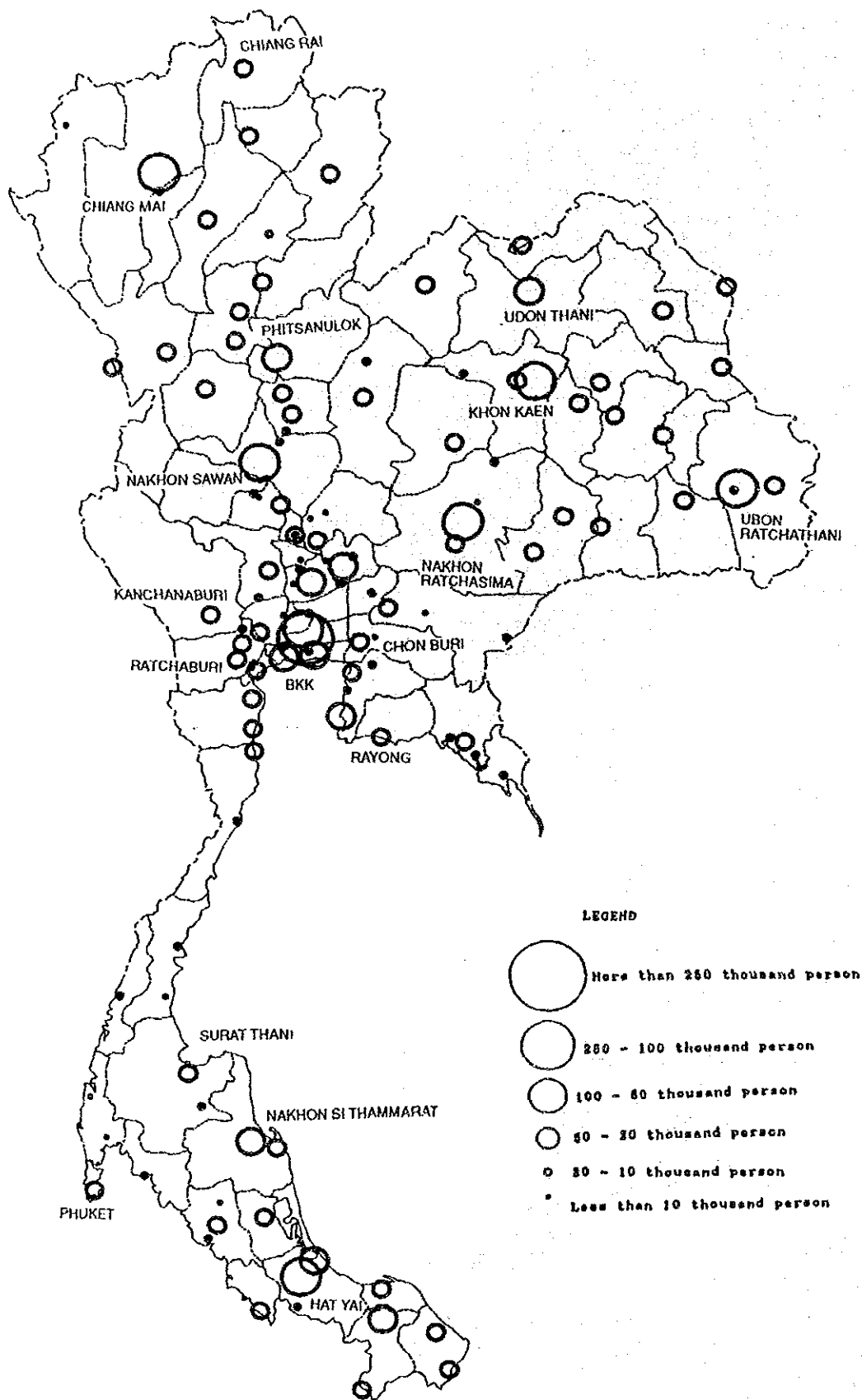


Figure 3.4 URBAN POPULATION BY MUNICIPALITY — 1988

3.2.2 Economy

1) Gross Domestic Product

In 1987, the Gross Domestic Product (GDP) amounted to 1,234 billion Baht with a growth rate of 8.4% which was higher than the growth during the period of the Fifth National Plan, 1982-1986, of 5.3%. In 1988, a higher growth of 11.0% was estimated due to the increase of export and the influx of foreign investment. This shows that Thailand's economy had upturned.

Table 3.3 GROSS DOMESTIC PRODUCT (million Baht)

	1981	1986	1987	1988
GDP AT CURRENT MARKET PRICES	760,195	1,094,679	1,234,030	1,465,736
GDP AT 1972 CONSTANT PRICES	318,439	411,814	446,361	495,374
GDP GROWTH RATE (%)		5.3	8.4	11.0

Source: National Economic and Social Development Board (NESDB).

Table 3.4 and Figure 3.5 show GDP by sector. Percentage share of agriculture had decreased from 20.4% in 1981 to 16.9% in 1988 and that of manufacturing had increased from 21.7% in 1981 to 23.0% in 1988.

Table 3.4 GDP BY SECTOR (%)

Sector	1981	1986	1987	1988
Agriculture	20.4	19.1	17.3	16.9
Mining and Quarrying	2.4	2.4	2.3	2.4
Manufacturing	21.7	21.7	22.7	23.0
Construction	4.5	3.9	3.9	4.0
Electricity and Water Supply	2.1	2.7	2.7	2.8
Transportation and Communication	6.5	7.3	7.3	7.3
Wholesale and Retail Trade	17.3	16.3	16.7	17.1
Banking, Insurance and Real Estate	2.6	2.9	3.4	3.6
Ownership of Dwellings	4.7	4.4	4.3	4.1
Public Administration and Defense	5.3	5.3	5.1	4.8
Services	12.5	14.0	14.2	14.0
GDP	100	100	100	100

Source: NESDB.

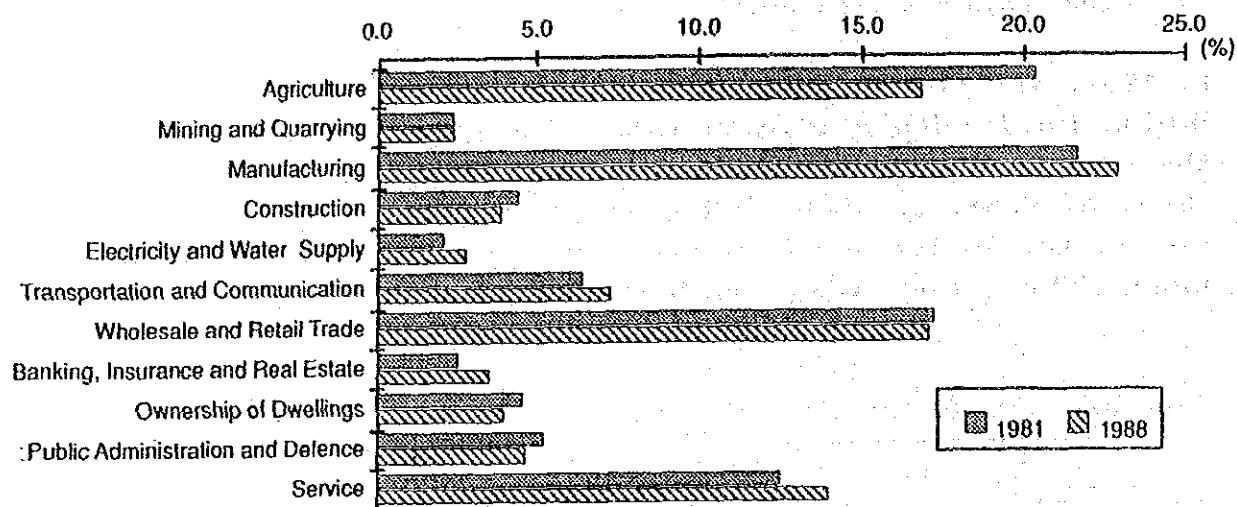


Figure 3.5. GDP BY SECTOR

2) Gross Regional Product

The Gross Regional Products (GRP) are shown in Table 3.5 and Figure 3.6. In 1987, BMR accounted for 605 billion Baht, i.e. 49.0% of whole kingdom's GDP, and was followed by Northeastern and Northern regions.

Table 3.5 GRP AT CURRENT MARKET PRICES

(million Baht)

REGION	1981	1986	1987
NORTHEASTERN	101,715 (13.4)	144,412 (13.2)	155,367 (12.6)
NORTHERN	96,744 (12.7)	126,170 (11.5)	138,283 (11.2)
SOUTHERN	81,026 (10.7)	111,449 (10.2)	122,471 (9.9)
EASTERN	57,161 (7.5)	100,961 (9.2)	100,497 (8.1)
WESTERN	45,884 (6.0)	59,161 (5.4)	62,731 (5.1)
SUB CENTRAL	37,054 (4.9)	45,035 (4.1)	49,516 (4.0)
BMR	340,611 (44.8)	507,489 (46.4)	605,165 (49.0)
WHOLE KINGDOM	760,195 (100)	1,094,679 (100)	1,234,030 (100)

Source: NESDB.

Remark: Figures in parenthesis show the composition ratio.

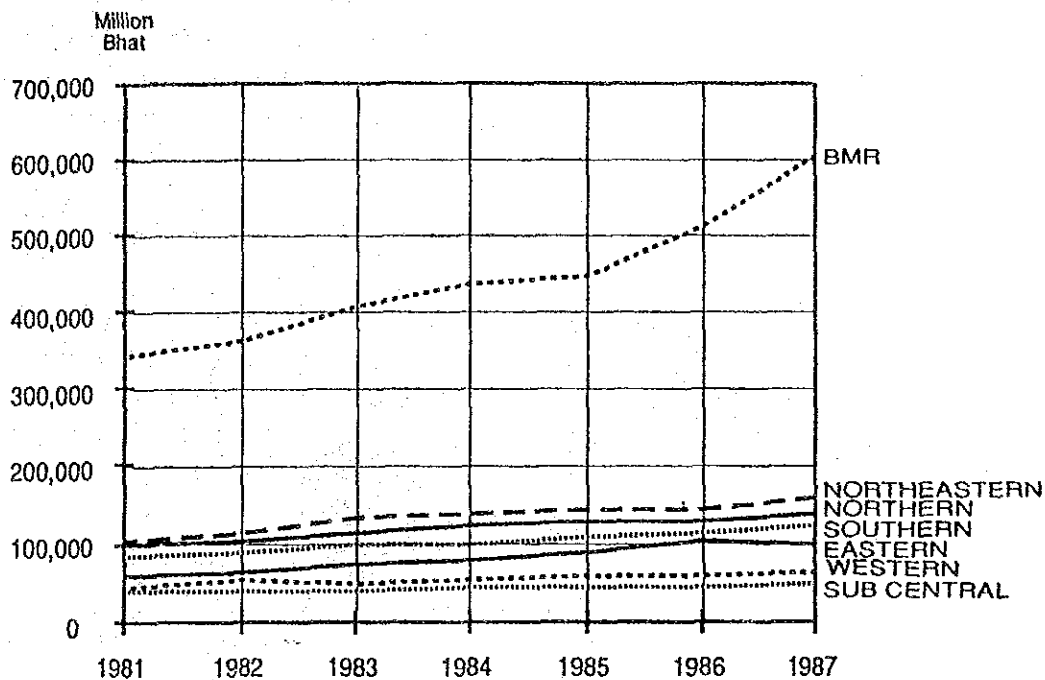


Figure 3.6 GRP AT CURRENT MARKET PRICES

Table 3.6 shows the annual growth rate of GRP. BMR had increased drastically from 5.0% in 1981-1986 to 15.3% in 1986-1987 due to the accelerated industrialization. Except BMR, the growth rates of other regions were nearly equal to or less than the national average. Figure 3.7 shows GRP by sector.

Table 3.6 GRP AT 1972 CONSTANT PRICES

(million Baht)

	GRP			Annual Growth Rate (%)	
	1981	1986	1987	1981-1986	1986-1987
NORTHEASTERN	45,186	59,741	60,733	5.7	1.7
NORTHERN	40,279	51,191	52,327	4.9	2.2
SOUTHERN	30,803	39,853	41,862	5.3	5.0
EASTERN	21,780	31,562	32,267	7.7	2.2
WESTERN	17,355	23,135	23,434	5.9	1.3
SUB CENTRAL	15,513	18,412	19,027	3.5	3.3
BMR	147,523	187,921	216,711	5.0	15.3
WHOLE KINGDOM	318,439	411,814	446,361	5.3	8.4

Source : NESDB.

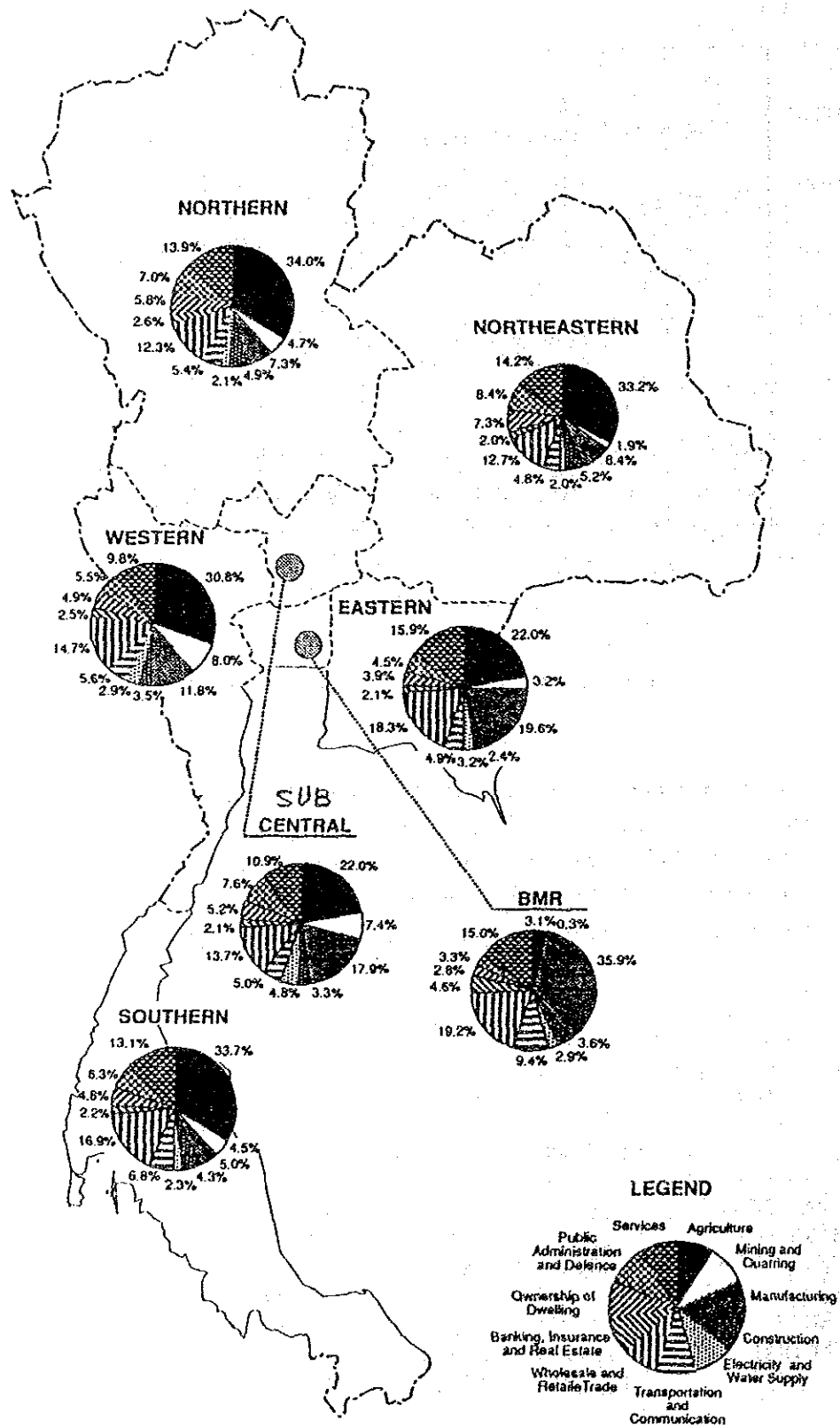


Figure 3.7 GRP BY SECTOR — 1987

Agriculture was the major economic sector except for the BMR. In the BMR, manufacturing was the biggest sector and followed by whole sales and retail trade. Percentage share of agricultural sector in BMR is only 3.1 percent.

3) Gross Provincial Products

Gross Provincial Products (GPP) by Changwat are presented in Appendix 3.4. BMA reached the highest GPP of 489,344 million Baht in 1987 with a share of 39.7% of GDP. Samut Prakan was the second highest GPP of 57,986 million Baht which shared only 4.7% of GDP.

Appendix 3.5 shows the growth rate of GPP. Samut Prakan attained the highest growth rate of 19.8% during the period 1986-1987 and was followed by BMA at 15.3% and Pathum Thani at 15.2%.

4) Per Capita GDP, GRP and GPP

Per capita GDP had increased from 15,925 Baht in 1981 to 26,876 Baht in 1988 as shown in Table 3.7. The growth rates of per capita GDP during 1981 - 1986, 1986 - 1987, and 1987 - 1988 were 3.2%, 6.5% and 9.1% respectively as shown in Table 3.8.

Regionally, BMR had increased 1.5 times from 47,785 Baht in 1981 to 71,566 Baht in 1987 and is followed by Eastern Region. Other regions show lower per capita GRP comparing with the national average of 23,021 Baht in 1987 as shown in Figure 3.8.

Table 3.7 PER CAPITA GDP AND GRP AT CURRENT MARKET PRICES

REGION	1981	1986	1987	1988
BMR	47,785	61,358	71,566	--
EASTERN	19,752	30,989	31,094	--
WESTERN	16,265	19,538	19,795	--
SUB CENTRAL	14,652	17,235	18,742	--
SOUTHERN	13,460	16,339	17,506	--
NORTHERN	10,101	12,208	13,185	--
NORTHEASTERN	6,067	7,879	8,343	--
WHOLE KINGDOM	15,925	20,790	23,021	26,876

Source: NESDB.

