

## 2.5 AIR TRANSPORTATION

### 2.5.1 General

Civil Aviation of Thailand is under the control of Ministry of Transport and Communications (MOTC). Three organizations of Airports Authority of Thailand (AAT), Department of Aviation (DOA) and Aeronautical Radio of Thailand Ltd.(AEROTHAI), which are organized under MOTC, are administrating the airports and air traffic control services of Thailand.

AAT is administrating the four major airports of Bangkok, Chiang Mai, Hat Yai and Phuket. AAT is also operating aerodrome/approach control services at Bangkok Airport. Other airports are administrated by DOA. AEROTHAI is responsible for enroute air traffic control services of Thailand and aerodrome/approach control services at the above four major airports.

### 2.5.2 Airports

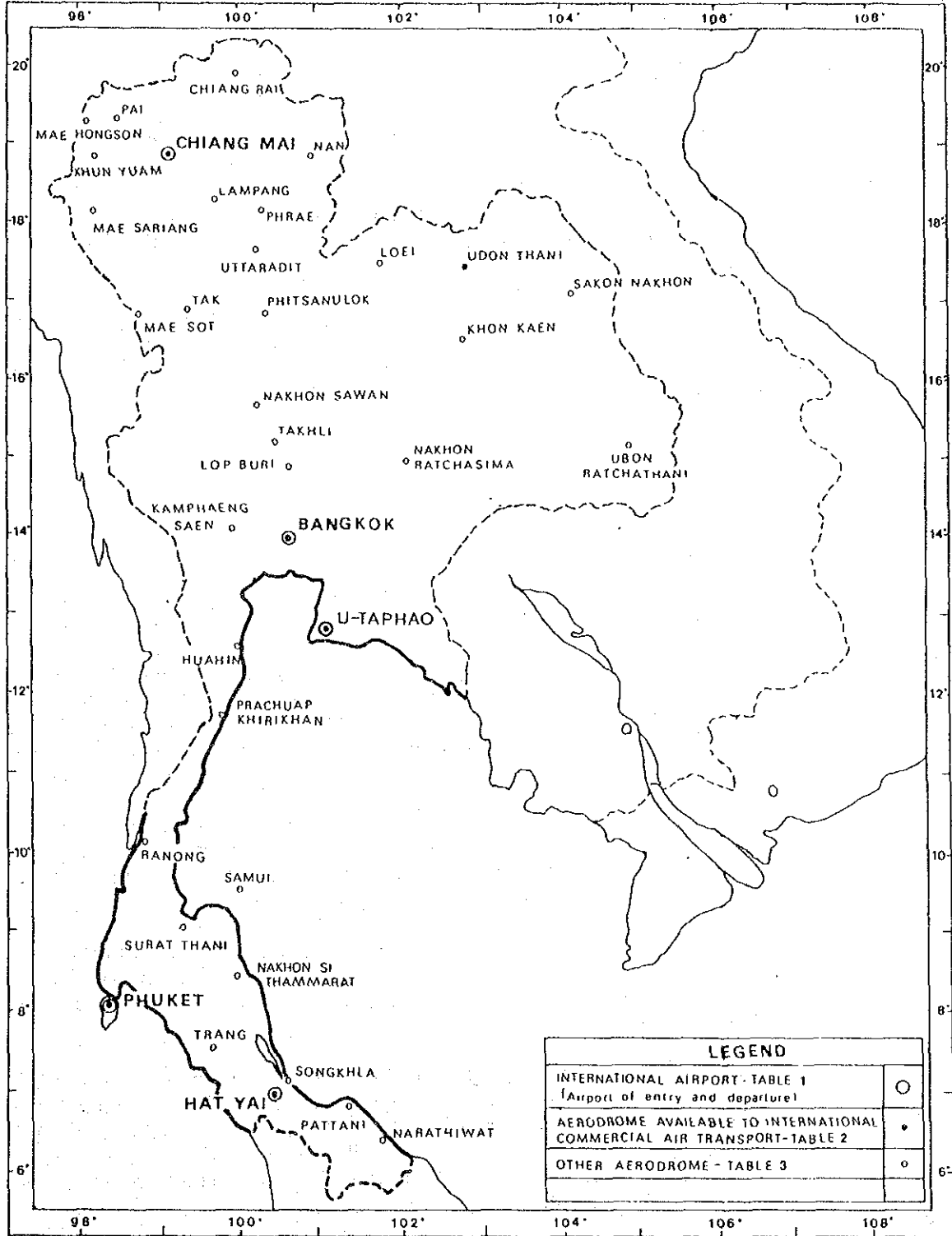
There are 39 airports around the country in Thailand as shown in **Figure 2.5.1**. The airports are categorized into two : i.e. international and domestic. (See **Table 2.5.1**)

There are five international airports consisting of Bangkok, Chiang Mai, Hat Yai, Phuket and U-Tapao and other remaining airports are classified as the domestic airports. Available airport to the international service is Udon Thani Airport. All international airports excluding U-Tapao are managed and operated by AAT, and all domestic airports are managed and operated by DOA. U-Tapao airport is operated by Royal Thai Navy only for non-scheduled international flights. Most of airports serving civil aviation activities is in common use with the Navy and Air Force.

Phuket International Airport serves only the civil aviation activities exclusively.

Four International airports managed by AAT take a big role in the civil aviation activities in comparison with other domestic airports from the point of view of handling volume of passengers and cargo. These airports take a role of the hub airport on the domestic air route network.

There are 17 heliports for exclusive use for the public : 12 heliports are owned by Private companies, 4 by Electricity Generating Authority of Thailand, 1 by Petroleum Authority of Thailand.



Department of Aviation

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Figure 2.5.1 Airports in Thailand

**Table 2.5.1 Airport Classification**

<u>Airports</u>		
International Service	Scheduled	4 Bangkok, Chiang Mai, Hat Yai, Phuket
	Non-scheduled	1 U-Tapao
Available to International Service		1 Udon Thani
Domestic Commercial Service		<u>33</u>
<b>Total</b>		<b>39</b>
<u>Heliports</u>		
Private		12
EGAT		4
PAT		<u>1</u>
<b>Total</b>		<b>17</b>

2.5.3 Air Services

(1) International Air Services

International air services in Thailand are heavily concentrated at Bangkok International Airport. According to the records of AAT in 1991, the total international aircraft movement amounted to 97,721, and 86,488 movements, 88.5 % of total movements were served at Bangkok International Airport.

Bangkok International Airport, as one of the major airports in Southeast Asia, is providing international flights from and to almost every major city around the world. In 1991 the scheduled international flights were provided by 64 airlines around the world.

**Table 2.5.2** presents the top ten airlines in terms of number of international aircraft movement at Bangkok International Airport. Thai Airways International provided 27.3 % of the total international movements in the country.

Apart from Bangkok International Airport, there are three international airports managed by AAT, as mentioned above, and airlines serving those airports are shown in **Table 2.5.3**. The share of Thai Airways International was 11.5 %, 43.4 % and 59.3 % in terms of international aircraft movements at Chiang Mai, Hat Yai and Phuket International Airports respectively in 1991.

**Table 2.5.2 Top Ten Airlines Serving Bangkok International Airport by International Aircraft Movement, 1991**

Airline	Movement	Share (%)
Thai Airways International	23,630	27.3
Cathay Pacific Airways	4,903	5.7
Singapore Airlines	4,403	5.1
China Airlines	4,047	4.7
Hang Khong Vietnam	3,485	4.0
Qantas Airways	3,051	3.5
Korean Air	2,689	3.1
Lufthansa German Airlines	2,233	2.6
Air France	2,217	2.6
Royal Dutch Airlines	1,767	2.0
Sub-total	52,425	60.6
Others	34,063	39.4
Grand total	86,488	100.0

Source: Air Transport Statistics at Bangkok International Airport, year 1991, AAT

**Table 2.5.3 International Aircraft Movements and Airlines in Services at Chiang Mai, Hat Yai and Phuket International Airports, 1991**

Airport	Airline	Movement	Share (%)
Chiang Mai	Thai Airways International	26	11.5
	Bangkok Airways	145	64.2
	Condor	12	5.3
	Others	43	19.0
	Total	226	100.0
Hat Yai	Thai Airways International	1,453	43.4
	Tradewinds	846	25.3
	Malaysia Airlines	877	26.2
	Others	169	5.1
	Total	3,345	100.0
Phuket	Thai Airways International	4,546	59.3
	Tradewinds	746	9.7
	China Airlines	660	8.6
	Dragonair	437	5.7
	Malaysia Airlines	312	4.1
	Others	961	12.6
	Total	7,662	100.0

Source: Air Transport Statistics at Regional International Airport, year 1991 AAT

(2) Domestic Services

Domestic air services are mainly operated by Thai Airways International and Bangkok Airways. In 1991, 6,940,127 passengers were transported on domestic services, of which 5,963,498 passengers (85.9 %) were served at four international airports operated by AAT. The domestic network covers the following cities and islands, as of August 1992.

**Thai Airways International**

Northern Routes		Northeastern Routes	
Bangkok	- Chiang Mai	Bangkok	- Khon Kaen
Bangkok	- Chiang Rai	Bangkok	- Nakhon Ratchasima
Bangkok	- Lampang	Bangkok	- Sakhon Nakhon
Bangkok	- Mae Hong Son	Bangkok	- Ubon Ratchathani
Bangkok	- Nan	Bangkok	- Udon Thani
Bangkok	- Phitsanulok	Nakhon Ratchasima	- Sakon Nakhon
Bangkok	- Phrae	<b>Southern Routes</b> Bangkok - Hat Yai Bangkok - Nakhon Si Thammarat Bangkok - <b>Phuket</b> Bangkok - Surat Thani Bangkok - Trang Hat Yai - Narathiwat Hat Yai - Pattani Hat Yai - <b>Phuket</b> Nakhon Si Thammarat - Surat Thani Nakhon Si Thammarat - <b>Phuket</b> Nakhon Si Thammarat - Trang <b>Phuket</b> - Surat Thani <b>Phuket</b> - Trang Surat Thani - Trang	
Chiang Mai	- Chiang Rai		
Chiang Mai	- Khon Kaen		
Chiang Mai	- Mae Hong Son		
Chiang Mai	- Mae Sot		
Chiang Mai	- Nan		
Chiang Mai	- Phitsanulok		
Chiang Mai	- <b>Phuket</b>		
Chiang Mai	- Tak		
Lampang	- Phitsanulok		
Nan	- Phitsanulok		
Nan	- Phrae		
Mae Sot	- Phitsanulok		
Mae Sot	- Tak		
Loei	- Phitsanulok		
Phitsanulok	- Tak		

**Bangkok Airways**

Bangkok	- Samui	<b>Phuket</b>	- Samui
Bangkok	- Hua Hin		

(3) Air Services at Phuket International Airport

International air services are provided for the following routes as of the summer schedule in 1992 (see Table 2.5.4, Figure 2.5.2)

Phuket	- Bangkok	- Kaohsiung	(TG/China Airlines)
Phuket	- Taipei		(TG/China Airlines)
Phuket	- Hong Kong		(TG/Dragon Air)
Phuket	- Kuala Lumpur		(TG/Malaysia Airlines)
Phuket	- Singapore		(Silk Air)
Phuket	- Penang		(TG)
Phuket	- Langkawi		(Malaysia Airlines)
Phuket	- Tokyo		(TG)
Bangkok	- Phuket	- Perth	(TG)

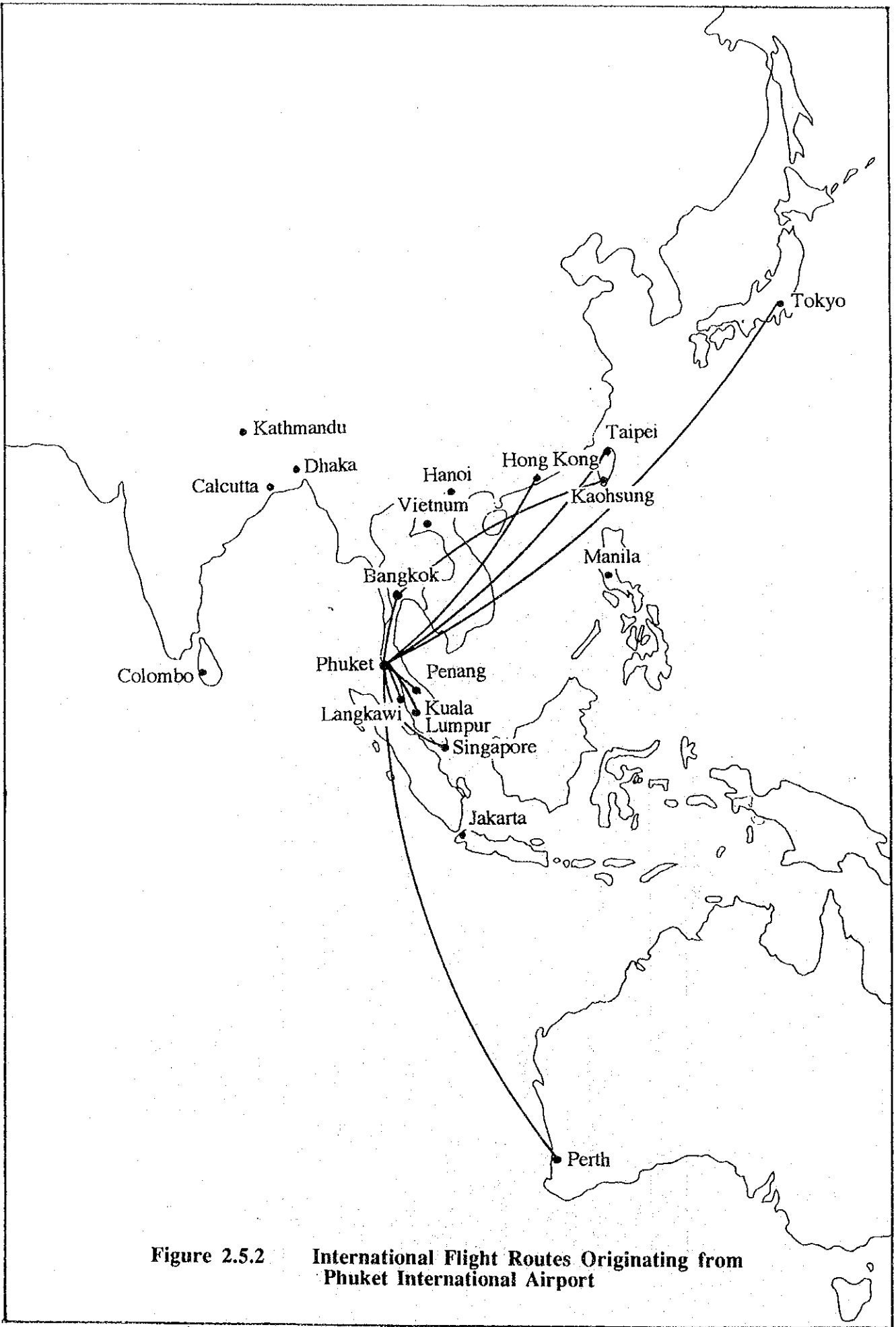
Table 2.5.4 International Air Services at Phuket International Airport

(Summer Schedule in 1992)

Arrival at Phuket International Airport			Departure from Phuket International Airport						
Flight Number	Time	Arrival from	1) Days of Operation			Flight Number	Time	Departure for	Days of Operation
TG609	16:55	Hong Kong	2	3	5	TG652	15:30	Bangkok-Kaohsiung	1 2 5 6
KA781	17:55	Hong Kong	1	4	6	CI644	15:15	Bangkok-Kaohsiung	3 7
TG653	14:30	Kaohsiung-Bangkok	2	3	6	KA780	18:50	Hong Kong	1 4 6 7
CI643	14:00	Kaohsiung	3	3	7	MH/TG787	12:25	Kuala Lumpur	3 7
MH/TG786	11:45	Kuala Lumpur				TG/MH423	11:00	Kuala Lumpur	2 6
TG/MH424	18:25	Kuala Lumpur	2	4	6	TG405	19:05	Singapore	1 2 3 4 5 6 7
TG406	10:10	Singapore	1 2 3	4	5 6 7	MH/TG789	13:10	Langkawi	5 7
MH/TG790	12:20	Langkawi	1	2 3	5	TG/MH411	14:15	Penang	1 2 3 4 5 6 7
TG/MH412	16:55	Penang	1 2 3	4	5 6 7	TG495	11:20	Perth	5
MI852	09:30	Singapore			5	MI851	10:10	Singapore	5
MI856	14:55	Singapore	3	3		MI855	15:35	Singapore	3 5
TG619	13:30	Taipei	2	4	5	TG618	15:45	Taipei	1 3 4 6
CI645	14:00	Taipei	1 2	4	5 6	CI646	15:15	Bangkok-Taipei	1 2 4 5 6
TG647	15:25	Tokyo	1	4	6				

Note 1):

- 1 Monday
- 2 Tuesday
- 3 Wednesday
- 4 Thursday
- 5 Friday
- 6 Saturday
- 7 Sunday



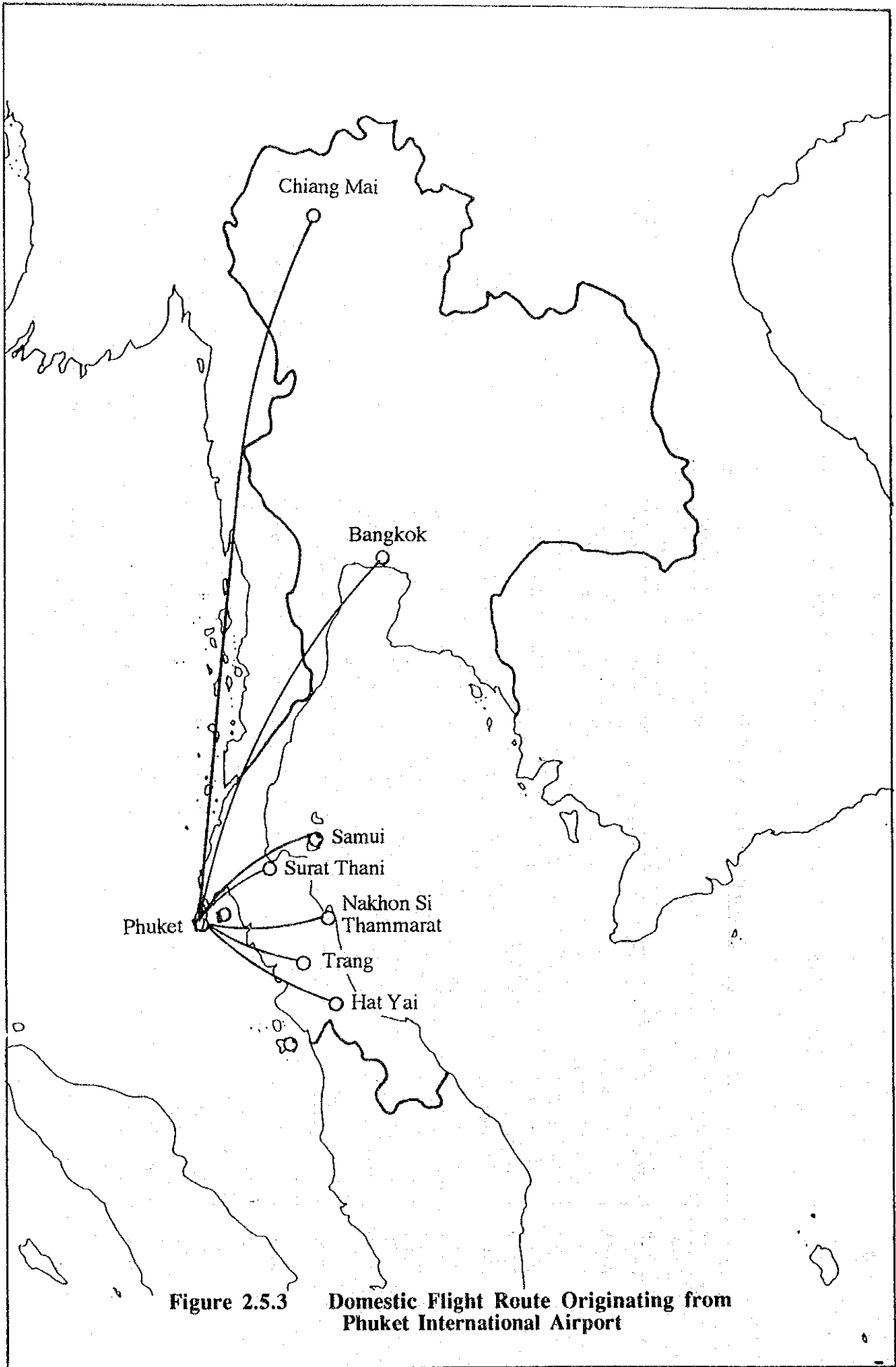
**Figure 2.5.2 International Flight Routes Originating from Phuket International Airport**

**Table 2.5.5 Domestic Air Services at Phuket International Airport**

(Summer Schedule in 1992)

Arrival at Phuket International Airport			Departure from Phuket International Airport				
Flight Number	Time	Arrival from	Days of Operation	Flight Number	Time	Departure for	Days of Operation
TG241	09:00	Bangkok	1 2 3 4 5 6 7	TG294	08:00	Bangkok	1 2 3 4 5 6 7
TG495	10:15	Bangkok	5	TG270	08:40	Bangkok	1 2 3 4 5 6 7
TG245	11:55	Bangkok	1 2 3 4 5 6 7	TG242	09:45	Bangkok	1 2 3 4 5 6 7
TG243	12:45	Bangkok	1 2 3 4 5 6 7	TG406	11:00	Bangkok	1 2 3 4 5 6 7
TG411	13:15	Bangkok	1 2 3 4 5 6 7	TG246	12:35	Bangkok	1 2 3 4 5 6 7
TG259	14:15	Bangkok	1 2 3 4 5	TG244	13:30	Bangkok	1 2 3 4 5 6 7
TG423	14:15	Bangkok	2 3 4 5 6	TG250	14:30	Bangkok	2 3 4 5 6 7
TG249	14:45	Bangkok	1 2 3 4 5 6	TG260	15:30	Bangkok	1 2 3 4 5 6 7
TG295	15:55	Bangkok	1 2 3 4 5 6 7	TG296	16:30	Bangkok	1 2 3 4 5 6 7
TG247	17:15	Bangkok	1 2 3 4 5 6 7	TG412	17:45	Bangkok	1 2 3 4 5 6 7
TG279	17:30	Bangkok	1 2 3 4 5 6 7	TG248	18:00	Bangkok	1 2 3 4 5 6 7
TG405	18:15	Bangkok	1 2 3 4 5 6 7	TG424	19:15	Bangkok	1 2 3 4 5 6 7
TG291	19:10	Bangkok	1 2 3 4 5 6 7	TG292	20:00	Bangkok	1 2 3 4 5 6 7
TG293	20:30	Bangkok	1 2 3 4 5 6 7	TG240	21:00	Bangkok	1 2 3 4 5 6 7
TG151	13:40	Chiang Mai	1 2 3 4 5 6 7	TG152	14:20	Chiang Mai	1 2 3 4 5 6 7
TG270	19:15	Hat Yai	1 2 3 4 5 6 7	TG273	13:20	Hat Yai	1 2 3 4 5 6 7
TG272	19:15	Hat Yai	1 2 3 4 5 6 7	TG279	18:05	Hat Yai	1 2 3 4 5 6 7
TG274	19:15	Hat Yai	1 2 3 4 5 6 7	TG280	10:15	Nakhon Si Tham.	1 2 3 4 5 6 7
TG281	12:55	Nakhon Si Tham.	1 2 3 4 5 6 7	PG212	10:00	Samui	1 2 3 4 5 6 7
PG211	09:40	Samui	1 2 3 4 5 6 7	PG214	15:10	Samui	1 2 3 4 5 6 7
PG213	14:50	Samui	1 2 3 4 5 6 7	TG280	08:35	Surat Thani	1 2 3 4 5 6 7
TG281	12:55	Surat Thani	1 2 3 4 5 6 7	TG282	11:15	Surat Thani	1 2 3 4 5 6 7
TG283	12:55	Surat Thani	1 2 3 4 5 6 7	TG297	09:00	Trang	1 2 3 4 5 6 7
TG298	10:45	Trang	1 2 3 4 5 6 7				





**Figure 2.5.3 Domestic Flight Route Originating from Phuket International Airport**

Phuket International Airport is providing domestic air services for seven routes as mentioned above and the detailed schedule is shown in **Table 2.5.5** and **Figure 2.5.3**.