Table 3.8 PER CAPITA GDP AND GRP AT 1972 CONSTANT PRICES (Baht)

REGION	GRP				Annual Growth Rate %		
	1981	1986	1987	1988	1981-1986	1986-1987	1987-1988
BMR	20,696	22,720	25,628	-	1.9	12.8	-
EASTERN	7,526	9,687	9,984	-	5.2	3.1	-
WESTERN	6,152	7,640	7,395	-	4.4	-3.2	-
SUB CENTRAL	6,134	7,046	7,202	-	2.8	2.2	-
SOUTHERN	5,117	5,843	5,984	-	2.7	2.4	-
NORTHERN	4,205	4,953	4,989	-	3.3	0.7	-
NORTHEASTERN	2,695	3,260	3,261	-	3.9	0.1	-
WHOLE KINGDOM	6,671	7,821	8,327	9,083	3.2	6.5	9.1

Source: NESDB.

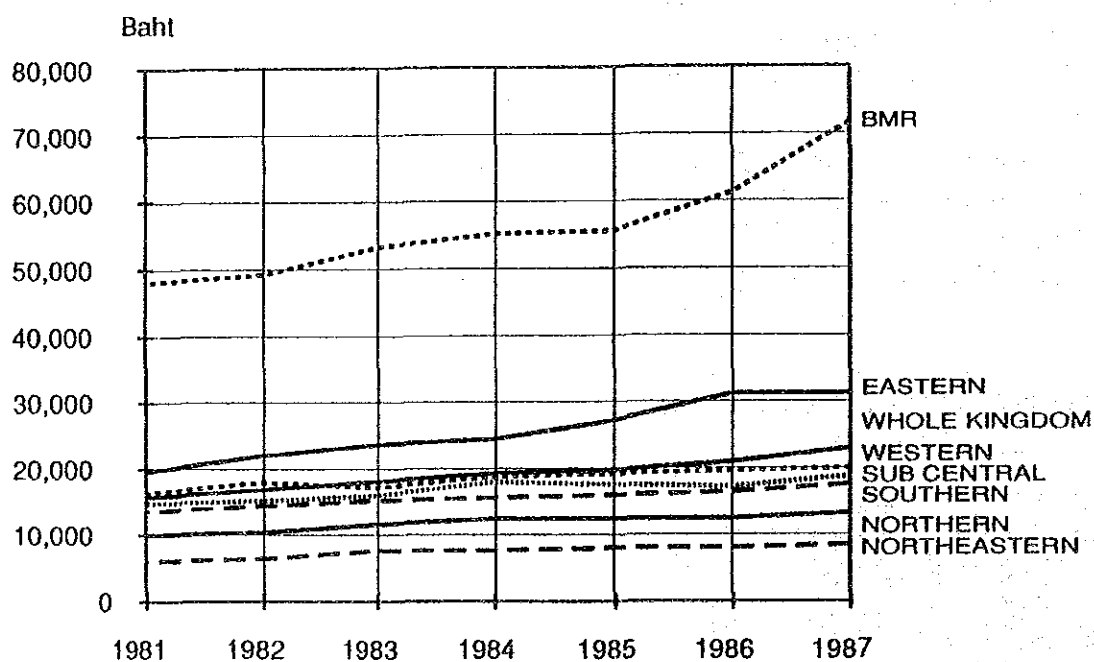


Figure 3.8 PER CAPITA GRP AT CURRENT MARKET PRICES

The growth rate of per capita GRP in BMR was the highest of 12.8% during 1986 to 1987 and that in other regions is lower than the national average of 6.5%. In recent years, differentials of per capita GRP between BMR and other regions have expanded increasingly.

According to the order of per capita GPP in 1987, Samut Prakarn achieved the biggest amount of 85,525 Baht which is 3.7 times of that of the national average. BMA and Chon Buri followed Samut Prakan. The per capita GPP of 14 Changwats in the whole country was counted at higher than the national average. The per capita GPP of 18 Changwats were counted at less than 10,000 Baht as shown in Appendix 3.6.

The growth rate of per capita GPP in Samut Prakan, also was counted at the highest of 15.9% and followed by Pathum Thani and BMA, as 13.7% and 12.5% respectively. The growth rates of 12 Changwats were counted as higher than the national average as shown in Appendix 3.7.

5) Manufacturing

The number of industrial factories in the Kingdom was counted about 87,000 in 1987. Among them, rice mill factories occupied more than half of the total as shown in Table 3.9.

According to the number of factories by region, except for BMR, the main type of factories in the Kingdom is agro-industry.

Table 3.9 NUMBER OF FACTORIES BY REGION

REGION	1986			1987		
	Rice Mills	Others	Total	Rice Mills	Others	Total
NORTHEASTERN	25,907	4,811	30,718	25,774	5,230	31,004
NORTHERN	10,970	3,475	14,445	10,834	3,818	14,652
SOUTHERN	4,538	2,742	7,280	4,513	3,007	7,520
EASTERN	1,885	3,097	4,982	1,884	3,189	5,073
WESTERN	1,475	2,325	3,800	1,458	2,377	3,835
SUB CENTRAL	1,398	1,013	2,411	1,398	1,069	2,467
BMR	772	21,072	21,844	776	21,894	22,670
WHOLE KINGDOM	46,945	38,535	85,480	46,637	40,584	87,221

Source: Ministry of Industry.

The share of rice mill factories in the Northeastern Region was 55% out of the total and that of other factories in BMR was 54% of the total. The number of factories by Changwat is presented in Appendix 3.8.

6) Tourism

International tourist arrivals in Thailand in 1988 reached 4,230,737, with an increase of 21.5% over the previous year.

Arrivals by air of all tourists numbered 3,290,145 or 77.8%, 895,078 or 21.2% by land and 45,514 or 1.1% by sea, as shown in Table 3.10.

According to the record of guest arrivals at all types of accommodation establishments in major cities, which is shown in Table 3.11, Bangkok reached 4,884,951, and Pattaya and Hat Yai followed.

Table 3.10 INTERNATIONAL TOURIST ARRIVAL (persons)

Mode	1986		1987		1988	
	Arrival	Change(%)	Arrival	Change(%)	Arrival	Change(%)
Total	2,818,092	+15.6	3,482,958	+23.6	4,230,737	+21.5
Air	2,110,800	+14.9	2,653,624	+25.7	3,290,145	+24.0
Land	669,751	+19.7	783,074	+16.9	895,078	+14.3
Sea	37,541	+17.2	46,260	+12.6	45,514	- 1.6

Source: Tourism Authority of Thailand

Table 3.11 NUMBER OF GUEST ARRIVAL (persons)

City	1987	1988
Total	8,617,079 (100.0)	9,886,817 (100.0)
Bangkok	4,369,306 (50.7)	4,884,951 (49.4)
Chiang Mai	827,666 (9.6)	945,879 (9.6)
Kanchanaburi	168,298 (2.0)	168,677 (1.7)
Pattaya	1,417,451 (16.4)	1,727,025 (17.5)
Phuket	546,949 (6.3)	726,173 (7.3)
Hat Yai	1,030,274 (12.0)	1,169,655 (11.8)
Sungai Kolok	257,135 (3.0)	264,457 (2.7)

Source : Tourism Authority of Thailand

Remark : Figures in parenthesis show the composition ratio.

3.2.3 Registered Vehicles

Table 3.12 presents the number of registered vehicles under the Motor Vehicle Act of the Police Department between 1973 and 1985. The data of 1988 are presented in Table 3.13 after introducing the Land Transport Act.

Table 3.12 NUMBER OF REGISTERED VEHICLES (1973 - 1985)

		1973	1975	1977	1979	1981	1983	1985
Whole Kingdom	Passenger Cars	250,689	290,399	331,266	392,798	345,599	411,982	545,375
	Motor Cycles	408,224	479,477	647,509	861,015	1,163,981	1,716,175	1,816,186
	Motor Tricycles	8,060	6,424	8,556	8,944	8,678	11,261	13,262
	Buses	21,572	22,717	31,295	32,079	170,133	221,006	256,256
	Vans & Trucks	179,394	238,057	346,222	416,850	466,463	568,802	598,764
	Others	19,135	24,087	31,358	40,490	42,025	47,701	50,613
	Grand Total	887,074	1,061,161	1,396,206	1,732,176	2,196,929	2,976,927	3,280,756

Source: Police Department

Although there are some differences between the number of registered vehicles by type in 1985 and in 1988 due to the change of registration method, the total number of registered vehicles has drastically increased from 3,280,756 in 1985 to 6,382,940 in 1988 with an annual growth rate of 24.8%.

Table 3.13 NUMBER OF REGISTERED VEHICLES - 1988

Type of Vehicle	Under Motor Vehicle Act	Under Land Transport Act	Total
Passenger car	1,146,512		1,146,512
Personal van and truck	723,882	254,244	978,126
Taxi and Service car	65,399		65,399
Bus		83,222	83,222
Motorcycle	3,894,824		3,894,824
Others	214,857		214,857
Total	6,045,474	337,466	6,382,940

Source: Department of Land Transport, Ministry of Transport and Communications

According to the registered vehicles under Motor Vehicle Act, the total number of registered vehicles in BMR was counted at 2 millions in 1988 with a share of 33.5% of the total number of vehicles. As for the passenger cars in BMR, especially, they have the highest share of 76.1% of the total passenger cars as shown in Table 3.14.

Table 3.14 REGISTERED VEHICLES BY REGION UNDER MOTOR VEHICLE ACT - 1988

Region	Passenger Car	Personal Van and Truck	Taxi and Service	Motor-cycle	Others	Total
Northeastern	54,103 4.7	131,689 18.2	5,684 8.7	625,732 16.1	40,759 19.0	857,967 14.2
Northern	76,489 6.7	159,778 22.1	5,640 8.6	920,259 23.6	87,906 40.9	1,250,072 20.7
Southern	39,514 3.4	94,758 13.1	5,328 8.1	659,189 16.9	1,996 0.9	800,785 13.2
Eastern	41,772 3.6	88,225 12.2	2,569 3.9	264,529 6.8	5,400 2.7	402,895 6.7
Western	26,871 2.3	59,620 8.2	1,060 1.6	277,104 7.1	5,944 2.8	370,599 6.1
Sub Central	35,234 3.1	44,998 6.2	3,823 5.8	232,793 6.0	18,225 8.5	335,073 5.5
BMR	872,529 76.1	144,814 20.0	41,295 63.1	915,218 23.5	54,227 25.2	2,028,083 33.5
Total	1,146,512 100	723,882 100	65,399 100	3,894,824 100	214,857 100	6,045,474 100

Source: Department of Land Transport, Ministry of Transport and Communications

3.3 TRANSPORT CONDITIONS

3.3.1 Transport Modes

The major domestic transport modes in Thailand consist of road, railway, coast, inland water and air transports. Each mode has been developed in such a manner to connect every part of the country with Bangkok.

Figure 3.9 shows domestic passenger and freight transports for each transport mode. As shown in this figure, the road acts a vital role between transport modes in the country.

In the passenger transport, the road occupies 90.5% of the share in terms of passenger-km and the railway is only 8.8%, while the share of the air is less than 1%.

The road is also prominent in the freight transport and its share reaches 84.0% in terms of ton-km. The railway is the second with a share of only 8.2%. The shares of the inland water and coast are not so much; 4.7% and 3.1%, respectively.

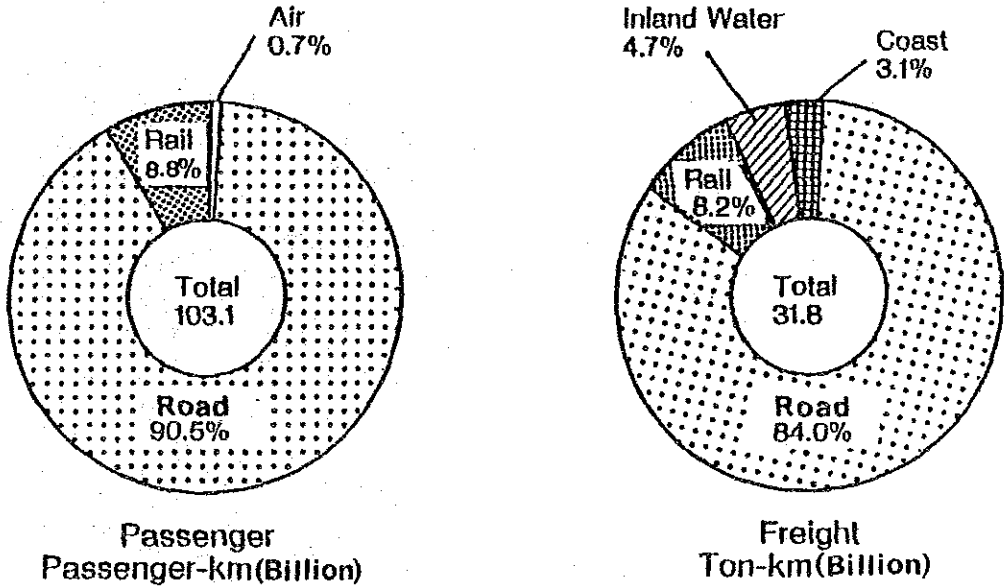
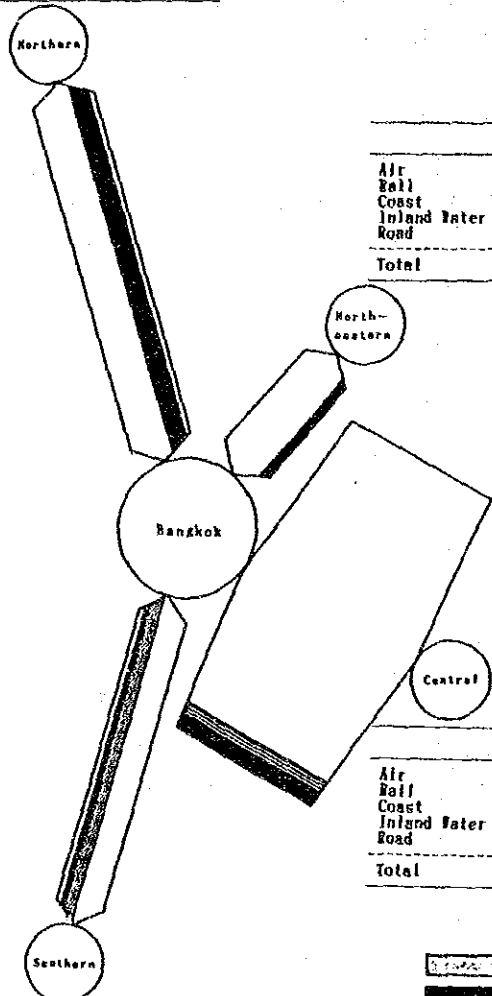


Figure 3.9 SHARE OF TRANSPORT MODES -- 1987

Figure 3.10 shows the freight traffic flow to/from Bangkok by mode in 1987, which is prepared based on "Transportation Statistics", MOTC. This figure clearly indicates that the road is the most important transport mode in Thailand.

	Thousand Ton	%
Air	803	9.2
Rail	1,862	28.5
Coast	0	0.0
Inland Water	0	0.0
Road	4,067	62.3
Total	6,633	100.0



	Thousand Ton	%
Air	142	2.4
Rail	727	12.4
Coast	0	0.0
Inland Water	0	0.0
Road	6,011	85.2
Total	6,878	100.0

	Thousand Ton	%
Air	0	0.0
Rail	1,078	3.0
Coast	266	0.7
Inland Water	1,355	3.8
Road	33,327	92.5
Total	36,016	100.0

	Thousand Ton	%
Air	511	10.2
Rail	485	9.7
Coast	1,136	22.7
Inland Water	0	0.0
Road	2,871	67.4
Total	5,002	100.0

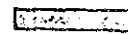




-  Air
-  Rail
-  Coast
-  Inland Water
-  Road

Figure 3.10 FREIGHT TRAFFIC FLOW TO/FROM BANGKOK BY MODE - 1987

3.3.2 Road Transport

Table 3.15 shows that there are various types of roads in Thailand and they are constructed and maintained by various agencies. The length of all of these roads reaches 176,530 km in 1988, increasing at a pace of about 3,000 km per year for the past 7 years from 1981 to 1988.

Table 3.15 LENGTH OF ALL ROADS (1981-1988)

(1,000 km)

Adminis- trated by	Road Type	Length of Roads							
		1981	1982	1983	1984	1985	1986	1987	1988
DOH	National Highways	15.26	15.60	15.58	15.58	15.70	16.52	16.57	16.70
DOH	Provincial Highways	28.66	28.36	28.71	28.95	29.46	30.03	32.03	33.17
ARD	Rural	15.72	16.58	17.39	17.96	18.55	19.07	19.51	19.51
PWD	Rural	2.60	2.91	3.16	3.36	3.64	3.93	4.43	6.17
RID	Rural	3.56	3.89	4.20	4.60	4.87	5.17	5.17	5.17
BKA	Municipal	1.15	1.15	1.15	1.15	1.16	2.79	2.79	2.79
Local Bodies	Municipal	7.39	7.39	7.39	7.39	7.39	7.39	11.92	11.92
Others	Rural	81.65	81.65	81.65	81.65	81.65	81.65	81.65	81.07
ETA	Bangkok Expressway	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03
Total		156.00	157.54	159.25	160.65	162.44	166.57	174.10	176.53

DOH : Department of Highways
 ARD : Accelerate Rural Development Office
 PWD : Public Works Department
 RID : The Royal Irrigation Department
 BKA : Bangkok Metropolitan
 ETA : Expressway and Rapid Transit Authority of Thailand
 Local Bodies : Municipalities & Sanitaries
 Source : DOH

Among them, DOH has responsibility for national and provincial highways which form a frame of the nationwide road network.

Details of the traffic flow for both passenger and commodity vehicles on the national highways are presented as the results of the OD roadside interview survey carried out by the Study Team in Chapter 6.

3.3.3 Railway Transport

The State Railway of Thailand, owned by the Government, has a railway system radiating from Bangkok with a total length of 3,735 km as of the end of fiscal year 1985. The railway network is shown in Appendix 3.9.

The main railway lines extend to Chiang Mai in the north, to Nong Khai and Ubon Ratchathani in the northeast, to Kanchanaburi in the west, to Sungai Kolok in the south and to Aranyaprathet in the east.

In the Central Region, a new railway line between Chachoengsao and Sattahip has recently been constructed.

Figure 3.11 shows the railway passenger traffic flow to/from Bangkok in 1987. The predominant number of passengers of about 12,100,000 is observed between Bangkok and Central Region followed by about 6,800,000 persons in the intra-Bangkok.

Figure 3.12 shows the railway freight traffic flow to/from Bangkok in 1987. The biggest freight flow of 1,860,000 tons is seen between Bangkok and Northern Region, and is followed by 1,080,000 tons between Bangkok and Central Region.

3.3.4 Coast Transport

Appendix 3.10 illustrates the location of main coastal ports in Thailand. All of these ports are located along the Gulf of Thailand except Phuket on the Andaman Sea.

The coast transport is mainly carried out between Bangkok and ports in Southern Region. The shipping amounts to Bangkok from these ports are illustrated in Figure 3.13. The predominant amount of about 224,000 ton is carried between Bangkok and Songkhla.

For trade ports, there are two deep sea ports at Bangkok and Sattahip, and new ports are being constructed at Laem Chabang and Map Ta Phut.

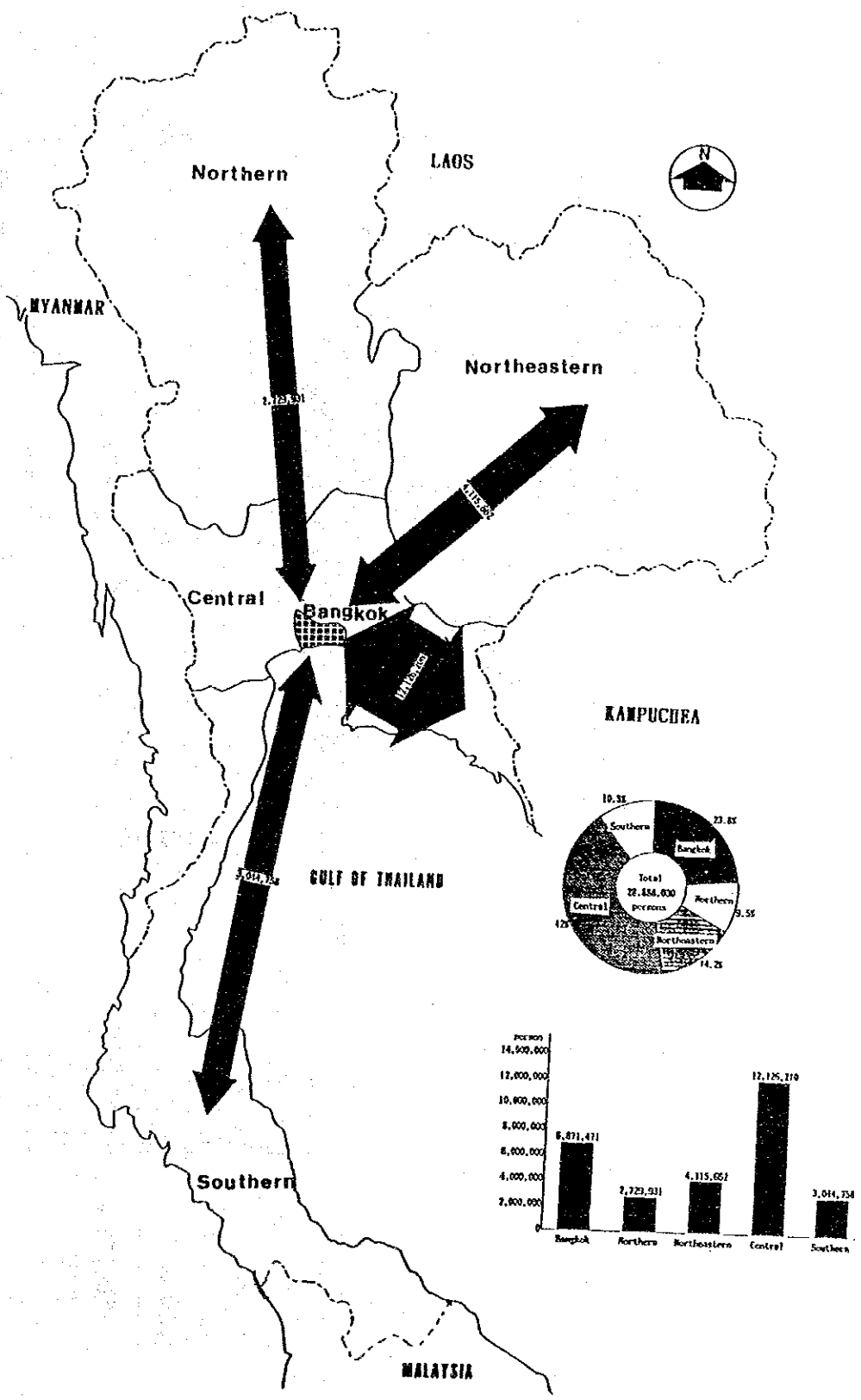


Figure 3.11 RAILWAY PASSENGER FLOW TO/FROM BANGKOK — 1987

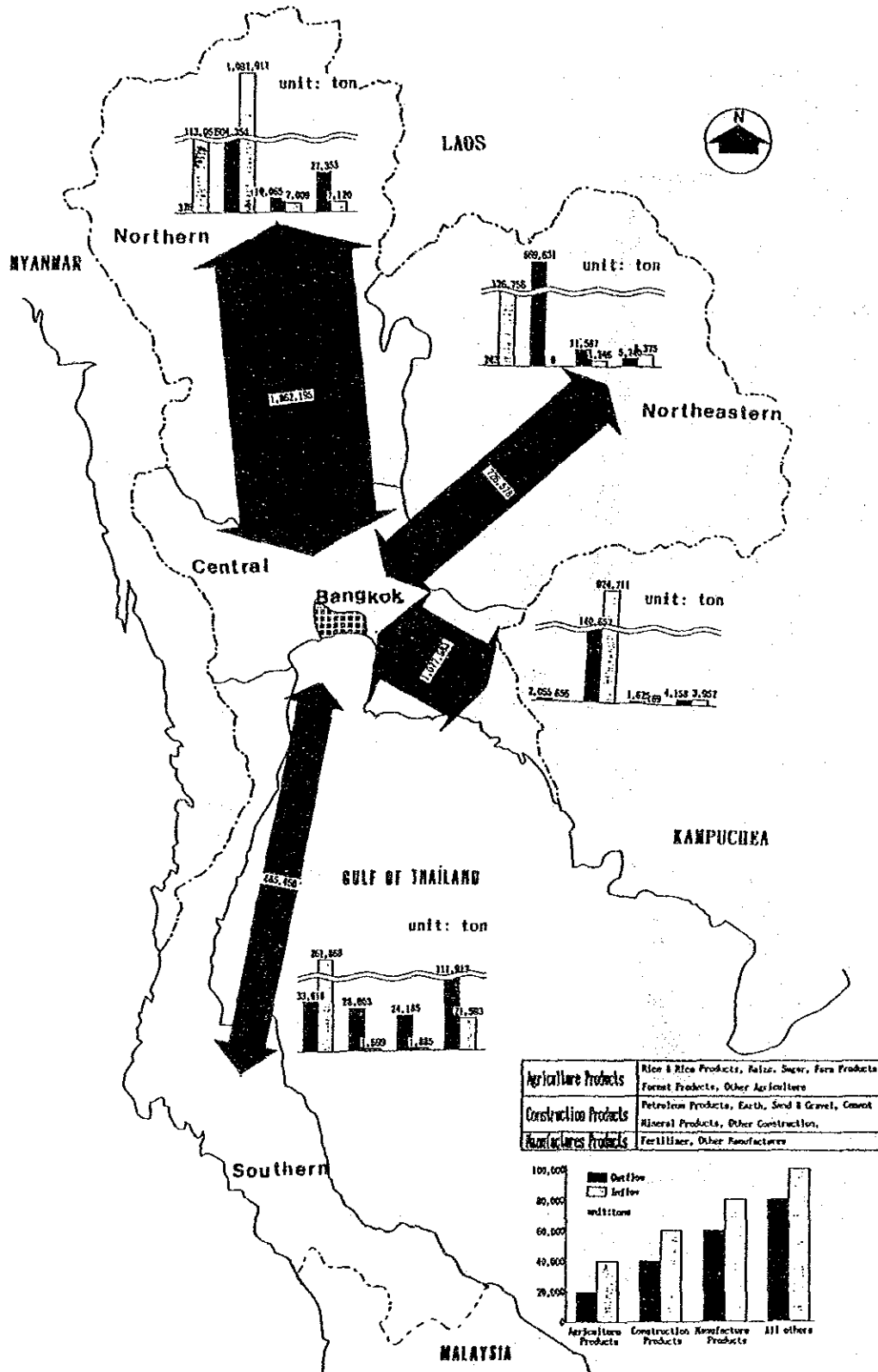


Figure 3.12 RAILWAY FREIGHT FLOW TO/FROM BANGKOK — 1987

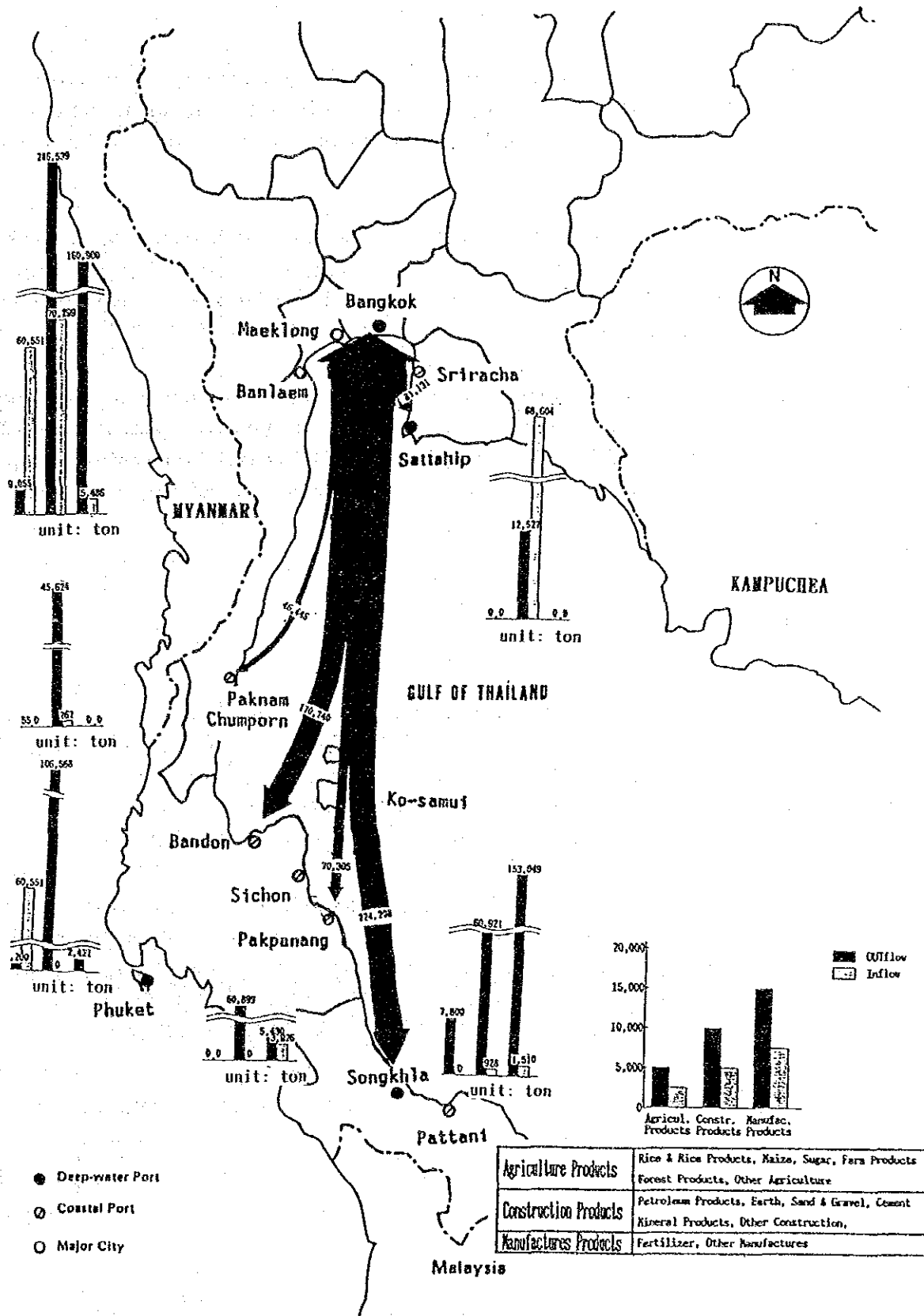


Figure 3.13 COAST FREIGHT FLOW TO/FROM BANGKOK — 1987

3.3.5 Inland Water Transport

Main rivers utilized for the inland water transport are Chao-phraya, Thachin and Meaklong rivers with their tributaries. Inland water ports are located along these rivers as shown in Appendix 3.11.

The inland water transport has lost its importance compared with road and railway transports. However, it still performs some role in freight transports, especially for agricultural products and construction materials.

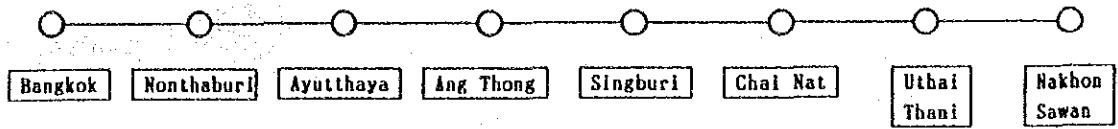
Figure 3.14 shows transportation amounts by commodity among ports along Chaophraya River. The amount between Bangkok and Chai Nat is about 330,000 tons to 370,000 tons. However, the amount on the northern part from Chai Nat has a share not more than about 30,000 tons.

3.3.6 Air Transport

Thai Airways International, owned by the Government, operates scheduled services radiating from Bangkok to all over the country. Total number of commercial airports reaches 22, including 3 international airports which are Bangkok, Chiang Mai and Phuket. The airports are shown in Appendix 3.12.

The air passenger traffic flow in these airports is shown in Figure 3.15. Comparing with other destinations, considerable numbers of passengers are observed from Bangkok to Chiang Mai, Hat Yai and Phuket.

River Chaophraya



Unit: tons

	Bangkok	Nonthaburi	Ayutthaya	Ang Thong	Singburi	Chai Nat	Uthai Thani	Nakhon Sawan
Rice		8,022	2,187	25	400	257		
Sugar					13,500			
Farm Products		24	18	147	1			
Earth, Sand & Gravel	2,970		286,058	720	2,118	400	42,277	400
Other Manufactures					24,430			
Total	338,504	340,622	333,634	327,909	370,586		39,307	38,330
Inflows	338,504	2,118	1,058	0	42,677	0	0	0
Outflows	0	0	8,046	5,725	0	331,279	977	38,330

Figure 3.14 INLAND WATER FREIGHT FLOW BY COMMODITY
IN CHAOPHRAYA RIVER — 1987

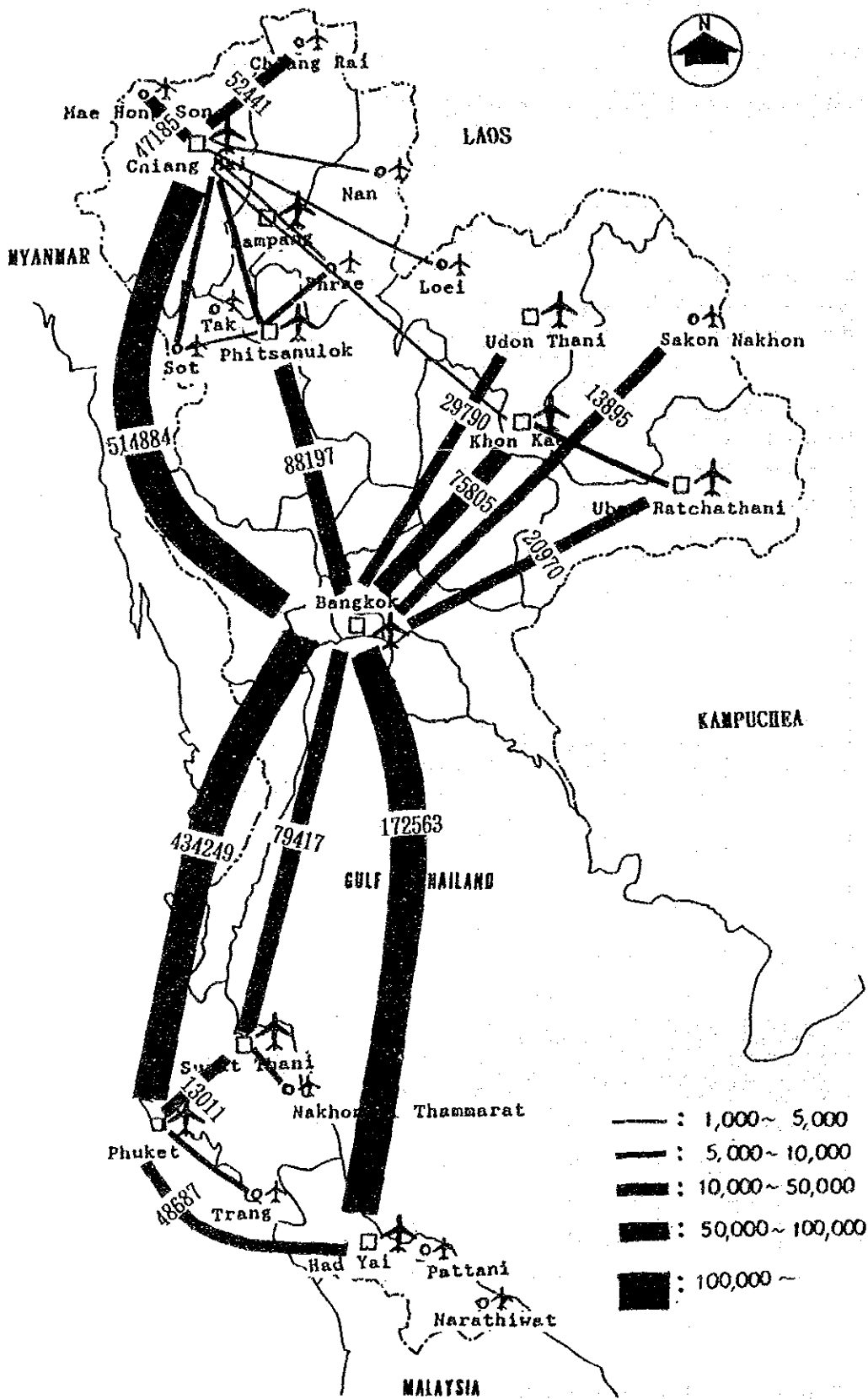


Figure 3.15 AIR PASSENGER TRAFFIC — 1987

3.4 HIGHWAY CONDITIONS

3.4.1 Highway Network

As described in the previous section 3.3, there are various types of roads managed by various agencies in Thailand. Among these roads, DOH has responsibility to construct and maintain national and provincial highways.