#### 2.6.4 Airlines

There are two main airlines in Thailand, which are Thai Airways International (TG), the national airline, and Bangkok Airways (PG).

Thai Airways International is the national flag carrier which solely deals with international services except Bangkok-Phnom Penh route in Thailand. Thai Airways International also operates most of the domestic trunk routes. **Table 2.5.6** shows its fleet as of 1992. Replacement plan of B-747-200 and DC-10 with B-747-400, MD-11, and B-777 is programmed as a means of aggressive strategy.

**Table 2.5.6 Fleet for Thai Airways International as of September, 1992**

Aircraft Type	Number of Aircraft	Aircraft Type	Number of Aircraft
<b>Owned</b>			
B747-400	4	B747-400	6
B747-300	2	B737-200	3
B747-200	6	BAe 146-300	5
MD-11	4	ATR-72	2
DC-10-30ER	3	ATR-42	2
A300-600	14		
A300-B4	8		
A310-200	2		
		Sub-total	61
<b>Leased</b>			
A300-B4	4	CL601-3A ER	1
A310-300	1		
		Sub-total	6
		<b>Total Fleet</b>	<b>67</b>

Source: Thai Airways International

Bangkok Airways is a private company, which provided air services for chartered flights in Thailand. At present four routes are served by Bangkok Airways; Bangkok - Koh Samui, Bangkok - Hua Hin, Phuket - Koh Samui and Bangkok - Phnom Penh.

Bangkok Airways began to operate daily scheduled international flights between Bangkok and Phnom Penh in September 1991 and provides 17 flights at present. On Koh Samui a private airport was opened by Bangkok Airways in 1989 and it is served by daily flights from Bangkok and Phuket. There is also a flight between Bangkok and Hua Hin by Bangkok Airways.

## 2.6.5 Air Traffic

### (1) General

The share of Bangkok International Airport in aircraft movements, number of passengers, volume of freight and volume of mail were 77.0 %, 75.4 %, 95.9 % and 60.6 % respectively and the share of Phuket were 11.0 %, 9.8 %, 0.9 % and 8.7 % respectively in 1991 as shown in **Table 2.5.7**. Air traffic of Phuket was the second largest in terms of aircraft movement, number of passengers and volume of mail, however its volume of freight was smallest among the four international airports. Details of air traffic at Phuket International Airport are described in a later section.

**Table 2.5.7 Air Traffic in Thailand, 1991**

Airport	Aircraft movement		Number of passengers		Volume of freight		Volume of mail	
	(movement)	(%)	(persons)	(%)	(tonnes)	(%)	(tonnes)	(%)
Bangkok	118,562	77.0	13,620,126	75.4	401,670	95.9	1,417	60.6
Chiang Mai	11,328	7.4	1,189,774	6.6	6,223	1.5	192	8.2
Hat Yai	7,128	4.6	513,236	2.8	4,370	1.0	402	17.2
Phuket	16,982	11.0	1,765,998	9.8	3,763	0.9	203	8.7
Domestic airports	n.a.		976,629	5.4	2,914	0.7	125	5.3
<b>Total</b>	<b>154,000</b>	<b>100.0</b>	<b>18,065,763</b>	<b>100.0</b>	<b>418,940</b>	<b>100.0</b>	<b>2,339</b>	<b>100.0</b>

Source: Air Transport Statistics at Bangkok International Airport, year 1991  
/Air Transport Statistics at Regional International Airports, year 1991  
AAT

Air Transport Statistics at Domestic Airports, DOA

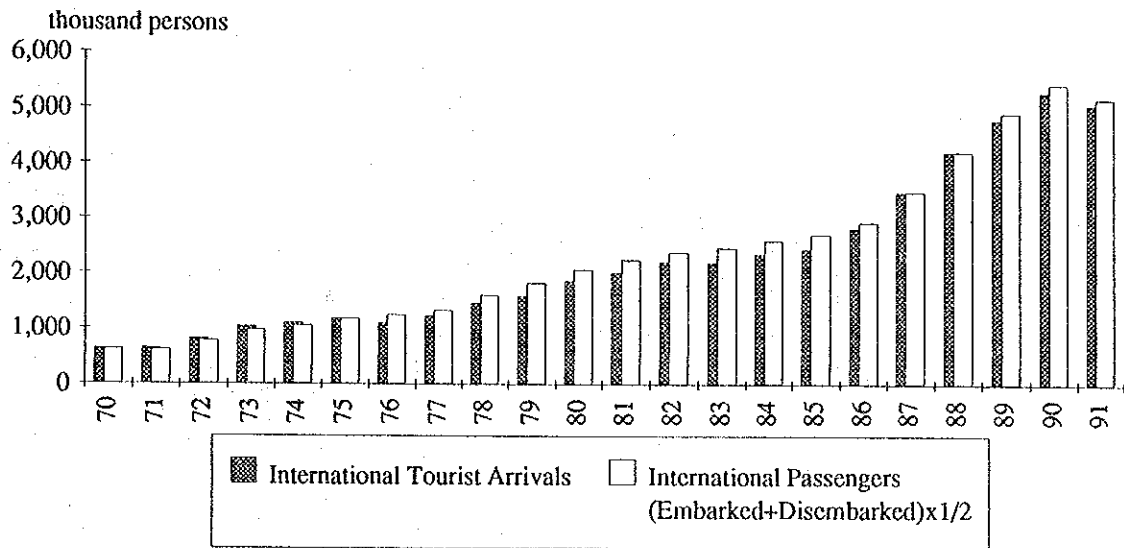
Note: Figure include domestic traffic.

Transit traffic is not included.

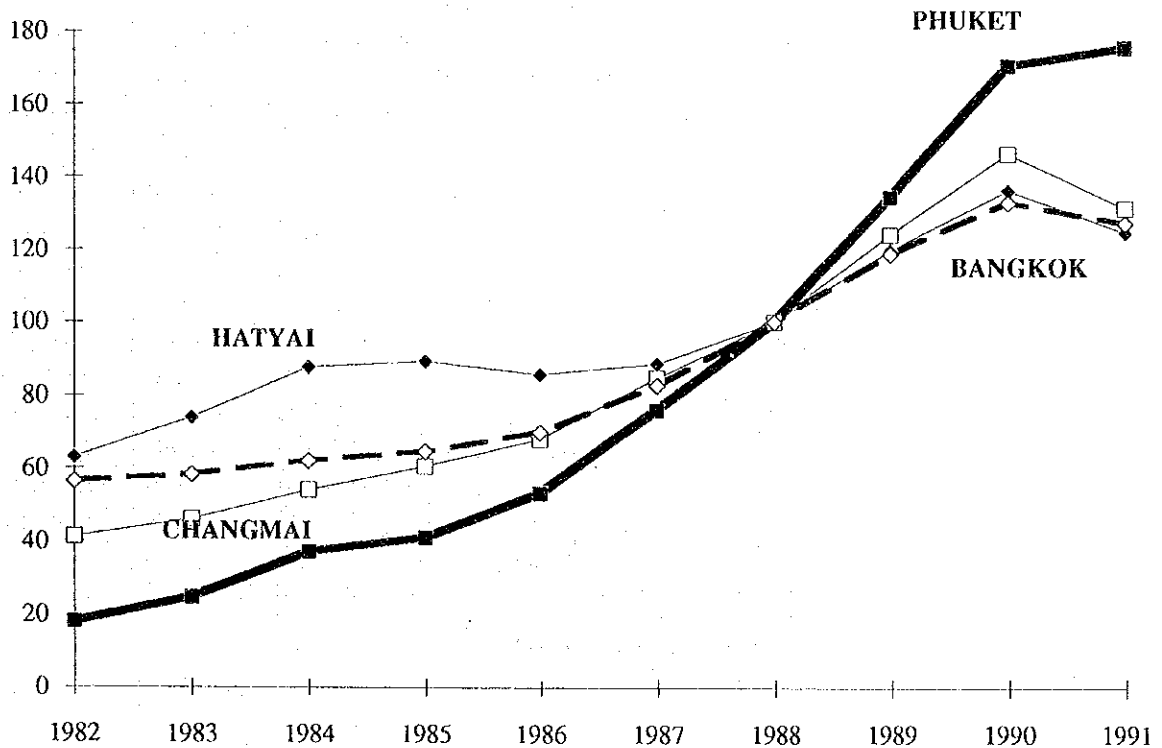
### (2) International Traffic

The changes in number of international air passengers and international tourist arrivals have been much the same in Thailand, because the number of out-going Thai people is small (863,416 persons in 1990) compared with international tourist arrivals to Thailand. **Figure 2.5.4** shows the number of international passengers at Bangkok International Airport and international tourist arrivals to Thailand.

Although the share of Bangkok International Airport in the air traffic of the country is very high as described above, the growth rate of international passengers at Phuket is highest among the four international airports, as shown in **Figure 2.5.5** and **Table 2.5.8**



**Figure 2.5.4 International Tourist Arrivals to Thailand and Number of Passengers at Bangkok International Airport (1970 - 1991)**



**Figure 2.5.5 Change in Number of Passengers at International Airports (1988=100)**

**Table 2.5.8 Number of Passengers at the Four International Airports**

Unit: persons

Year	Bangkok	Phuket	Chiang Mai	Hat Yai	Total
<b>International Passengers</b>					
1982	4,759,295	49,049	47,034	120,113	4,975,491
1983	4,926,090	72,326	35,228	127,454	5,161,098
1984	5,176,605	133,686	41,513	168,110	5,519,914
1985	5,400,375	156,009	79,522	188,302	5,824,208
1986	5,843,328	77,127	1,547	115,472	6,037,474
1987	6,980,852	135,845	18,117	127,971	7,262,785
1988	8,455,594	184,102	9,089	137,530	8,786,315
1989	9,855,372	275,618	1,236	155,192	10,287,418
1990	10,906,432	398,755	731	197,045	11,502,963
1991	10,377,433	555,305	6,140	186,758	11,125,636
<b>Domestic Passengers</b>					
1982	617,966	134,488	329,455	144,573	1,226,482
1983	744,178	154,647	381,366	169,753	1,449,944
1984	970,914	202,523	450,203	186,751	1,810,391
1985	1,135,439	229,089	474,544	175,462	2,014,534
1986	1,328,229	440,937	621,251	234,338	2,624,755
1987	1,685,266	628,640	759,218	234,911	3,308,035
1988	2,099,163	822,960	908,839	255,131	4,086,093
1989	2,813,730	1,089,358	1,123,475	305,254	5,331,817
1990	3,422,905	1,322,210	1,335,683	360,446	6,441,244
1991	3,242,693	1,210,693	1,183,634	326,478	5,963,498
<b>Total Passengers</b>					
1982	5,377,261	183,537	376,489	264,686	6,201,973
1983	5,670,268	226,973	416,594	297,207	6,611,042
1984	6,147,519	336,209	491,716	354,861	7,330,305
1985	6,535,814	385,098	554,066	363,764	7,838,742
1986	7,171,557	518,064	622,798	349,810	8,662,229
1987	8,666,118	764,485	777,335	362,882	10,570,820
1988	10,554,757	1,007,062	917,928	392,661	12,872,408
1989	12,669,102	1,364,976	1,124,711	460,446	15,619,235
1990	14,329,337	1,720,965	1,336,414	557,491	17,944,207
1991	13,620,126	1,765,998	1,189,774	513,236	17,089,134

Source: Air Transport Statistics at Bangkok International Airport, year 1991  
/Air Transport Statistics at Regional International Airports, year 1991  
AAT

Note : Transit passengers are not included.

(2) Domestic Traffic

**Table 2.5.9** shows the changes in domestic air traffic in terms of passengers and freight. The average annual growth rate of passengers and freight were 17.4 % and 22.9 % respectively during the last five years. The increase of domestic freight at international airports was particularly high.

**Table 2.5.9 Domestic Passengers and Freight**

Year	Number of Domestic Passengers			Volume of Domestic Freight (tonnes)		
	Int'l airports	Domestic airports	Total	Int'l airports	Domestic airports	Total
1982	1,226,482	216,941	1,443,423	3,084	977	4,061
1983	1,449,944	278,612	1,728,556	4,429	1,149	5,578
1984	1,810,391	402,413	2,212,804	5,340	1,299	6,639
1985	2,014,534	439,757	2,454,291	6,176	1,363	7,539
1986	2,624,755	484,662	3,109,417	8,617	1,479	10,096
Annual growth (1982-86)	21.0%	22.3%	21.1%	29.3%	10.9%	25.6%
1987	3,308,035	512,385	3,820,420	9,352	1,708	11,060
1988	4,086,093	568,689	4,654,782	16,526	2,007	18,533
1989	5,331,817	721,777	6,053,594	18,112	1,821	19,933
1990	6,441,244	847,252	7,288,496	23,392	1,774	25,166
1991	5,963,498 (85.9%)	976,629 (14.1%)	6,940,127 (100.0%)	25,416 (89.7%)	2,914 (10.3%)	28,330 (100.0%)
Annual growth (1986-91)	17.8%	15.0%	17.4%	24.2%	14.5%	22.9%

Source: Air Transport Statistics at Bangkok International Airport, year 1991  
 /Air Transport Statistics at Regional International Airports, year 1991  
 AAT  
 Air Transport Statistics at Domestic Airports, DOA

## 2.6 OTHER TRANSPORT

### 2.6.1 General

The National highway network of Thailand has a total length of 17,486 km, and is supplemented by a Provincial highway network of 27,959 km (1990). More than 99 % of the National highways and 77 % of the provincial highways are paved.

The highway network in the Southern Region is connected to the Malaysian highway system at Sungai Kolok to the east coast and at Betong and Sadao to the west coast of Malaysia.

The State Railway network has a total length of 3,861 kilometers and 85,303 thousands passengers were carried by rail in 1990. The State Railway serves 41 provinces out of the total 73. The southern railway line from Bangkok is connected with Singapore through Malaysia.

The traffic volume of sea cargo is concentrated at Bangkok Port on the Chao Praya River and at Sattahip Port in the Gulf of Thailand. Foreign trade largely depends on these two ports, where 99 % of the total import and 95 % of total export was handled in 1988. Excluding these two ports, Songkhla handled most of the exports followed by Phuket (1988).

Phuket Port is designed to accommodate 15,000 GRT with total berth length of 360 m. Rubber and tin are the main products handled as outbound cargoes.

The number of foreign tourists arriving in Thailand by means of air accounted for 82 % of the total arrivals, arrival by land accounted for 16 % and only 2 % arrived by sea (see **Table 2.6.1**). The share of air transport increased to 82 % in 1990 from 72 % in 1982, while that of land transport decreased to 16 % from 26% during the same period.

**Table 2.6.1 International Tourist Arrivals to Thailand by Mode of Transport**

	1982	1986	1990
Air	72 %	75 %	82 %
Land	26 %	24 %	16 %
Sea	2 %	1 %	2 %
Total	100 %	100 %	100 %

Source: Thailand Tourism Statistics Report, TAT

Almost 95 % of the tourists from America, Europe, Pacific and Asia except those from ASEAN countries, arrived by air. **Table 2.6.2** shows the number of international tourist arrivals to Thailand by nationality and mode of transport in 1990. For Malaysian tourists, land transport is the most common mode of access to Thailand. Almost 80 % of the total Malaysian tourists arrived by land in 1990.

### 2.6.2 Transport Access to Phuket

International access to Phuket is provided by air transportation at Phuket International Airport and sea transportation at Phuket Port. **Table 2.6.3** shows immigration records from October 1991 to September 1992 at Phuket Island. Total number of international entries and departures was 805,663 persons, of which the mode of air transportation amounted to 99 %. The share of Thai people was only 1 % of total entries and departures by air transportation mode.

**Table 2.6.3 Immigration Record in Phuket Island by Mode of Transport (Oct 1991 - Sep. 1992)**

	Air		Sea		Unit : Persons
					Total
Thai	7,792 (83%)	1%	1,636 (17%)	16%	9,428 (100%)
Foreigner	787,849 (99%)	99%	8,386 (1%)	84%	796,235 (100%)
Total	795,641 (99%)	100%	10,022 (1%)	100%	805,663 (100%)

Source: Immigration Division, Phuket

For the access from Bangkok to Phuket, air and land transportations are the main modes of transport. Direct aviation services are provided at Phuket International Airport with a flight time of 1 hour 15 minutes. National Highway No.4 connects Phuket with Bangkok over a length of 862 km, where air-conditioned buses are operated by both the public and private sectors. The Sarasin Bridge connects the islands with the mainland. The State Railway connects the east coast of the southern peninsula with Bangkok, however, there is no rail access from the east coast to Phuket. The nearest station is Surat Thani and it takes almost five hours from Surat Thani to Phuket by taxi (see **Figure 2.6.1**).

**Table 2.6.4** indicates the comparison of the fare and traveling time of air and bus transport from Bangkok to Phuket.

**Table 2.6.4 Fare and Traveling Time between Bangkok and Phuket**

	From Bangkok to	Distance (km)	Traveling time	Fare ((bahts)	Remarks
Air	Phuket Airport		1 hr 15 min	2,000.00	economy class/ oneway
Bus	Phuket Town (express)	867	12 hrs 42min (express)	204.50	additional service charges added based on its conditions
Tour bus	Phuket Town	867			
Rail	Surat Thani (express)	651	approx. 12 hrs	470.00 244.00 107.00	1st 2nd 3rd

Source: DOH, TAT, AAT etc.