National highways are the roads which play primarily important roles for the national economic development, administration and defense by forming an arterial highway network which connects regions and key areas each other.

Provincial highways are roads which have an indispensable role for the development of areas in regions and to supplement the national highway network.

The total length of the existing national and provincial highways reaches 49,868 km in 1988, of which national highways are 16,698 km and provincial highways 33,170 km, as shown in Table 3.16.

The Government of Thailand has recently emphasized to introduce investments from private sector and toll systems for construction and operation of highways because of shortage of the national budget. There are 2 existing toll highways of 243 km in total as shown in Table 3.17.

Table 3.16 LENGTH OF HIGHWAYS UNDER DOH RESPONSIBILITY - 1988 (Km)

Region	Special/National Highways					Provincial Highways					Total				
	Under Paved	Un-paved	Total	Under const-ruccion	Total	Under Paved	Un-paved	Total	Under const-ruccion	Total	Under Paved	Un-paved	Total	Under const-ruccion	Grand Total
North	3,366	16	3,382	360	3,742	6,117	1,424	7,541	3,592	11,133	9,483	1,440	10,923	3,952	14,875
North-East	4,597	34	4,631	90	4,721	5,538	2,056	7,594	1,548	9,142	10,135	2,090	12,225	1,638	13,863
Central	4,754	20	4,774	310	5,084	4,893	1,390	6,283	1,396	7,679	9,647	1,410	11,057	1,706	12,763
South	3,105	7	3,112	39	3,151	3,504	973	4,477	739	5,216	6,609	980	7,589	778	8,367
Total	15,822	77	15,899	799	16,698	20,052	5,843	25,895	7,275	33,170	35,874	5,920	41,794	8,074	49,868

Source : DOH

Table 3.17 EXISTING TOLL HIGHWAYS - 1990

No	Route No.	Origin - Destination	Length (Km)	No. of Lanes	No. of Toll Gates	Opening year
1	32	Bang Pa In Nakhon Sawan	185	2	2	1974
2	34	Bang Na Bang Pakong	58	4	1	1988
TOTAL			243			

Existing national highway network including toll highways is identified based on the DOH road map and road inventory data. This is shown in Figure 3.16.

3.4.2 Traffic Condition

To estimate the Average Daily Traffic (ADT) volume and to establish seasonal and daily traffic variations, DOH has been conducting periodical traffic counting surveys since 1962, and permanent surveys on some locations since 1988, on both national and provincial highway networks.

As a general analysis, Figure 3.17 gives the cumulative frequency distribution for the number of traffic volume counting sections on the national highways and different ranking values of ADT in the year 1989. The four regions as well as the whole Kingdom are presented in this figure. According to the DOH policy, the limit of ADT for two-lane highways is 8,000 vehicles. The percentage of sections with an ADT of 8,000 vehicles or more in the whole national highway network is about 17%, with the highest value of 38% in the Central Region and the lowest of 3% in the Northern Region. Assuming an approximate growth factor of 4.0 up to the target year 2010, sections with an ADT of 2,000 vehicles at present will exceed ADT of 8,000. In the whole country, the percentage is about 67%, with the highest value of 83% in the Central Region. In 2010, almost all of the national highways in the Central Region will require to be improved to multi-lane divided highways.

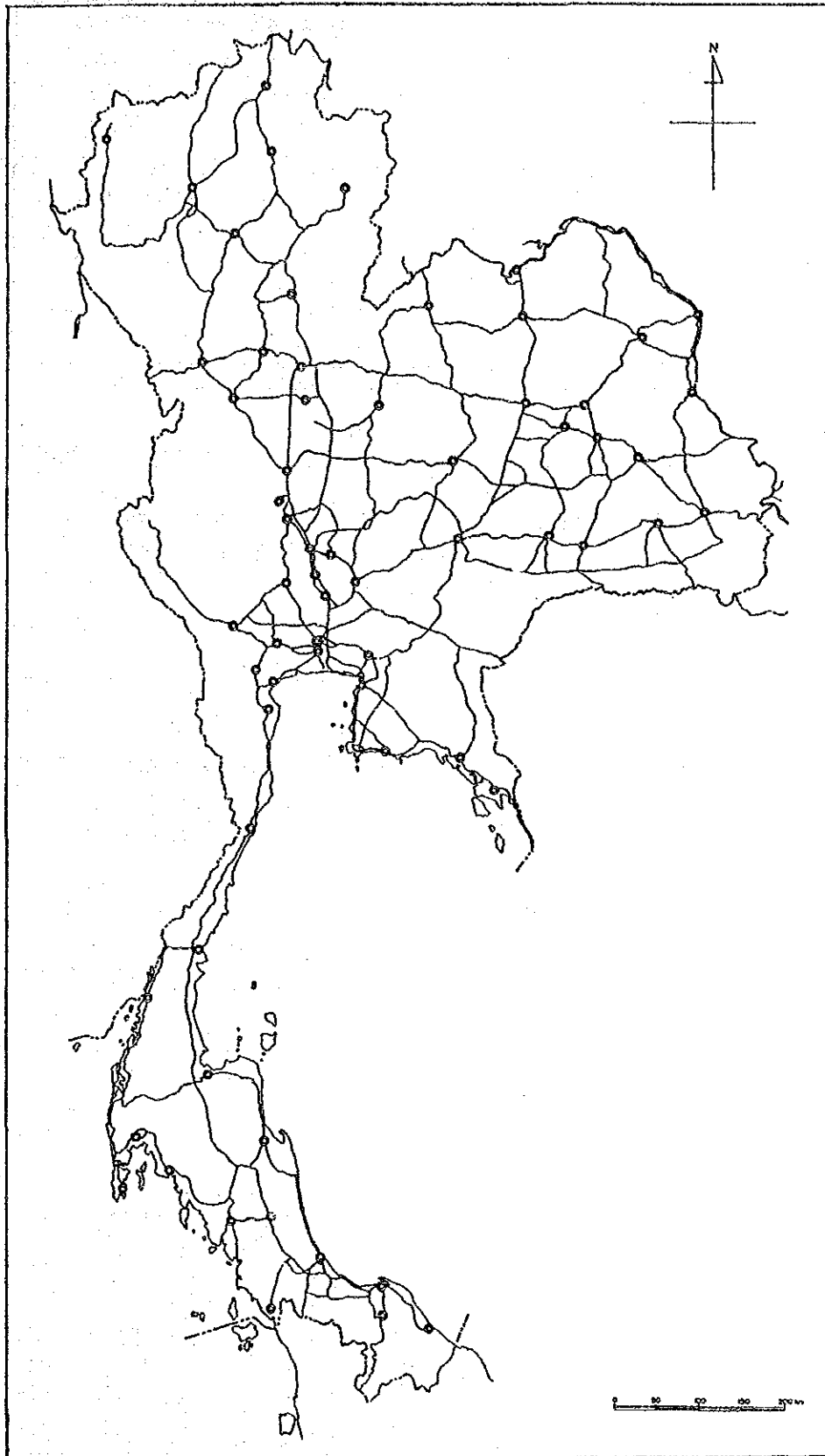


Figure 3.16 NATIONAL HIGHWAY NETWORK

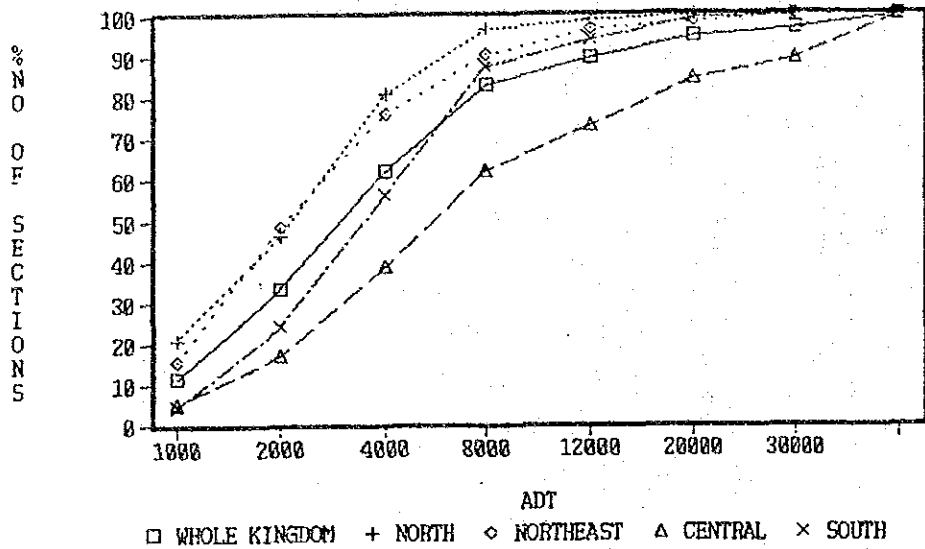


Figure 3.17 CUMULATIVE NO. OF SECTIONS AND ADT OF ALL NATIONAL HIGHWAYS - 1989

3.4.3 Budget of DOH

The amount of DOH's budget in 1988 is 10,007 million Baht which is about 4% of the government national budget as shown in Figure 3.18.

The breakdown of this amount is 1,983 million Baht for administration, 5,208 million Baht for construction and 2,816 million Baht for maintenance.

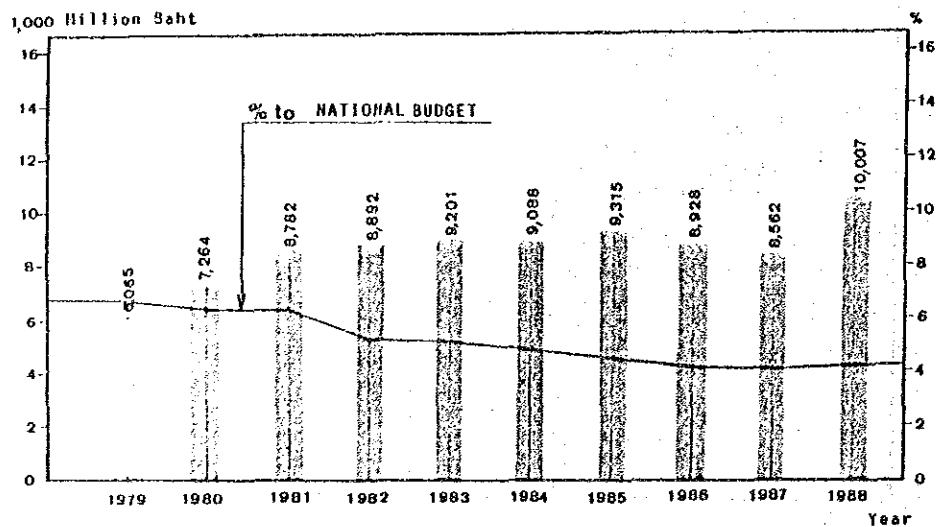


Figure 3.18 TREND OF DOH BUDGET

On the other hand, and as in the 6th Highway Development Plan, DOH's budget is directed to the works of rehabilitation of existing highways, upgrading standards of national highways and construction of paved roads as shown in Table 3.18.

Table 3.18 TARGETS OF THE 6TH NATIONAL HIGHWAY DEVELOPMENT PLAN (1987-1991)

Highway Class	Construction Targets in 1987-1991			Committed Amount Spilled Over (Mil. Baht)
	Number of Roads	Length (Km)	Construction Cost (Million Baht)	
<u>National Highways</u>				
1. Rehabilitation of Existing Highways	86	2,443.0	4,879	246
2. Upgrading Standards	23	295.0	1,920	816
3. Construction of Paved Roads	-	-	-	-
4. New Construction	23	248.4	918	341
5. Construction of Interchanges and Viaducts	9	4.1	460	280
Total	141	2,990.5	8,177	1,683
<u>Provincial Highways</u>				
1. Rehabilitation of Existing Highways	90	1,807.0	3,438	303
2. Upgrading Standards	4	9.0	120	90
3. Construction of Paved Roads	149	3,193.0	6,030	1,833
4. New Construction	5	78.5	293	57
5. Construction of Interchanges and Viaducts	2	0.9	60	-
Total	250	5,088.4	9,941	2,283
Grand Total	391	8,078.9	18,118	3,966

3.4.4 Management for Toll Highways

In order to cope with the management of toll highways, DOH has set up Toll Highway Office under the Chief Engineer for maintenance whose organization chart is shown in Figure 3.19.

Toll Highway Office has 5 sections in DOH's head office in Bangkok, which are: Administration, Planning, Toll Income,

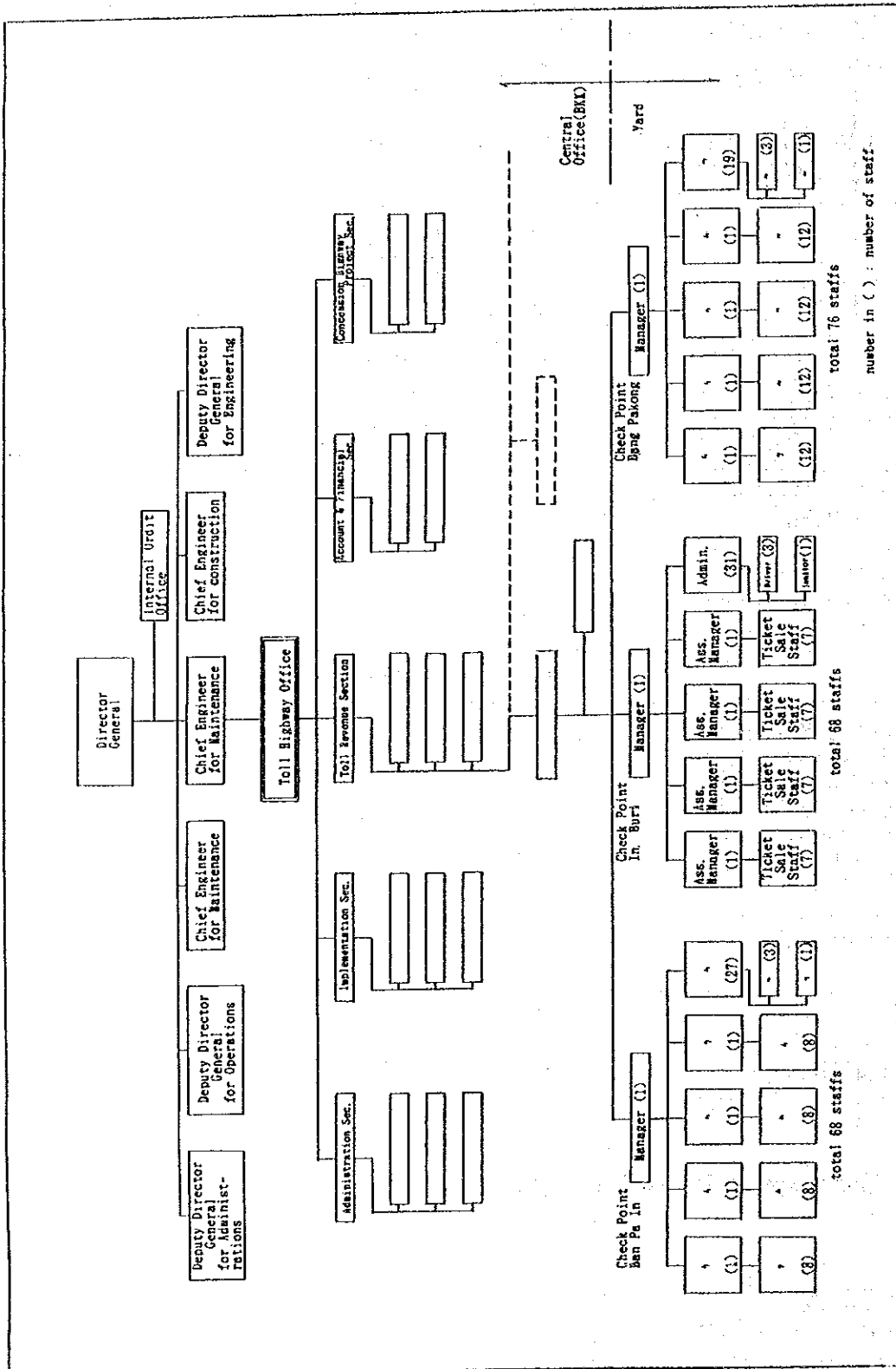


Figure 3.19 ORGANIZATION OF TOLL HIGHWAY OFFICE

Account and Finance, and Concession Highway, and 3 toll collection offices in the sites of Ban Pa In and Inn Buri (Route No. 32), and Bang Na (Route No. 34) under the jurisdiction of Toll Income Section. The total permanent staff in the three toll collection offices is 212 persons.

The open system is adopted by DOH at present as a toll collection system for all toll collection gates. Existing toll rates by type of vehicles are 1 Baht for motorcycle, 3 Baht for 4-wheel car, 8 Baht for 6-wheel truck and 10 Baht for 10-wheel truck, based on the indicated toll rates under Toll Highway Act.

The toll revenue of DOH is steadily increasing year by year in proportion to the increasing number of vehicles passed as shown in Figure 3.20. The toll revenue in 1989, which is the second year after operating the Bang Pakong toll gate in 1987, is 3 times to that revenue of 1985. The collected toll revenue is put in the Ministry of Finance through the National Bank as a Toll Fee Fund. On the other hand, the expenses of the Toll Highway Office in the period from 1985 to 1989 are illustrated in Figure 3.21. The expenses in 1989 is 88 million Baht which is 4.4 times to that in 1985 and 77% of toll revenue in 1989.

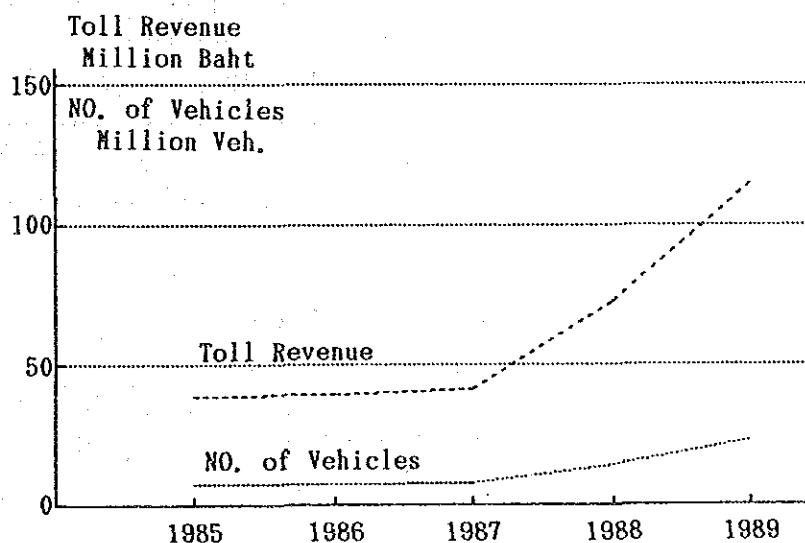


Figure 3.20 TOLL REVENUE AND NUMBER OF VEHICLES

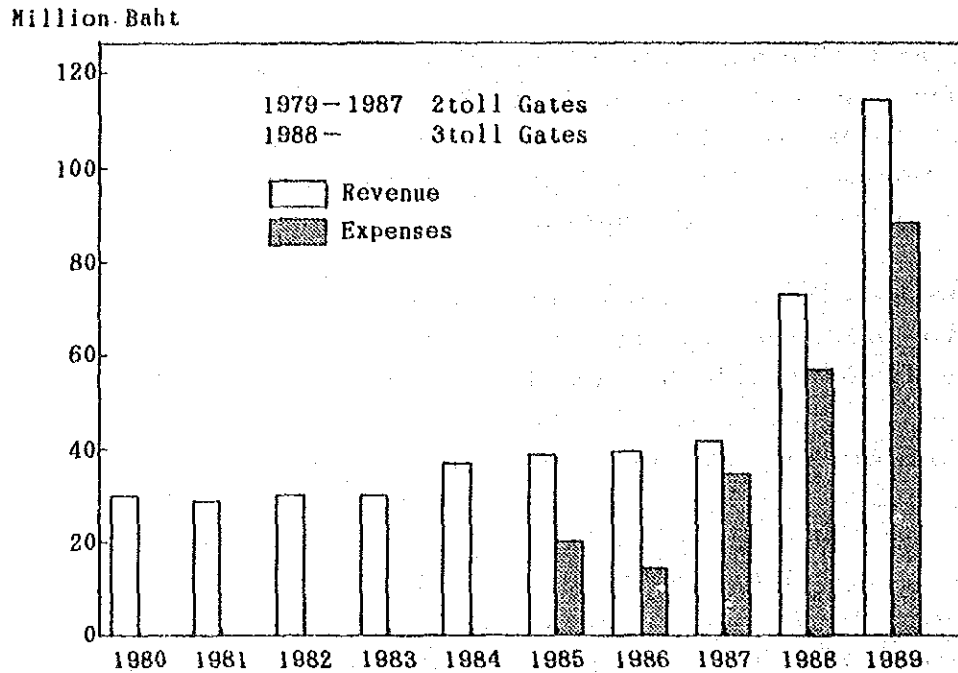


Figure 3.21 TOLL REVENUE AND TOLL HIGHWAYS OFFICE EXPENSES

3.4.5 Design Standards

It is necessary that highways should be designed to be capable of carrying the estimated traffic volumes and the consequent accumulated axle loads for all types of vehicles during the design life of the facility. In general, roads carrying low traffic volumes have a narrower width consisting of thinner pavement depths, whereas roads subject to higher traffic volumes are wider having thicker pavement sections.

The average daily traffic (ADT) dictates the design of a highway in regard to its width, number of lanes, lane width and the surface type. Based on this criteria, the DOH has established the following design standards:

<u>Highway Classification</u>	<u>No. of standards</u>
Primary Highways	4 standards (P _D , P ₁ , P ₂ , P ₃)
Secondary Highways	5 standards (S _D , S ₁ , S ₂ , S ₃ , S ₄)
Provincial Highways	7 standards (F _D , F ₁ , F ₂ , F ₃ , F ₄ , F ₅ , F ₆)

The design standards and a typical cross section for primary highways are presented in Appendix 3.13 and Figure 3.22, respectively.

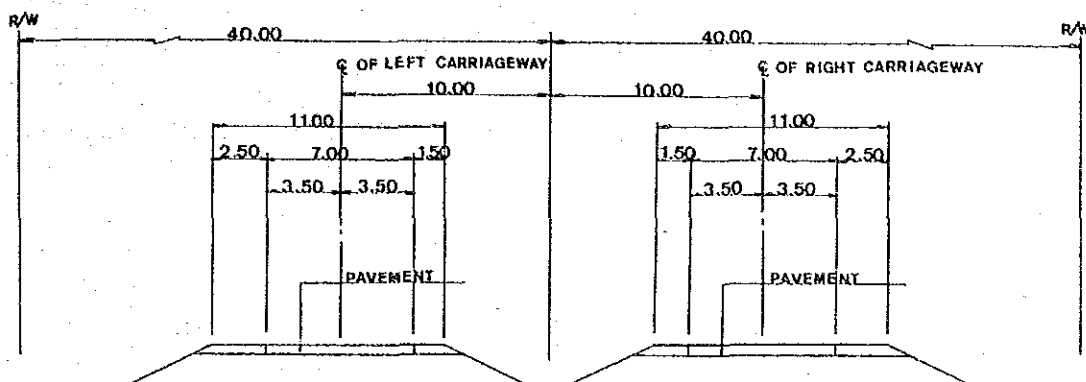


Figure 3.22 TYPICAL CROSS SECTION OF DIVIDED PRIMARY HIGHWAY

3.4.6 Traffic Accidents on Highways

Table 3.19 shows the number of traffic accidents and casualties on the highways under DOH responsibility. The accidents and casualties by type on the highways are classified for the year 1988 as shown in Table 3.20.

Table 3.19 NUMBER OF TRAFFIC ACCIDENTS AND CASUALTIES ON DOH HIGHWAYS -- 1988

Year	Accidents	Fatalities	Injured Persons
1981	3,211	1,652	4,749
1982	3,264	1,952	6,202
1983	2,875	1,661	5,286
1984	2,061	1,063	3,437
1985	3,178	1,629	5,681
1986	2,614	1,466	4,859
1987	2,782	1,564	4,569
1988	3,173	2,115	5,563

Table 3.20 NUMBER OF ACCIDENTS AND CASUALTIES ON DOH HIGHWAYS
BY ACCIDENT TYPE - 1988

Type of Accident	No. of Accidents				No. of Casualties	
	Total	Fatal	Injury	Damage	Fatal	Injury
Motorcycle vs. Pedestrian	33	8	21	3	31	58
Motorcycle vs. Bicycle	51	21	30	0	27	72
Motorcycle vs. Motorcycle	317	168	130	19	309	311
Motorcycle vs. Fixed Object	9	6	3	0	7	13
Motorcycle Turn Over or Run Off	9	6	3	0	2	8
Vehicle vs. Pedestrian	185	117	65	3	125	114
Vehicle vs. Bicycle	40	24	13	3	37	51
Vehicle vs. Vehicle	1,314	109	578	226	954	3,036
Vehicle vs. Train	3	2	1	5	32	47
Vehicle vs. Animal/Animal Drawn	6	2	2	2	2	6
Vehicle Turn over or Run off	389	131	129	129	294	1,070
Vehicle vs. Fixed Object	625	48	141	432	177	435
Others	187	44	48	101	118	265
Total	3,173	1,082	1,164	927	2,115	5,563

3.4.7 Expressways in Bangkok

In Bangkok, there are three routes of toll expressways, with 27.1 km in total, operated by ETA (The Expressway and Rapid Transit Authority of Thailand) under the jurisdiction of the Ministry of Interior.

ETA was established under the Announcement No. 290 of the Revolutionary Party dated 27 November, 1972 as a public enterprise with main objectives as follows:

- 1) To construct, to organize, as well as to maintain the exclusive roadway system.
- 2) To carry out the operation or supervision of the business undertakings concerning the rapid transit system.
- 3) To handle all businesses in relation with the operation of the expressway and rapid transit system.

All these are carried out in order to accommodate convenience and ease the traffic and transportation flow, especially to alleviate the traffic congestion in Bangkok and road transport operation with great difficulties. The First Stage Expressway System of ETA is funded by the Government's budget and partially by foreign loan, and the loan amortization is covered by the ETA's operating revenue.

The expressway network in Bangkok is shown in Figure 3.23. Table 3.21 shows the existing and future plan of the expressways in Bangkok. According to those figure and table, the 27.1 km section of the expressway has been operated since 1988 and another 50 km will be in operation up to 1995 with about 40,000 million Baht of project cost in which 20,000 million Baht will be the borrowings.

Figure 3.24 illustrates the organization chart of ETA in 1988.

The management of toll collection system is under the responsibility of the Toll Collection Division, the Expressway Management Department. The service is in operation with a computer system to control toll collection accuracy at all time.

Table 3.21 EXISTING EXPRESSWAYS AND FUTURE PLAN OF EXPRESSWAY IN BANGKOK

First Stage Expressway System (FES)				Ekamai-Ramindra Expressway (ERE)			Second Stage Expressway System (SES)			Third Stage Expressway System (TES)					
Section	Length (Km)	Year in operation	Project cost Million Baht	Section	Length (Km)	Year in operation	Section	Length (Km)	Year in operation	Section	Length (Km)	Year in operation			
Din Daeng - Port	8.9	1981	1,900	Ekamai-Ramindra	18.2	1994	Bang Khlo - Chaeng Wattan	24.8		Silom - Phet Kasem					
Bang Na - Port	7.9	1983	1,600				Hua Lam Pong - Makkasan	2.8 (2.0)		Dao Kanong - BEK Noi/Nakorn Chaisri Hwy					
Dao Kanong - Port	10.3	1987	3,900				Phaya Thai - Srinatharindra	11.5 (5.0)		Bang Kapi - Nonthaburi Bang Na - Saenit Prakarn					
	27.1		7,400		18.2			39.1 (31.8)	1995			1996			
				Estimated Project Cost (Million Baht)						Estimated Project Cost (Million Baht)					
				Land Acquisition			2,577			Land Acquisition			11,000		
				Construction			6,803			Construction			19,400		
							9,380						30,400		

Source: Annual Report 1988 (ETA). Role, Function and Projects Concerned (ETA).

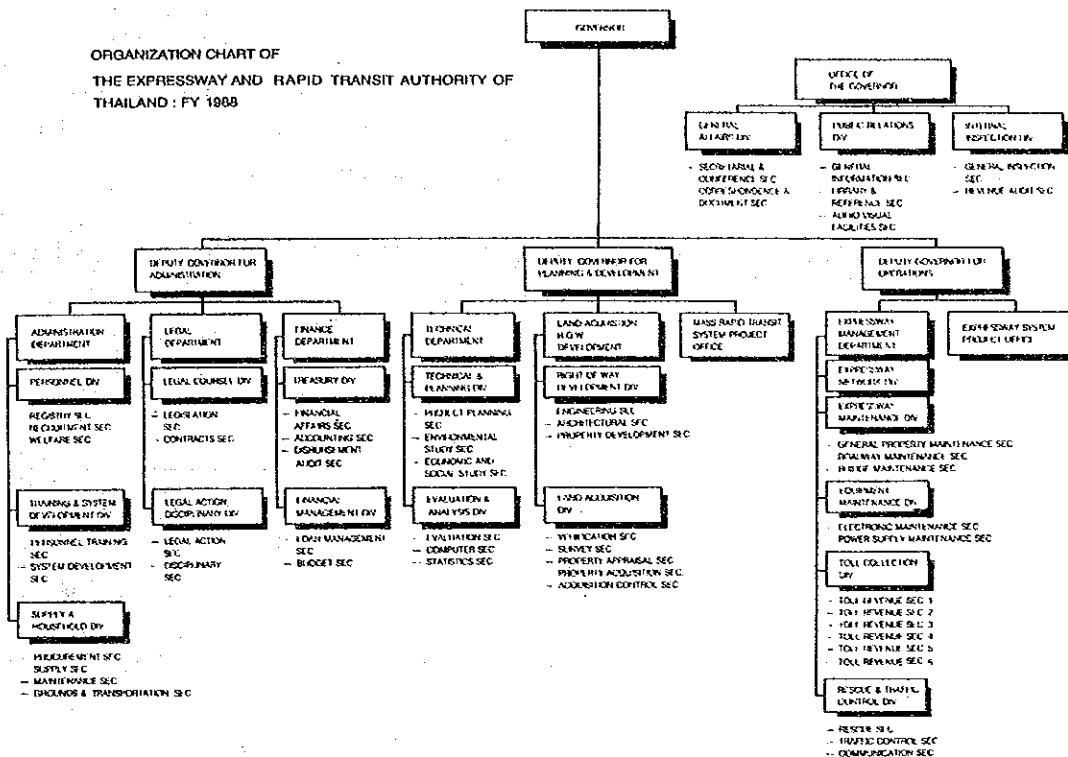


Figure 3.24 ORGANIZATION OF ETA

There are altogether 10 toll plazas, with each plaza having the number of toll booths as follows: Din Daeng, 9 ; Sukhumvit, 2 ; Petchaburi, 3 ; Rama IV, 4 ; Riverside, 4 ; Kasemraj I, 4 ; Kasemraj II, 3 ; At Narong, 4 ; Sukhumvit 62, 4; and Bang Na, 9.

Toll rates have been classified at three categories:

- Four-wheel vehicles — 10 Baht
- Six or ten-wheel vehicles — 20 Baht
- More than ten-wheel vehicles — 30 Baht

At present, there are 144 toll collectors, 40 supervisors and 48 chiefs, working three shifts per day. The toll collection is

carried out by toll collectors, who are responsible for cash collection. The supervision of the toll collecting operations of all lanes through the Control Board and Visualization Desks is carried out by supervisors, and the management of the plazas is carried out by chiefs.

Beside the above mentioned traffic control system, the axle weight equipment is also provided at the entry point of the expressway to control the overloaded trucks.

The schematic diagram of the existing traffic control system is shown in Figure 3.25.

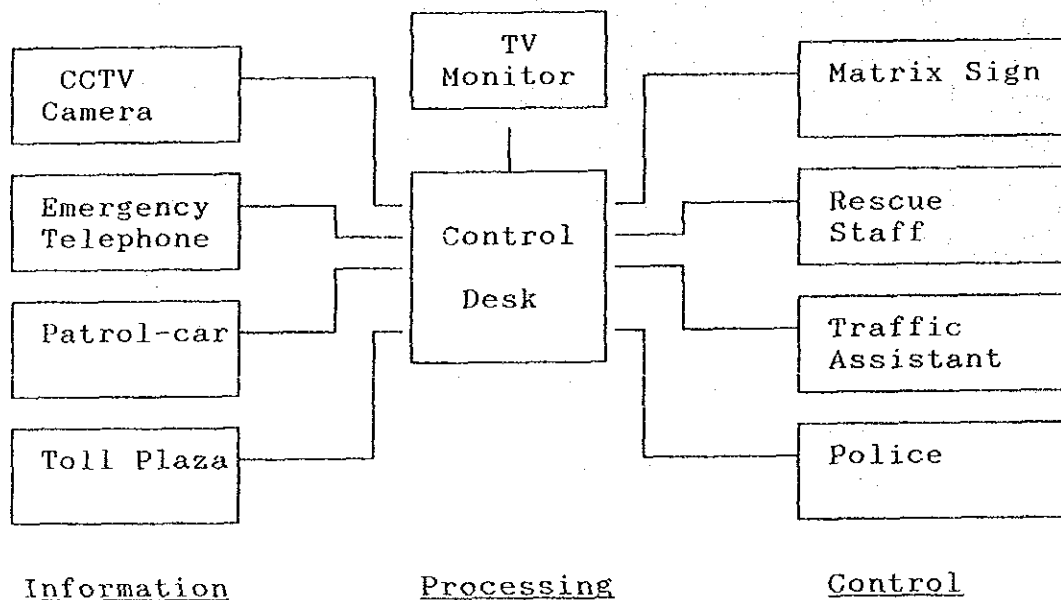


Figure 3.25 SCHEMATIC DIAGRAM OF THE TRAFFIC CONTROL SYSTEM

The revenue and expenses of ETA in the years 1982 — 1988 are shown in Table 3.22. The toll revenue in 1988 is 858.47 million Baht against 76.6 million vehicles which used the expressways. This indicates that average toll rate per vehicle is 11.2 Baht.

On the other hand, the expenses in 1988 is 1,633.53 million Baht. Out of the total, 703.6 million Baht, which is 43% is expenses for general administration.