**Table 2.6.2 International Tourist Arrivals to Thailand by Nationality and Mode of Transport, 1990**

unit:persons

Country	Total		Air		Land		Sea	
		%		%		%		%
The Americans	361,894	100.00	365,756	95.77	11,894	3.11	4,254	1.11
Argentina	1,736	100.00	1,666	95.97	63	3.63	7	0.40
Brazil	4,259	100.00	4,091	96.06	139	3.26	29	0.68
Canada	74,550	100.00	70,032	93.94	3,585	4.81	933	1.25
Mexico	3,708	100.00	3,643	98.25	43	1.16	22	0.59
U.S.A.	291,635	100.00	280,492	96.18	7,895	2.71	3,248	1.11
Othes	6,006	100.00	5,832	97.10	159	2.65	15	0.25
Europe	1,322,752	100.00	1,265,962	95.71	47,872	3.62	8,888	0.67
Austria	42,003	100.00	40,837	97.22	989	2.35	177	0.42
Belgium	25,574	100.00	24,788	96.93	591	2.31	195	0.76
Denmark	32,127	100.00	30,117	93.74	1,826	5.68	184	0.57
Finland	28,887	100.00	28,225	97.71	423	1.46	239	0.83
France	194,618	100.00	188,889	97.06	4,015	2.06	1,714	0.88
Germany	239,915	100.00	229,524	95.67	8,682	3.62	1,709	0.71
Italy	107,430	100.00	105,855	98.53	1,390	1.29	185	0.17
Netherlands	65,742	100.00	62,339	94.82	3,026	4.60	377	0.57
Norway	14,905	100.00	13,892	93.20	857	5.75	156	1.05
Spain	34,188	100.00	33,606	98.30	489	1.43	93	0.27
Sweden	67,171	100.00	61,644	91.77	4,644	6.91	883	1.31
Switzerland	76,263	100.00	72,037	94.46	3,821	5.01	405	0.53
United Kingdom	318,220	100.00	300,871	94.55	15,683	4.93	1,666	0.52
East Europe	28,666	100.00	27,649	96.45	408	1.42	609	2.12
Others	47,043	100.00	45,719	97.19	1,028	2.19	296	0.63
Africa	31,943	100.00	31,094	97.34	773	2.42	76	0.24
Middle East	76,924	100.00	75,632	98.32	1,185	1.54	107	0.14
Israel	20,866	100.00	20,858	99.96	2	0.01	6	0.03
Kuwait	4,347	100.00	4,326	99.52	19	0.44	2	0.05
Saudi Arabia	6,489	100.00	6,398	98.60	89	1.37	2	0.03
Others	45,222	100.00	44,050	97.41	1,075	2.38	97	0.21
East Asia & Pacific	3,214,779	100.00	2,930,303	91.16	278,331	8.60	106,145	3.30
ASEAN	1,195,011	100.00	432,513	36.19	732,025	61.26	30,473	2.55
Brunei	4,733	100.00	4,370	92.33	349	7.37	14	0.30
Indonesia	48,117	100.00	42,262	87.83	5,089	10.58	766	1.59
Malaysia	804,629	100.00	138,637	17.23	638,258	79.32	27,734	3.45
Philippines	48,121	100.00	45,395	94.34	1,753	3.64	973	2.02
Singapore	289,411	100.00	201,849	69.74	86,576	29.91	986	0.34
Australia	226,785	100.00	216,023	95.25	9,201	4.06	1,561	0.69
China	64,738	100.00	63,491	98.07	61	0.09	1,186	1.83
Hong Kong	265,585	100.00	264,429	99.56	995	0.37	161	0.06
Japan	635,555	100.00	629,906	99.11	4,809	0.76	840	0.13
Korea	144,747	100.00	142,476	98.43	2,167	1.50	104	0.07
New Zealand	35,790	100.00	32,804	91.66	2,688	7.51	298	0.83
Taiwan	480,896	100.00	478,455	99.49	2,053	0.43	388	0.08
Others	165,672	100.00	70,206	42.38	24,332	14.69	71,134	42.94
South Asia	270,568	100.00	253,804	93.80	10,456	3.83	6,408	2.37
Bangladesh	42,029	100.00	38,135	90.73	3,646	8.67	248	0.59
India	138,415	100.00	130,472	94.26	2,130	1.54	5,813	4.20
Nepal	19,397	100.00	18,827	97.06	550	2.84	20	0.10
Pakistan	46,217	100.00	42,642	92.26	3,454	7.47	121	0.26
Sri Lanka	21,157	100.00	20,381	96.33	570	2.69	206	0.97
Others	3,353	100.00	3,347	99.82	6	0.18	0	0.00
Grand Total	5,298,860	100.00	4,322,581	81.58	850,401	16.05	125,878	2.38

Source: Thailand Tourism Statistical Report, 1990, TAT

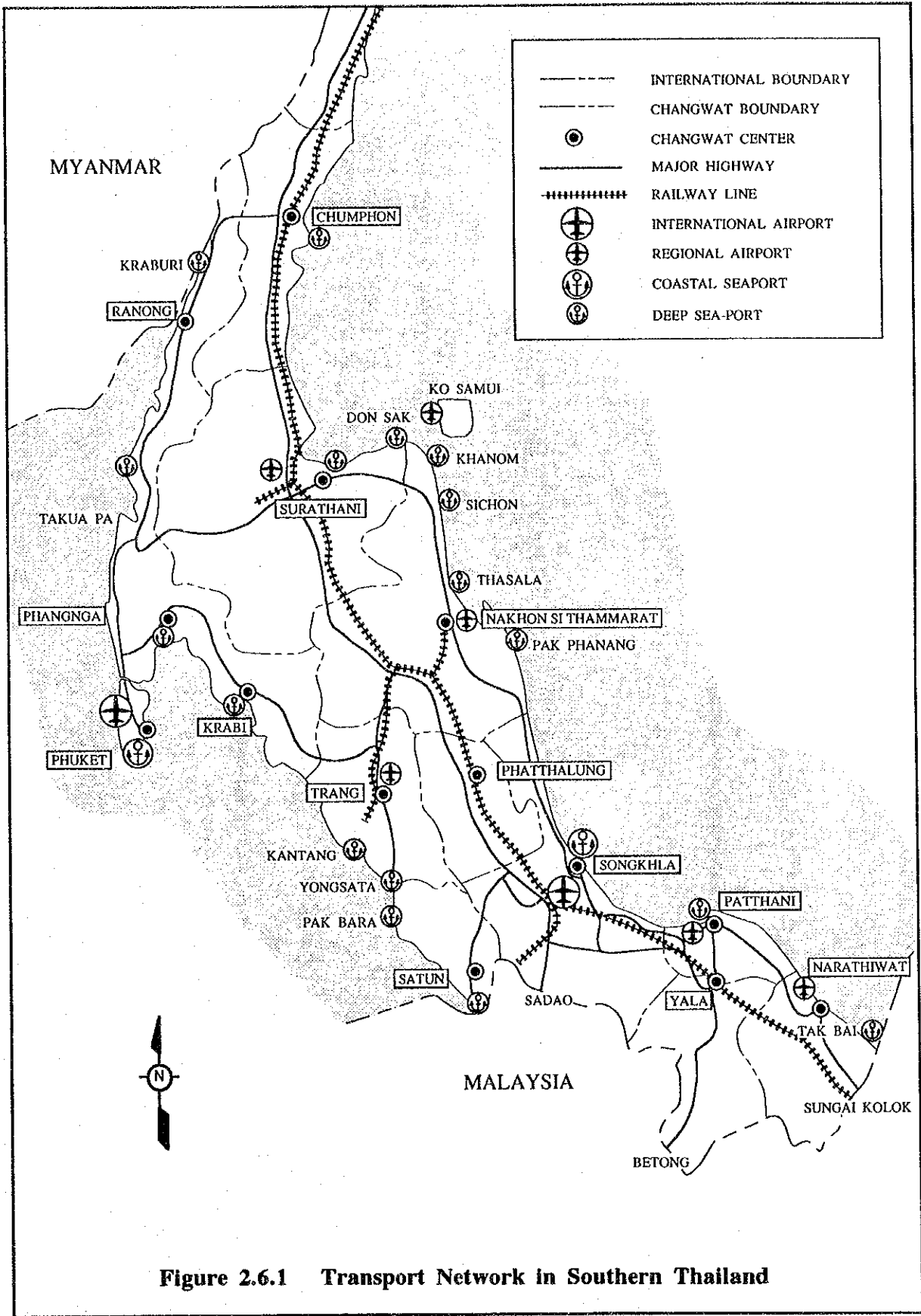
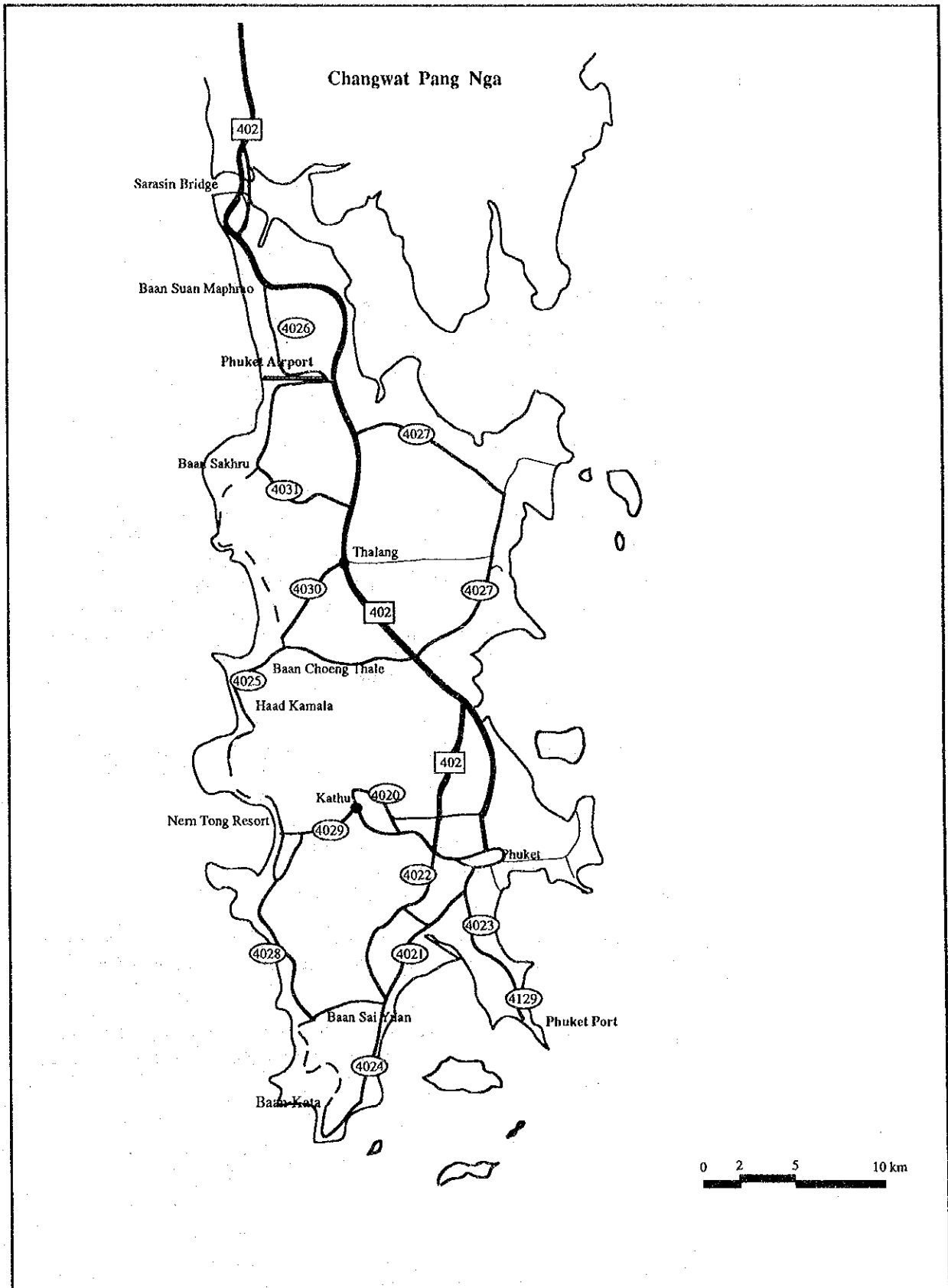


Figure 2.6.1 Transport Network in Southern Thailand

### 2.7.3 Internal Transport in Phuket

The internal road network connects the major beaches with Phuket Town, making sometimes a long detour inland (see **Figure 2.6.2**). The coastal road is under construction at present, and after completion it will connect beaches directly without going inland. A new bridge between the mainland and the island has completed adjacent to the existing bridge in December 1992. Roads presently under construction on the island are described below:

- 1) Route: from Baan Suan Maphrao to Airport Road  
Length: approximately 4,670 m  
Scheduled date of completion: March 1994
- 2) Route: from Baan Sakhru to Baan Cheng Thale  
Length: approximately 9,000 m  
Scheduled date of completion: March 1994
- 3) Route: from Haad Kamala to Nern Tong Resort  
Length: approximately 9,000 m  
Scheduled date of completion: March 1994
- 4) Route: from Baan Kata to Baan Sai Yuan  
Length: approximately 9,400 m  
Scheduled date of completion: March 1994
- 5) Route: from Sarasin Bridge to Tha Chatchai  
Length: approximately 2,800 m  
Scheduled date of completion: Early 1993



**Figure 2.6.2 Transportation Network in Phuket**

## 2.7 ENVIRONMENT

### 2.7.1 Legislation On Environment

#### (1) Natural Environmental Protection

The original law for environmental protection was established as the "Enhancement and Conservation of National Environmental Quality Act, B.E.2518" (called the "Old Law") in Thailand in 1975.

One of the major three targets of The Seventh National Economic Social Development Plan (1992-1996) by the National Economic and Social Development Board (NESDB) is declared "To develop human resources, quality of life and environmental and natural resources" because the socio-economic activity is encouraged and environmental pollution is becoming a big problem. Therefore, the above mentioned old law was revised by "Enhancement and Conservation of National Environmental Quality Act, B.E. 2535" in 1992 (called the "New Law") so as to follow up on the change of circumstances.

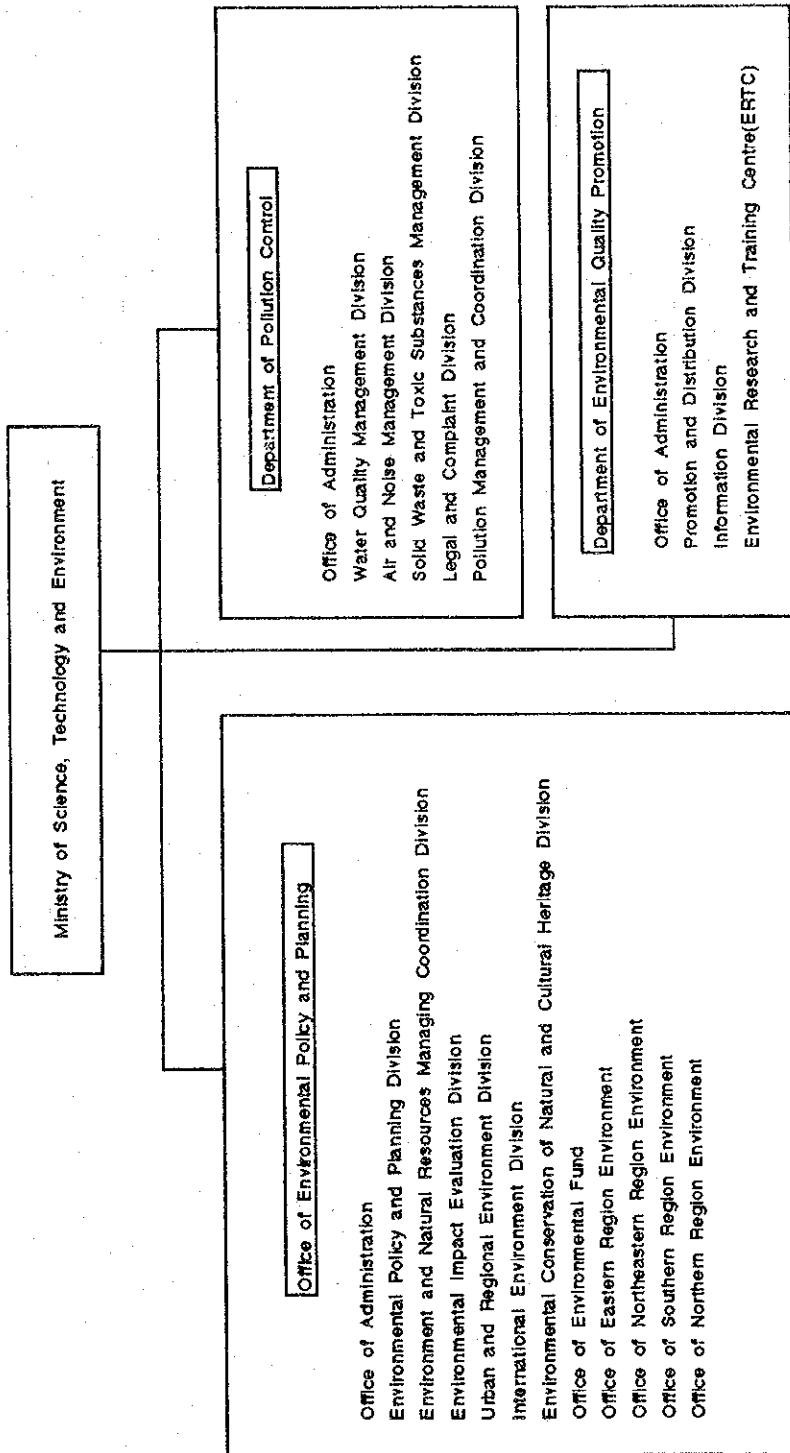
As one of main revisions, NEB, which was one of the divisions of Ministry of Science, Technology and Energy, was promoted to the Ministry of Science, Technology and Environment (MSTE) and Environmental Fund was established so as to facilitate the conservation of the environmental condition. Also the Pollution Control Areas were designated for the nationwide areas around Thailand. Phuket Island is also included in this designation with Pattaya Area, etc. because of the serious recognition of the protection of natural circumstances of Phuket Island from the environmental pollution which has taken place at Pattaya.

For the new Ministry of Science, Technology and Environment, Departments shown in **Figure 2.7.1**, deals with environmental matters are as follows:

- Office of Environmental Policy and Planning.
- Department of Pollution Control.
- Department of Environmental Quality Promotion.

An Environment Impact Assessment System was revised by the new law, however Environmental Standard established by the old law are now in effect.

On the natural protection, there are some laws and regulations; "National Park Act B.E. 2504" in 1961 , "National Forest Reservation Act B.E. 2507" in 1964 and so on.



**Figure 2.7.1 Organization Chart of Departments Concerned, Ministry of Science, Technology and Environment**

(2) Environmental Impact Assessment (EIA) System

a) Administrative Organization

The Environmental Impact Evaluation Division of the Office of Environmental Policy and Planning, MSTE, has full responsibility on the processing of environmental impact evaluation in compliance with the regulations revised in 1992. Other regulations are effective under the old law at present.

b) Types and Sizes

The types and their sizes to be covered by the assessment law (EIA) are shown in **Table 2.7.1**. All plans on this Table are subjects to be evaluated by EIA and this airport project shall be required EIA in the category of Commercial Airports.

c) Processing of Assessment

NEB has been issued the guideline of EIA named "Manual of NEB Guideline for Preparation of Environmental Impact Evaluation (1979)."

The guideline consists of 4 articles as follow:

- General Guidelines
- Supplemental Guidelines.
- IEE (Initial Environmental Examination) Guidelines.
- EIS TOR Guidelines.