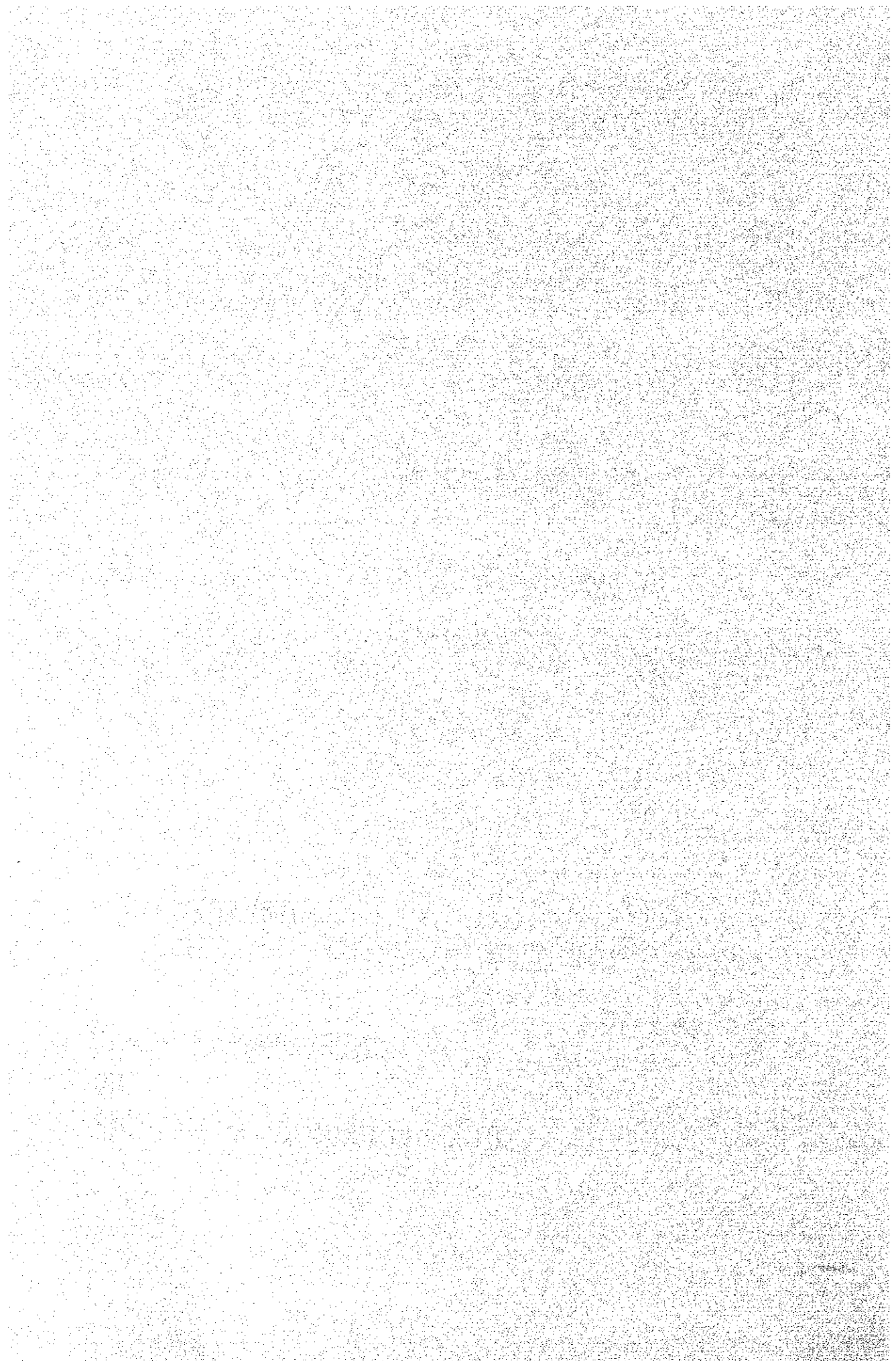
Table 3.22 TREND OF EXPRESSWAY OPERATIONS IN BANGKOK

Year	Operating Length (Km)	Traffic Volume (Million Vehicles)	Manpowers (persons)	Toll	Others	Total	General Admi.	Project Mana.	Total
1982	8.9	9.3	456	102.85	24.22	127.07	115.59	706.74	822.33
1983	16.3	26.8	702	294.56	43.19	337.75	200.07	374.43	574.50
1984	16.8	40.1	784	449.60	71.02	520.62	251.48	224.47	475.95
1985	16.8	45.3	852	506.96	68.46	575.42	329.89	916.61	1,246.50
1986	16.3	49.2	861	548.48	69.60	618.08	371.36	1,342.70	1,714.06
1987	16.8	55.5	866	617.92	89.25	707.17	424.39	1,536.25	1,961.14
1988	27.1	76.6	1,081	858.47	101.35	959.82	703.60	929.93	1,633.53

Source: Statistical Report 1988, ETA.

CHAPTER FOUR

**DEVELOPMENT PLANS
AND
SOCIO-ECONOMIC FRAMEWORK**



CHAPTER 4

DEVELOPMENT PLAN AND SOCIO-ECONOMIC FRAMEWORK

4.1 THE NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN

4.1.1 Objectives and Target of the Sixth Plan

The Sixth National Economic and Social Development Plan (1987—1991) is the currently authorized National Economic and Social Development Plan presented by NESDB. The Seventh National Economic and Social Development Plan (1992—1996) is being established.

The principal objectives of the Sixth Plan are to raise national development to a level that enables the country to progress and prosper in the future and to solve the economic and social problems that have accumulated over the past. The Sixth Plan defines its two major objectives as follows:

- The annual average growth rate of GDP is to be maintained at a level not below 5 per cent.
- The national identity, culture, and system of values will be maintained and the quality of life of the Thai people will be raised in both rural and urban areas.

4.1.2 Development Guidelines in the Sixth Plan

In order to attain the principal economic and social objectives and targets described above, the following guidelines are defined to be used as the basis for formulating appropriate work and operational plans.

- To increase the efficiency of national development in regard to human resources, science and technology, natural resources and the formation of integrated systems of administration and management.

- To improve the production and marketing systems and raise the quality of the basic economic factors to reduce the cost of goods, diversify into more types of goods together with market expansion.
- To improve the distribution of income and prosperity into provincial regions and rural areas by focusing on the low income population in these areas as the main target group for receiving the benefits of national development efforts.

4.1.3 Main Programs

Based on the foregoing objectives and guidelines for development, the Sixth Plan specifies 10 programs divided into 3 major categories as follows:

- Improving the efficiency of development:
 - 1) Overall Economic Development;
 - 2) Population, Social and Cultural Development;
 - 3) Development of National Resources and the Environment;
 - 4) Development of Science and Technology;
 - 5) Improving the Administration and Reviewing the Role of the Government in National Development;
 - 6) Development of State Enterprises.
- Restructuring production and improving the quality of infrastructure services:
 - 7) Development of the Production System, Marketing and Employment,
 - 8) Development of Infrastructure Services.
- Distributing prosperity and creating justice:
 - 9) Development of Urban and Specific Areas,
 - 10) Rural Development.

4.1.4 Regional Development Plan

Bangkok and the vicinity provinces will grow more orderly

because economic growth will be limited to Bangkok and its environs and this will create congestion and great economic loss for the country. Therefore, the Sixth Plan sets a strategy to decentralize socio-economic activities concentrated in Bangkok to designated regional urban growth centers in different parts of the country. These centers are classified as follows:

- Regional urban growth centers:
Chiang Mai, Khon Kaen, Nakhon Ratchasima, Songkhla-Hat Yai and Chon Buri.
- Second-generation urban growth centers:
Phitsanulok, Nakhon Sawan, Udon Thani, Ratchaburi, Surat Thani and Phuket.
- Other regional urban growth centers:
Lampang, Chiang Rai, Ubon Ratchathani, Roi Et, Surin, Sakon Nakhon, Rayong, Chachoengsao, Saraburi, Kanchanaburi, Phetchaburi, Pattani and Nakhon Si Thammarat.

They are shown in Figure 4.1.

In the Sixth Plan, the Eastern Seaboard and other new economic areas are developed as big-scale industrial areas, and the Southern Region is designated as an area for potential future development.

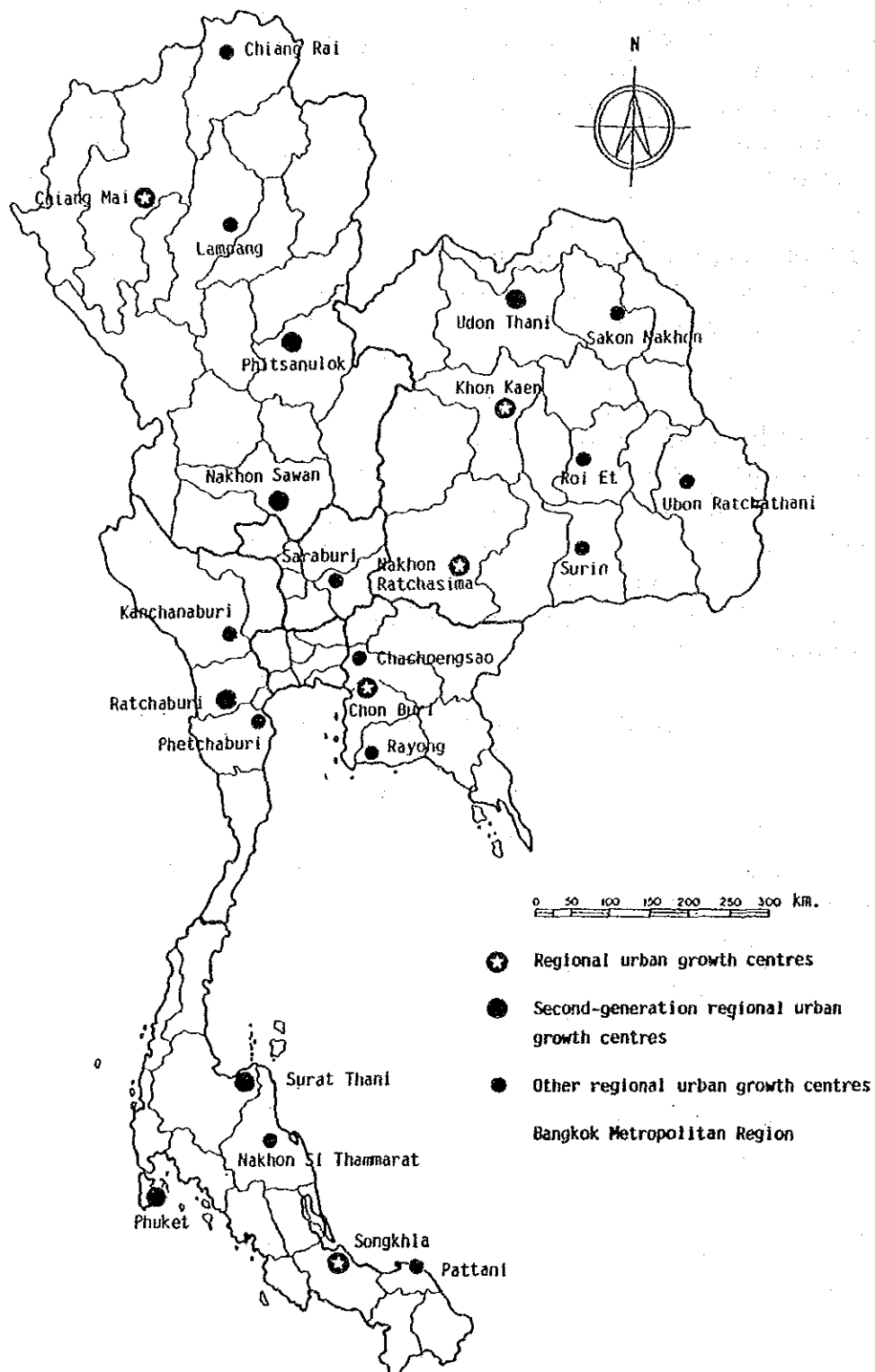


Figure 4.1 REGIONAL URBAN GROWTH CENTERS

4.2 EASTERN AND SOUTHERN SEABOARD DEVELOPMENT PROGRAMS

4.2.1 Eastern Seaboard Development Program

The Eastern Seaboard Development Program which the high priority is given over the Fifth and Sixth Plans is based on new infrastructure and industrial activities that will boost Thai economy, external trade and regional balanced growth in the country. This program is now in the advanced stage of implementation and the major objectives are as follows:

- To accelerate the already robust industrial growth rate of the country.
- To offer an alternative for industrial expansion out of the Bangkok area, and to promote regional growth.
- To develop infrastructure to enhance international competitiveness of the Thai economy, to promote new industries and to attract foreign investment.
- To provide jobs and facilities that will encourage urban development away from Bangkok.

The Eastern Seaboard area consists of three Changwats: Chon Buri, Chachoengsao and Rayong, with a total area of about 13,215 square kilometers and a total population of about 2 million people as shown in Figure 4.2.

Initially, the following two main locations are going to be promoted for industrial activities:

1) Laem Chabang Area

The Laem Chabang complex is located 125 km southeast of Bangkok and 10 km north of the international resort of Pattaya. It is planned to have a commercial deep-sea port, an industrial estate and an export processing zone backed up by a complete urban center and essential infrastructure. The planned industries are mainly small-scale labour-intensive and non-polluting.

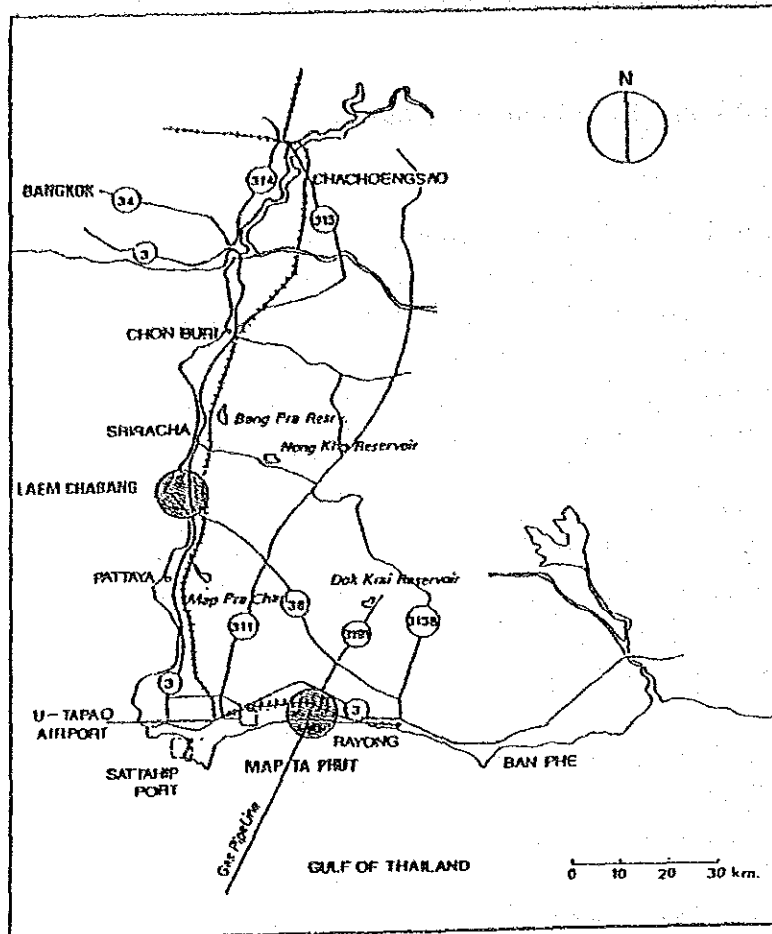


Figure 4.2 EASTERN SEABOARD DEVELOPMENT PROGRAM

General plan is presented in Figure 4.3. Construction of the deep-sea port has already started. It will be primary gateway for containerized and break-bulk cargo to and from Thailand and will be able to handle 4 million tones per year by 1995. It can handle up to 3,000 TEU container vessels and 120,000 DWT agri-carriers.

Improvements of road network will be made by the construction of 60 km 4-lane toll road bypassing Chon Buri and connecting with Highway No. 36 east of Pattaya. Also, construction of rail spur from the new Chachoengsao-Sattahip line to the port and industrial estate areas is expected to be completed by 1991.

As shown in Figure 4.3, the General Industrial Estate and Export Processing Zone are being developed by the Industrial Authority of Thailand. It offers 400 ha. of industrial land on lease.

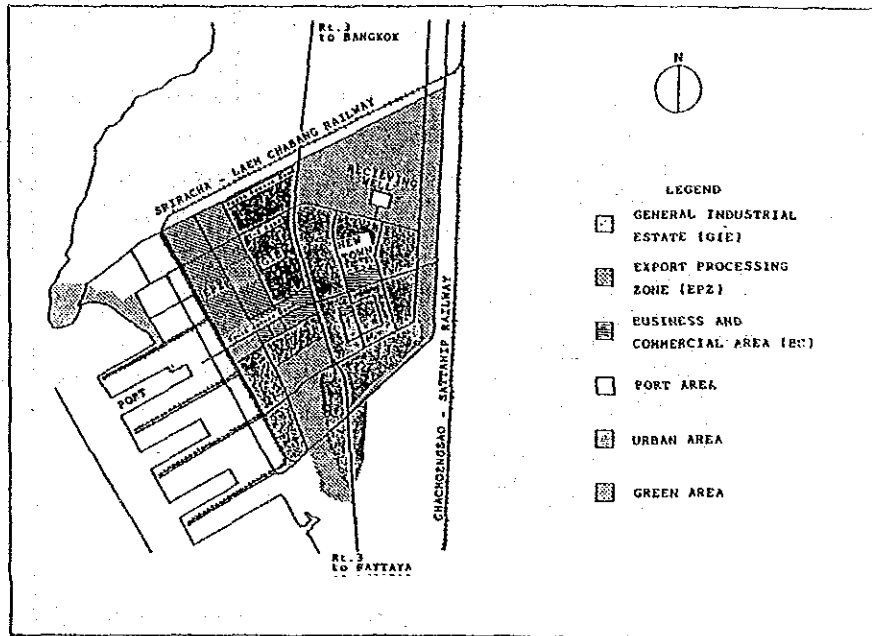


Figure 4.3 LAEM CHABANG INDUSTRIAL COMPLEX

2) Map Ta Phut Area

Map Ta Phut Complex is located to the west of Rayong and 180 km southeast of Bangkok. The complex is becoming a large gas-related and heavy industry. Thai Government has planned for an industrial deep-sea port to be built adjacent to an industrial estate of 870 ha., presently under construction together with full supporting infrastructures and utilities.

General plan is presented in Figure 4.4. The Natural Gas Separation Plant has been operating successfully since January 1985. It produces methane, ethane, LPG and propane.

The Industrial Port is designated for 60,000 DWT vessels, but the first stage development will consist of one multipurpose berth for ships up to 20,000 DWT and two 8,000 DWT liquid berths for ships bringing in industrial raw materials and carrying away the finished products from the heavy industries.

A Planned urban area to provide housing and other facilities for the new residents is now under construction.

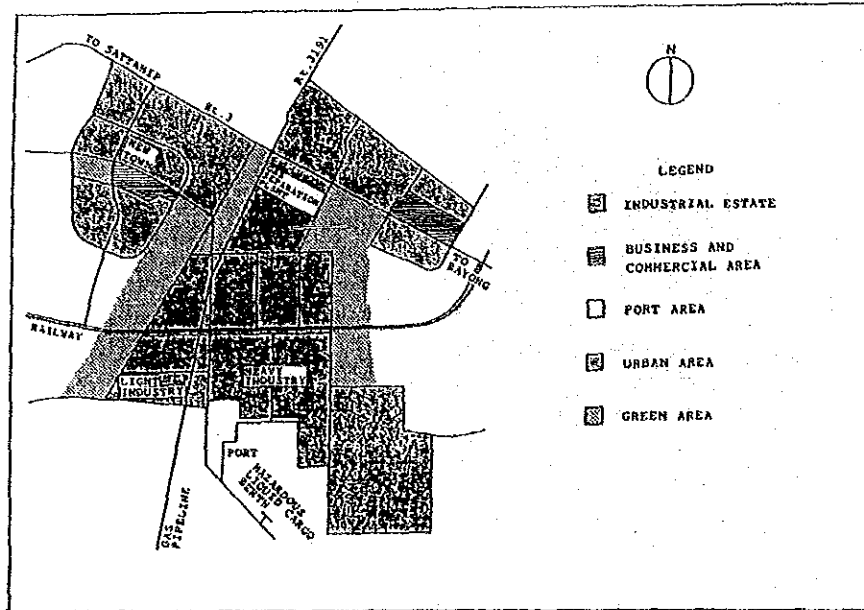


Figure 4.4 MAP TA PHUT INDUSTRIAL COMPLEX

The Map Ta Phut Complex area is already served by a highway. Substantial improvement, however, will be needed to handle increased traffic in the Pattaya-Sattahip road. A rail spur of 24 km to connect the complex with the new Chachoengsao-Sattahip line is scheduled for completion in 1992.

4.2.2 Southern Seaboard Development Program

The Southern Seaboard is intended to become a regional development core under the Sixth Plan. The development of the Southern Seaboard is one step to alleviate the urban concentration around Bangkok by strengthening the productive capacities and investing in infrastructure of the area.

In order to implement the program, the Royal Thai Government (RTG) established Southern Seaboard Development Committee, under Chairmanship of the Prime Minister, to direct and

supervise the policy planning, program design and project implementation.

A Master Plan for the Southern Seaboard Development Program is being prepared by The Office of the Southern Seaboard Development Committee (OSSD) which was created as an executive body to perform the program.

A landbridge of approximately 180 km long connecting Krabi on the west coast and Khanom on the east coast will act as the catalyst for the establishment of new economic zones at the end terminals of the landbridge as shown in Figure 4.5.

The basic components of the program are:

- Krabi Terminal: Offshore loading-unloading crude terminal/
deep-sea port/ industrial estate/ new town
- Khanom Terminal: Offshore loading-unloading crude terminal/
deep-sea port/ industrial estate/ new town
- Landbridge: High speed road/ rail/ liquid (crude/
natural gas/petrochemical/water) pipeline

4.3 ESTABLISHMENT OF SOCIO-ECONOMIC FRAMEWORK

This section presents the future framework by Changwat for the whole kingdom in order to forecast the future traffic volumes. As described in Chapter 2, motorway development affects the promotion of regional development and the socio-economic activities, which will lead to increasing the traffic demand. It is very difficult to establish a socio-economic framework taking all changes in socio-economic conditions into considerations. Thus conventional and statistical projections for the future framework are made. Traffic volumes considering the changes in socio-economic activities due to motorway development are estimated in Chapter 6.

Population and GPP are selected here as the major items of the framework, because they are closely related to traffic generation and attraction.

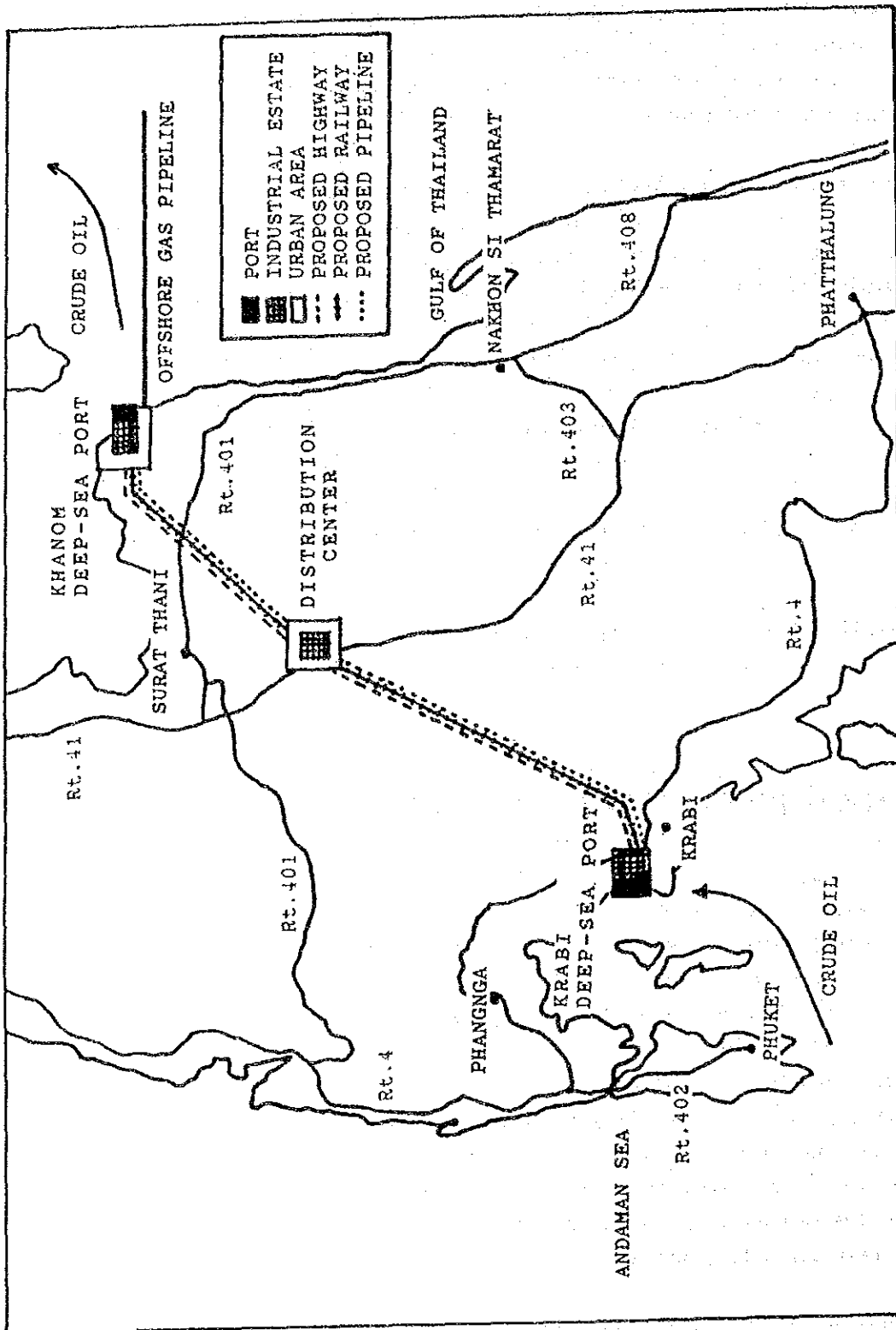


Figure 4.5 SOUTHERN SEABOARD DEVELOPMENT PROGRAM

4.3.1 Population

Various estimations have been made on future population size. "The population projections for Thailand 1980-2015" prepared by a working group on population projections, NESDB, is useful as basic data for development planning because rates in this report are analyzed and projected based on the age structure, birth and death ratio and migration.

Figure 4.6 shows the population growth rates of high, medium and low fertility assumptions projected by NESDB. In this figure, the medium fertility assumption is recommended by NESDB for policy and plan formation for the same reasons as mentioned above.

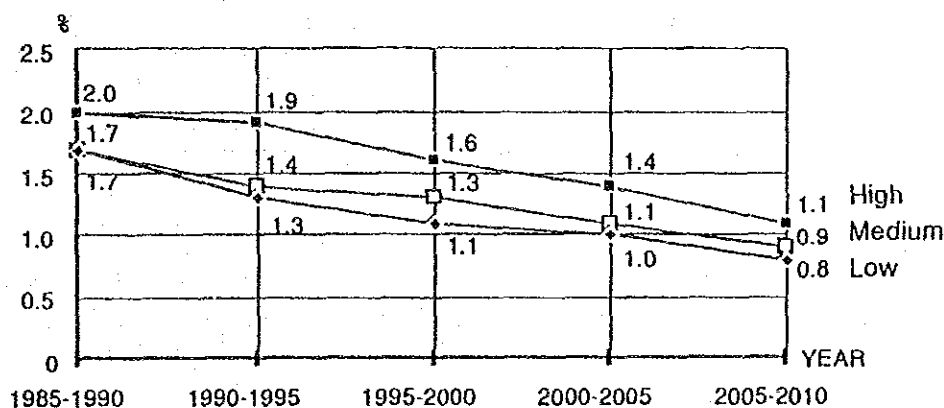


Figure 4.6 ESTIMATED POPULATION GROWTH RATES BY NESDB

A review of the past population trend in Thailand reveals that population increased from 3.6% during the period of 1970-1975 to 2.0% during that of 1985-1988 as shown in Table 4.1.

Table 4.1 POPULATION GROWTH (1970-1988) (%)

	1970-1975	1975-1980	1980-1985	1985-1988
Annual Growth Rates	3.6	2.1	2.0	2.0

Source: Registration Division, Department of Local Administration, Ministry of Interior.

In Table 4.1, the growth rate during the period of 1985–1990 estimated by NESDB doesn't adapt to the existing condition.

In this study, the growth rate during the same period is assumed at 2.0% based on the past trend. After the year 2000, the population growth rate will be reduced to the same level of medium assumption projected by NESDB because of promotion and acceleration of family planning. The growth rates during 1990–1995 and 1995–2000 are estimated by means of interpolation of the existing growth rate and that after the year 2000. The estimated population growth rates are shown in Table 4.2.

Table 4.2 ESTIMATED POPULATION GROWTH RATE (%)

	1985- 1990	1990- 1995	1995- 2000	2000- 2005	2005- 2010
Annual Growth Rates	2.0	1.8	1.4	1.1	0.9

On the basis of above growth rates, the total population of the whole Kingdom is forecasted as shown in Figure 4.7.

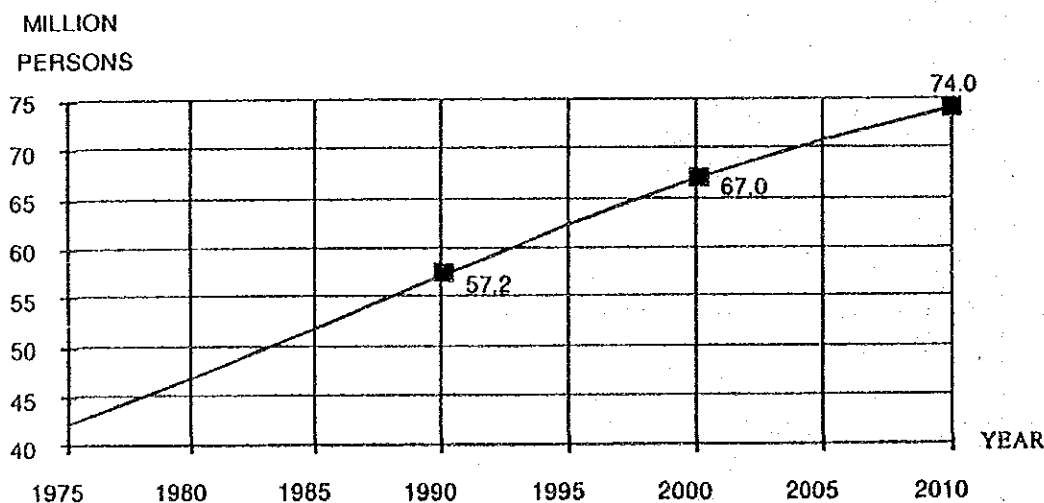


Figure 4.7 FUTURE POPULATION

The regional population is estimated by using assumed growth rates of population based on the past trend and NESDB's projection. Table 4.3 shows the population growth rates by Region.

Table 4.3 ESTIMATED POPULATION GROWTH RATE BY REGION (%)

REGION	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
NORTHEASTERN	1.8	1.5	1.4	1.1	0.9
NORTHERN	1.4	1.2	0.9	0.7	0.6
SOUTHERN	2.2	2.0	1.6	1.3	1.1
EASTERN	1.9	1.7	1.6	1.3	1.1
WESTERN	1.4	1.2	1.1	0.9	0.7
SUB CENTRAL	0.9	0.8	0.7	0.6	0.5
BMA	2.3	2.0	1.8	1.4	0.9

The regional population is modified by means of the total population as the control total. The results of estimation are shown in Figure 4.8.

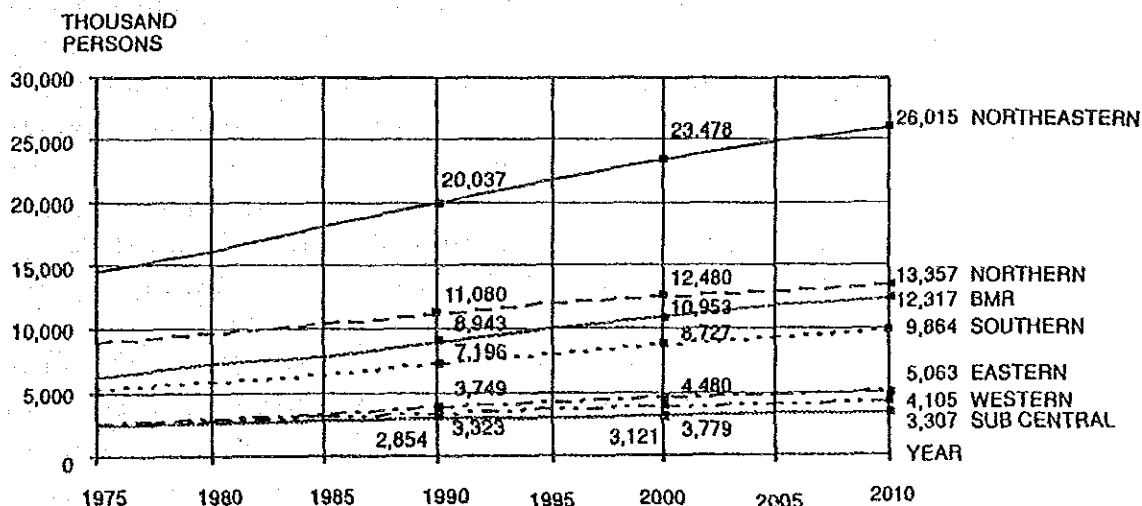


Figure 4.8 FUTURE POPULATION PER REGION

The population by Changwat is calculated based on the trend during the period of 1975-1988. The predicted Changwat population is modified in the same way by means of the population in the region as the control total. The results of estimated population by Changwat are shown in Appendix 4.1.

4.3.2 Economic Indicators

The annual GDP growth rate expected by NESDB is 5.0% for the 6th Plan period of 1987-1991. Taking account of high economic

growth due to booming in exports and a high influx of foreign investment, NESDB revised the GDP annual growth rate for the 6th Plan period to 8.4% as presented in Table 4.4.

Table 4.4 TARGET AND REVISED GDP GROWTH RATE (%)

Target	Revised			
	1989	1990	1991	1987-1991
1987-1991				
5.0	8.5	7.0	7.0	8.4

Although the 6th Plan period will keep the recent high economic growth, there are many problems to affect the economic growth in future as follows:

- The country's structure of production, in both the agricultural and industrial sectors, is not flexible enough to allow for product diversification and quality adjustments to accommodate changes in the increasingly competitive overseas markets.
- Current structure of industrial productions is still largely dependent in imports of capital goods and raw materials.
- Prices of agricultural and primary commodities will remain on the decline due to the changes in technology and consumption structures and the preferences of consumers.
- The country's economic stability and financial situation is now a serious concern at the international level.
- Thailand will be affected by the fluctuations in the world economy such as the restructuring of international economy as a consequence of recession in the developed countries and protectionism of trade.
- Deterioration of natural and environmental resources together with ecological problems will become more serious.

The 7th Plan is being established and will be a continuation of the 6th Plan to maintain high economic growth and to improve the country's monetary and fiscal stability. Based on the foregoing analysis of the current economic situations, the following assumptions on the process of estimating future GDP,

through the year 2010, are taken in this study.

- A booming in recent year will continue for the present and gradually slow down. The annual growth during the period of next five-year plan 1992-1996 will keep at 6.8% which is the average value between the annual growth rates of the 5th and 6th Plans and is not so high comparing to the past trend.
- During the period of 2002-2006, the annual growth will be at the same level as the target of the 6th Plan of 5.0% which is a target for stable economic growth, and 5.0% growth rate will continue from that time.
- The annual growth during the period 1997-2001 will be interpolated at 5.9% between that of 1992-1996 and 2002-2006.