The EIA approval process is shown in **Figure 2.7.2**.

d) Guideline for Airport

The guideline of EIA for airports is established as "Guideline for Preliminary Study of Environmental Impact for Commercial Airport Project (1991 by Office of National Environmental Board, ONEB)"

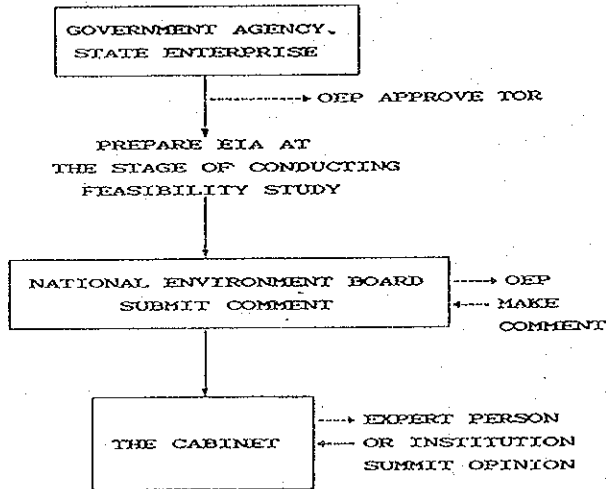
**Table 2.7.1 Types and Sizes of Projects or Activities Requiring EIA Reports**

Items	Types of Projects or activities	Sizes
1	Dam or Reservoir	storage volume greater than 100,000,000 cubic meters or storage surface area greater than 15 square kilometers
2	Irrigation	irrigated area greater than 80,000 rais (12,800 hectares)
3	Commercial Airport	all sizes
4	Hotel or Resort Facilities environmentally sensitive areas such as areas adjacent to rivers, coastal areas, lakes, beaches or in the vicinity of national parks	greater than 80 rooms
5	Mass Transit System and Expressway as defined by the Announcement of the Revolutionary Party No. 290,24, November B.E.2515	all sizes
6	Mining as defined by the Mineral Act No.1 B.E.2510, No.2 B.E.2516 and No.3 B.E.2522	all sizes
7	Industrial Estates as defined by the Industrial Estate Authority of Thailand Act, B.E.2522	all sizes
8	Commercial Port and Harbour	with capacity for vessels of greater than 500 gross-ton
9	Thermal Power Plants	Capacity greater than 10 MW.
10	Industries	
	(1) Petrochemical Industry	greater than 100 tons/day of raw materials required in production processes of oil refinery and/or natural gas separation
	(2) Oil Refinery	all sizes
	(3) Natural Gas Separation of Processing	all sizes
	(4) Chlor-Alkaline Industry requiring NaCl as raw material for production of Na <sub>2</sub> CO <sub>3</sub> , NaOH, HCl, Cl <sub>2</sub> , NaOCl and Bleaching Powder	production capacity of each or combined product greater than 100 tons/day
	(5) Irons and/or Steel Industry	requiring from and/or scrap iron as raw materials for production greater than 100 tons/day or using furnaces with combined capacity greater 5 tons/batch
	(6) Cement Industry	all sizes
	(7) Smelting Industry other than Iron and Steel	production capacity greater than 50 tons/day
	(8) Pulp Industry	production capacity greater than 50 tons/day

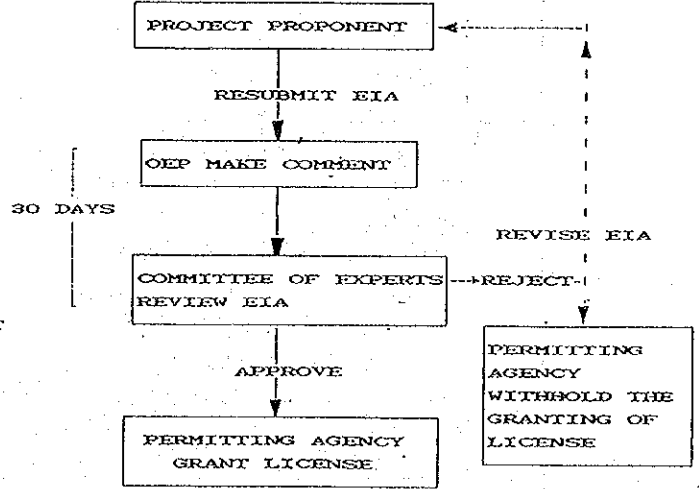
Source: Notification of the Ministry of Science, Technology and Energy, B.E.2524 issued under National Environmental Quality Act, B.E.2518 as amended in B.E.2521, published in the Royal Government Gazette (Special issue), Vol.98, Part 158, dated September 27, B.E. 2524(1981)



APPROVAL PROCESS FOR EIA OF GOVERNMENT AGENCY,  
STATE ENTERPRISE OR TO BE JOINTLY UNDERTAKEN  
WITH PRIVATE ENTERPRISE



APPROVAL PROCESS FOR EIA OF  
PRIVATE SECTOR PROJECTS.  
(REVISION PROCESS)



APPROVAL PROCESS FOR EIA OF  
PRIVATE SECTOR PROJECTS.

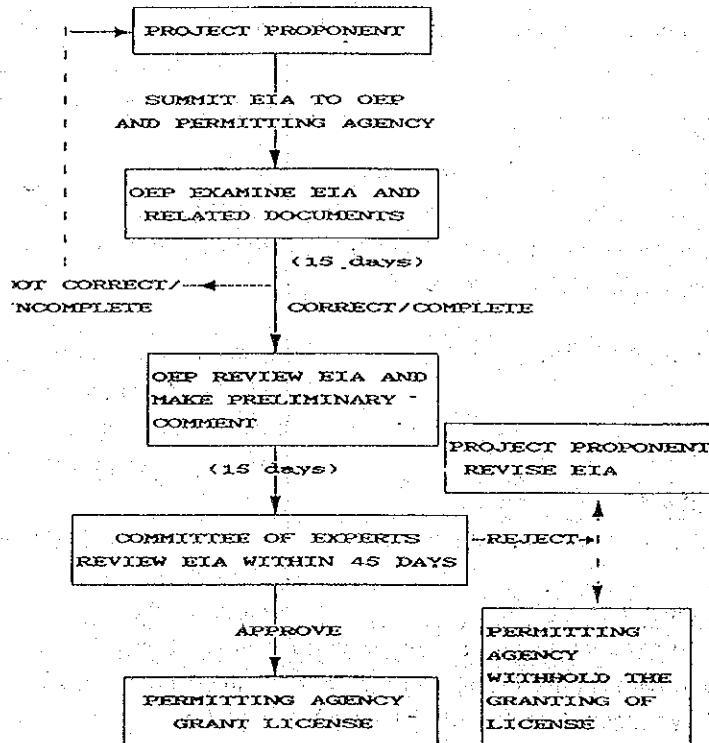


Figure 2.7.2 EIA Approval Process

(3) Environmental Standards

The stipulation of environmental standards shall comply with the Environmental Quality Standards, 1985 established by the old law.

This law stipulates the following standards.

- Air quality standards
- Noise standards
- Water quality standards
- Solid waste and waste standards
- Night soil and hazardous waste management
- Toxic substance legislation

However, the standards for aircraft noise has not been established.

There are severe standards of water quality for coastal water at Phuket Island as follows:

- Coastal water quality standard for Karon Bay Phuket
- Coastal water quality standard for West Coast of Phuket

(4) Conservation of Cultural Properties

The law of "Act on Ancient Monuments, Antiques, Objects of Art and National Museums, B.E 2504" was established in 1961 and was revised partially in 1992.

The law stipulated the conservation of ancient monuments, antiques and objects of art and establishment of national museum and penalties. There are detailed descriptions as "Antiques or objects of art, buried in or concealed or abandoned at any place shall become State Property" in Section 24 of the law.



## CHAPTER 3

### EXISTING AIRPORT AND SURROUNDINGS



## CHAPTER 3 EXISTING AIRPORT AND SURROUNDINGS

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### 3.1 GENERAL

Phuket International Airport, located at the north end of Phuket Island, about 32 km from Phuket town, is operated by the Airports Authority of Thailand. No military or privately-owned aircraft are based at the airport; there are very few non-commercial operations.

Airline service is provided primarily by Thai Airways International, with six to seven Airbus round-trips per day to Bangkok, daily Airbus service to Singapore, three Airbus services a week to Tokyo, weekly Airbus service to Perth, and feeder aircraft service to Chiang Mai, Trang, Hat Yai and Surat Thani. Service is also provided by Tradewinds to Singapore, by Malaysia Airlines to Penang and Kuala Lumpur, by China Airlines to Kaohsiung and Taipei, by Bangkok Airways to Samui and by various charter carriers from international points such as Europe and Hong Kong.

The airport served approximately 1.9 million passengers in 1992. Growth during recent years has been very sharply increased, with passenger traffic increase of 14-54% per year over the past four years and aircraft movements increase about 20% per year over the same period.

The existing airport layout plan is shown in **Figure 3.1.1** and **3.1.2**.

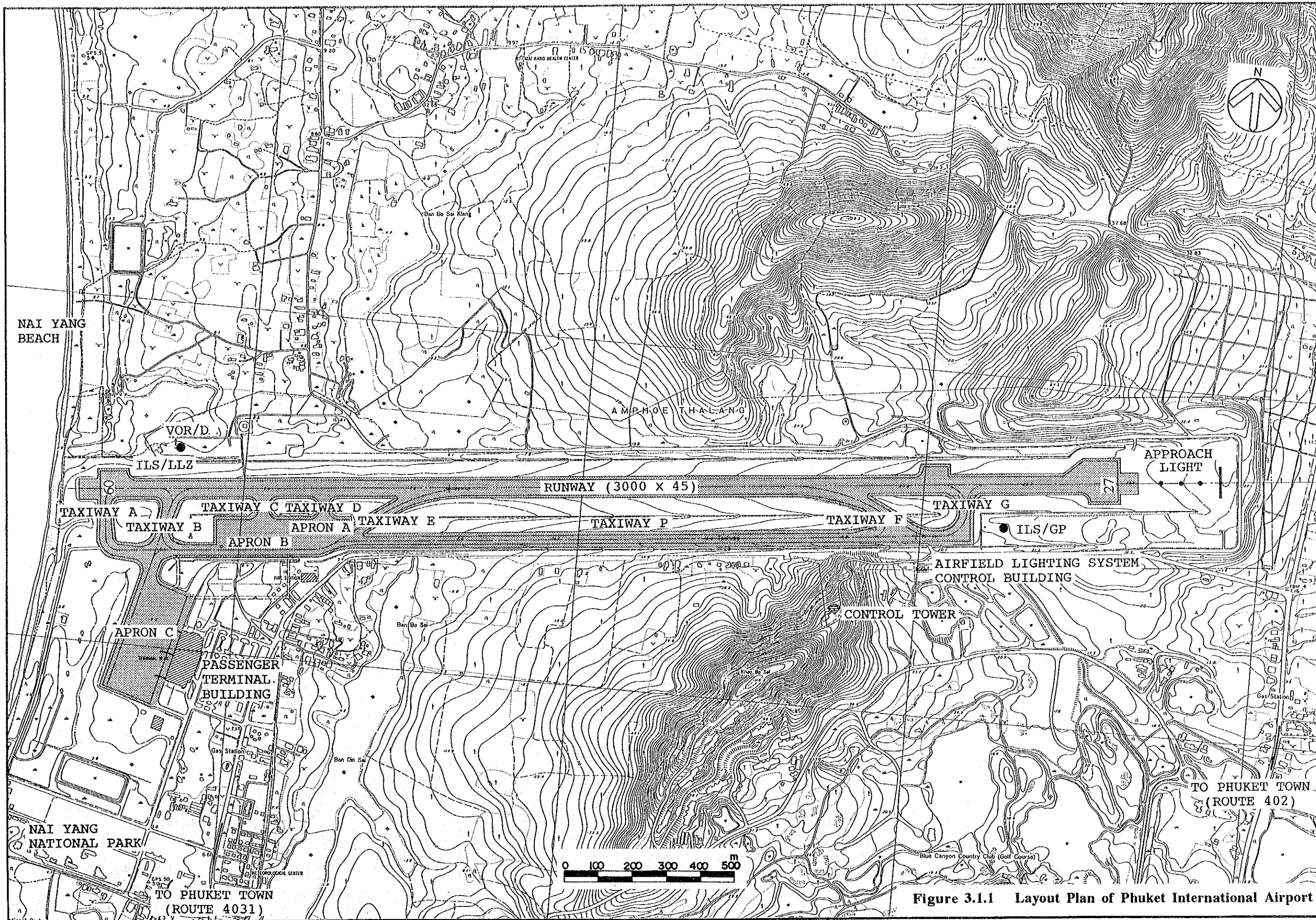


Figure 3.1.1 Layout Plan of Phuket International Airport





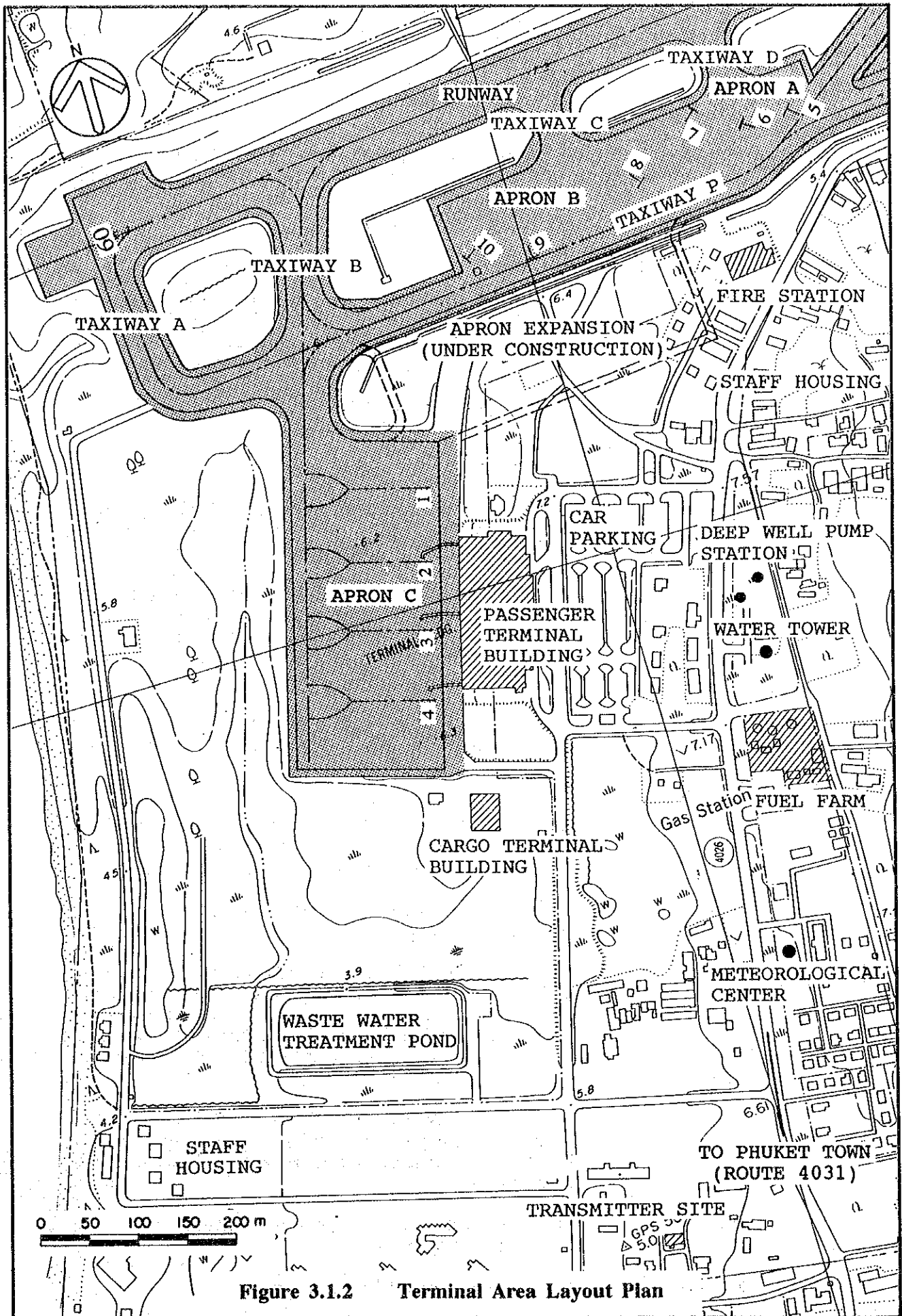


Figure 3.1.2 Terminal Area Layout Plan

## 3.2 AIRPORT HISTORY

Since Phuket Airport was constructed in 1947, it was used for Military activities under Royal Thai Airforce, located far from Phuket city to the north-west about 32 km (at Phuket city gate). It has been consistently developed and improved. The development is divided into following stages:

### 1st Stage Development

1961-1962 In 1961 an asphalt runway of 30 x 1,440 meters, taxiway and apron was built to service DC-3 and Avro-748 operations. At that time Thai Airways operated scheduled domestic service from Bangkok to Phuket and international services from Bangkok via Phuket to Penang, Malaysia. A terminal building and control tower were built in 1963.

### 2nd Stage Development

1976-1978 The Department of Aviation improved and expanded the runway (45 x 2,500 meters), taxiway, parking apron, airport entrance road, and passenger terminal to meet the increasing traffic demand and upgraded as international airport.

The terminal building expansion consists of expanding the passenger lounge, renovation of the air conditioning system in the passenger lounge, improving rest rooms, extending the aircraft apron, and repairing and reinforcing the runway surface.

It also included expanding the parking lot and constructing the building for installation of the navigation aid equipment.

### 3rd Stage Development

1984 On August 7th Department of Aviation handed over Phuket Airport to business systems administrated by private enterprise for the smoothness in operation.

1987 Extension of the runway to 3,000m length to the east with aeronautical field lights.

1988 On October 8th AAT was handed over Phuket Airport to operate for the 3rd airport, following to Chiang Mai Airport and Hat Yai Airport. They were Aeronautical Telecommunication Service, Air Navigation Service, and Traffic Control under the responsibility of Aeronautical Radio of Thailand Ltd.

1989 Completion of new apron (Apron C) of 255 x 150 meters with 3 parking positions, and new passenger terminal building. Four Airbus aircrafts were accommodated at the new terminal.

1989 On May 23rd Phuket Airport was inaugurated as an International Airport.

1989-1990 Installation of 2 sets of Boarding Bridges.

1990	On October 5th opened as a new Phuket International Airport.
1991	Inauguration of scheduled international flights by China Airline.
1991	Completion of new Control Tower Building.  Installation of 3rd Boarding Bridge and extension of apron to the south.  Site preparation for new cargo terminal building.
1992	Completion of new Fire Station Building  Expansion of taxiway connecting the new and old aprons, construction a parallel taxiway and construction of airfield lighting and drainage systems.
1993	Completion of a new parallel taxiway, rapid exit taxiways and turn-around pads including airfield lighting, grading of runway strip, and renovation of drainage system. Completion of a new cargo terminal building.

### 3.3 AIRPORT INVENTORY

An inventory of Phuket International Airport is shown in **Table 3.3.1**.

**Table 3.3.1 Inventory of Phuket International Airport**

Item	Description
<b>Aerodrome Data</b>	
- City/Aerodrome	PHUKET/Phuket International Airport
- International/Domestic	International and Domestic
- ICAO Reference Code	4D
- Aerodrome Reference Point	08°06'38" N, 98°18'45" E (center of the runway 660 m from THR RWY 09)
- Distance and Direction from City	32 km NW from Phuket Town
- Elevation	25 m (82 ft)
- Reference Temperature	33.2°C
- Magnetic Variation	1°18' W (1990) Annual change 7" increase
- Operational Hours	24 hours
- Seasonal Availability	All seasons
- Aerodrome Operator	Airports Authority of Thailand
- Transportation Available	Buses, taxis and limousines

(To be continued)

**Table 3.3.1 (Con't.)**

Item	Description
<b>Aircraft Operational Data</b>	
<ul style="list-style-type: none"> <li>- Runway Usability               <ul style="list-style-type: none"> <li>* Crosswind component not exceeding 13 kt</li> <li>* Crosswind component not exceeding 20 kt</li> </ul> </li> <li>- Operational Category</li> <li>- Established Procedure</li>   <li>- Transition Altitude</li> <li>- Local Flying Restrictions</li> <li>- Pre-flight Altimeter Check point</li> </ul>	<p>99.77%</p> <p>99.97%</p> <p>Precision instrument approach LLZ-DME for RWY 27 VOR for RWY 09/27 VOR/DME for RWY 09/27 NDB for RWY 27 11,000 ft NDB for RWY27 Nil 25 m (82 ft)</p>
<b>Runway</b>	
<ul style="list-style-type: none"> <li>- Designation</li> <li>- True Bearing</li> <li>- Dimensions</li> <li>- Shoulders</li> <li>- Longitudinal Slope</li> <li>- Stopway</li> <li>- Clearway</li> <li>- Surface</li>   <li>- Strength</li> </ul>	<p>09/27 085/265 3,000 m x 45 m 7.5 m each Average 0.6, Max. 1.25% 60 m (09/27) Nil Asphalt concrete with Cement concrete pads at each End PCN 61/F/C/X/T</p>
<b>Runway Strip</b>	
<ul style="list-style-type: none"> <li>- Dimensions</li> </ul>	<p>3,240 m. x 150 m.</p>
<b>Taxiway "A / G"</b>	
<ul style="list-style-type: none"> <li>- Configuration</li> <li>- Width</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Connection 30 m Cement Concrete PCN 56/R/C/X/T</p>
<b>Taxiway "B / C"</b>	
<ul style="list-style-type: none"> <li>- Configuration</li> <li>- Width</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Connection 30 m Cement Concrete PCN 56/R/C/X/T</p>
<b>Taxiway "D"</b>	
<ul style="list-style-type: none"> <li>- Configuration</li> <li>- Width</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Connection 23 m Asphalt Concrete PCN 47/F/C/X/T</p>

(To be continued)

**Table 3.3.1 (Con't.)**

Item	Description
<p><b>Taxiway "E / F"</b></p> <ul style="list-style-type: none"> <li>- Configuration</li> <li>- Width</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Rapid Exit 30 m Cement Concrete PCN 56/R/C/X/T</p>
<p><b>Taxiway "P"</b></p> <ul style="list-style-type: none"> <li>- Configuration</li> <li>- Width</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Parallel 23 m, partially 30 m Cement Concrete PCN 56/R/C/X/T</p>
<p><b>Apron "A"</b></p> <ul style="list-style-type: none"> <li>- Aircraft Stands</li> <li>- Dimensions</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>Small Aircraft x 3 150 x 60 m Asphalt Concrete PCN 47/F/C/X/T</p>
<p><b>Apron "B"</b></p> <ul style="list-style-type: none"> <li>- Aircraft Stands</li> <li>- Dimensions</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>A300 x 3 120 x 80 m, 110 x 120 m Cement Concrete PCN 56/R/C/X/T</p>
<p><b>Apron "C"</b></p> <ul style="list-style-type: none"> <li>- Aircraft Stands</li> <li>- Dimensions</li> <li>- Surface</li> <li>- Strength</li> </ul>	<p>B747 x 4 320 x 150 m Cement Concrete PCN 56/R/C/X/T</p>
<p><b>Heliport</b></p> <ul style="list-style-type: none"> <li>- Location</li> </ul>	<p>Adjacent to apron, near terminal building</p>
<p><b>Passenger Terminal Building</b></p> <ul style="list-style-type: none"> <li>- Total Floor Area</li> <li>- Structure</li> </ul>	<p>23,855 sq.m. Reinforced concrete structure 3 stories</p>
<p><b>Cargo Terminal Building</b></p> <ul style="list-style-type: none"> <li>- Floor Area</li> <li>- Structure</li> </ul>	<p>1,100 sq.m. Steel frame, and reinforced concrete, one story</p>

(To be continued)

**Table 3.3.1 (Con't.)**

Item	Description
Control Tower Building	<ul style="list-style-type: none"> <li>1,092 sq.m.</li> <li>Reinforced concrete structure, 9 stories</li> <li>34.0 m above ground</li> <li>109.8 m above sea level</li> <li>79.0 m above sea level</li> <li>2° 42'</li> </ul>
Car Parking	<ul style="list-style-type: none"> <li>5,700 sq.m. excluding green area</li> <li>190 cars</li> </ul>
Access Road	<ul style="list-style-type: none"> <li>4031, 4026 (Under Diversion Work)</li> <li>Asphalt concrete</li> </ul>
Air Navigation System	<ul style="list-style-type: none"> <li>VOR/DME</li> <li>NDB</li> <li>LLZ/DME</li> <li>G/P (RWY 27)</li> <li>M/M (RWY 27)</li> <li>ASR/SSR</li> <li>Air-Ground VHF Communications (5 freq.)</li> <li>Air-Ground UHF Communications (3 freq.)</li> <li>AFTN</li> <li>SALS (RWY 27)</li> <li>T-VASIS (RWY 27)</li> <li>PAPI (RWY 09)</li> <li>Runway Threshold Lights</li> <li>Runway End Lights</li> <li>Runway Edge Lights</li> <li>Taxiway Edge Lights</li> <li>Apron Flood Lights</li> <li>Aerodrome Beacon</li> <li>Obstacle Lights</li> <li>Illuminated Wind Direction Indicator</li> <li>Observation by South Western Regional Meteorological Center</li> <li>Wind direction and velocity</li> <li>Temperature and Dew point</li> <li>Pressure</li> <li>RVR</li> <li>Ceilometer</li> </ul>
- Radio Navigation System	
- Air Traffic Control System	
- Telecommunication System	
- Aeronautical Ground Lighting System	
- Meteorological System	

(To be continued)

Table 3.3.1 (Con't.)

Item	Description
<ul style="list-style-type: none"> <li>- Emergency Power Supply System</li> </ul>	Weather Rader Automatic Observation System  Secondary power supply system are provided.
<b>Rescue and Fire Fighting Facilities</b>	
<ul style="list-style-type: none"> <li>- Fire Vehicles</li> </ul>	1 RIV 2 Major vehicle 1 Ambulance 1 Water Tank Vehicle
<ul style="list-style-type: none"> <li>- Fire Station</li> </ul>	984 sq.m.
<ul style="list-style-type: none"> <li>- Structure</li> </ul>	Reinforced concrete structure with steel roof frames.
<ul style="list-style-type: none"> <li>- Level of Protection</li> </ul>	Category - 8
<ul style="list-style-type: none"> <li>- Trained Personnel</li> </ul>	30 persons
<b>Airport Utilities</b>	
<ul style="list-style-type: none"> <li>- Power Supply System</li> </ul>	Capacity of PEA Substation : 50 MVA Stand-by generators : total 262.5 KVA
<ul style="list-style-type: none"> <li>- Water Supply System</li> </ul>	7 Deepwells and 1 elevated water storage tank Total water supply capacity : 300 ton/day
<ul style="list-style-type: none"> <li>- Sewerage System</li> </ul>	Type of treatment : Oxidation Pond Capacity : 250 ton/day
<ul style="list-style-type: none"> <li>- Telephone System</li> </ul>	PABX System
<b>Other Facilities</b>	
<ul style="list-style-type: none"> <li>- Aviation Fuel Supply System</li> </ul>	Fuel Storage Capacity Jet-A1 : 538 kl Av Gas : 3 kl  Hydrant System : 3 pits Trucking system : available
<ul style="list-style-type: none"> <li>- Airport Maintenance Vehicles</li> </ul>	1 Tractor 1 High-lift Car 1 Sweep-and-Suck Car 1 Follow-Me Truck
<ul style="list-style-type: none"> <li>- GSE Maintenance Workshop</li> </ul>	Old general aviation hangar.
<ul style="list-style-type: none"> <li>- Airport Housing</li> </ul>	AAT Staff Housing

### 3.4 AIR TRAFFIC CHARACTERISTICS

This section describes traffic characteristics of Phuket International Airport based on the historical record of AAT and the result of the traffic survey.

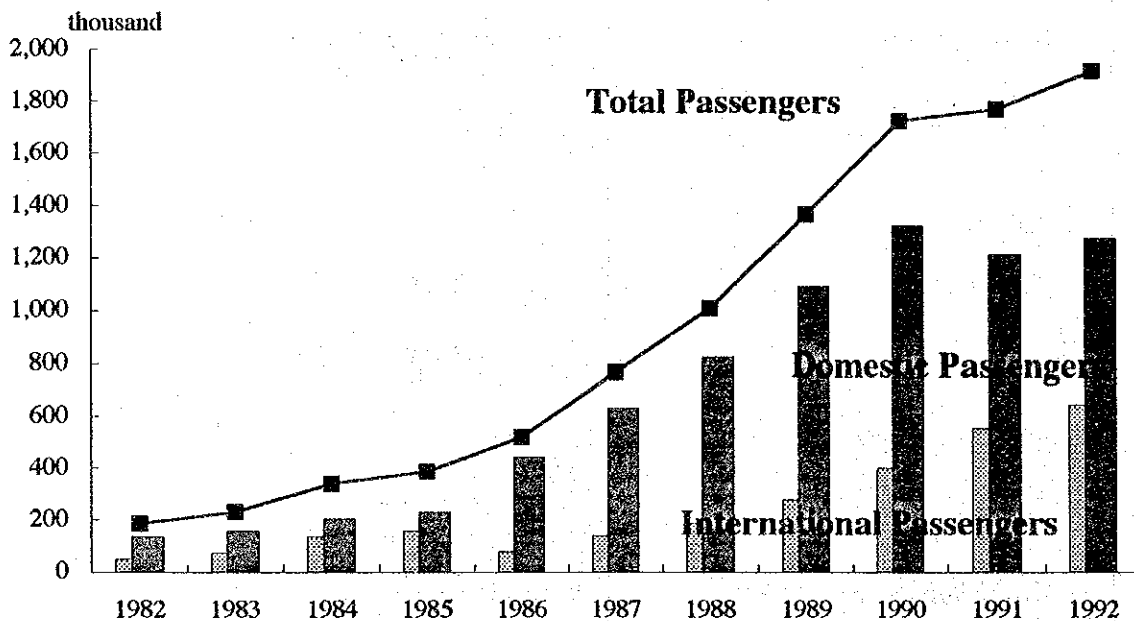
Air traffic characteristics at Phuket International Airport are summarized below for the following categories:

- Passenger
- Freight and mail
- Aircraft movement
- Peak hour

#### 3.4.1 Passengers

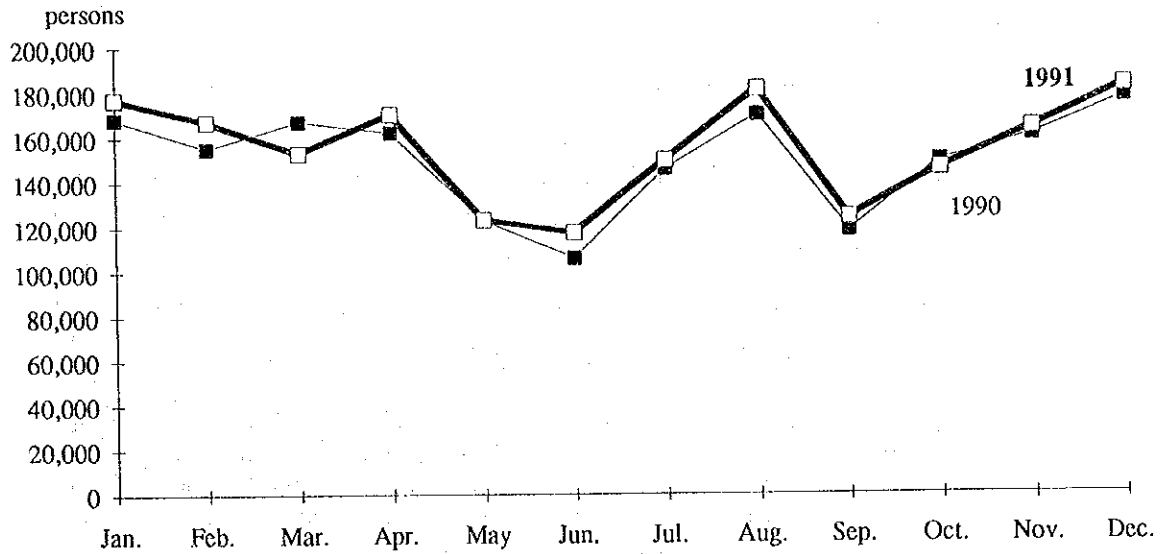
According to the preliminary figures in 1992, the total number of passengers at Phuket International Airport was 2,005,797 persons including transit passengers. The number of international passengers at Phuket International Airport amounted to 626,250 persons with a growth rate of 35.8 % in 1991, when all of the international airports, except Phuket, in the country showed a decline in number of international passengers. The growth rate of international passengers has been extremely high since 1987 at Phuket International Airport. (see **Figure 3.4.1** and **Appendix 3.4.1** ).

**Figure 3.4.2** shows seasonal fluctuations in the number of passengers by month at Phuket International Airport in 1990 and 1991. The traffic is low in May, June and September.



**Figure 3.4.1** Record of Air Passengers From/To Phuket





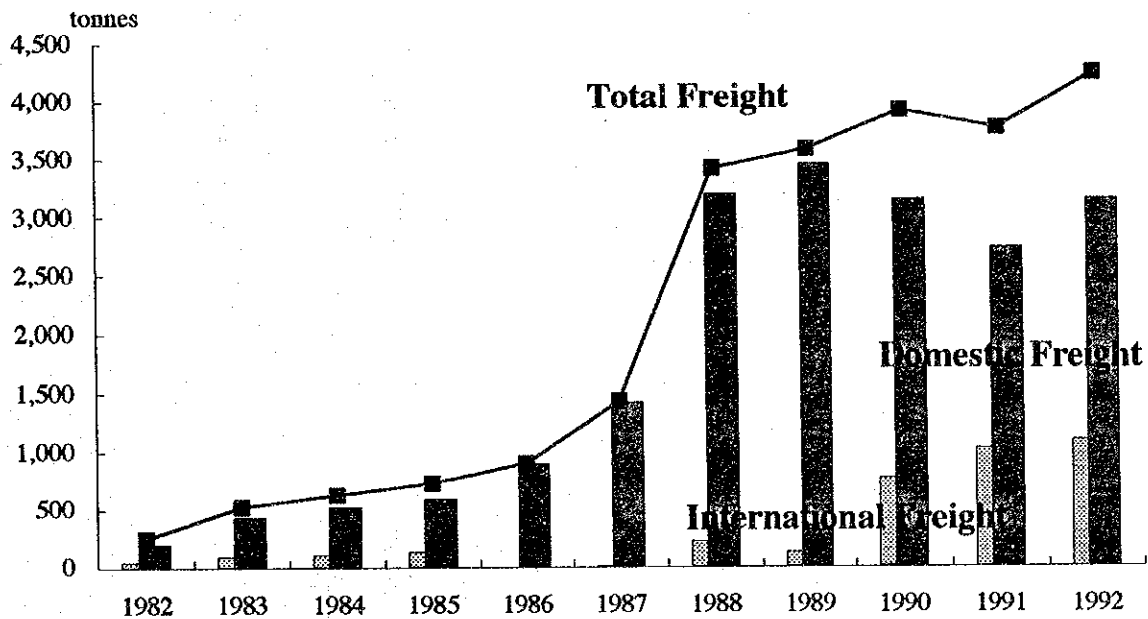
**Figure 3.4.2** Number of Total Passengers by Month (1990 and 1991)

### 3.4.2 Freight

The total terminal cargo increased to 3,124 tonnes in 1992 from 248 tonnes in 1982, however, there was a decline in volume in 1991 and 1992. The share of Phuket International Airport of the total freight volume handled in the country is very small (0.9% in 1991).

**Figure 3.4.3** shows the volume of freight by year at Phuket International Airport. (see **Appendix 3.4.2** for details)

The volume of mail handled in Phuket International Airport was 414 tonnes in 1992 (see **Appendix 3.4.3**).



**Figure 3.4.3** Record of Air Freight From/To Phuket

### 3.4.3 Aircraft Movement

The aircraft movement are shown in **Table 3.4.1** and **Table 3.4.2**, by year and month respectively.

The share of international flights in the aircraft movement was 45.1 % and 10 % of the international movement was provided by non-scheduled flights in 1991 (see **Appendix 3.4.4**).

Thai Airways International provided 59.3 % of total international aircraft movement in 1991, followed by Tradewinds (9.7 %) and China Airlines (8.6 %) as shown in **Appendix 3.4.5**.

It shows a significant characteristics in the aircraft movement by type of aircraft. The share of B-737 and A-300 was high and the total share of these two types amounted to 86.6 % of international aircraft movements in 1991. A-300 was the most common aircraft for domestic aircraft movements (see **Appendix 3.4.6**).

Capacity for each type of aircraft are given and load factor is calculated by type of aircraft in **Table 3.4.3**.

**Table 3.4.1 Aircraft Movement at Phuket International Airport by Year**

Unit:movements

Year	International	Domestic	Total
1979	n.a.	n.a.	3,187
1980	n.a.	n.a.	3,114
1981	n.a.	n.a.	3,516
1982	924	2,862	3,786
1983	1,230	3,021	4,251
1984	1,740	3,617	5,357
1985	1,862	4,023	5,885
1986	720	5,648	6,368
1987	1,193	6,574	7,767
1988	1,904	7,537	9,441
1989	3,626	7,885	11,511
1990	5,410	9,428	14,838
1991	7,662	9,320	16,982
1992	8,520	10,324	18,844

Source:AAT

**Table 3.4.2 Aircraft Movement at Phuket International Airport by Month**

Unit: movements

International Aircraft Movement at Phuket International Airport						
	Year1990			Year1991		
	Arrival	Departure	Total	Arrival	Departure	Total
Jan.	227	208	435	325	295	620
Feb.	213	197	410	294	266	560
Mar.	233	214	447	317	288	605
Apr.	239	207	446	328	298	626
May	215	186	401	328	298	626
Jun.	211	181	392	311	282	593
Jul.	224	192	416	338	304	642
Aug.	236	206	442	347	317	664
Sep.	223	190	413	315	287	602
Oct.	255	226	481	329	302	631
Nov.	276	249	525	372	346	718
Dec.	317	285	602	404	371	775
Total	2,869	2,541	5,410	4,008	3,654	7,662
Domestic Aircraft Movement at Phuket International Airport						
	Year1990			Year1991		
	Arrival	Departure	Total	Arrival	Departure	Total
Jan.	400	419	819	378	408	786
Feb.	358	375	733	346	372	718
Mar.	390	407	797	364	396	760
Apr.	385	418	803	382	410	792
May	387	418	805	376	407	783
Jun.	373	403	776	345	377	722
Jul.	388	419	807	371	405	776
Aug.	401	432	833	389	420	809
Sep.	379	411	790	362	389	751
Oct.	402	430	832	390	417	807
Nov.	320	351	671	391	414	805
Dec.	366	396	762	390	421	811
Total	4,549	4,879	9,428	4,484	4,836	9,320
Total Aircraft Movement at Phuket International Airport						
	Year1990			Year1991		
	Arrival	Departure	Total	Arrival	Departure	Total
Jan.	627	627	1,254	703	703	1406
Feb.	571	572	1,143	640	638	1278
Mar.	623	621	1,244	681	684	1365
Apr.	624	625	1,249	710	708	1418
May	602	604	1,206	704	705	1409
Jun.	584	584	1,168	656	659	1315
Jul.	612	611	1,223	709	709	1418
Aug.	637	638	1,275	736	737	1473
Sep.	602	601	1,203	677	676	1353
Oct.	657	656	1,313	719	719	1438
Nov.	596	600	1,196	763	760	1523
Dec.	683	681	1,364	794	792	1586
Total	7,418	7,420	14,838	8,492	8,490	16,982

**Table 3.4.3 Load Factor (Passengers Average) by Type of Aircraft (1990 and 1991)**

	Capacity (seats)	1990				1991			
		Number of flight (movements)	Number of passengers (persons)	Passenger per flight	Load factor (%)	Number of flight (movement)	Number of passengers (persons)	Passenger per flight	Load factor (%)
A-300	260	4,797	913,059	190	73	7,740	1,185,780	153	59
A-310	265	1,598	357,960	224	85	799	124,244	155	59
B-747	392	104	27,182	261	67	40	9,379	234	60
B-737	120	2,856	251,744	88	73	4,602	407,331	89	74
B-757	231	134	20,783	155	67	68	10,359	152	66
B-767	225	354	64,186	181	81	422	73,596	174	78
B-727	182					42	5,499	131	72
DC-10	325	147	39,615	269	83	68	17,621	259	80
MD-87	120	612	44,938	73	61	30	2,728	91	76
ATR-42	54	909	27,928	31	57	1,524	37,040	24	45
BAE-143-146	106	1,306	98,049	75	71	538	44,739	83	78
DASH-8	36	721	16,680	23	64	722	19,151	27	74
<b>Sub-total</b>		13,538	1,862,124	138	75	16,595	1,937,467	117	62
Others		1,300	20,803			387	4,159		
<b>Total</b>		14,838	1,882,927			16,982	1,941,626		

Source: AAT

Note: Flight = International + Domestic

Passengers = Disembarked + Embarked + 2 x Transit

#### 3.4.4 Peak Hour

30th peak hour and 1st peak hour of aircraft movement and those of international and domestic passengers are shown in **Appendix 3.4.7**.

### 3.5 METEOROLOGICAL CONDITIONS

#### 3.5.1 Wind Velocity and Direction

A wind rose is produced based on the wind data during the three years from August 1989 through July 1992 as shown in **Figure 3.5.1**.

The characteristics of the wind velocity and direction are summarized as follows:

- (1) Two distinctive seasons are observed regarding wind in Phuket, namely rainy season from May to October and dry season from November to April.
- (2) The calm condition (wind speed nil up to 5 kt) accounted for 36.9% in the rainy season and 49.4% in dry season respectively of total observations.
- (3) Occurrence of the wind velocity of more than 10kt was relatively high in the rainy season with 8.6%, while only 1.8% in the dry season.
- (4) In the rainy season the western winds (west to west-southwest) are predominant. The western winds accounted for 74.8% of the total observations excluding calm conditions.
- (5) In the dry season the eastern winds (east to northeast) and the western winds (west to west-southwest) are predominant. The eastern and western winds respectively accounted for 33.6% and 17.6% of the total observations excluding calm conditions.

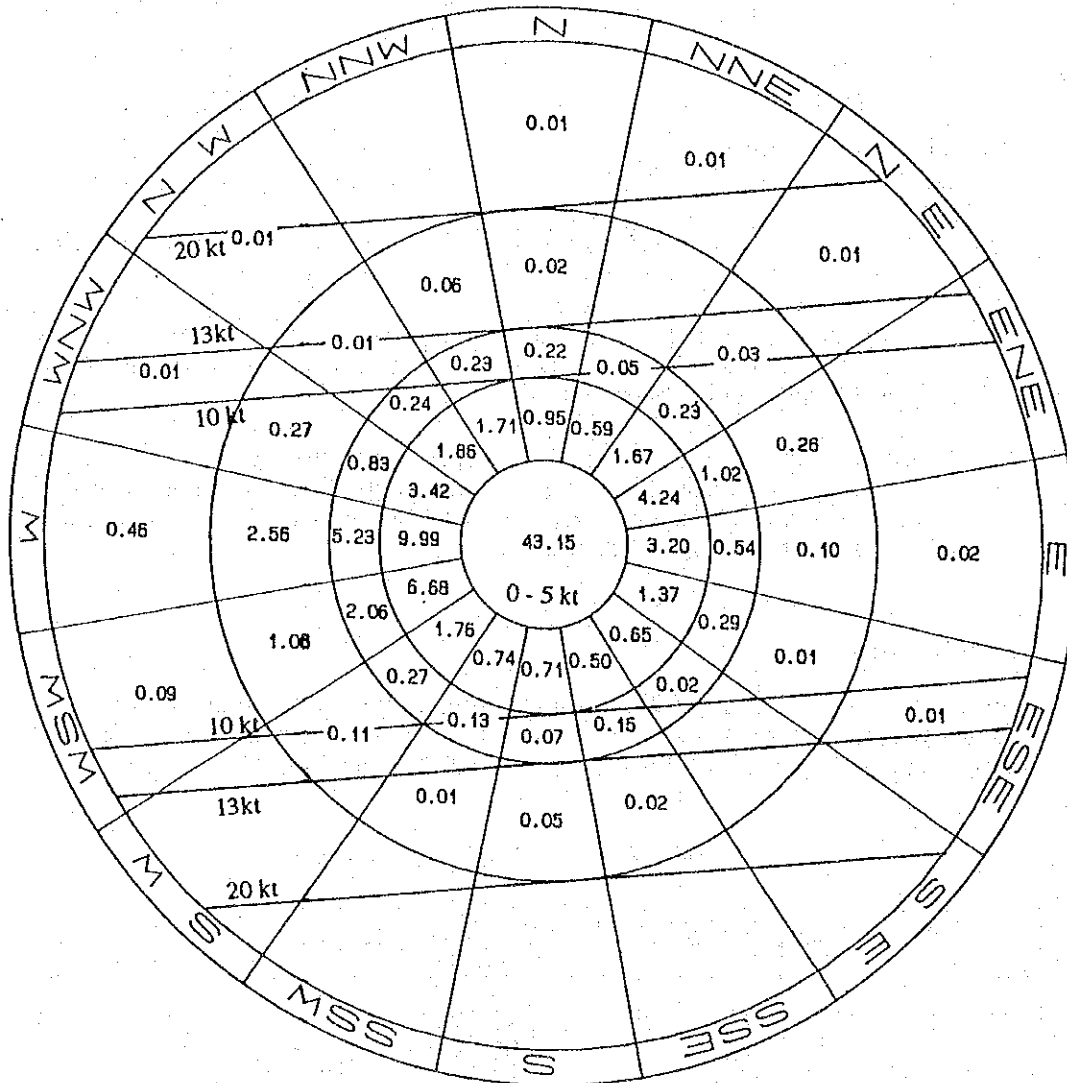
#### 3.5.2 Wind Coverage

The wind coverage for the existing runway orientation is calculated as shown in **Table 3.5.1**. As seen in the table, the wind coverage for the crosswind components not exceeding 13kt and 20kt is 99.77%, and 99.97% respectively.