According to the above target, the GDP in 2010 is estimated as 1,767 billion Baht at 1972 constant prices with an annual growth rate of 6.5% during the period of 1988-2010 as shown in Figure 4.9. The GDP in 2000 is estimated as 1,073 billion Baht by means of interpolation.

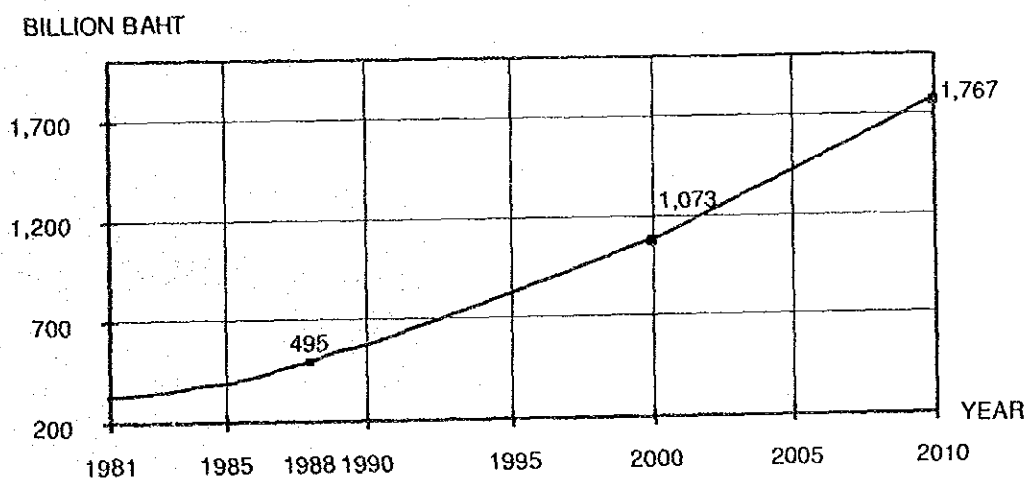


Figure 4.9 FUTURE GDP AT 1972 CONSTANT PRICES

The GRP is estimated by using the results of regression analyses based on the past trend during the period of 1981-1987. Appendix 4.2 shows the formula and parameters applied to this study. The GRP thus is modified by means of GDP as the control total as shown in Figure 4.10. The GPP is estimated, as presented in Appendix 4.3, on the same manner of estimating GRP.

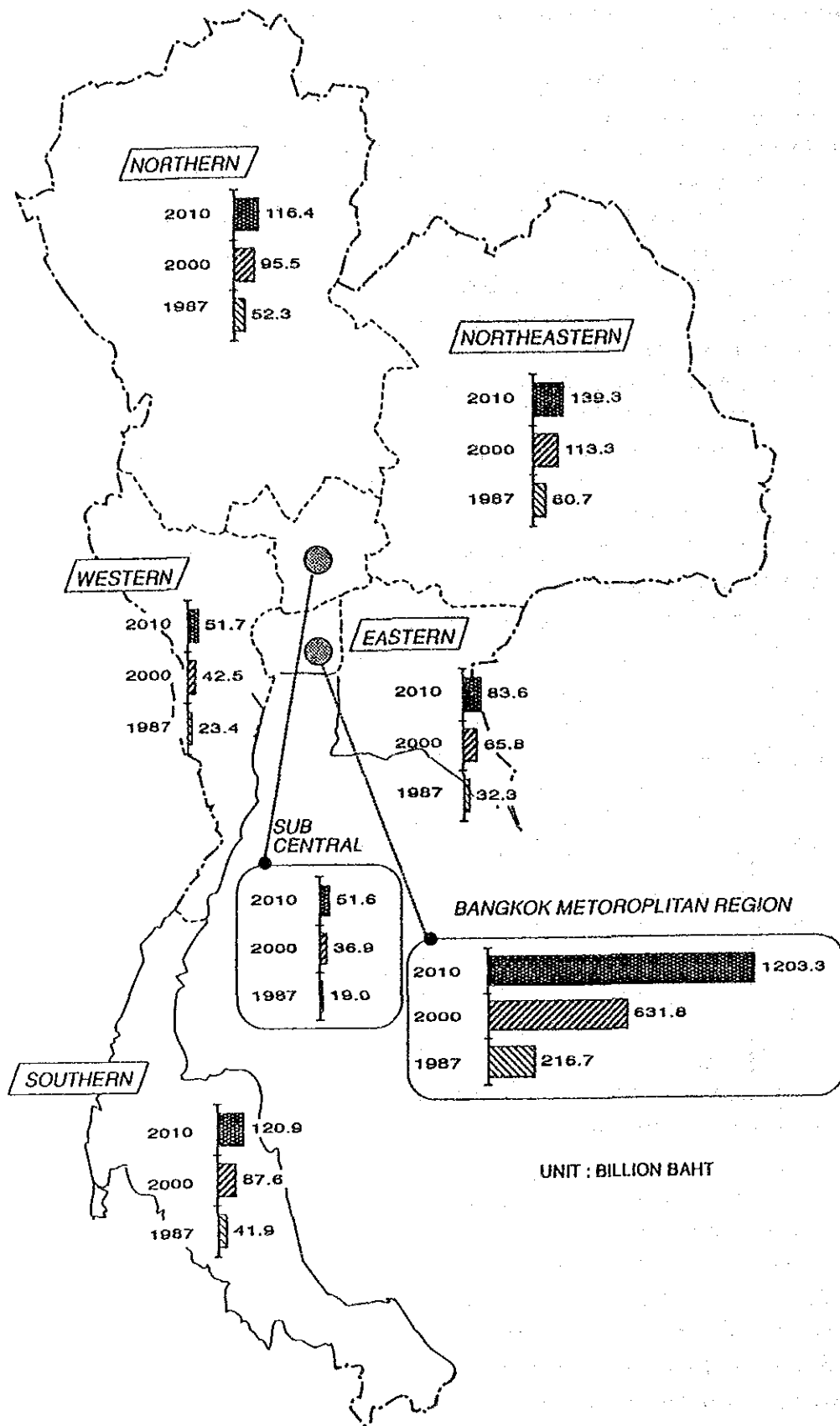


Figure 4.10 FUTURE GRP AT 1972 CONSTANT PRICES

CHAPTER FIVE

**TRANSPORTATION
DEVELOPMENT
PLANS**



CHAPTER 5

TRANSPORTATION DEVELOPMENT PLAN

5.1 FUTURE PLAN OF TRANSPORTATION SECTORS

The Government of Thailand is preparing the Seventh National Economic and Social Development Plan (the Seventh Plan) to establish basic national policies for the next 5 years from 1992 to 1996.

The overall goals of the plan are as follows:

- To maintain stable growth of the economy.
- To distribute income and development into regional areas.
- To develop quality of life and conserve environment and natural resources.

Guidelines for transport development to instruct the development strategies for transportation are to be included in the Seventh Plan as one of the important national policies.

The guidelines under examination are described below for each of the 3 transport modes of land, water and air, as well as the expected contents of these guidelines.

5.1.1 Land Transport

Roles

- 1) Land transport will continue to be the major mode.
- 2) Land transport must support air and water transport to provide efficient inter-modal transport.

Objectives

- 1) To develop efficient, fast, safe and economic freight and passenger transport system in order to maintain high growth of national economy into the future, without negative impact to environment.

- 2) To develop land transport as to support the growth of all sectors of the economy.
- 3) To emphasize land transport as a mean of distributing development to people in rural areas, improving living standards and protecting the environment.
- 4) To attempt to solve the problem of congestion and to reduce environmental damage in towns, especially in seriously affected areas, i.e. Bangkok Metropolitan Region.

Strategies

- 1) Developing land transport in line with growth in the national economy.
 - To develop land transport for special economic areas.
 - To develop land transport links with neighbouring countries.
 - To provide land transport links with other modes.
- 2) Distributing the development of land transport to the regions and to rural areas.
 - To expand the road network in the regions.
 - To increase the efficiency of rail transport.
 - To construct passenger and freight terminals.
 - To promote the efficient use of roads.
- 3) Alleviating the problem of traffic congestion and the deterioration of the environment in towns.
 - To adopt a long term plan (15 years) to solve the problem.
 - To encourage private sector participation in solving the problem.
 - To adopt overhead mass rapid transit system.
 - To adopt transport system management to increase efficiency.
 - To construct urban expressways.
 - To amend rules and regulations.

5.1.2 Water Transport

Roles

- 1) Thailand's location is suitable for the country to develop as a center for water transport, and Government policy is to change the Indochina battlefield into a trade zone.
- 2) Water transport will play a role to stimulate investment and international trade.

Objectives

- 1) To support the growth of international trade.
- 2) To support decentralization.

Strategies

- 1) Providing incentives for international use of Thai ports.
 - To develop and modernize port facilities to reduce costs, and simplify procedures to provide fast and safe services.
 - To expand ports in the Eastern Seaboard area to serve traffic growth.
 - To develop a landbridge between the Andaman Sea and the Gulf of Thailand to provide an alternative route to that of the Malacca strait.
- 2) Expediting integrated transport between ports and airports.
 - To develop the water, road and rail transport networks to expedite integrated transport between ports and airports.
 - To develop the Eastern Seaboard to be the center of an integrated transport system.
 - To simplify customs procedures, set up a quick transit system at seaports and airports. Notify customers that the system is available.
- 3) Increasing investment and the efficiency and quality of water transport.
 - To improve the merchant shipping company including its fleet, docks and personnel.
 - To improve domestic water transport facilities and coast-

- al shipping.
- To develop the transport network, connecting roads, railways and waterways to provide a complete link between production areas, regional freight centers and national freight centers for export.
 - To encourage the private sector to participate in investment and management and apply technology to water transport.
- 4) Improving organization draft/amend laws.
- To improve the planning, management and assessment capability of water transport organizations.
 - To improve draft laws, rules and regulations suited to investment and management.
- 5) Dispersing development to high potential areas.
- To dredge and maintain important water channels to serve business, i.e. industry, fisheries and agriculture.
 - To encourage setting up of export freight centers on the coasts and on main rivers.
- 6) Providing measures to protect from and to reduce water transport pollution and to increase personal safety and the security of property.
- To protect against sea pollution from fuel.
 - To reduce pollution from waste (liquid waste and rubbish).
 - To reduce noise pollution.

5.1.3 Air Transport

Roles

- 1) Air transport has played an important role in supporting the growth of the economy.
- 2) During the Seventh Plan, air transport role will be important in encouraging development.

Objectives

- 1) To develop Thailand as a center for South-East Asian re-

gional air transport.

- Market opportunities in the Asia-Pacific region are favorable compared to other regions.
- Growth of international transport competition especially from the open-door policy at other international airports as well as the economic grouping of European countries.

Strategies

1) Developing Thailand as a center for South-East Asian regional airports.

- To proceed with measures to encourage airlines to land in Thailand and to increase flights.
- To develop the national airline to compete with other airlines in size and quality especially in this region by coordinating with the Tourism Authority of Thailand in order to link domestic tourism with that in neighboring countries.
- To proceed with measures to promote air transport and linkage between air and sea freight transport, such as U - Tapao Airport and the Eastern Seaboard ports.

2) Improving air transport infrastructure.

- To increase the capacities and standards of existing airports and develop new airports, i.e. U - Tapao Airport, to divert traffic from Bangkok.
- To expand and improve the supporting infrastructure, i.e. access roads, railways, seaports and communications network, to provide good connections between airport and regional cities, special economic areas and between tourism spots.
- To reduce the dominant role of Bangkok airport. Carry out a feasibility study to develop a new airport near Bangkok, such as at Nogn Ngfu Hao.

3) Increase planning and management capabilities and investment.

- To prepare a long term (15 years) plan for development and investment by the departments concerned to cover related transport and communications network, and other activities, such as tourism promotion, investment, exports, and aviation innovation. Emphasis should be given to development of a permanent planning.
- To implement a long term plan to develop personnel to serve sector, in particular for planning and technical

staff.

- To encourage enterprises concerned with air transport such as Thai Airports International, Airports Authority of Thailand and Aeronautical Radio of Thailand to be more commercial both in terms of management and investment, especially by increasing the role of the private sector.

5.2 CONCEPT OF THE SEVENTH HIGHWAY DEVELOPMENT PLAN

According to the concept on Road Transport Plan guidelines for the Seventh National Socio-Economic Development Plan, the implementation of motorways (fully access controlled highways) linking inter-city is one of the major objective for the road transport. The guideline requires the completion of inter-city toll motorway network within twenty years.

In the light of the above, the policy for the Seventh Highway Development Plan (1992 — 1996) is made by DOH as follows:

- 1) To develop the Special Highways System or the Inter-city Motorway System (fully access controlled), and upgrade highway standards especially the increase of the traffic lanes for the important road network, i.e. the roads linking Bangkok and other regions, the roads connecting major and minor cities, and the road network access to industrialized area.
- 2) To emphasize on the rehabilitation of the existing roads.
- 3) To construct the bypass road in the major cities which have serious traffic problems.
- 4) To develop and expand the provincial highway network.
- 5) To emphasize on traffic road safety programme.
- 6) To introduce toll motorway system.

Following the policy mentioned above, the draft on the development of inter-city motorway network will be submitted to NESDB for approval as a part of the transportation development plan. The briefing of this draft is introduced here.

The plan is to develop inter-city motorway network with full control of access, the same type as modern transport technology in developed countries, for fast, economic, safe and efficient movement of motor vehicles, with minimal air and noise pollution, thus, enhancing better quality of life.

Furthermore, motorways have more economic return per unit vehicle and longer service life comparing with ordinary highways, because overloaded trucks could be effectively controlled. Construction plan will be long-term 20 year plan to cover the whole country, in order to spread development into regional area. Motorway should be tolled for paying back the investment. Priority routes in the first stage are in the Eastern, Western and Southern regions, because road development in these regions is very low comparing with international standard. A special fund could be set up for financing the project.

5.3 FUTURE PLANS OF THE NATIONAL HIGHWAYS

Lists of the routes for widening and new construction of the national highways, which are committed in the budget for 1991 fiscal year, are shown in Tables 5.1 and 5.2 respectively.

In addition to these plans, DOH is preparing a concept that the four main trunk roads from Bangkok to each of Chiang Mai, Nong Khai, Chantha Buri and Hat Yai will be widened from two-lane to four-lane highways during the next five year highway development plan.

Table 5.1 COMMITTED ROUTES FOR WIDENING -- 1990

Rt. No.	Length (km)	Present		Future	
		Standard	No. of Lanes	Standard	No. of Lanes
1	2.0	PD	6	PD	10
1	19.1	PD	4	PD	10
1	59.1	PD	4	PD	6
1	49.6	P1	2	PD	4
2	94.7	P1	2	PD	4
2	30.4	P2	2	PD	4
3	120.8	P1	2	PD	4
3	10.9	P3	2	PD	4
4	66.9	P1	2	PD	4
4	48.9	P3	2	PD	4
11	34.6	P1	2	PD	4
32	151.7	P1	2	PD	4
33	16.9	P3	2	PD	4
35	53.7	P1	2	PD	4
110	28.5	S3	2	SD	4
224	28.4	S3	2	SD	4
304	54.8	S1	2	SD	4
304	44.9	S3	2	SD	4
314	21.7	S1	2	SD	4
327	6.1	S3	2	SD	4
340	89.6	S1	2	SD	4
411	4.3	S3	2	SD	4
Total	1047.6				

Table 5.2 COMMITTED ROUTES FOR NEW CONSTRUCTION -- 1990

Route No.	Length (km)	Standard	No. of Lanes
4	48.0	PD	4
24	45.0	P1	2
31	16.2	PD	6
36	132.8	PD (P1)	4 (2)
340	132.3	PD	4
343	21.5	SD	6
345	10.6	S1	2
Total	406.4		

DOH has, also, a future plan for the toll highways as shown in Table 5.3. According to this table, 751 km of national trunk roads in nine routes will be operated as toll highways by the year 1994.

Table 5.3 FUTURE DOH PLAN OF TOLL HIGHWAYS

Route No.	Origin - Destination	Length (Km)	No. of Lanes		No. of Inter-changes	Tentative opening year
			Present	Future		
338	Bangkok Noi Nakhon Chaisi	31	4	4	n.a.	1990
31	Din Daeng Don Muang A/P	16	10	6	n.a.	1993
1,32	Bang Pa In Nakhon Sawan	185	2	4	6	1993
2	Sara Buri Nakhon Ratchasima	143	2	4	6	1993
35	Thon Buri Pak Tho	72	2	4	4	1993
340	Talino Chan Suphan Buri	95	4	4	n.a.	1993
36	Chon Buri Pattaya	64	-	4	n.a.	1993
36	Bangkok Chon Buri (new highway)	83	-	4	n.a.	1994
340	Outer Ring Road	62	-	4	n.a.	1994
TOTAL		751				

CHAPTER SIX

**TRAFFIC SURVEY,
ANALYSIS
AND FORECAST**



CHAPTER 6

TRAFFIC SURVEY, ANALYSIS AND FORECAST

6.1 INTRODUCTION

6.1.1 General

To estimate the traffic volumes on the planned motorway network, three traffic surveys on the national highway network are conducted. Collected data are used to analyze the present traffic characteristics and to establish OD tables for inter-Changwat trips per vehicle category. Then, a trip generation model is developed on the basis of the estimated future socio-economic indicators to forecast the future trip generation of each Changwat. The forecasted trips are applied to trip distribution process to establish the future OD tables for the target years of 2000 and 2010.

Traffic volumes are assigned first on the existing and future national highway networks without considering the proposed motorway network, which is the case of "Without Project". Next, volumes of traffic which will be handled in the future on both of the motorway network and the national highway network are determined, which is the case of "With Project".

6.1.2 Definition of Regions And Divisions

In this study, and for all the tasks related to the traffic surveys and analysis, the definition of regions and divisions as presented in Table 6.1, and shown in Figure 6.1, is used.

Figure 6.1 contains the coding system used for Changwats and also for survey stations. Each survey station is located at the boundary between two adjacent Changwats. The two codes of any two Changwats give the code of the survey station between them. The codes of the two Changwats have six digits, and a