**Table 3.5.1 Wind Coverage**

Season	Cross Wind	Runway Orientation	Remarks
	(kt)	(85-265)	North-South
All	13	99.77	95.32
	20	99.97	99.42
Dry	13	98.73	98.69
	20	99.96	99.95
Rain	13	99.81	92.01
	20	99.99	98.90

WIND ROSE of R/W 85 - 265  
(ALL SEASONS)



Source	: Meteorological Department, South Western Regional Meteorological Center
Location	: Phuket International Airport
Period	: August 1989 to July 1992
Runway Orientation	: N85°E
Wind Coverage	: 99.77 (Cross Wind 13 kt)
	: 99.97 (Cross Wind 20 kt)

Figure 3.5.1 Wind Rose at Phuket International Airport

### 3.5.3 Changeable Ceiling and Visibility

According to AAT Phuket, since there often occurs bad weather conditions in the rainy season, weather condition will change quickly to be in good condition. Therefore, holding aircraft can expect the improvement of ceiling and visibility for landing, so flight diversions occur only on few occasions.

## 3.6 AIRPORT MANAGEMENT

### 3.6.1 Organization

The existing organization for the airport operation and management and its responsibility are summarized as follows:

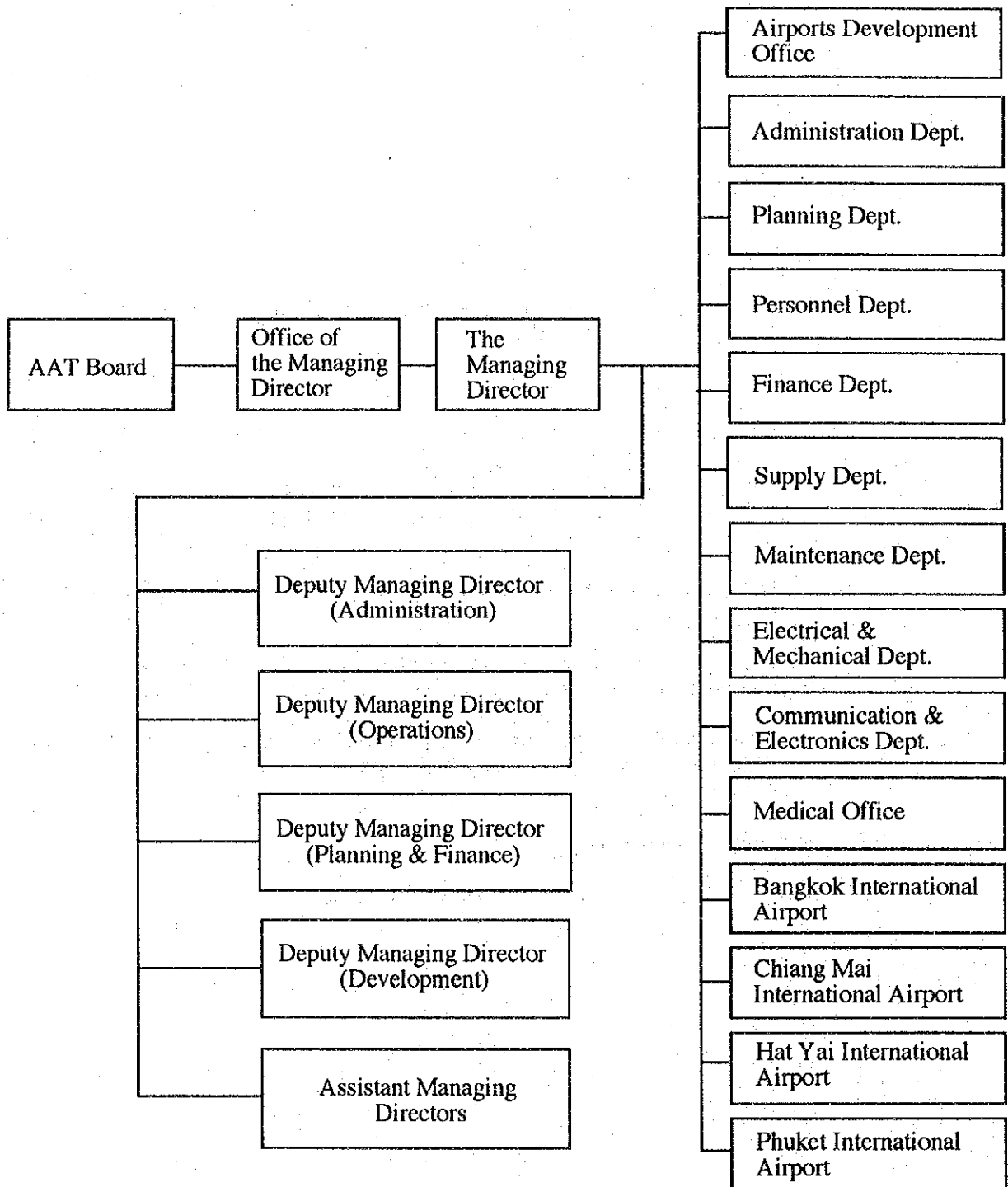
- Management and operation such as operation within the airports boundary, accommodating and servicing for aircraft, passengers, cargo and articles, security and rescue and fire fighting by Airports Authority of Thailand (AAT).
- Operation and maintaining of telecommunication services, navigation aids equipment and air traffic control by Aeronautical Radio of Thailand LTD (AEROTHAI)
- Meteorological observation and distribution of information by Department of Meteorology.

AAT has been handed over the responsibility of airport management of Phuket International Airport from the Department of Aviation since October 8, 1988.

AAT has also the responsibility of airport management for not only Phuket but also Bangkok International, Chiang Mai, and Hat Yai Airports.

### 3.6.2 Structure of Overall AAT

The overall structure of AAT is shown in **Figure 3.6.1**.



**Figure 3.6.1 Overall AAT Organizational Structure**



### 3.6.3 Financial Status of AAT

Table 3.5.2 shows the income statements of AAT. The operating revenues of AAT consist of "landing and parking charges", "passenger service charges", "aircraft service charges" rent for offices and real properties", "service revenues" and "concession revenues". The total number of air passengers excluding transit passengers of four AAT's airports increased from 12,872 thousand in 1988 to 18,226.5 thousand in 1992 and the average annual growth rate was 9.1 % per year. Meanwhile the operating revenues increased from 2,205.15 million Baht in 1988 to 4,036.71 million Baht in 1992 with the average annual growth rate of 16.3 % and the net profit for the year also increased with the average annual growth rate of 18.1 %.

**Table 3.5.2 Income Statements of AAT**

	Unit: million Baht				
	1988	1989	1990	1991	1992
Revenue and Expenses					
Operating Revenues	2,205.15	2,948.31	3,554.31	3,807.47	4,036.71
Operating Expenses	778.37	972.68	1,213.85	1,425.95	1,654.83
Operating Income	1,426.78	1,975.63	2,340.46	2,381.52	2,381.88
Other Income	188.76	288.81	453.40	692.30	633.72
Other Expenses	234.37	260.29	253.07	293.49	325.84
Net Profit for the Year	1,381.17	2,004.15	2,540.79	2,780.33	2,689.76
Number of Passengers (thousand persons)					
	12,872.4	15,619.2	17,944.2	17,089.1	18,226.5

Source: Annual Report, AAT

### 3.7 SECURITY

#### 3.7.1 Facility of Airport Security

The following facilities are provided for airport security.

- a) Security and boundary fencing along the airport boundary.
- b) X-ray detector for passenger's cabin baggage screening at the gate to waiting lounge in the passenger terminal building.

Handy type metal detectors are used for inspecting passengers.

#### 3.7.2 Procedure of Security Check

##### (1) Domestic Passengers

The separation between passengers and well-wishers is conducted at the entrance of the waiting lounge.

Departing passenger's cabin baggage is checked by X-ray detector at the entrance of the waiting lounge located on the second floor of the passenger terminal building.

##### (2) International Passengers

The security check for international departing passengers is conducted through the following procedures:

- a) Passengers must proceed to the inspector who checks passenger's luggage in front of the check-in counter.
- b) Then, prior to entering the waiting lounge, passengers must proceed to the X-ray inspection for cabin baggage and body inspection. After these inspections, passengers proceed to the immigration and customs counter.

##### (3) Cargo

At present (as of Sept. 1992) security check for cargo is performed by manual inspection and no equipment is available for security check. As cargo volume to be handled increases in the future, it may be preferable to install a security check equipment for better efficiency.

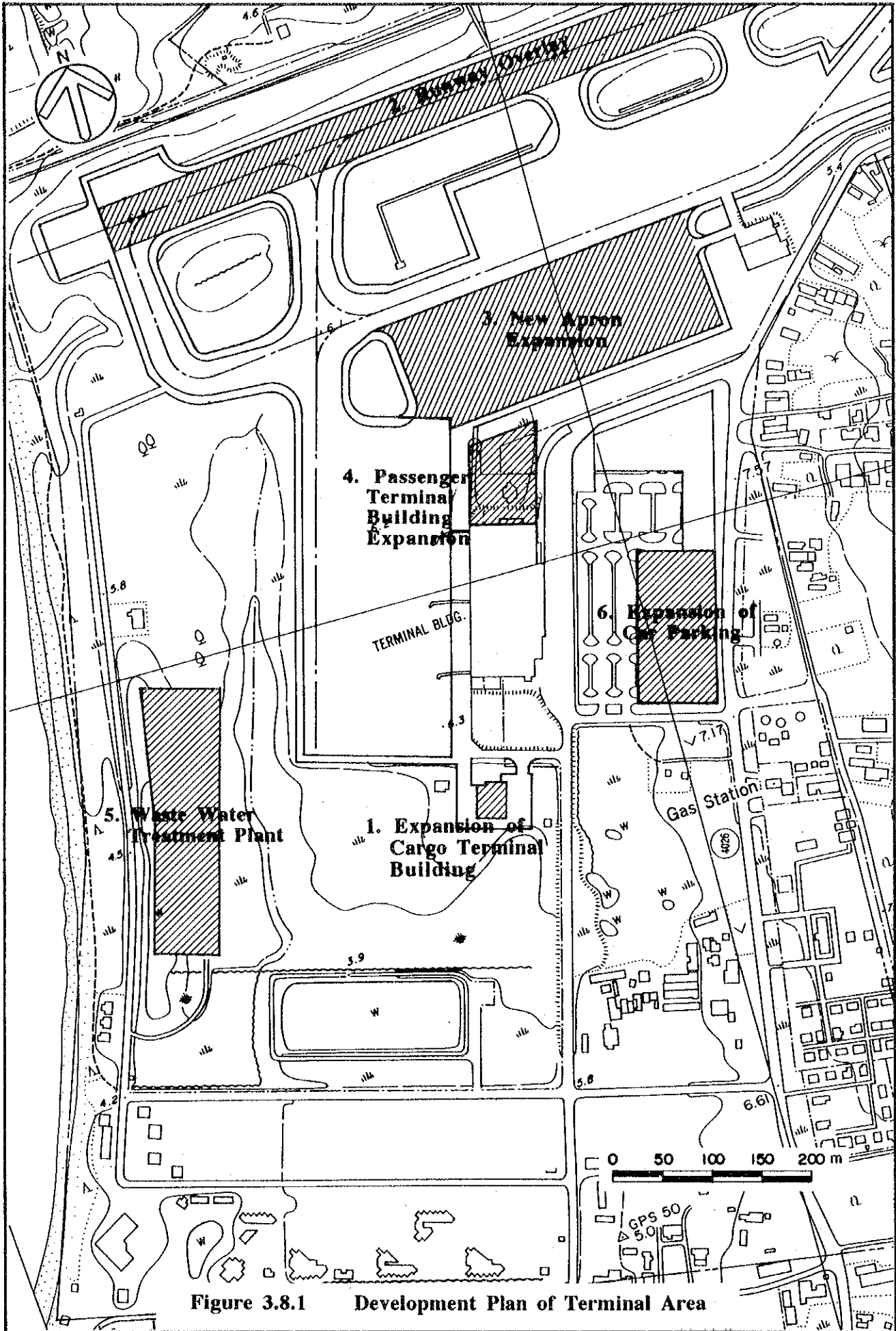
### 3.8 PRESENT DEVELOPMENT WORKS

At present, some improvement works are in progress at Phuket International Airport and several other works are planned by AAT to be executed within a few years.

**Table 3.8.1** and **Figure 3.8.1** shows the major works which are under construction or scheduled to be implemented within a few years.

**Table 3.8.1 Major Development Works**  
(As of June, 1993)

	<b>Name</b>	<b>Progress at the moment</b>	<b>Construction Period</b>	<b>Construction Cost</b>	<b>Remarks</b>
1.	Expansion of Cargo Terminal Building	Under Planning Stage	1993 - 1994		
2.	Runway Overlay	Under Construction	1993	Bht.95 mil.	t = 8 cm.
3.	New Apron Expansion (T/W side)	Under Construction	1993	Bht. 90 mil.	A300 class, 6 stands
4.	Passenger Terminal Building Expansion	Under Concept Design Planning Stage	1993 - 1995	About Bht. 300 mil.	5,400 sq.m.
5.	Waste Water Treatment Plant	Under Construction	1993	-	
6.	Expansion of Car Park	Under Concept Design Planning Stage	1993 - 1994	About Bht. 25 mil.	200 lots



**Figure 3.8.1 Development Plan of Terminal Area**

# CHAPTER 4

## AIR TRAFFIC DEMAND FORECAST



## CHAPTER 4 AIR TRAFFIC DEMAND FORECAST

### 4.1 GENERAL

This chapter discusses the traffic demand forecasts of Phuket International Airport until the target year of 2010, based on the present air traffic demand and the future economic framework for the area.

The later sections will disclose, economic framework of the country and Phuket Changwat are applied as independent variables to indicate future demand. The economic framework of the country and the area have been estimated based on the National Development Plan, population projection, sectoral master plan, etc.

Figure 4.1.1 has been prepared to provide the logic for the process.

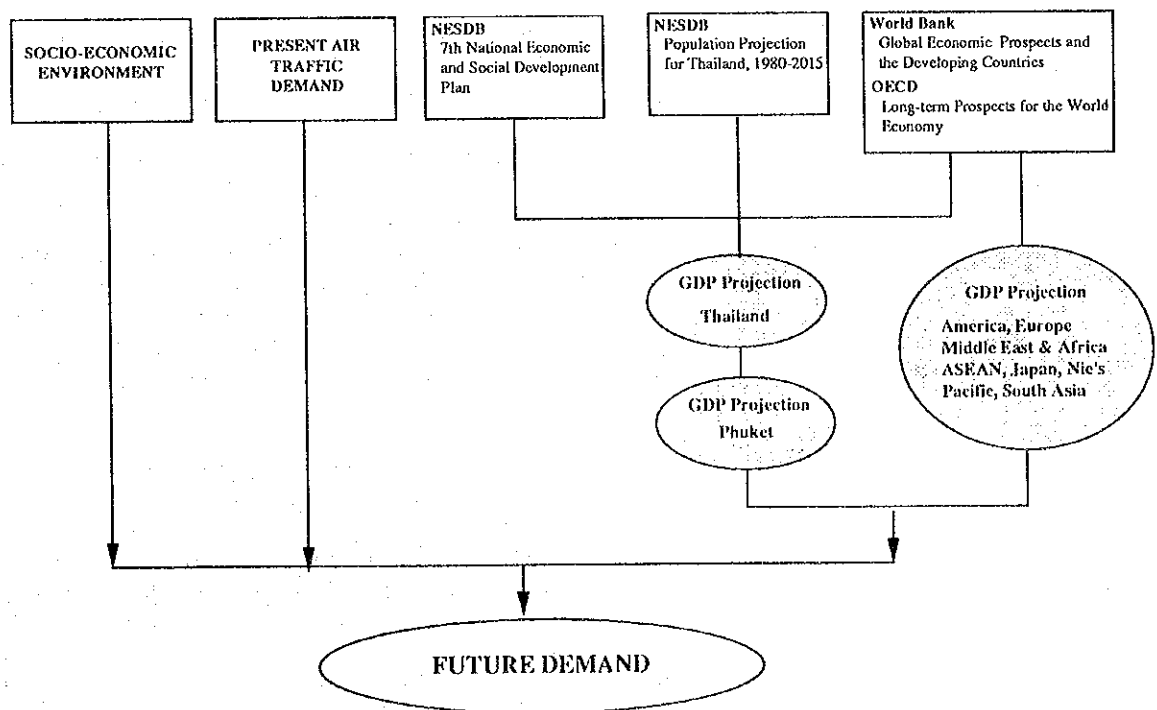


Figure 4.1.1 Workflow of Demand Forecast

## 4.2 Development Plan

### 4.2.1 General

This section describes the National Development Plan, Transport Development Plan, AAT's Development Plan and Tourism Development Plan in Phuket in order to formulate the planning framework for the country and Phuket.

### 4.2.2 National Development Plan

During the period of the Sixth National Economic and Social Development Plan (NESDP), 1987-1991, the Thailand economy has experienced a rapid growth. In spite of the high economic growth, the pattern of growth has led the Thai economy to several structural imbalances, which may become long-term development issues for the country, such as income disparities, infrastructure bottlenecks, gap between savings and investments, difficulties to adjust the structure of society to the economic changes and deterioration of natural resources and environment.

The Government has set forth the 7th NESDP (1992-1996), aiming at the balance in terms of quantitative and qualitative development dimensions, as well as social equity aspects in order to bring about more sustainable development for the country. The main objectives in the 7th NESDP are as follows:

- 1) Maintain economic growth rates at appropriate levels to ensure capability to sustain ability and stability.
- 2) Redistribute income and decentralize development to the regions and rural areas more widely
- 3) Accelerate the development of human resources, and upgrading quality of life, the environment and natural resource management.

In order to bring about a well balanced development and to attain the three development objectives, as mentioned above, the Government has also set forth the development targets in term of quantity and quality. The main targets are shown in **Table 4.2.1** in comparison with the targets and the actual performance in the 6th NESDP. The target of average economic growth rate is estimated at 8.2% per year during the planning period.

### Regional Development and Infrastructure Services to the Regions

Decentralization has been one of the most important issues in national economy and the expansion of infrastructure services to support regional urban centers is still crucial in the country's future development, as there are still bottleneck problems requiring improvement.

In 1989 the Government has announced to launch a new development program in the Southern Seaboard to promote the development of the peninsular Thailand. Krabi on the Andaman Sea and Khanom in the Gulf of Thailand have been selected as the center of development. Main components of the program are as follows:

- Land bridge connecting Krabi on the west coast and Khanom on the east coast
- Regional oil and petroleum products facilities
- Related infrastructure developments

In the 7th NESDP, Phuket is promoted to develop as a regional urban center, a deep-sea port and a center of international tourism, services and export oriented industries of the Upper South Region.



**Table 4.2.1 Major Development Targets of 7th NESDP**

	Sixth Plan (1987-1991)	Actual	Seventh Plan (1992-1996)
	Target		Target
GDP per capita in current prices ( in bahts)	27,783	44,000	71,000
GDP Growth (percentage changes at constant prices) -			
	5.0	10.5	8.2
Agriculture		3.4	3.4
Industry		13.7	9.5
Construction		18.7	8.9
Services		11.0	8.1
Consumption (percentage changes in constant prices)			
Private	3.7	9.1	5.7
Public	5.3	2.0	3.3
Investment (percentage at constant prices)			
Private	8.1	26.0	8.8
Public	1.0	6.5	8.5
Export of Goods			
Average Value(billion bahts)	290.7	496.0	1,063.0
Average Growth Rate per year	10.7	24.5	14.7
Import of Goods			
Average Value(billion bahts)	326.7	664.3	1,358.0
Average Growth Rate per year	9.5	32.6	11.4
Trade Balance			
Average Value(billion bahts)	(35.9) <sup>1)</sup>	(168.0)	(313.0)
Trade Balance/GDP(%)	2.7	(8.4)	(9.4)
Income from Tourism			
Average Value(billion bahts)	7.4	119.0	198.3
Average Growth Rate per year	7.4	27.5	13.3
Current Account Balance			
Average Value(billion bahts)	(11.8)	(99.0)	(170.3)
Current Account Balance/GDP(%)	(0.9)	(4.9)	(5.2)
Population			
Number(million)		56.9	61.0
Growth Rate(%)		1.4	1.2

Source: 6th NESDP and 7th NESDP

Note 1) : ( ) minus

#### 4.2.3 Transport Development Plan

During the 6th NESDP, some infrastructure services were inadequate to meet the strong demands of rapid economic growth, and the bottlenecks have become more severe at present.

Thai economy has an opportunity for further export expansion to the countries such as European Community, North America and the Asia-Pacific economies. Furthermore, when the political stability in Indochina countries will be realized, the prospects for trade and investment opportunities to those countries will improve and the position of Thailand will be enhanced. Together with the Government's policy to liberalize the financial sector and foreign exchange markets since 1990, Thailand is enhanced to become the region's economic and financial center.

Therefore, infrastructure development policy during the 7th NESDP will emphasize expansion of investment in the provision of basic services to ensure adequate quantity of supply at sufficiently high quality to meet the demands. Three targets for the development of transport sector proposed by the Government are as follows:

- 1) Increase capability and efficiency of transport sector to provide services which are convenient, rapid, safe and at lower costs, to support development of other sectors and enhance international competitiveness of the Thai economy.
- 2) Utilize the transport sector as the accelerator or analyst of development, leading to dispersion of development benefits to the regions and a better quality of life of the people.
- 3) Emphasize safety and quality of land, sea and air environmental conditions.

In order to attain the three targets above, the development guidelines for air transport have been set forth by the Government, as summarized below.

- 1) Promote Thailand to become the air transportation center of the Southeast Asian region by:
  - Enhancing capacity of the existing international airports and the new-coming one to provide convenient services for passengers and cargoes, and upgrade quality of services to be comparable to international standards.
  - Encouraging foreign airlines to increase regular flights to Thailand, particularly to the international airports in the regions.
  - Expanding and upgrading infrastructure facilities which are connected to airports.
  - Increasing efficiency in management and development of airlines.
  - Encouraging and facilitating air travel into Thailand for tourism purposes.
  - Encouraging cargo transport system, and
  - Considering construction of the Second Bangkok International Airport.
- 2) Increase efficiency in planning, administration, management and investment methods by:
  - Formulating long-term plans to cover a 15 year period for development and investment of various agencies.
  - Restructuring organizations involved with air transport, and
  - Supporting establishment of training institutes of personnel related to air transportation sectors within Thailand.

#### 4.2.4 AAT's Development Plan

The AAT Corporate Plan, which has been prepared by AAT every two years since 1985, is a guideline for its management policy in compliance with the country's development plan. The Government announced the 7th National Economic and Social Development Plan (NESDP) during 1992-1996 period and AAT followed with its 4th AAT Corporate Plan. Major issues of the Corporate Plan related to the 7th NESDP are defined as described below:

1) Connection with Objectives and Goals of the 7th NESDP

In line with the 7th NESDP, the AAT Corporate Plan describes AAT's policy of managing all its airports and other related businesses with the ultimate goal of supporting other businesses sectors. In order to achieve the goals, seven plans were prepared by AAT, including the development and maintenance of airports, administration, personnel, finance, marketing, services and security.

2) Relevance to Air Freight Development

The government set forth two goals for transportation development in its 7th NESDP. The first one is to promote Thailand as the pre-eminent air cargo center in the Southeast Asian Region and the second is to increase effectiveness in planning, administration, management and investment. AAT has created several focused plans to meet the goals.

3) Relevance to State Enterprise Development Plan

The 7th NESDP detailed various methods to improve efficiency of the management system of State Enterprises, such as operational systems, pricing policy, and management of the joint venture projects. AAT followed all of these methods.

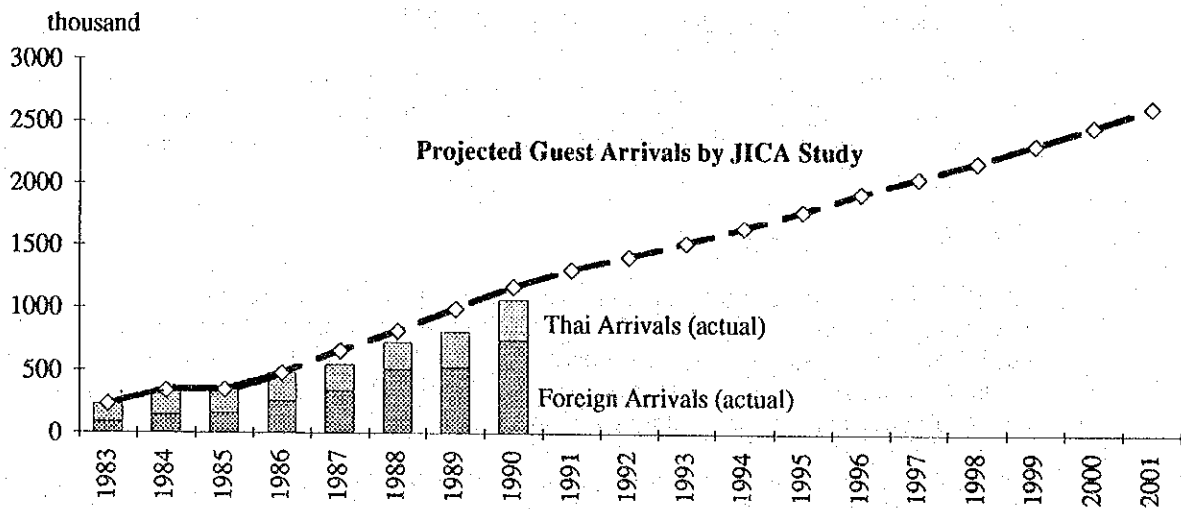
#### 4.2.4 Tourism Development in Phuket

In 1989, Japan International Cooperation Agency (JICA) had completed the study on Potential Tourism Development for the Southern Region of Thailand. In Part I of the study the Phuket cluster has been selected as a potential area for tourism development in the Southern Region of Thailand, and in Part II policies and strategies of tourism development for selected clusters was formulated.

The future tourist arrivals to Phuket up to 2001 has been projected in the study as shown in **Table 4.2.2** and **Figure 4.2.1**.

**Table 4.2.2 Projection for Guest Arrivals to Phuket**

	Actual		Projection in the Previous JICA Study					
	Total Guest Arrivals	Growth Rate	Thai	Growth Rate	Foreign	Growth Rate	Total	Growth Rate
	(thousand)	(%)	(thousand)	(%)	(thousand)	(%)	(thousand)	(%)
1983	234	22.4	147	22.4	87	14.5	234	19.3
1984	341	45.7	196	33.3	145	66.7	341	45.7
1985	345	1.2	189	-3.6	156	7.6	345	1.2
1986	477	38.3	223	17.9	254	62.8	477	38.3
1987	547	14.7	256	15.0	399	57.1	655	37.3
1988	726	32.7	295	15.0	516	30.0	811	23.8
1989	810	11.6	339	15.0	648	25.0	987	21.7
1990	1,065	31.5	390	15.0	778	20.0	1,168	18.3
1991			448	15.0	856	10.0	1,304	11.6
1996			722	10.0	1,201	7.0	1,923	8.1
2001			1,013	7.0	1,607	6.0	2,620	6.4



Source: The Study on Potential Tourism Development for the Southern Region of Thailand

**Figure 4.2.1 Projection of Guest Arrivals to Phuket**

## 4.3 PLANNING FRAMEWORK

### 4.3.1 National Planning Framework

#### Population

The growth rate of the country's population is planned to decrease to 1.2 % with a population of 61 million in 1996 according to the 7th National Plan. The long-term population projections of the whole country and by Region until 2015 were undertaken by the Working Group on Population Projections under the NESDB in 1988. The population by Changwat was also estimated up to 2000 in the projection(see **Appendix 4.3.1**).

Based on the NESDB's projection and the actual population registered at the Local Administration Department of the Ministry of Interior, the future population is estimated as shown in **Table 4.3.1**.

**Table 4.3.1 Population Forecast**

	1990	1995		2000		2005		2010	
	Population registered	Population projection	Annual growth rate 1990-1995 (%)	Population projection	Annual growth rate 1995-2000 (%)	Population projection	Annual growth rate 2000-2005 (%)	Population projection	Annual growth rate 2005-2010 (%)
Whole Kingdom	54,532	58,564	1.44	62,323	1.25	65,731	1.07	68,591	0.86
Phuket	168	193	2.80	219	2.54	242	2.00	267	2.00

Source: Population Projection for Thailand, 1980-2015, NESDB adopting the case of "Medium Fertility Assumption" and "Constant Migration Assumption"

Note: The growth rate of Phuket during the period of 2000-2010 is estimated by JICA Study.

#### Production

National Domestic Product (GDP) of the country during the planning period for the master plan up to 2010 has been estimated based on the historical records of the country's GDP, the Seventh National Economic and Social Development Plan (1992 - 1996) and the GDP projection by international agencies; the "Global Economic Prospects of the Developing Countries" by the World Bank and the "Long-term Prospects for the World Economy" by OECD (see **Figure 4.1.1**).

For the preparation of the master plan of Phuket International Airport, national economic framework has been estimated as shown in **Table 4.3.2**.

**Table 4.3.2 National Economic Framework (Whole Kingdom)**

	GDP	Population	Per capita GDP	
	Avg. Annual Growth	Avg. Annual Growth	(Bahts at 1990 prices)	(US\$) 1)
1985-90 (actual)	9.9 %	1.73 %	38,509	1,481
1995	7.0	1.44	50,293	1,934
2000	6.0	1.25	63,244	2,432
2005	5.0	1.07	76,532	2,944
2010	5.0	0.86	93,604	3,600

Note: 1) Converted by using the exchange rate of US\$ 1.00=Bahts 26.00

#### 4.3.2 Planning Framework of Phuket

According to the population projections described above, the growth rate of the country's population is estimated to slow down to 0.77 % in 2010 from 1.52 % per year in 1991. Meanwhile, the growth of Phuket is estimated to remain at a high level of 2.50 % in 2000. In 2000, the population of Phuket is estimated to amount to 219,000 with an average growth rate of 2.54 % during the 1995-2000 period. As the population projection beyond the year 2000 by Changwat has not been prepared by the NESDB's projection, the growth rate in Phuket has been estimated to grow at 2.00 %, slightly below the rate in the late 1990's, by the JICA Study.

Per capita GPP in Phuket has been assumed to grow at a level of US\$ 2,900 in 1990 to a level of US\$ 7,000 in 2010 with the same growth rate as national level.

Provincial economic framework for Phuket is estimated in **Table 4.3.3**.

**Table 4.3.3 Provincial Economic Framework of Phuket Changwat**

	GDP	Population	Per capita GDP	
	Avg. Annual Growth	Avg. Annual Growth	(Bahts at 1990 prices)	(US\$) 1)
1985-90 (actual)	16.0 %	2.66 %	75,699	2,912
1995	8.5	2.80	98,863	3,802
2000	7.4	2.54	124,321	4,782
2005	6.0	2.00	150,442	5,786
2010	6.0	2.00	184,000	7,077

Note: 1) Converted by using the exchange rate, US\$ 1.00=Bahts 26.00

#### 4.3.3 Global Economic Prospects

Country's tourism development is essential not only for international air traffic but also domestic air traffic. Particularly in Thailand the effect of world economy on the growth of air passengers is remarkable, as the share of foreign tourists is high in both international and domestic passengers in Thailand. Therefore the global economic prospects, which affect international tourist demand, have a significant influence on air traffic demand.

In order to project the future volume of foreign passengers for international and domestic air traffic in Thailand, the GDPs of major countries in the world have been estimated based on the two studies for the future world economy; "Global Economic Prospects and the developing Countries" by the World Bank in 1992 and "Long-term Prospects for the World Economy" by OECD in 1992.

The major origins of the countries for international passengers have been classified into five regions; America, Europe, Middle East & North Africa, Pacific and Asia, and the Asian area has been divided into four regions furthermore; ASEAN, Asian NIE's, Japan and South Asia, as the share of Asian passenger is/will be increasing (40 % in 1991) and the increase rates of those passengers differ among those regions.

**Table 4.3.4** shows the respective projections for annual growth rate of GDP by region.

**Table 4.3.4 Projection for Annual Growth Rate of GDP by Region**

	America	Europe	Middle East & North Africa	East Asia			Pacific	South Asia
				ASEAN	Japan	NIEs		
1985-1990 (actual)	3.0	3.0	0.0	6.1	4.6	9.6	2.4	5.4
1991-1995	3.0	3.0	4.0	7.0	4.0	7.0	5.0	5.0
1996-2000	3.0	3.0	4.0	6.0	4.0	5.0	5.0	5.0
2001-2010	2.5	3.0	3.0	5.0	3.0	5.0	4.0	4.0

Source: "Global Economic Prospects and the developing Countries" by the World Bank in 1992  
 "Long-term Prospects for the World Economy" by OECD in 1992  
 "World Development Report" by the World Bank

#### 4.4 AIR TRAFFIC DEMAND

##### 4.4.1 General

Air traffic demands for the airports, which are the principal planning factors for all airport facilities, have been forecasted up to the year 2010 covering the following categories:

- a) International Passengers
- b) Domestic Passengers
- c) International Freight
- d) Domestic Freight
- e) Aircraft Movement

The results of demand forecast are shown in **Table 4.4.1**.

**Table 4.4.1 Results of Demand Forecast**

	1995	2000	2010
International Passengers (thousand)	1,093	1,749	3,105
Domestic Passengers (thousand)	1,492	2,039	3,701
Total Passengers (thousand)	2,585	3,788	6,806
International Freight (tons)	1,544	2,370	4,615
Domestic Freight (tons)	4,581	7,262	14,574
Total Freight (tons)	6,125	9,632	19,189
International Aircraft Movement	6,500	9,000	14,400
Domestic Aircraft Movement	5,100	8,400	15,300
Total Aircraft Movement	11,600	17,400	29,700

##### 4.4.2 Previous Demand Forecasts

The Airport System Master Plan Study in Thailand (**ASMPS**) has been completed by AAT in 1990, which includes a coordinated development master plan for the four international airports which are the responsibility of AAT; Bangkok, Chiang Mai, Hat Yai and Phuket International Airports. Air traffic demands were projected up to 2010 for whole country and the respective airports including Phuket International Airport. ASMPS is the latest authorized master plan for Phuket International Airport in AAT.

The Study on air travel demand and capacity, "the Asia-Pacific Aircraft Movement Forecast" has been conducted by the International Air Transport Association (**IATA**) in May 1992 in which air traffic demands for selected seven airports in Asian-Pacific region including Bangkok International Airport have been projected for the period up to the year 2010.

The results of demand forecast in two studies have been referred in the process to ensure the forecast of the JICA Study. Apart from the two studies, a number of forecasts have been prepared for Bangkok International Airport during the 1980's and main forecasts including two studies are shown in **Table 4.4.2**.



**Table 4.4.2 Previous Air Traffic Forecasts of International Passengers and International Freights for Bangkok International Airport**

	International passengers (millions)		International freight (thousands of tons)	
	1995	2010	1995	2010
NACO, 1983	14.8	28.5	480	1,400
ICAO, 1984	14.0	27.0	450	1,050
ICAO/UNDP, 1988	15.4	36.3	592	2,320
ASMPS, 1990				
(Bangkok)	18.2	40.5	785	2,432
(Whole Kingdom)	19.2	43.8	790	2,469
(Phuket)	0.5	1.3	1	6
IATA, 1992				
(Bangkok)	17.3	48.8		
(Whole Kingdom)	19.0	55.2		

Source: Airport System Master Plan Study in Thailand, AAT  
Asia-Pacific Aircraft Movement Forecast, IATA

4.4.3 Air Passenger Demand Forecast

(1) Characteristics of Air Passengers at Phuket International Airport

Figure 4.4.1 shows the routes of access for air passengers to Phuket. International passengers consist of foreign passengers and Thai passengers, and domestic passengers also consist of foreign passengers and Thai passengers. Air passengers to Phuket are categorized into four groups according to the routes of their access to Phuket International Airport (HKT) as shown in Table 4.4.3.

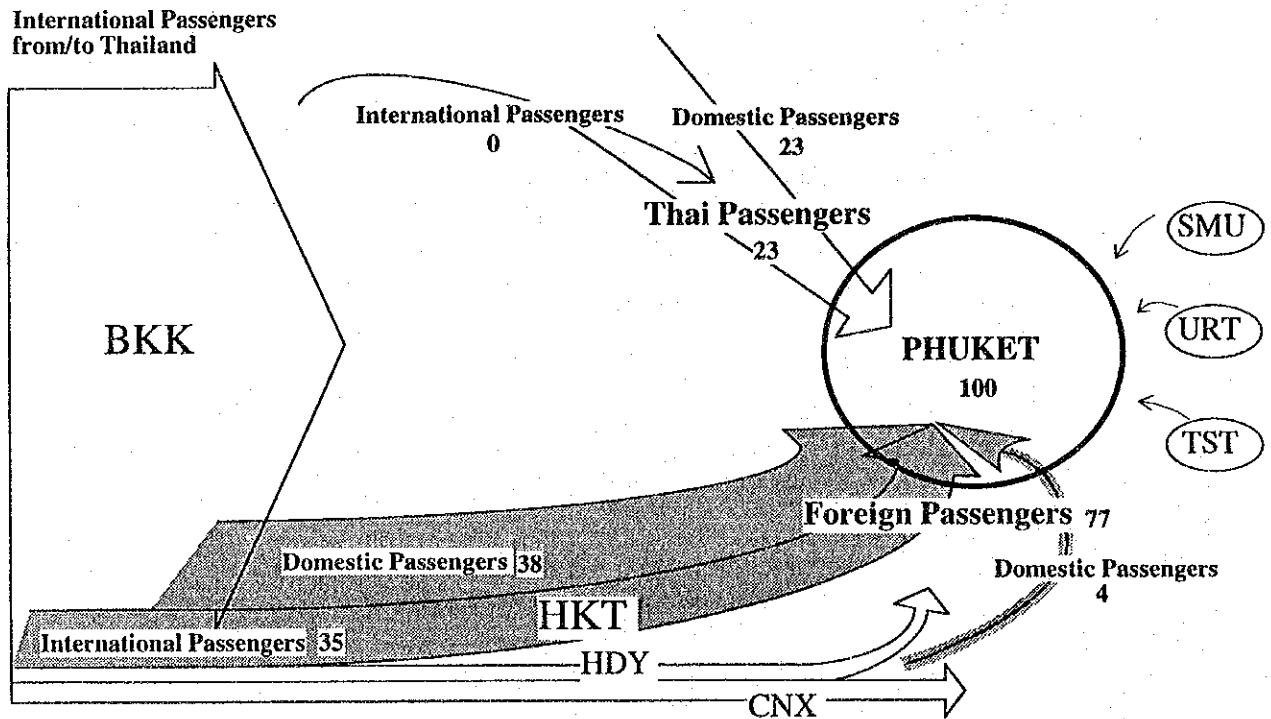


Figure 4.4.1 Air Passengers Access to Phuket International Airport

**Table 4.4.3 Route of Access to Phuket International Airport**

1) Foreign International Passengers:	arrive at HKT by international flights or arrive at Bangkok International Airport as international transit passengers and travel to HKT by domestic flights. The share of this group is estimated at 35 % of total passengers in HKT.
2) Foreign Domestic Passengers through Bangkok International Airport or other airports:	arrive and pass CIQ at Bangkok International Airport (and occasionally stay in Bangkok) and travel to HKT by domestic flights, or arrive at HKT from other airports such as Hat Yai, Chiang Mai, Samui, Surat Thani and Trang by domestic flights. The share of this group is estimated at 42 % of total passengers in HKT.
3) Thai International Passengers:	arrive at HKT by international flights or arrive at Bangkok International Airport as international transit passenger and travel to HKT by domestic flights. The share of this group is very small.
4) Thai Domestic Passengers from Bangkok International Airport or other airports:	arrive at HKT from Bangkok International Airport or other airports in Thailand as domestic passengers. The share of this group is estimated at 23 % of total passengers in HKT.

The share of each group in total air passenger from/to HKT presented in **Figure 4.4.1** and **Table 4.4.3** has been estimated based on the following:

- 1) The traffic data from January to June 1992 provided by AAT report that the share of international passengers at HKT was 34 %.
- 2) According to the immigration records, the share of Thai nationals of international air arrivals and departures was approximately 1 %.
- 3) According to the results of passenger interview survey of JICA Study and the report by Thai International Airways, the share of foreign passengers in the domestic flights between Bangkok International Airport and HKT is estimated approximately at 65 % and the rest are Thai passengers.
- 4) According to the traffic data by flight provided by Thai International Airways, foreign domestic passengers from airports other than Bangkok International Airport is estimated to be 4 % of the total passengers at Phuket International Airport.

It is necessary to clarify words used in demand forecast properly:

- a. Passengers: Unless otherwise noted, are totals of disembarking and embarking, excluding transit.
- b. International: means activity with one point of origin/destination within Thailand and the other outside Thailand.
- c. Domestic: means activity with origin/destination within Thailand
- d. Aircraft movement: are either landings or takeoffs, counted separately.
- e. Tourist: any person visiting Thailand for any reason other than to exercise remunerated activity within Thailand. Person must stay at least 24 hours but no longer than 60 days.
- f. Out-going Thais: Thai citizens leaving the Kingdom.
- g. Non-tourist traveler: All foreigners who have residence in Thailand leaving the Kingdom temporarily.
- h. Accommodation establishments: Place in which rooms are provided for tourists, such as hotel, guest-house and bungalows.

In Phuket International Airport, the share of foreigners in total air passengers are estimated at 77 %; 35 % for international passengers and 42 % for domestic passengers. Thai domestic passengers share 23 % of the total.

Future traffic demand of international passengers is largely influenced by the economic growth of their own countries, as the purpose of travel to Phuket for foreign passengers is to spend holidays. As for future demand of domestic passengers, it is usually domestic economic factors that represent a strong influence on the traffic of domestic passengers, when the share of foreign passengers in domestic passengers is small. In Phuket International Airport, however, it is not only the economic growth of Thailand but also the global economic factors that have a significant influence on growth of domestic passengers, due to the high share of foreign passenger in domestic traffic.

Therefore the future passenger demand for Phuket International Airport has been separately projected not in terms of international passengers and domestic passengers but in terms of foreign passengers and Thai passengers.

Firstly the future traffic demand for international passengers from/to Thailand has been projected in order to assume the growth model of foreign passengers in Thailand.

Secondly demand of domestic passengers for the whole country has been prepared.

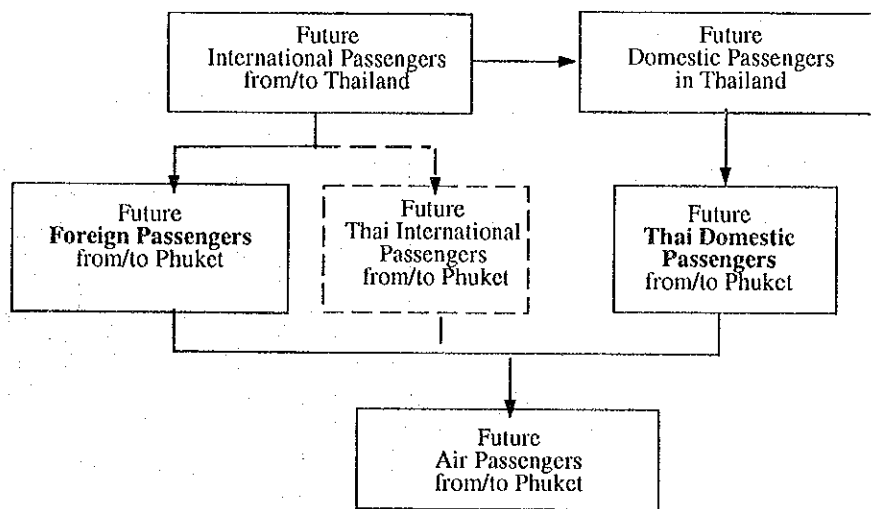
Thirdly demand of foreign passengers from/to Phuket (for both international and domestic passengers) has been projected based on the results of demand forecasts of international passengers from/to Thailand.

Fourthly demand of Thai domestic passengers from/to Phuket has been projected based on the demand of domestic passengers in the whole of Thailand.

Finally the total future traffic of air passengers from/to Phuket International Airport has been projected in terms of foreign passengers and Thai passengers. Total demand of air passengers has been allocated to international passengers and domestic passengers.

As the demand of Thai nationals in international passengers is estimated to be very small, it has been assumed that their share will be constant up to 2010.

The process of the passenger forecast is shown **Figure 4.4.2.** and **4.4.3.**



**Figure 4.4.2** Process of Air Passenger Demand Forecast for Phuket International Airport

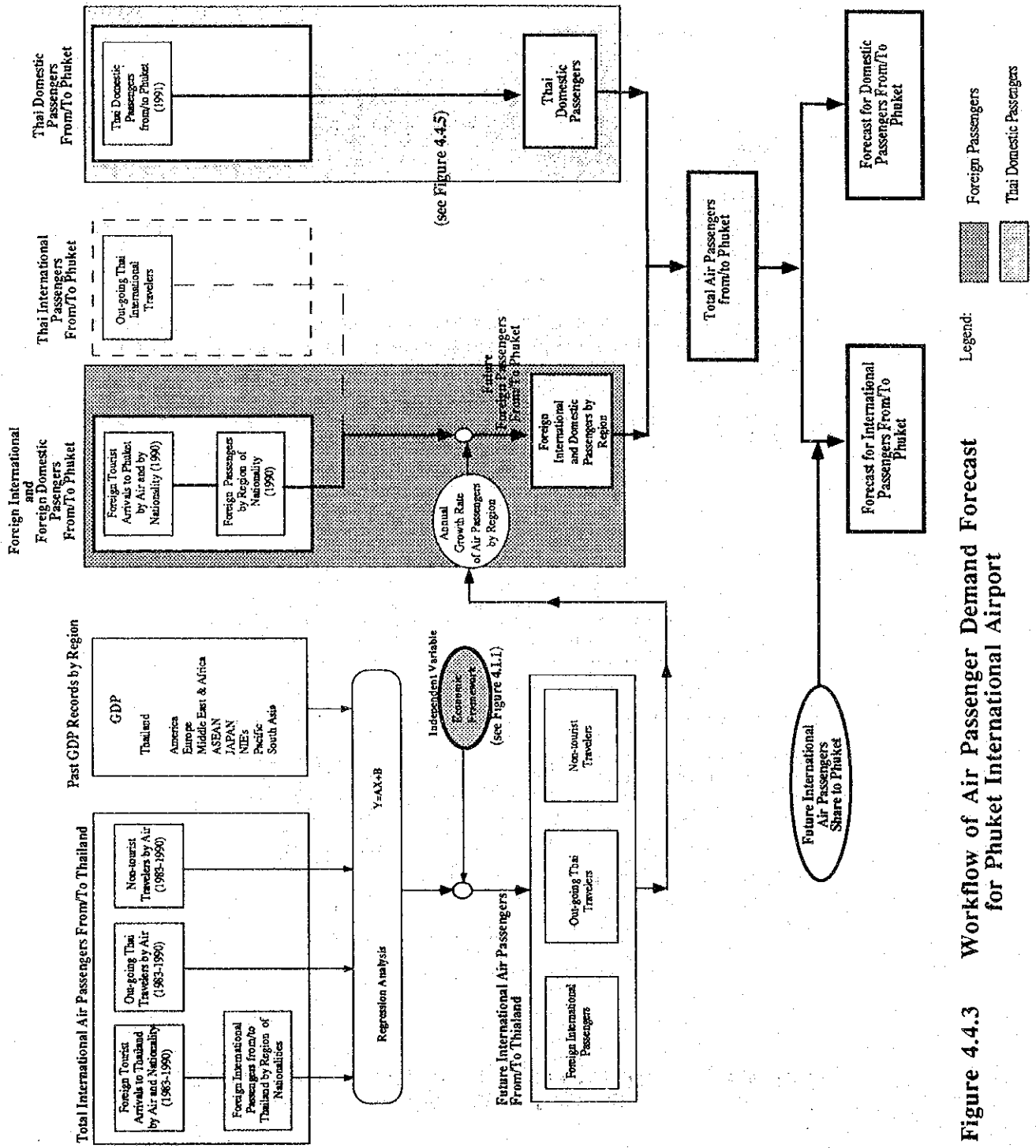


Figure 4.4.3 Workflow of Air Passenger Demand Forecast for Phuket International Airport

(2) International Passenger From/To Thailand

International passengers from/to Thailand are classified into three categories or ten market segments; foreign tourists from eight regions in the world, out-going Thai travelers and non-tourists travelers.

Future international traffic demand for ten market segments has been projected in the process shown in **Figure 4.4.3**, using an econometric model as follows:

- 1) The number of international passengers is the "dependent variable" and the GDPs of respective market segments have been selected as "independent variables".
- 2) Historical data (1983-1990) and future estimates (1992-2010) of the "independent variables", the GDPs for respective markets are prepared in **Appendix 4.4.1** and **4.4.2**, based on the planning framework described in the previous section. Historical data of "dependent variables" (1983-1990), number of international passengers, have been prepared in **Table 4.4.4**.
- 3) The relationship between the dependent and the independent variables during the period 1983-1990 has been specified for respective ten markets, using the following linear model:

$$Y = AX + B$$

where, Y (Dependent Variable): International Passengers  
 X (Independent Variable): GDP  
 A and B (Coefficient): Model Parameters

The model parameters and the coefficients of determination ( $R^2$ ), which were obtained by regression analysis between dependent and independent variables are shown in **Table 4.4.5**.

**Table 4.4.5 Parameter and Coefficient of Determination( $R^2$ )**

	Independent Variable	Correlation Coefficient		$R^2$	
		A	B		
America	GDP(*1)	0.359	-1187.017	0.958	Y=AX
Europe	GDP(*2)	2.717	-7435.287	0.966	
Africa and Middle East	GDP(*3)				
East Asia (ASEAN)	GDP(*4)	4.410	-606.828	0.989	
East Asia (JAPAN)	GDP(East Asia)	1.198	-2120.146	0.940	
East Asia (NIES)	GDP(*5)	18.512	-1818.763	0.927	
Pacific	GDP(*6)	7.591	-1321.025	0.811	
South Asia	GDP(South Asia)	1.553		0.771	
Out-going Thais	GDP(Thailand)	3.255	-254.856	0.960	
Non-tourist Travelers	GDP(Thailand)	2.936	-783.874	0.990	

Note: Weighted GDP (see Appendix 4.4.1 and 4.4.2) for:

- \*1 USA + Canada
- \*2 W. Germany + France + UK + Italy
- \*3 Middle East + North Africa
- \*4 Indonesia + Malaysia + Philippines + Singapore
- \*5 Korea + Hong Kong
- \*6 Australia + New Zealand

**Table 4.4.4 International Passengers From/To Thailand by Market Segments (1983 - 1990)**

	1983	1984	1985	1986	1987	1988	1989	1990
<b>International Tourists</b>								
America	336,764	369,728	413,006	465,148	546,408	627,668	698,450	731,512
Europe	887,976	919,336	982,008	1,193,818	1,625,389	2,056,960	2,311,388	2,531,984
Middle East & Africa	190,224	231,422	229,946	247,134	272,346	297,558	278,148	213,452
East Asia (ASEAN)	449,636	491,170	511,192	539,770	615,885	692,000	768,530	865,026
East Asia (JAPAN)	443,670	438,778	436,554	512,290	701,846	891,402	1,083,622	1,259,812
East Asia (NIES)	380,648	418,346	501,594	657,130	915,291	1,173,452	1,745,008	2,038,114
Pacific	147,554	158,892	185,908	194,938	250,524	306,110	443,108	497,654
South Asia	339,784	393,496	433,626	411,372	473,256	535,140	480,192	507,608
Sub-total	3,176,256	3,421,168	3,693,834	4,221,600	5,400,945	6,580,290	7,808,446	8,645,162
<b>Out-going Thais</b>	n.a.	1,016,494	916,234	1,082,766	1,301,210	1,466,542	1,601,316	1,766,656
<b>Non-fourist Travelers</b>	n.a.	1,082,252	1,214,140	733,108	560,630	709,483	877,656	1,091,145
Sub-total	1,984,842	2,098,746	2,130,374	1,815,874	1,861,840	2,176,025	2,478,972	2,857,801
<b>Total</b>	5,161,098	5,519,914	5,824,208	6,037,474	7,262,785	8,756,315	10,287,418	11,502,963

Unit:persons



- 4) The performance of equation models obtained above has been examined by the followings tests:

- the coefficient of multiple determination,  $R^2$  Test
- T Statistics

$R^2$  in every case other than "Africa and Middle East" shows a satisfactory figure to confirm the "goodness of fit" of the estimated relationship and T statistics in every case other than "Africa and Middle East" show the significant relationships between the variables.

As a results of regression for Africa and Middle East region was not satisfactory, the future demand of Africa and Middle East has been assumed by using a growth rate of 5 % up to 2000 and 4 % during 2001-2010, a slightly higher level of the GDP growth of its region. The effect of the traffic from Africa and Middle East regions on total traffic is very small, as its share of total international air passenger was 2.5 % in 1990.

- 5) Adopting the equation model and the estimation of independent variables in future, the "dependent variables", the traffic forecasts of international passengers have been derived.

The traffic of international passengers from/to Thailand has been projected to amount to 23.0 million in 2000 and 40.3 million as shown in **Table 4.4.6, 4.4.7 and Appendix 4.4.3**, after some adjustments as follows:

- 1) The actual figure of international passengers in 1991 and the estimated figures for 1992 have been employed.
- 2) The demand curve from 1993 up to 2010 obtained in the above econometric model has been shifted in parallel; that is the demand from 1993 to 2010 has been forecasted by using the growth rates which were obtained by the econometric analysis.

**Figure 4.4.4** compares the result of demand forecast for international passengers from/to Thailand with the forecasts of the previous studies. The projection in JICA Study remains at a slightly low level than the projections in other studies, mainly due to the unexpected decline of air traffic in 1991.

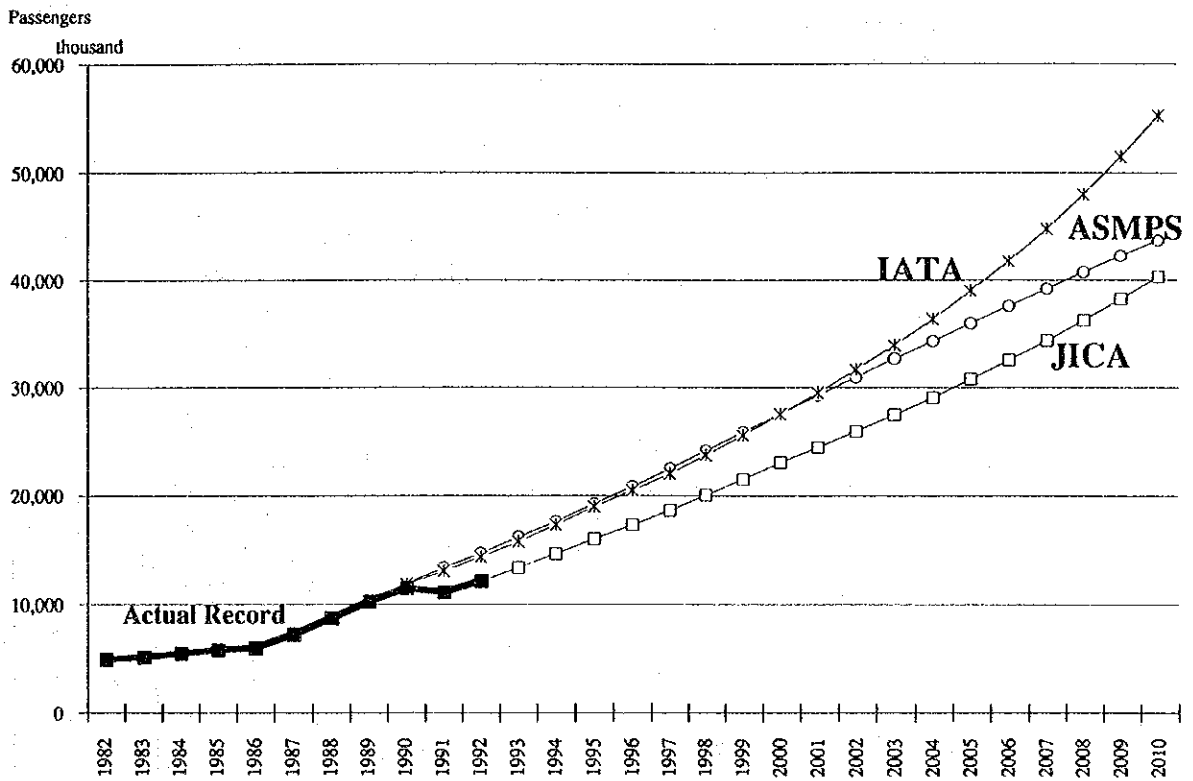
**Table 4.4.6 Forecast for International Passengers From/To Thailand (1991-2010)**

	Unit:thousand				
	1991	1995	2000	2005	2010
America	645	920	1,255	1,576	1,939
Europe	2,386	3,485	5,100	6,973	9,143
Middle East & Africa	199	242	309	376	457
ASEAN	856	1,227	1,799	2,425	3,223
Japan	1,063	1,521	2,207	2,821	3,533
Asian NIEs	1,971	2,946	4,204	5,811	7,860
Pacific	399	666	1,125	1,586	2,146
South Asia	494	623	796	968	1,178
Non-tourist travelers	1,188	1,806	2,680	3,636	4,855
Sub-total of					
Foreign Passengers	9,201	13,435	19,476	26,170	34,334
Out-going Thais	1,924	2,602	3,567	4,621	5,967
Grand-total	11,126	16,037	23,043	30,791	40,301

Note: Transit passengers are not included.

**Table 4.4.7 Projected Average Annual Growth Rate of International Passengers From/To Thailand (1991-2010)**

	1991-1995	1996-2000	2001-2005	2006-2010
America	9.3%	6.4%	4.7%	4.2%
Europe	9.9%	7.9%	6.5%	5.6%
Middle East & Africa	5.0%	5.0%	4.0%	4.0%
ASEAN	9.4%	8.0%	6.2%	5.9%
Japan	9.4%	7.7%	5.0%	4.6%
Asian NIEs	10.6%	7.4%	6.7%	6.2%
Pacific	13.6%	11.1%	7.1%	6.2%
South Asia	6.0%	5.0%	4.0%	4.0%
Non-tourist travelers	11.0%	8.2%	6.3%	6.0%
Sub-total of				
Foreign Passengers	9.9%	7.7%	6.1%	5.6%
Out-going Thais	7.8%	6.5%	5.3%	5.2%
Grand-total	9.6%	7.5%	6.0%	5.5%



**Figure 4.4.4 Forecast for International Passenger From/To Thailand**

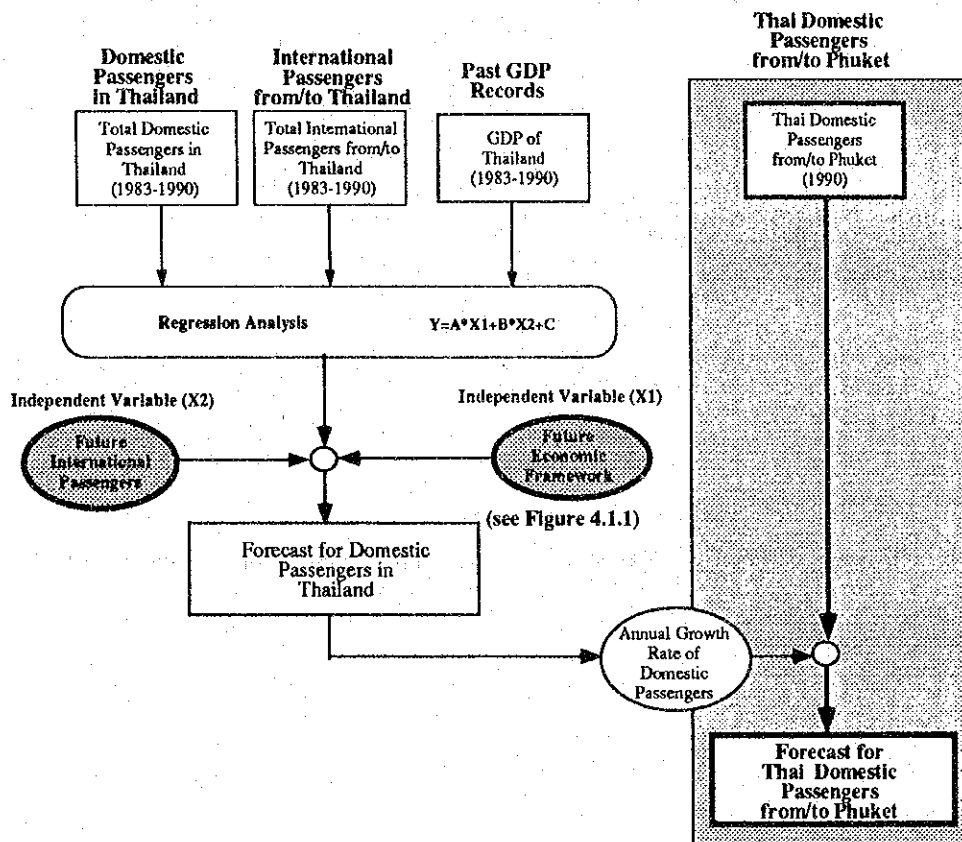
(3) Domestic Passengers in Thailand

International passengers will affect the demand of domestic passengers, as the international air services will continue to heavily concentrate at Bangkok International Airport and the foreign tourists will share a considerable portion of domestic passengers in Thailand in future.

Total domestic passengers in Thailand has been estimated using the following multiple linear model in which the GDP of Thailand and number of international passengers were adopted as independent variables (see **Appendix 4.4.4**). The process of forecast is prepared in **Figure 4.4.5**.

$$Y = AX_1 + BX_2 + C$$

where, Y (Dependent Variable): Domestic Passengers  
 X<sub>1</sub> (Independent Variable): GDP of Thailand  
 X<sub>2</sub> (Independent Variable): International Passengers  
 A, B and C (Coefficient): Model Parameters



**Figure 4.4.5 Workflow of Domestic Passengers Forecast in Thailand**